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THE BEOTHUK INDIANS.

BY ALBERT S. GATSCHET.

Third Article.

(*Read before the American Philosophical Society, January 3, 1890.*)

Among the three vocabularies which I have recently had the good fortune of receiving, there is one just as old as the century, and another comes from an aged person who has actually heard words of the language pronounced by a Beothuk Indian. I take pleasure in placing these lists before the Society, together with a number of new ethnographic facts gathered in the old haunts of the extinct race, which will prove to be of scientific value.

BIBLIOGRAPHY.

Since my first article the following publications on the Beothuk Indians have come to my notice :

Blake, Mrs. Edith: "The Beothuk Indians," in the monthly periodical, *Nineteenth Century* (Kegan & Co., publishers, London), December, 1888, pp. 899–918. This article contains important extracts from J. Cartwright's manuscript and interesting details about Shanandithit. An American reprint of the *Nineteenth Century* is published by Leonard Scott, New York City.

Murray, Chas. Aug. (author of the "Prairie Bird," etc.): "The Red Indians of Newfoundland." Philadelphia : T. B. Peterson, 98 Chestnut street (no date, about 1850 ?) ; illustrated. The book is pure fiction ; the first chapter alone contains some ethnologic points.

New York Herald, Correspondence of. Date specified below.

Stearns, Winfrid Alden : "Labrador : A Sketch of its Peoples, its Industries," etc. Boston : Lee & Shepard, 1884. Small 8vo, 8 and 295 pages. The description, pp. 254–272, suggests interesting comparisons of the Labrador Indians with the Beothuks.

Storm, Prof. Gustav : "Studies on the Vineland Voyages." In Mémoires de la société royale des antiquaires du Nord ; nouvelle série. Copenhague, 1888. 8vo. The Beothuks are spoken of, pp. 361, 362. Storm assumes, that the Helluland of the Norse explorers was Labrador; Vineland, Nova Scotia ; Markland, Newfoundland.

The Harbor Grace Standard and Conception Bay Advertiser : Linguistic and biographic article. Date specified below.

ETHNOGRAPHIC NOTES.

While returning from one of his annual explorations in the autumn of 1882, Mr. James P. Howley met Mr. Duggan, who owns a settlement at La Scie, one of the more northern harbors of Newfoundland, in northeast part of the isle ; he informed him that numerous stone implements and utensils had at various times been found in his neighborhood, especially at Pacquet and Fleur-de-lys harbors,* and that the officers of the French men-of-war, as well as the fishermen of that nationality, who annually frequent that part of the island, took away many of these relics. He noticed that the marine officers took special care in collecting such specimens, and hence they may have been commissioned to do so by one or some of the scientific institutions of France. At Fleur-de-lys, he stated, many stone pots were found, the material having been evidently quarried from the steatite rock occurring in the neighborhood. Many cavities are seen in the rock corresponding with the size of the pots themselves, while others are still there half-grooved out. His description of the process, by which he supposed the Indians performed this difficult task, struck Mr. Howley forcibly as being identical with the one described in Lieut. Geo. M. Wheeler's "Reports," Vol. vii, pp. 117–121 ("The Method of Manufacture of Soapstone Pots." By Paul Schumacher; with illustration exhibiting method, p. 121).

A pipe of black marble found on an island in White Bay, and given away by Mr. Duggan's father to one of the French ship captains about 1850, had a large bowl and was beautifully finished, but part of the stem was broken off. The carved figure of what seemed to be a dragon rested against the inner side of the bowl, with its head projecting over the edge of the latter, while the tail was twisted around the stem (a similarly carved pipe from Vancouver's Island was deposited in the Geological Museum, Ottawa). Before this it had always been asserted that the Beothuks were not acquainted with tobacco or any narcotic usages ; but they had a word for *tobacco*, nechwa, and *kinnikinnik* as well as *red-rod* are abundant upon the island ; when the Micmacs have run short of the white man's tobacco, they make use of these. Black marble exists not far from where the pipe was found.

While engaged in locating land and making a survey of the Bay of

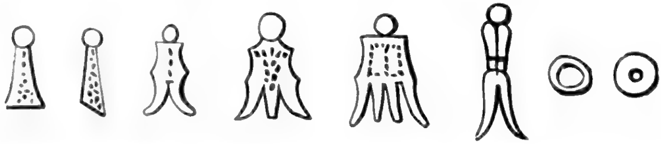
* Fleur-de-lys island and harbor is situated near Partridge Point, in 50° 7″ Lat.

Exploits during the summer season of 1886, Mr. J. P. Howley had the opportunity of conversing with some of the oldest settlers, who saw and remembered well the last individuals of the Red Indian race. He also collected a number of relics from an old burial place of theirs, which was known as such to the fishermen for the last thirty-five years, and hence had been ransacked repeatedly and by different parties. Lloyd visited it when there and took away everything he could find. While overhauling this interesting spot, Mr. Howley found a number of curiously fashioned and carved bone ornaments, with fragments of human skeletons scattered about. The latter appear to be of little scientific value. In another part of the Great Bay of Notre Dame, the interesting and valuable find of the mummified body of a boy, about ten years old, was made. Besides this, the following objects were found there and afterwards placed on exhibition at St. John's, in 1886:—the skull and leg bones of an adult male, several stone implements, a large number of ingeniously carved bone ornaments, models of canoes, cups, dishes, etc., made of birch bark, beautifully sewn together and all daubed with red ochre; fragments of deer-skin dresses, models of bows, arrows, paddles, a package of dried fish bound up in a casing of birch bark, and other articles. In the mummy a few of the neck vertebræ are disconnected, and one of the hands is missing, but otherwise the body of the boy is perfectly preserved. It is doubled up with the knees against the stomach, feet slightly crossed, arms folded across the chest, and when found it lay on the left side. The skin is intact, even the finger and toe nails being uninjured. The fleshy portions appear to have dried up completely, leaving only the bones encased in the shrunken and wrinkled skin, which latter has the appearance of dressed deer skin or well-tanned chamois. The whole was encased first in a deer-skin robe, then placed into a casket of birch bark neatly and closely sewn together, being apparently almost air-tight. The mummy bore a close resemblance to the Alaskan mummy preserved in the National Museum in Washington, and described by Mr. William H. Dall, in Vol. xxii of "Smithsonian Contributions to Knowledge," 1878, 4to. The reason why this body was interred with so much care, provided with fine and new clothing and accompanied with food, tools and spare garments, must be sought for in the *tender years* of the deceased child, which needed more care and support on its peregrinations toward the future abode of the soul than an adult would require.

The same find is referred to in the article on the Beothuk by Mrs. Blake, and in a correspondence of *The New York Herald* from St. John's, N. F., dated October 23, 1886, where the locality is distinctly specified as being on *Pilley's island*, Notre Dame Bay. That bay may be described as forming the northern part of the Bay of Exploits, one of the old homes of the Red Indian people; the island is situated about 55° 42′ Long. west of Greenwich, and 49° 35′ Lat. The *Herald* correspondent adheres to the old and mistaken idea that the Beothuks are a branch of the Algonkin family. His statements, not included in the reports of others, are as follows:

"Only a few relics of the Beothuks have been preserved ; they are either in private hands, or on exhibition in the Newfoundland Museum. * * * In the Pilley island excavation the skull of an adult was found in an excellent state of preservation. It has the characteristics of the skull of a savage, but it is well shaped and pretty well developed in the intellectual region * * * and proves that the 'Bethuks' were by no means of a low type. * * * Only three bones of the skeleton were found along with the skull. * * * But the greatest curiosity is the nearly perfect skeleton of a young 'Boethic' nine or ten years of age. The body had been wrapped in birch bark, doubled together, laid on its side and covered with a heap of stones ; * * * it has somewhat the appearance of a mummy. The skull is detached from the body, the vertebræ of the neck having been destroyed or removed. It is well shaped and in a good state of preservation. In addition, there are in the collection specimens of beautifully finished arrow-heads, small models of canoes made of birch bark, bone ornaments, * * * which, according to the Indian custom, had been buried with the dead."

Small objects made by this people, especially *bone carvings*, have lately come into Mr. Howley's possession which attract attention through their peculiar form and nice finish. He thinks they were used as pendants to their deer-skin dresses, and all have some rude design carved upon either side. Many of them are simple flat pieces, either square or cut obliquely at the lower ends ; others have from two to four prong-shaped ends :



Perforated circular pieces of bone and shell accompanied the above carvings, also some red ochre tied up in small packages encased in birch bark, and some neatly made birch-bark cups of an oval pattern and red-ochred. Also a small iron knife and tomahawk with wooden handles. Some of the above articles manufactured of bone apparently represent the human frame.

What Mr. Howley learned on the Bay of Exploits about the peculiarities of *Shananditkit* was the following : When any of the Micmacs came near her during her stay with Peyton and his family, she exhibited the greatest antipathy toward any of them, especially toward one Noël Boss, whom she greatly dreaded. Mr. Peyton stated that, whenever he or even his dog appeared near the house, Shananditkit would run screeching with terror towards him and cling to him for protection. She called him *Mudty Noël* ("Wicked Noël"), and stated that he once fired at her across the Exploits river, wounding her in the hips and legs, as she was in the act of cleaning venison. In proof thereof she exhibited several shot wounds at the spots referred to, and W. E. Cormack confirms this statement. The enmity between the two tribes must have been at a high pitch to prompt a man to perform such an act against a defenseless woman.

Micmac tradition states, however, that in earlier times a better feeling existed between the two peoples. The Red Indians certainly were on good terms with the "Mountaineers" or Naskápi of Labrador, whose language is of the same family as that of the Micmacs.

The above anecdote fully proves that Shananditliit became acquainted with individuals of the Micmac tribe, and this explains why Cormack has so many Micmac terms mixed with his Beothuk words. He was unable to distinguish the ones from the others. Mudty, "bad," is a Micmac, not a Beothuk word.

A CAPTURE FOLLOWED BY A WEDDING.

The capture of another Beothuk woman is related at length in the following traditionary account, which Rev. Silas Tertius Rand, of Hantsport, Nova Scotia, sent me in August, 1886. The event may have occurred as early as the beginning of the nineteenth century, for Mr. Rand heard it from an aged woman of Hantsport, Mrs. Nancy Jeddore, and she heard it from her father, Joseph Nowlan, who died about A. D. 1870, ninety-five years old. Nowlan had at one time stayed with the family of which that Beothuk woman was the mother and mistress, in Newfoundland, and had also lived long with the Eskimos. His regular home was in Nova Scotia, at St. Margaret's Bay, on the side of the Atlantic ocean.

The history of this woman is rather extraordinary, and with serious people I might incur the peril of being regarded as pitching into the domain of romance. But to avoid all suspicion, I shall transcribe the account with the very words of my correspondent, who made use of the same provincialisms, which have served in delivering the "story" to him. The absence of the Beothuk woman's name is a great deficiency in the tale. Some of the more learned remarks will be readily recognized as additions made by Mr. Rand, whose works prove him to have been a studious expounder of the Micmac grammar and lexicon (died October 4, 1889).

"The Micmacs have been in the habit of crossing over to Newfoundland to hunt 'time out of mind.' They called it Uktakumcook, *mainland;* so they supposed at the time when the name was given that it was not an island. Still it is as good or perhaps better than the silly and untruthful *long* name Newfoundland. The Micmacs could never 'scrape acquaintance' with the Indians of the *other tribe* there. Still, they found them *out*, also their *red* custom (their skin was quite white) and their power of magic, by which they became aware of the distant approach of strangers, when they fled on their snowshoes for their lives. But once three young hunters from 'Micmac-Land,' Meghum-ahghee, came upon three huts belonging to them, which were built up with logs around a 'cradle hollow,' so as to afford protection from the guns of the foe. These huts had just been deserted, but the three men gave chase, came as near to the fugitives as to hail them and make signs of friendship, which were left unheeded. On and on they pursued--one of the young women of the party snapped the strap of the snowshoes and had to sit down and repair it. Her father came back, assisted her and they fled again; but the mended strap failed a second time. The poor girl shrieked with fright; she was left and overtaken. She could not be induced to go with her pursuers; so they constructed a small wigwam and remained on the spot a day or two. At first, she touched no food for days; then her fear relented in regard to one of the young men, and starting out again with the hunting party, clung to that youth who had first won her confidence. This she showed by keeping him between her and all the others. After staying two years with the Micmac people she acquired their language and was married to that same young man. She often recounted the eventful story of her life, and conversed with Nancy Jeddore's father on the circumstances connected therewith, after she had become the mother of a family."

A correction of a former statement needs to be inserted here. The Hudson Bay Company never had control of Newfoundland, but it was a number of English merchants who retarded settlement in the interior. The immense tracts and forests of the interior were given up to the deer, bears, foxes, wolves, and to a few straggling Micmac hunters, whereas the entire white population was *compelled* to live along the sea-coast.

Mr. Howley having favored me with more particulars about these firms, I would state first that these merchants were chiefly *fish dealers*, and that they purchased furs only incidentally. Even now fish is the chief article of trade with them. There are but few of these *old* firms now in existence, and of these, Newman & Co.'s establishment at Harbor Button, Fortune Bay, and Gaultor's, in Hermitage Bay, south side of the island, are probably the oldest. Slade & Co. once ruled supreme in Notre Dame Bay during the first half of this century, and to their employés is ascribed the cruel treatment of the last Beothuk Indians. But things are now assuming a different aspect, and the present mercantile firms no longer oppose the opening up of the country, for a railway act together with a loan act has lately passed the legislature. The railway is now being constructed, and will be of best service for opening the lands for settlement.

THE JURE VOCABULARY.

While engaged in surveying the Bay of Exploits during the summer months of 1886, Mr. Howley became acquainted with Mrs. Jure, then about seventy-five years old, who once had been the fellow-servant of Shanandithit, or Nancy, at Mr. John Peyton's, whose widow died about the close of the year 1885. Mrs. Jure was, in spite of her age, hale and sound in body and mind, and remembered with accuracy all the little peculiarities of Shanandithit, familiarly called "Nance." Many terms of Beothuk learned from Nance she remembered well, and at times was complimented by Nance for the purity of her pronunciation ; many other terms were forgotten owing to the great lapse of time since 1829. Mr. Howley produced his vocabularies and made her repeat and pronounce such words in it as she could remember. Thus he succeeded in correcting some of the words recorded by Leigh and Cormack, and also to acquire a few new ones. He satisfied himself that Mrs. Jure's pronunciation must be the correct one, as it came directly from Shananditbit, and that its phonetics are extremely easy, much more so than those of Micmac, having none of the nasal drawl of the latter dialect. She also pronounced several Micmac words exactly as Micmacs pronounce them, and in several instances corrected Mr. Howley as to the mistranslation of some Beothuk words. The twenty-three words which Mr. Howley has obtained from this aged woman embody nine new ones; he repeated all of them to his brother, Rev. Dr. M. F. Howley, P.A., and I received a second copy of the list written by that gentleman, having the words accentuated. This enabled me to add in parentheses their true pronunciation and wording in my scientific alphabet.

THE MONTREAL VOCABULARY.

Although this is a misnomer, I shall designate by it another copy or "recension" of the W. E. Cormack vocabulary which I obtained from Rev. Silas T. Rand, of Hantsport, N. S., on September 1, 1885. It was accompanied by the following remarks :

"Sir William Dawson, my excellent friend,* sent me this list of Beothuk words some years ago, and I had to return his copy to him. There were copyist's mistakes in it, *u* for *a*, *u* for *n*, etc. I don't remember the name of the man who took the vocabulary, nor that of the woman who gave it to him. But I remember that the woman was said to have married a man of another tribe, and that she was the last of the race and the only one of the race ever *tamed* (to use the Indian term). She cannot have been Mary March."

This vocabulary contains 228 items, including the numerals and names of months; the words are syllabicated, and begin with capital letters. The copy before me was written by a scribe who evidently did not realize the importance of the document, for even the English significations are, in part, faulty, as *anus* for *arms* (memayet), *catte* for *cattle*, *celp* for *cup*, *ticklevee* for *ticklas* (gotheyet), on page 419, and others. The letter u is often put instead of n, l for t, o for a, t for k, r for z, e for c, and *vice versâ*, the whole being written in a sloven hand, as all the Beothuk vocabularies are which I have seen. The manuscript has haddabothie *body* instead of haddabothic, molheryet *cream jug* for motheryet, adademiuk *spoon* for adadimiute, jigganisut *gooseberry* instead of jiggamint ; but, in many instances, appears to have a more original form preferable to the one copied by Mr. Howley, which I have utilized, as in giwashuwet *bear* for gwashuwet,

* Principal of McGill College, Montreal.

atho-onut *twenty* for dtho-onut, and in some instances has two words for one English term, as in *ankle* moosin, *and* gei-je-bursut ; (to) *bite* boshoodik *or* boshwădit ; *boat* and *vessel* adothe, *or* odeothyke ; and what will be found under *head, man, moon, stockings, sun, teeth, woman, woodpecker.*

This vocabulary is arranged alphabetically after the English terms, which stand *before* their Beothuk equivalents, and contains many terms new to us, which corroborates the supposition previously advanced by me, that the original Cormack vocabulary must have been more extensive.

To insert all the two hundred and twenty-eight terms of this new "recension" of the Cormack collection *in bulk* into the list to be given below, would have the result of increasing the confusion already existing in the wording of the Beothuk terms. Therefore, I have omitted not only those terms which are written *alike* to the terms which stand first in my list of 1885, pp. 415–424, but also those which rest upon an evident error of the copyist, as mamiruateek *houses* for mammateek, berroieh *clouds* for berroick, moocas *elbow* for moocus, etc.

It is probable, that W. E. Cormack made several copies of his vocabulary himself, which differed among each other, or were written in an illegible hand ; this would explain many of the "lectiones variæ" which now puzzle the Beothuk student, and cause more trouble to him than it does to edit a Roman or Greek author from the mediæval manuscripts with all their errors and mistakes.

THE CLINCH VOCABULARY.

A vocabulary of Beothuk has just come to light, which appears to be, if not more valuable, at least older than the ones investigated by me heretofore. It contains one hundred and twelve terms of the language, many of them new to us. It was obtained, as stated, by the Rev. John Clinch, a minister of the Church of England, and a man of high education, stationed as parish priest at Trinity, in Trinity Bay, Newfoundland. The original is contained in the "Record Book," preserved in the office of Justice Pinsent, D.C.L., of the Supreme Court at Harbor Grace, and it has been printed in the *Harbor Grace Standard and Conception Bay Advertiser*, of Wednesday, May 2, 1888, some biographic and other notes being added to it in the number of May 12.

Among these the following will give us a clearer insight into the question of authenticity of Clinch's vocabulary. John Clinch was born in Gloucestershire, England, and in early youth studied medicine under a practitioner at Cirencester, where he became a fellow of Dr. Jenner, who discovered the celebrated specific against small-pox. In those times, no law compelled a man to undergo examinations for diplomas ; so Clinch migrated to Bonavista, Newfoundland, and established himself there in 1775 as a physician, but in 1783 removed to Trinity. Besides his practice, he conducted services in church, was ordained deacon and priest in London, in 1787, then worked over thirty years at Trinity in his sacred calling, until his death, which must have occurred about 1827. He has the merit of introducing vaccination upon that island, and there are people living now who were vaccinated by him. He was also appointed to judicial charges.

Simultaneously with Mr. Clinch, a Beothuk Indian stayed in that town, known as John August. Tradition states that he was taken from his mother when a child and brought up by a colonist, Jeffrey G. Street. He then remained in Street's house as a faithful and intelligent servant, and when arrived at manhood was entrusted with the command of a fishing smack manned by whites. Frequently he obtained leave to go into the country, where he probably communicated with his tribe. The parish register of Trinity records his interment there on October 29, 1788.

As there is no other Beothuk Indian known to have resided among white people of Newfoundland at that time, it is generally supposed that Mr. Clinch, who lived there since 1783, obtained his collection from none else but from John August. The selection of words differs greatly from that in Leigh's vocabulary, but the identity of a few terms, which are quite specific, as *hiccups, shaking hands, warming yourself*, induces Mr. Howley to believe that he had Clinch's vocabulary before him. One item in Clinch's list, "Ou-bee : *her own name*," seems to indicate that it was obtained from a female. Indeed, in 1803, a Beothuk woman was captured, presented to Governor Gambier, and subsequently sent back to her tribe. Mrs. Edith Blake, in her article, "The Beothuks," gives a description of her and of her presence at a social meeting at the Governor's house, at St. John's.

I have obtained a copy of the printed vocabulary through Mr. Howley. It was full of typographic errors, and these were corrected by him with the aid of a copy made of the original at Trinity by Mrs. Edith Blake, who took the greatest pains to secure accuracy. The "Record Book" states that Rev. Clinch obtained the vocabulary in *Governor Waldegraves' time*, and the volume which contains it embodies documents of the year 1800; this date would form an argument against the supposition, that it was obtained from the female captured in 1803. Below I have reproduced all the terms of this vocabulary, as it surpasses all the others in priority, though perhaps not in accuracy. The words are all syllabicated, but none of them shows accentuation marks; I have printed most of them in their *syllabicated* form.

Capt. Robinson has consulted and partly copied the Clinch vocabulary, as will be readily seen by a comparison of the terms in both.

THE THREE VOCABULARIES COMBINED.

Abbreviations.—CM.: The W. E. Cormack vocabulary from a Montreal copy of the manuscript.

J.: The Jure vocabulary.

No letter: The Clinch vocabulary.

Words in parentheses contain the transcription of vocables into my scientific alphabet.

abenick *gaping*, CM.
abideeshook *domestic cat*, CM.
abus-thib-e *kneeling.*
adayook *eight;* ee-adajook *eighteen*, CM.
adi-ab *wood.*
adjieich *two;* ee-ajike *twelve*, adjeich atho-onut *twenty-two*, CM.
adothe or odeothyke *boat, vessel*, CM.
agamet *buttons* and *money*, CM.
ah-wadgebick, awadgebick (ā'wa-dshibík), *middle finger*, J.
amshut or yamyess *get up*, CM.; cf. kinnup.
anaduck *sore throat*, CM.
arrobauth *blood;* ashabooutte or ig-gobauth (for izzobauth) *blood*, CM.
atho-onut *twenty;* adjeich atho-onut *twenty-two*, CM.
bashedtheek *six;* ee beshedtheek *sixteen*, CM.
bay-sot, băzot, besot, besut, *to walk*, J.
beathook *Red Indian*, CM.
beteok *good night*, CM.
boas-seek *blunt*, CM.
bobodísh *sea pigeon*, J.; bobbidish *pigeon, black guillemot*, CM.
boddebmoot *woman's bosom*, CM.
boo-it, buit (bú-it), *thumb*, J.
boshoodik or boshwădit *to bite*, CM.
botonet - onthermayet *teeth*, CM. (onthermayet alone means *teeth;* cf. below).
buggishamā'n *man*, J.; bukashman or bookshimōn *man*, CM; push-aman *man.*
buggishamísh *boy*, J.; bugasmeesh *white boy*, CM.
chee-a-shit *groaning;* cheasít, CM.
chee-thing *a walking stick.*
cobthun-eesamut *January*, CM.
co-ga-de-alla *leg.*
coosh *lip.*
corrasoob *sorrow; snow* (snow, by confounding it with kaususs-book ?).
cowasazeek *July*, CM.
cusebee *louse;* casebeet, CM.
cush *nails.*
dabseek *four;* ee-dabseek *fourteen*, CM.
deshudodoick *to blow*, CM.
deu-is *sun* or *moon* (doubtful).
dis-up *fishing line.*
dogemat or ashoog-ing (Howley: ash-vog-ing) *arrow*, CM.
drúmmet, drúm-mĕt (drúm't), *hair*, J.; don-na (Clinch).
ebauthoo *water;* ebanthoo, CM.
eemommoos, ímmawmoose (íma-mūs), *woman*, J.
eemommooset, ímmomoosét (íma-muset), *girl*, J.
eewo-in, éwoin (i'wo-in), *knife*, J.; yew-oin *a knife.*
ejeedowéshin, edgedoweshin (edshi-dowéshin), *fowl*, J.
ejibidinish *silk handkerchief*, CM.
emeethook *dogwood*, CM.
ersh-bauth *catching fish.*
euano *go out*, CM.
eve-nau *feathers.*
gei-je bursŭt; see moosin.
giggaremanet *net*, CM.

giwashuwet *bear*, CM.
gosset *stockings*; gasaek, CM.
gothieget *ticklas*, CM.
goun *chin*, CM.
gun or guen *nose*, CM.
hadda-bothy *body*.
hadibiet *glass*, CM.
hados-do-ding *sitting*.
hanamait *spoon*.
han-nan *a spear;* first letter uncertain.
ha-the-may *a bow*.
hedy-yan *stooping*.
hods-mishit *knee*.
hod-thoo *to shoot*.
hod-witch *fool*.
hurreen and huz-seen *a gun*.
huzza-gan *rowing*.
ii-be-ath *yawning*.
io-ush-zath *stars* (doubtful).
is-shu, izhu, ishu (i'zhu), *make haste*, J.
ite-ween *thigh*.
jib-e-thun (or, iib-e-thun) *a trap or gin*.
jigganisut *gooseberry*, CM.
yamyess; see amshut.
yaseek *one;* ee-yagiesk *eleven*, CM.
yeothoduck *nine;* ee-yeothoduck *nineteen*, CM.
yew-one *wild goose*.
yew-why *dirt*.
keathut; gorathun (obj. case) *head*, CM.; he-aw-thou *head*, ke-aw-thon *your head*.
kess-yet *a flea*.
king-abie *standing*.
kinnup, kinup, *get up*, J.
koo-rae *lightning; fire*.
koothabonong - bewajowite *February*, CM.
kuis; mangaronish *sun*, CM.; kuis *watch*, CM.
kuis and washewnishte *moon*, CM.
mady-u-a *leaves*.
magorrm *deer's horns*, CM.
mamasheek *islands*, CM.
mām-isutt *alive*, CM.
mamegemethin *shoulders*, CM.; momezabethon *shoulder*.
mammadronitan *lord bird*, CM.
mammasamit *dog*, J. (mammasavit is incorrect); mammasareet, mamoosernit *dog*, CM. (-*reet* false for *mit*).
mamoosemich *puppy*, CM.
manarooit *blanket*, CM.
mangaronish; see kuis.
manjebathook *beard* (on page 421: *bread*, which is probably false; see annawhadya), CM.
mau-the-au-thaw *crying*; cf. su-au-thou.
memajet *anus*, CM. (false for *arms*).
memet *hand*, CM.; memen (obj. case) *hands and fingers;* meman momasthus *shaking hands*.
me-ma-za *tongue*.
menome *dogberries*.
me-roo-pish *twine, thread*.
midy-u theu *sneezing*.
mithie *coal*.
mi-a-woth *flying;* meaoth *flying*, CM.
mis-muth *ear*.
moadamūtt *to boil, as dinner*, CM.
mom-au *a seal*.
mome-augh *eyebrow*.
moocus *elbow*.
moosin and gei-je-bursūt *ankle*, CM.
mowgeenúck, mougenuk (maudshinúk), *iron*, J.; mowageene *iron*.
mudy-rau *hiccups*.
mud-ty *bad* (dirty); mudeet *bad* (of character).
mush-a-bauth *oakum* or *tow*.
nethabete *cattle*, CM.
nine *knife*, CM. (false for u-ine, yewoin).
ninejeek *five*; ee-ninezeek *fifteen*, CM.
n'o-mash-nush *scalping*.
now-aut *hatchet*.
obodish, obbodish, *cat*, J.; obditch *a beast;* cf. abideeshook.

obosheen *warming yourself.*
obseedeek *gloves*, CM.
odasweet-eeshamut *December*, CM.
od-au-sot *rolling.*
oddesamick, ŏdd-essămick (odesă-mík), *little finger*, J.
odemet *ochre*, CM. (ochre mixed with oil, emet, Howley).
onnus, onnûs (o′nĕs), *forefinger, index*, J.
oodzook *seven;* ee-oodyook *seventeen*, CM.
oregreen (?) *scissors*, CM.
oreru *ice*, CM.; cf. ozeru.
osarate *rowing*, CM.
ōsweet (ō′swit) *deer*, J.; osweet, CM.
Ou-bee (nom. pr. fem.) "*her own name.*"
ou-gen *stone.*
ou-ner-mish *a little bird* (species of ?).
outhermay *teeth.*
ow-the-je-arra-thunum *to shoot an arrow perpendicularly.*
pa-pa de aden *a fork.*
pau-shee *birch rind; paper.*
peatha *fur, hair of beast.*
pedth-ae *rain.*
pe-to-tho-risk *thunder.*
pig-a-thee *a scab.*
pis-au-wau *lying.*
podibeac *oar*, CM.; poodybe-ac *an oar.*
poopusraut *fish.*
poorth *thumb;* cf. boad.
popa-dish *a large bird* (species of ?).
posson *the back.*
poss-thee *smoke;* cf. baasdic.
pug a-thuse *beating;* pug a-tho *throwing.*
pug-a-zoa *eating.*
pug e-non *to break a stick.*
puth-u-auth *sleep.*
shabathooret *trap*, CM.
shamye *currants.*
shansee *ten*, CM.
shaub-ab-un-o *I have to throw your trap.*
shau-da-me *partridge berries.*
shebohowit; sheebuint *woodpecker*, CM.
she-both *kissing.*
shēdbasing *upper arm*, CM.
she-ga-me *to blow the nose;* shegamik, CM.
shemabogosthue *moskito* (black fly), CM.
shendeek (or sheudeek ?) *three;* ee-shaedeek *thirteen*, CM.
shisth *grass.*
shucodimít *Indian cup*, CM.
sou-sot *spruce rind.*
stioeena *thumb*, CM.
su-au-thou *singing.*
su-gu-mith *bird's excrement.*
susut *fowl, partridge.*
tapaithook *canoe*, CM.; cf. thub-a-thew.
tedesheet *neck.*
the-oun *the chin;* cf. goun.
thub-a-thew *boat or canoe.*
thub-wed gie *dancing.*
tis eu-thun *wind.*
traw-na-soo *spruce.*
tus-mug *pin;* tus-mus *needle.*
tu-wid-yie *swimming.*
waine *hoop*, CM.
washeu *night, darkness*, CM.
wasumaw - eeseek *April, June, September*, CM.
washewnishte; see kuis and washeu.
weshemesh *herring*, CM.
who-ish-me *laughing.*
wíddun (wídun or wídăn), *asleep;* also euphemistically for *dead.*
woodrut *fire*, CM.
wothamashet *running*, CM.; wothamashee *running.*
wooth-yan *walking.*
wyabick (wáyabik) *ring-finger*, J.
zatrook *husband*, CM.
zosweet *partridge* (willow grouse), CM. (same word as susut).

REMARKS ON SINGLE TERMS.

The ending -bauth occurs so frequently that we may have to consider it as a suffix used in the derivation of substantives ; thus we have, *e. g.*, izzo-bauth *blood,* ersh-bauth *catching fish,* mushabauth *oakum, tow.*

emamoose *woman,* emamoset *child, girl,* resemble strongly the following Algonkin terms : amemens *child* in Lenape (Barton), amosens *daughter* in Virginian (Strachey, Vocab., p. 183). Ama'ma is *mother* in the Greenland Inuit.

The sound *l* occurs but four times in the words which have come to our notice : adolthtek, lathun, messiliget-hook, nadalahet. In view of the negligent handwriting in which all of these vocabularies have reached us, it is permitted to doubt its existence in the language.

menome *dogberries* is a derivative of manus *berries.* mamoose *whortleberries,* Rob., is perhaps misspelt for manoose. Cf. min *grain, fruit, berry,* in all Eastern Algonkin dialects.

ozeru, ozrook, *ice ;* E. Petitot renders the Montagnais (Tinné) ezogè by "gelée blanche" *(frost),* t'en-zure by "glace vive." The resemblance with the Beothuk word seems only fortuitous.

poopusraut *fish* is identical with bobboosoret *codfish* (or *bacalaos,* Mscr.).

pug-a-zoa *eating* ; the latter probably misspelt for *beating.*

stioeena *thumb,* CM., is misspelling of itweena, which means *thigh,* not *thumb.*

The new ethnologic and linguistic facts embodied in this "Third Article" do not alter in the least the general results which I deduced from my two previous articles and specified in "Proceedings" of 1886, pp. 426 to 428. On the contrary, they corroborate them intrinsically and would almost by themselves be sufficient to prove that the Beothuk race and language were entirely *sui generis.* By the list contained in this "Third Article" the number of Beothuk vocables known to us is brought up to four hundred and eighty, which is much more than we know of the majority of other American languages and dialects.

The violent hatred and contempt which the Beothuks nourished against all the races in their vicinity seems to testify by itself to a radical difference between these and the Algonkin tribes. The fact that we know of no other homes of the Beothuk people than Newfoundland, does not entitle us to conjecture, that they were once driven from the mainland opposite and settled as refugees upon the shores of that vast island. It is more probable that this race anciently inhabited a part of the mainland *simultaneously* with the island, which would presuppose that the Beothuks were then more populous than in the historic period. Numerous causes may account for the fact that we do not notice them elsewhere since the beginning of the sixteenth century : fragmentary condition of our historic knowledge, rigorous colds, epidemics, want of game, famine, infanticide, may be wars among themselves or with strangers. Some of these potent factors may have coöperated in extinguishing the Beothuks of the mainland, from whom the island Beothuks must have once descended—while the tribes settled upon Newfoundland may have increased and prospered, owing to to a more genial climate and other physical agencies.

ENGLISH-BEOTHUK VOCABULARY.

alive mām-isutt.
ankle ; see moosin.
anus ; see memajet.
April wasumaw - eeseek.
arm, upper, shēdbasing.
arms memajet.
arrow ; see dogemat.
asleep wi'ddun.
bad mud-ty.
back, the, posson.
beard ; see manjebathook.
bear giwashuwet.
beast ; see obodĭsh.
beast, hair or *fur of,* peatha.
beating pug-a thuse.
birch rind pau-shee.
bird, a little (not specified), ou nermish.
bird, a large (not specified), popadish.
bite, to, boshoodik.
black guillemot ; see *sea pigeon.*
blanket manarooit.
blood arrobauth.
blow, to, deshudodoick.
blow the nose, to, she-ga-me.
bosom, woman's, boddebmoot.
blunt boas-seek.
boat adothe, thub-a-thew ; see *canoe.*
body hadda-bothy.
boil, to, v. trans., moadamūtt.
bow ha-the-may.
boy bugglshamĭsh.
break a stick, to, pug-e-non.
buttons agamet.
canoe tapaithook ; thub-a-thew ; see *boat.*
cat, domestic, abideshook ; obbodĭsh.
cattle nethabete.
catching fish ersh-bauth.
chin goun, the-oun.
coal mithie.
crying mau-the-au-thaw.
currants shamye.
dancing thub-wed-gie.
darkness washeu.
dead wĭddun.
December odasweet - eeshamut.
deer ōsweet.
deer's horns magorrm.
dirt yew-why.
dirty mud-ty.
dog ; see mammasamĭt.
dogberries menome.
dogwood emeethook.
ear mis-muth.
eating ; see pug-a-zoa.
eight adayook.
eighteen ; see *eight.*
elbow moocus.
eleven ; see yaseek.
excrement of bird su-gu-mith.
eyebrow mome-augh.
feathers eve-nau.
February koothabonong - bewajowite.
fifteen ; see ninejeek.
fingers ; see memet.
finger, middle, ah-wadgebick.
fire woodrut ; koo-rae.

fish poopusraut.
fishing line dis-up.
five ninejeek.
flea, a, kess-yet.
fly, to, mi-a-woth.
fool hod-witch.
fork, a, pa-pa-de-aden.
forefinger onnus.
fourteen ; see dabseek.
four dabseek.
fowl ejeedowéshin ; susut.
fur peatha.
gaping abenick.
get up amshut ; kinnup.
gin, a ("a trap or gin"), jib-e-thun.
girl eemommooset.
glass hadibiet.
gloves obseedeek.
good night beteok.
gooseberry jigganisut.
go out euano.
grass shisth.
groaning chee-a-shit.
grouse ; see zosweet.
gun, a, hurreen.
hair drúmmet.
hand memet.
handkerchief of silk ejibidinish.
hatchet now-aut.
head ; see keathut.
herring weshemesh.
hiccups mudy-rau.
hoop waine.
husband zatrook.
ice oreru ; ozeru.
I have to throw your trap shaub-ab-un-o.
index onnus.
Indian cup shucodimít.
iron ; see mowgeenúck.
islands mamasheek.
January cobthun - eesamut.
June wasumaw - eeseek.
July cowasazeek.
kissing she-both.
knee hods-mishit.
kneeling abus-thib-e.
knife ; see eewo-in, nine.
laughing who-ísh-me.
leaves mady-u-a.
leg co-ga-de-alla.
lightning koo-rae.
lip coosh.
little finger oddesamick.
lord bird mammadronitan.
louse cusebee.
lying pis-au-wau.
man buggishamā'n.
make haste is-shu.
money ; see *buttons.*
moon deu-is ; kuis.
moskito shemabogosthue.
nails cush.
neck tedesheet.
needle tus-mus.
net giggaremanet.
night washeu.
nine yeothoduck.
nineteen ; see *nine.*
nose gun, guen.
oakum mush-a-bauth.
oar podibeac.
ochre odemet.
one yaseek.
Oubee ; nom. pr. fem.
paper pau-shee.
partridge susut ; zosweet.
partridge berries shau-da-me.
pigeon ; see *sea pigeon.*
pin tus-mug.
puppy mamoosemich.
rain pedth-ae.
Red Indian beathook.
ring-finger wyabick.
rolling odausoot.
rowing huzza-gan ; osarate.
running wot amashet.
scab pig-a-thee.
scalping no-mash-nush.
scissors ; see oregreen.
seal, a, mom-au.
sea pigeon bobodísh.

September wasumaw - eeseek.
seven oodzook.
shaking hands; see memet.
shoot, to, hod-thoo.
shoot, to, an arrow perpendicularly, ow-the-je-arra-thunum.
shoulder; see mamegemethin.
singing su-au-thou.
sitting hados-do-ding.
six bashedtheek.
sixteen; see *six.*
sleep puth-u-auth.
smoke poss-thee.
sneezing midy-u-theu.
snow; see corrasoob.
sore throat anaduck.
sorrow corrasoob.
spear; see han-nan.
spoon hanamait.
spruce traw-na-soo.
spruce rind sou-sot.
standing king-abie.
stars io-ush-zath.
stockings gosset.
stone ou-gen.
stooping hedy-yan.
sun kuis; deu-is (?).
swimming tu-wid-yie.
teeth outhermay; see botonet.
ten shansee.
ticklas gothieget.
thirteen; see *three.*
thigh ite-ween.
tongue me-ma-za.
tow or *oakum;* see *oakum.*
thread me-roo-pish.
three shendeek.
throwing; see pug-a-thuse.
thumb boo-it, poorth; see stioeena.
thunder pe-to-tho-risk.
trap, a, jib e-thun, shabathooret.
twelve; see *two.*
twenty atho-onut.
twenty-two; see *two.*
twine me-roo-pish.
two adjieich.
vessel adothe.
walk, to, bay-sot; wooth-yan.
walking stick chee-thing.
warming yourself obosheen.
watch, a, kuis.
water ebauthoo.
wild goose yew-one.
willow-grouse zosweet.
wind tis-eu-thun.
woman eemommoos.
wood adi-sb.
woodpecker shebohowit.
yawning ii-be-ath.
your, in: "your head;" see keathut.

The Eye, Ocular Muscles and Lachrymal Glands of the Shrew-mole (Blarina talpoides Gray).

By John A. Ryder.

(Read before the American Philosophical Society, January 3, 1890.)

As far as I am aware, the minute anatomy of the eyes of the American Soricidæ or shrew-mice has been but little studied. Recently I have had an opportunity to obtain the eyes of the short-tailed shrew-mole, *Blarina talpoides,* and thinking their anatomy might present something novel, they were cut into series of sections. These disclosed the peculiarities to be mentioned later.

The eyes were dissected out, and, as the sequel proved, together with the uninjured lachrymal glands and ocular muscles.

The eye and gland together measured 2.5 mm. in the longest diameter, and about 1.5 mm. thick, and nearly 2 mm. wide. The form of the whole mass was that of a depressed oval. So far as the evidence goes, that can be derived from the sections, it indicates that the ocular muscles do not reach the skull, and that the eyes are no longer under the control of the same kind of a muscular mechanism as is found in other mammals. In fact, the tendons and muscles of the snout seem to completely cover the skull in the region of the orbit. Indeed so slight is the attachment of the eyes to the skull, that in removing the skin from the head but little difficulty is found in removing the eye-ball and lachrymal gland with the former. In *Scalops*, our common mole, this happens with still less difficulty.

The whole eye-ball in *Blarina* measures 0.9 mm. in diameter or considerably less than one-twenty-fifth of an inch. The lens is well developed and is very large in proportion to the whole eye-ball, measuring more than half the diameter of the latter. Consequently there is but little aqueous humor, and also but little vitreous, since the lens fills nearly the whole of the chamber of the ball. The cornea is thin, very convex, and approximates the lens anteriorly. At the edge of the cornea there is no thickening of the sclerotic, such as occurs in the eyes of other vertebrates as a result of the development of the ciliary muscles or apparatus of accommodation. This apparatus is obviously very rudimentary and defective, from which it may be inferred that the power of adjustment of the lens for different ranges of vision is poorly developed in *Blarina.*

There is a retinal coat of pigment and a choroid coat, which latter extends for a little distance over the optic nerve. The thickness of the sclerotic, choroid and retinal layer of pigment taken together is not over a fourth of the total thickness of the retina, thus showing other strong contrasts in respect to the development of the tunics of the eye-ball in other forms of vertebrates.

The total thickness of the retina is nearly a third of the total diameter of the eye-ball, and is developed as far forward as the ciliary region, though it is thickest a little behind this point. The usual number of layers are discernible in the retina, and it is perforated as usual by the very slender and diminutive optic nerve, which is only .07 mm. in diameter. The retina is therefore developed as usual, though the rods and cones were not well enough preserved in my materials to be certainly made out. At any rate, it is clear that such an eye may still be more or less functional as a visual organ even though obviously degenerate in some respects. The number of retinal elements is absolutely and relatively much less, however, than in a larger eye where the arc covered by the retina is part of a larger circle than in Blarina. There is a well-defined iris and pupil.

The lachrymal gland is many times larger than the entire eye ball. Its duct opens into the conjunctival cavity.

The muscles of the eye consist, first, of a choanoid muscle or retractor of the ball. It is inserted upon the sclerotic in a circular manner near the entrance of the optic nerve; it extends back and its origin is lost in the connective tissue of the lachrymal gland. No definite account of the recti muscles or of the oblique muscles can be given here. All that my sections disclose is the fact that muscles which are apparently the homologues of the recti are inserted upon the sclerotic nearly as far forward as the ciliary region. These muscles, like the choanoid, pass backward to arise from the connective tissue of the lachrymal gland with which they blend and in which they become lost, or they join a relatively thick muscular tunic composed of voluntary muscular fibres which invests nearly the whole lachrymal gland.

This muscular investment of the lachrymal gland suggests that the function of such a muscular apparatus is to compress the tear gland and force its secretion over the eye-ball, and to thus wash away any dirt which may find its way under the very much reduced eye-lids, the opening in which is scarcely half a millimetre wide.

The foregoing brief sketch of the anatomy of the eyes of one of the commonest of our American shrew-mice suggests much in the way of further study. The remarkable and apparently voluntary mechanism for compressing the tear gland is evidence distinctly against the conclusion as respects at least our North American shrews, reached by Mr. Darwin in regard to the Tucu-tuco or *Ctenomys* of South America, in which case he suggests that the repeated irritation and inflammation of the eyes of these burrowing rodents, due to the dirt or sand which found its way beneath the lids, would aid in rendering the eyes inefficient, and in the course of generations abortive, as they are sometimes found to be. It is clear that if the interpretation of the function of the muscular investment of the tear gland in *Blarina* here suggested is correct, that in this case, at least, there is a direct and very special structural provision by which irritation from the presence of sand or dirt in the eyes, as a consequence of a burrowing habit, may be guarded against in the most efficient manner conceivable.

That the eye of *Blarina*, as a whole, has suffered from degeneration may be inferred with certainty from the diminutive size of the eye-ball and optic nerve, and the evidence furnished by the muscles suggests that while the eye-ball is no longer rotated in precisely the manner which obtains in other forms, it is clear that there are ocular muscles, and that the eye is capable of adjustment for the direction of vision, though it is evident that the muscles which effect such an adjustment no longer arise directly from the skull, as in all other normal forms of the eye of vertebrates. The extra tunic of voluntary muscular fibres investing the lachrymal gland seems to be something which has been superadded to the optic apparatus of *Blarina*, which, like the relatively large lachrymal gland itself, is really an indication of specialization to meet the requirements of special conditions of life.

Description of a New Species of Carollia and Remarks on Carollia brevicauda.

By Harrison Allen.

(Read before the American Philosophical Society, December 6, 1889.)

Carollia is one of the most common of the South American leaf-nosed bats. Notwithstanding its wide range of distribution (it is found from Mexico to the southern limit of Brazil, including the Antilles), the type of the genus is that of the single species also. I have recently examined this form—*Carollia brevicauda*—with the object in view of determining whether or not an example of Carollia in the collections of the National Museum might prove to be new.

The facts which led me to suppose that this might be the case were the following:

The specimen was smaller than *C. brevicauda,* the color was of a light chestnut brown tint, instead of the ashy shade of *C. brevicauda.* The interfemoral membrane was not incised. The nose-leaf was relatively small, delicate, with entire, rounded nostrils, and the lower border sharply defined to a point near the median line, where a small naked space alone was seen.

I have had a knowledge of these facts for a long time, but I hesitated to describe the form as new, for in general appearance in the proportions of the membrane, in the form of the ear, in the markings of the wing membranes and the shapes of the terminal phalanges, the two forms appeared to be essentially the same. I had but a single specimen—a young male from Costa Rica. I concluded that before describing it an examination of all the specimens of *Carollia* should be made. A large number of specimens of the genus were available for the purpose from the collections of the Museum of Comparative Zoölogy, but unfortunately nine only of the twenty-six examples were in good condition.

From among these a young male was found, and I was thus able to show that the smaller size of the specimen, as well as the difference of coloration of the new form, as compared with the old, were not due to age.*

As a result of this examination, I venture to describe the single example as a type of a new species in the following language:

Carollia castanea, n. sp.

Smaller than *C. brevicauda*. Fur long and silky. Above, lustrous light chestnut brown at basal one-half and at the tip. The intervening portion is yellow brown (old gold). Below, the same colors prevail, excepting that over the abdomen and pubis the brownish tip is absent and the body of the hair not golden. There is no hair on the forearm (the parts are slightly

*The teeth were all erupted, the epiphyses of the radii, metacarpals and phalanges were united to their shafts, but the tibia was slightly flexible and the foot was covered by a looser skin than is seen in matured individuals. It is not always easy to determine the age of bats.

rubbed), and scarcely any on the dorsum of the metacarpal bone of the thumb. The distribution of the hair on the wing membrane is as in *C. brevicauda.**

The general form of the auricle as in *C. brevicauda*, but is proportionately longer. The outer border is more emarginate. When the auricle is laid on the head, it reaches a point as far as the end of the muzzle. The tragus is obscurely acuminate; the inner border, therefore, not straight, but the apical half abruptly narrowed. The outer border crenulate, rather than pectinate. The basal lobe and the process above it well developed. The nose-leaf is more delicate than in *C. brevicauda*. The height is 7 mm.; the breadth $4\frac{1}{2}$ mm. The lower border is much more distinct than in *C. brevicauda*. The nostrils are rounded, well defined, and not continuous with a concavity on the outer border.† The warts on the mentum are arranged in three obscurely disposed rows, the middle one being the larger, but none of them are elongate. The tail reaches to a point opposite the knee.

Skull. The general proportions of the skull are the same in the two species. The brain case at the procephalon is inflated and the temporal crest does not extend over the inflated part. Hence the impressions for the temporal muscles are not defined on the frontal bone. The upper border of the anterior nasal aperture is on a line with the canine tooth. The distance between the lachrymal ridges is greater than between the lachrymal ridge of one side and the corresponding central incisor. The distance from the last maxillary molar to the posterior limit of the nasal chamber is less than the distance from the point last named to the end of the long endopterygoids. The palatal rugæ are more trenchant, curved and wider apart opposite the premolars, than is the case with *C. brevicauda*.

Teeth. The number of the teeth is the same as in *C. brevicauda*, viz.:

$$\frac{2}{2} - \frac{1}{1} - \frac{2}{2} - \frac{3}{3} \times 2 = \frac{16}{16} = 32$$

The maxillary central incisors touch their entire lengths.‡ The lateral

* The fur of *C. brevicauda* is described as follows:

Above, moderately long only. The base is plumbeous, the tip brown, and the intermediate part pallid—almost white. Below, the fur is short, plumbeous at basal half, and of the peculiar mouse-gray so often seen in Phyllostomidæ. G. E. Dobson (Cat. Chir. Br. Mus., 1878) describes the fur as brown above and beneath. None of the nine specimens examined were so marked. The brown aspect of the animal as seen in spirit is much more apparent than when dried. The nose-leaf is covered with fine short hairs on both sides. The back of the thumb is densely covered with short hair in *C. brevicauda*.

† The nostrils are oval in outline, are not separable from the outline of the nose-leaf above, and are continuous with a concavity (as one speaks of a mouth of a pitcher being concave), on the outer border. The peculiarity just named is best seen by holding the specimen so as to keep the vertex of the head upward, the observer looking downward from the tip to the base of the nose-leaf.

‡ G. E. Dobson (Cat. Chir. Br. Mus., 1878) gives this as a character of *C. brevicauda*. From my examinations, I cannot agree with this writer. The teeth exhibit a Λ-shaped space between the cutting edges.

incisors are very small and are free from both the central incisor and the canine. The first premolar is distinctly caniniform and does not touch either the canine or the second premolar.

The mandibular second premolar does not touch the third premolar. The distance from the anterior border of the canine to the first molar is 3 mm., a distance over ½ mm. greater than that from the anterior border of the canine to the central incisors.

Measurements.		*mm.*
Head and body (from crown of head to base of tail)		44
Length of arm		25
" forearm		32
First digit	Length of first metacarpal bone	4
	" first phalanx	6
Second digit	Length of second metacarpal bone	26
	" first phalanx	3
Third digit	Length of third metacarpal bone	32
	" first phalanx	16
	" second phalanx	20
	" third phalanx	10
Fourth digit	Length of fourth metacarpal bone	30
	" first phalanx	13
	" second phalanx	11
Fifth digit	Length of fifth metacarpal bone	32
	" first phalanx	11
	" second phalanx	10
Length of head		15
Height of ear		15
" tragus		6
Length of thigh		11
" tibia		13
" foot		10
" interfemoral membrane		15
" tail		8

Costa Rica. Collections of National Museum. Collected by J. C. Zeledon.

The nine specimens of *C. brevicauda*, which formed the basis of my study, were chiefly interesting from the measurements which were made of the peripheral parts. These are arranged in tabular form (p. 22).

TABLE OF MEASUREMENTS OF CAROLLIA BREVICAUDA. / CAROLLIA CASTANEA.

		3997 ♀	3129 ♀	3128 ♀	3231 ♀	3998 ♀	3993 ♀	3230 ♂	3229 ♂	4192 ♂	12,914 ♂
		mm.	mm.	mm.	mm.	mm.	mm.	mm.	mm.	mm.	mm.
	Arm*	26	26	26	28	25	25	26	27	25	25
	Forearm†	37	37	39	40	37	38	38	39	35	32
I	Metacarpal	5	5	5	5	4	6	5	5	5	4
I	1st phalanx	4	6	5	5	4	4	5	4½	4	3
II	Metacarpal	24	30	30	27	30	31	31	28	28	26
II	1st phalanx	3½	5	4	4	3	3	5	4	3½	3
III	Metacarpal	34	37	37	36	35		37	36	35	32
III	1st phalanx	13	17	17	17	14	16½	17	15	16	16
III	2d phalanx	21	22	22	21½	20	22	21	18	21	20
III	3d phalanx	11	11	11	11	11	11	10½	11	10	10
IV	Metacarpal	32	36	36	35	34	34	34	34	34	30
IV	1st phalanx	13	13	13	11	13	13	14	12½	13	13
IV	2d phalanx	14	12½	12½	10½	13	12	13	11	12	11
V	Metacarpal	36	37½	37½	35	35	35	36	36½	35	32
V	1st phalanx	11	12	12	12	12	12	12	11	12	11
V	2d phalanx	11	11	11	11	11	12	10½	10	11	10
	Femur	14	14	15	12	13	12½	14	12	12	11
	Tibia	14	14	17	16	15	15	18	18	14	13
	Foot	11	11	11	11	11	11	11	11	11	10
	Tail	7½	5	7	6	7½	7½	7	7	13	8
	Head	22	22	22½	24	22	22	23	22½	23	20½
	Auricle‡	12	12	13	13	12	13½	12	12	12	15
	Tragus‖	6	5	6	6½	6	6	6	6	6	6
	Width of 2d digital interspace	6	4	5	5	4½	6	6		5	4
	Width of 3d digital interspace	22	16	20	21	23	21	19	20	20	21
	Width of 4th digital interspace	31	28	32	31	35	35	26	27	28	30

* From top of shoulder to epicondyle.
† From epicondyle to end of radius.
‡ From outer border posteriorly.
‖ Outer border.

With the exception of the foot, which is constantly 11 mm. long, all the measurements are subject to variation—indeed, no two specimens in all respects are alike. This statement is made while making due allowance for the difficulty in taking some of the measurements, as for example those of the thigh and of the membranous expansions. Specimens which had been macerated in weak alcohol were rejected. But among those which were accepted it was not always possible to determine (owing to the contraction of the tissues), the exact extent to which the parts should be extended, so as to represent as far as possible the position of the wings in flight. One of the most interesting measurements is that of the width of the third digital interspace. This space, so small in Pteropidæ, Molossi, and in Noctilio, is wide in Phyllostomidæ, excepting Phyllostoma. Another interesting feature is the extent of the incision on the free margin of the interfemoral membrane. In well-preserved specimens of *C. brevicauda* the incision is conspicuous, while in the type of *C. castanea*, which is also in good condition, the incision is absent. Yet in slightly macerated specimens of *C. brevicauda* the incision disappears, showing that it is a character which is dependent upon tonicity and not on any distinctive structural peculiarities, and cannnot, therefore, have much value. One of the marked ranges of measurements is seen in the length of the tail. The shortest tail is 5 mm. long and the longest 7 mm. The tip of the tail answered in three specimens to the middle of the femur, in four to the junction of the middle with the lower third, and in two lack one-fifth only in being as long as the femur. In none, therefore, was the tail as long as in the single example of *C. castanea*.

The length of the thigh varies from 12 mm. to 15 mm. Hence the relative lengths of these quantities will be also variable, especially so since even in the same individual the length of the tail does not tautogenize* with the length of the femur. The length of the tibia—a character of value in Cheiroptera—varies from 14 mm. to 18 mm.

The length of the forearm, perhaps the most important single measurement which can be taken, varies from 35 mm. to 40 mm.

The following includes the variations of the manus and their range:

		mm.		mm.		mm.
First metacarpal	from	4	to	6	Range	2
Second "	"	24	"	35	"	9
Third "	"	33	"	37	"	4
Fourth "	"	32	"	36	"	4
Fifth "	"	35	"	37½	"	2½
First phalanx first digit	"	4	"	6	"	2
†First " second "	"	3	"	6	"	3
First " third "	"	13	"	17	"	4

* Tautogeneity—a word introduced by Prof. Rolleston as a more correct term in this connection than corelation.

† An apparent anomaly exists on the left side of specimen No. 3993. There are *two* phalanges to the second digit.

				mm.		mm.		mm.
First phalanx	fourth digit	....	from	11	to	14	Range	3
First "	fifth	"	"	10	"	12	"	2
Second "	third	"	"	20	"	21½	"	1½
Second "	fourth	"	"	10½	"	14	"	4½
Second "	fifth	"	"	10	"	12	"	2
Third "	third	"	"	10	"	11	"	1

The length of the head appears to be subject to very slight variation, namely, from 22 mm. to 23 mm. That of the ear, from 12 mm. to 13½ mm., a slight difference and yet one which might disturb the novice in attempting to identify the species, since the proportion between the height of the ear and the length of the muzzle is so often used in descriptions of bats. In *Carollia* these quantities are not fixed. The height of the auricle is variable, but the length of the muzzle is constant. No estimate of relations of measurements between them can be undertaken.

The tragus varies in height from 5 mm. to 6 mm. It presents different degrees of thickness along the median border. As a rule, very thick, this border may be thin and membranous. The processes on the outer border may be two or five, those toward the apex of the tragus tending to merge in one another. This tendency appears to be most marked in males.

The size of the nose-leaf is constant, being 10 mm. high and 6 mm. broad. The lower border shows striking peculiarities in some specimens.

Three of the males exhibited warts arranged in one or two rows across the upper lip on the line occupied in *Artibeus, Phyllostoma,* etc., with a well defined ridge or border. This variation is one of generic rather than specific value. At least it does not indicate any disposition to reversion to *C. castanea,* since in this species no warts are seen, the intervals between the margins of membrane at the side of the base of the nose-leaf simply being smaller than usual, and giving to the eye the appearance of extending directly across the lip. I know of no genus in which this variation of the nose-leaf of *Carollia brevicauda* is a constant character.

In *C. brevicauda,* the warts in the second row on the mentum are elongate in all the nine examples, except one in which they are rounded and do not differ from those of the first row. This arrangement resembles that seen in *C. castanea.*

It is probable that the two outermost rows of warts in *C. brevicauda* coalesce to form the elongate wart, which, as a rule, exists.

In reviewing the measurements of *C. castanea,* when placed in tabular form with those of *C. brevicauda,* it is seen that in the species first named that many of the measurements are the same ; that is to say, in some one of the examples of *C. brevicauda* the measurement of a given part will be found to be the same as in *C. castanea.* Thus the arm is of the same length in three specimens of *C. brevicauda.* The length of the bones of the digits find their complements in *C. brevicauda,* excepting the metacarpals of the fourth and fifth digits, which are shorter than in any example of that species. The metacarpal of the first digit is of the same length in one specimen of *C. brevicauda,* while the first phalanx is shorter than in any. The head is shorter while the ear is longer. The tragus remains the same in the two species. The thigh and the leg are both shorter in *C. castanea,* while the tail is absolutely longer by 1 mm.

The proportion of the widths of the second, third and fourth interdigital spaces is shown to be subject to variation. Specimens numbered 3129, 3231, 3128, 3230, 3229, and 4192 are of those in the best condition ; and it is seen that the differences are less than in the remaining specimens. But after all possible sources of error are eliminated, it will be seen that in three only of *C. brevicauda* (the males, Nos. 3230, 3229, 4192—and thus suggestive of sexual distinction) is the difference between the widths of the second and third spaces less than 10 mm., while in the single example of *C. castanea* (also a male), the difference amounts to but 9 mm.

In this connection I may allude to the value which attaches to the last-named measurements in the study of the Cheiroptera.

If a specimen of a bat, which is preserved in spirit, is so held in the hand that the wing is supported in the position of flight, it will be seen that the intervals between the metacarpal bones hold a definite relation to each other.

The width of the spaces between the metacarpals, now being recorded (the measurements are taken at their widest parts), it will be seen that the second interspace is the narrowest and the fourth the widest. In this way a formula may be stated. It is proper to add the length of the forearm to the formula, since this measurement is one of relative constancy and is of importance in framing the diagnosis of the species.

Examination of the table herewith presented exhibits at a glance the marked contrasts which obtain in the Phyllostomidæ in the composition of this formula.

It is especially interesting to note the difference which exists between the widths of the second and the third interspaces. It will be observed that no two formulæ are alike, nor is any fixed ratio preserved between the formulæ of genera which are allied. Nevertheless the measurements are sufficiently distinctive to warrant the recommendation that they be taken in all discriminating studies, not only of the Phyllostomidæ, but of the entire order.

Formulæ of the Widths of Second, Third and Fourth Interspaces in the Genera of Phyllostomidæ.

	II	III	IV	Forearm.	Differ'e bet. III & IV
	mm.	*mm.*	*mm.*	*mm.*	*mm.*
Lophostoma	7	17	18	49	1
Schizostoma	3	16	21	32	5
Macrotus	2	15	22	44	7
Desmodus.........	2	21	37	53	10
Vampyrops	3	17	27	36	10

	II	III	IV	Forearm.	Differ'e bet. III & IV
	mm.	*mm.*	*mm.*	*mm.*	*mm.*
Sturnira	3	21	31	38	10
Chilonycteris	1½	15	17	40	12
Carollia	5	20	32	26	9–12
Vampyrus	16	41	53	105	12
Lonchoglossa	3	19	32	33	12
Monophyllus	3	17	34	32	14
Artibeus	4	21	39	51	18
Brachyphylla	3	25	43	64	18
Mormoops	3	16	35	50	19
Phyllostoma	4	29	62	81	45

The study of measurements has given valuable results in the study of the human cranium and has enabled anatomists to come to definite conclusions respecting the validity of characters even when derived from scanty and imperfect material.

No reason can be urged why similar methods may not prove acceptable in describing a new species of mammal.

Extended observations on a number of examples of allied species enhance the value of those upon which it is proposed to announce a new one.

The following table includes the formulæ in families other than the Phyllostomidæ:

Rhynchonycteris	5	16	25	40	9
Cynopterus marginatus	10	18	27	58	9
Vespertilio murinus	2	11	31	59	10
Epomophorus franqueti	13	21	39	83	11
Rhinopoma	3	13	30	64	17
Atalapha	½	9	26	37	15
Molossus rufus	½	5	35	46	30
Noctilio	2	13	58	83	45
Pteropus edwardsii	18	17	69	145	52

Stated Meeting, January 3, 1890.

Present, 10 members.

President, Mr. FRALEY, in the Chair.

Correspondence was submitted as follows:

Letters acknowledging election to membership from Mr. A. Sydney Biddle and Dr. George Friebis, Philadelphia; Dr. C. C. Abbott, Trenton, N. J.; Rt. Rev. John J. Keane and Hon.

Fernando Cruz, Washington, D. C.; Hon. J. M. Le Moine, Quebec, Canada.

The San Francisco Public Library was, on motion, placed on exchange list to receive Proceedings and Transactions.

The Brooklyn Entomological Society communicated a change of address to No. 200 Washington street, Brooklyn.

The decease of members was announced as follows:

Dr. Charles A. Ashburner, Pittsburgh, Pa. (b. February 9, 1854; d. December 24, 1889).

Dr. James H. Hutchinson, Philadelphia (b. 1834; d. December 27, 1889).

Hon. George H. Boker, Philadelphia (b. October 6, 1823; d. January 2, 1890).

On motion, the President was authorized, at his discretion, to appoint suitable persons to prepare the usual obituary notices.

The President reported that he had appointed Hon. Richard Vaux to prepare the obituary notice of the late Franklin B. Gowen, and the appointment of Hon. James B. Angell to prepare the obituary notice of the late Henry S. Frieze, and that the same had been accepted.

The clerks and judges reported that at the annual election for officers and council, held this afternoon, the following gentlemen had been duly chosen:

President.

Frederick Fraley.

Vice-Presidents.

E. Otis Kendall, W. S. W. Ruschenberger, J. P. Lesley.

Secretaries.

George F. Barker, Daniel G. Brinton, Henry Phillips, Jr., George H. Horn.

Counselors (for three years).

Daniel R. Goodwin, William A. Ingham, Thomas H. Dudley, Robert Patterson.

Curators.

John R. Baker, Patterson DuBois, J. Cheston Morris.

Treasurer.

J. Sergeant Price.

Mr. Henry Phillips, Jr., was nominated for Librarian, and the nominations were closed.

Dr. A. S. Gatschet presented through the Secretaries a "Third Article on the Beothuk Indians."

Prof. Ryder presented a paper on "The Eye, the Ocular Muscles, and the Lachrymal Glands of the Shrew-mole."

Pending nominations Nos. 1203, 1204 and 1205, and new nominations Nos. 1206 and 1207 were read.

And the Society was adjourned by the President.

Stated Meeting, January 17, 1890.

Present, 20 members.

President, Mr. FRALEY, in the Chair.

Dr. George Friebis, a lately elected member, was presented to the Chair, and took his seat.

Correspondence was submitted as follows:

A letter from Dr. Antonio Peñafiel (Mexico), announcing that his address would be, for some time to come, Berlin, Prussia (Kupfergraben 4).

Accessions to the Library were announced from the Académie des Sciences, Cracow, Austria; Physiologische Gesellschaft, Berlin; Gartenbauverein, Darmstadt; Deutsche Gesellschaft für Anthropologie, Ethnologie, etc., Munich Bavaria; Académie Royale de Belgique, Bruxelles; Senator Pietro Ellero, Bologna, Italy; Biblioteca N. C., Firenze; R. Accademia dei Lincei, Rome; Rédaction "Cosmos," Sociétés de l'Enseignement, Geographie, Ethnographie, Ecole des

Mines, Paris; Geological, Astronomical, Meteorological, Geographical Societies, Lords Commissioners of the Admiralty, "Nature," London; Natural History Society of Northumberland, Durham and Newcastle-upon-Tyne, Newcastle-upon-Tyne; Philosophical Society, Glasgow; Geological and Natural History Survey of Canada, Montreal; Canadian Institute, Toronto; American Academy of Arts and Sciences, Society of Natural History, Boston; Museum of Comparative Zoölogy, Cambridge; Brown University, Providence, R. I.; Yale University, "American Journal of Science," New Haven, Conn.; Entomological Society, Prof. W. Le Conte Stevens, Brooklyn; Cornell University, Ithaca; New York Academy of Sciences, American Chemical Society, New York Historical Society, Rev. John Hall, D.D., New York; College of Pharmacy, Franklin Institute, Editors of the "Medical and Surgical Reporter" and the "Medical News," Prof. H. D. Gregory, LL.D., Philadelphia; U. S. Naval Institute, Annapolis; Maryland Institute, Baltimore; U. S. Engineer Office, Department of the Interior and of State, Commissioner of Education, U. S. Fish Commission, Mr. Lester F. Ward, Col. Garrick Mallery, Washington, D. C.

Photographs were received from Il Marchese de Gregorio Palermo, and Dr. R. H. Alison, Ardmore, Pa.

The deaths of the following members were announced:

J. H. C. Coffin, U.S.N., January 8, 1890, Washington, D.C. æt. 75.

William D. Kelley, M. C. (of Philadelphia), at Washington, D. C., January 9, 1890 (b. April 12, 1814).

The stated business of the meeting was then taken up, and Henry Phillips, Jr., was unanimously reëlected Librarian for the ensuing year.

On motion, the President was authorized to appoint at his leisure the Standing Committees of the Society, which he subsequently appointed as follows:

Finance.

William B. Rogers, Philip C. Garrett, C. S. Wurts.

Publication.

Daniel G. Brinton, George H. Horn, Samuel Wagner,
Patterson DuBois, Horace Jayne.

Michaux Legacy.

Thomas Meehan, J. Sergeant Price, Aubrey H. Smith,
William M. Tilghman, Isaac Burk.

Hall.

J. Sergeant Price, William A. Ingham, Charles A. Oliver.

Library.

Edwin J. Houston, William V. McKean, Wm. John Potts,
Jesse Y. Burk, William H. Greene.

Henry M. Phillips' Prize Essay Fund.

Richard Vaux, Henry Phillips, Jr., William V. McKean,
Furman Sheppard, Joseph C. Fraley,
and
The President of the Society, } *ex officio.*
The Treasurer of the Society, }

Dr. Harrison Allen made an oral communication on "The Variations of the Forms of Human Teeth."

He stated that monocuspidate teeth are those which first appear in any given series, and that the bicuspidate and the multicuspidate forms are complications due to additions to the monocuspidate. He claimed that the quadritubercular human molar resolves itself into two pairs of adjoined cusps which are arranged endo-ectally, and not as he at one time stated* into a tritubercular form to which is appended a rudimental fourth cusp. He also believed that teeth when degenerated do not of necessity descend along the lines of ascent. As a rule they infrequently do so. In his opinion, degenerated teeth (and these were illustrated from the orders of Cheiroptera, Rodentia, and Primates) are all essentially alike, inasmuch as they exhibit losses of characteristic details, while retaining the lateral thickenings and contour lines. Some of these may be mimetic of the true tritubercular molar. It is necessary to remember, that forms of teeth when passing into degeneration are in reality expressions of teratological phenomena and have little or no taxonomic value.

* "Dental Cosmos," December, 1874.

Pending nominations 1203, 1204, 1205, 1206, 1207 and new nomination 1208 were read.

Mr. Henry Phillips, Jr., presented some statistics relating to the Society.

Dr. Oliver offered the following preamble and resolution:

Whereas, It is both honorable and just that we, the present representatives of the American Philosophical Society, should show our affection and regard for our illustrious founder and first President, Dr. Benjamin Franklin, who died on the 17th day of April, 1790, be it,

Resolved, That we commemorate his life, his wisdom, his labors, and his achievements by proper and fitting ceremonies becoming such an occasion, on the 17th day of April, 1890; the form of the commemoration to be referred to a Special Committee of five members, to be appointed by the President, who shall be empowered to take all necessary action.

Which, after discussion, was adopted.

The President subsequently appointed as such Committee, Messrs. Charles A. Oliver, Henry Phillips, Jr., Arthur Biddle William John Potts and William H. Greene.

Dr. Morris made some remarks on the desirability of better accommodations for the possessions of the Society. On motion of Mr. Dudley it was

Resolved, That the President appoint a Committee of five members to consider the whole subject, and to ascertain if the Society can obtain additional space in the vicinity of its Hall, and that the President should also be a member of the Committee.

The President subsequently appointed as such Committee, Messrs. J. Cheston Morris, Thomas H. Dudley, J. Sergeant Price, Richard Vaux and William P. Tatham.

A communication from the Chairman of the Committee on the Michaux Legacy, in reference to an appropriation of $150 towards the expenses of a scientific expedition about to proceed to Mexico, was referred to the Committee to report upon at the next meeting.

And the Society was adjourned by the President.

Stated Meeting, February 7, 1890.

Present, 8 members.

Prof. EDWIN J. HOUSTON in the Chair.

Correspondence was submitted as follows:

Letters from Sir George G. Stokes, F.R.S., London, and Dr. Friederich S. Krauss, Vienna, accepting membership in the Society.

A letter from the Physikalisch-Oekonomische Gesellschaft zu Kœnigsberg in Preussen, announcing the approaching Centennial Anniversary of its formation (February 22, 1890).

An invitation from Columbia College, New York city, N. Y., to be present by delegate at the inauguration of Seth Low as President, on February 3, 1890.

Letters of envoy were received from the K. Leopoldinisch-Carolinische Akademie, Halle a. S.; Meteorological Office, London.

Letters of acknowledgment were received from the Royal Society of Victoria, Melbourne (129); Naturwissenschaftlicher Verein des Regierungs-Bezirks, Frankfurt a. O. (129); K. Leopoldinisch-Carolinische Akademie, Halle a. S. (129); Prof. J. Victor Carus, Leipzig (127, 128); Société des Sciences Physiques et Naturelles, Bordeaux (129); Sir Monier Monier-Williams, London (128, 129); Hon. J. M. LeMoine, Quebec (129, 130); Nova Scotian Institute of Natural Science, Halifax (96–130, Catalogue, etc.); Anthropological Society, Washington, D. C. (125, 126, 127, 128); Prof. James B. Angell, Ann Arbor (129); Geological Survey of Missouri, Jefferson City (129, 130, Catalogue, etc.).

Letters of acknowledgment (130) were received from the Geological and Natural History Survey, Ottawa, Canada; University of Toronto, Canadian Institute, Toronto; Maine Historical Society, Portland Society of Natural History, Portland, Me.; Northern Academy of Arts and Sciences, Prof.

C. H. Hitchcock, Hanover, N. H.; Mr. John G. Whittier, Amesbury, Mass.; Boston Athenæum, State Library of Massachusetts, American Statistical Association, Boston Society of Natural History, Massachusetts Historical Society, Hon. Robert C. Winthrop, Boston; Harvard College Library, Museum of Comparative Zoölogy, Profs. Alexander Agassiz, Joseph Lovering, Robert N. Toppan, Cambridge, Mass.; Mr. James B. Francis, Lowell, Mass.; Free Public Library, New Bedford; Dr. Pliny Earle, Northampton; Essex Institute, Salem; American Antiquarian Society, Worcester; Rhode Island Historical Society, Prof. Thomas Chase, Providence; Connecticut Historical Society, Hartford, Conn.; New Haven Colony Historical Society, Profs. H. A. Newton, W. D. Whitney, New Haven, Conn.; Profs. James Hall, Edward North, C. H. F. Peters, Clinton, N. Y.; New York Hospital, Astor Library, Dr. Daniel Draper, New York State Library, New York Historical Society, Columbia College Library, Prof. Joel A. Allen, Messrs. J. Douglas, R. W. Raymond, Dr. J. J. Stevenson, New York; Vassar Brothers' Institute, Poughkeepsie; Oneida Historical Society, Utica; U. S. Military Academy, West Point; Mr. William John Potts, Camden; New Jersey Historical Society, Newark; Prof. C. F. Brackett, Princeton; Dr. Charles B. Dudley, Altoona, Pa.; Academy of Natural Science, College of Physicians, Wagner Free Institute, Pennsylvania Hospital, Numismatic and Antiquarian Society, Messrs. Harrison Allen, John Ashhurst, Richard L. Ashhurst, R. Meade Bache, Cadwalader Biddle, George D. Boardman, W. G. A. Bonwill, Arthur E. Brown, Samuel Castner, Jr., Henry C. Chapman, C. H. Clark, Thomas M. Cleemann, E. D. Cope, Samuel Dickson, Patterson du Bois, Persifor Frazer, F. A. Genth, Jr., Daniel R. Goodwin, William H. Greene, H. V. Hilprecht, E. J. Houston, Francis Jordan, Jr., E. Otis Kendall, Joseph Leidy, Francis W. Lewis, Morris Longstreth, E. Y. McCauley, F. A. Mühlenberg, Isaac Norris, Charles A. Oliver, C. Stuart Patterson, C. N. Peirce, William Pepper, Henry Phillips, Jr., Franklin Platt, Theodore D. Rand, George B. Roberts, W. S. W. Ruschenberger, Lewis A. Scott, Aubrey H. Smith, Albert H. Smyth, George Stuart, William P. Tatham, William Thomson, H. Clay Trumbull, David K. Tuttle, William H. Wahl, Ellis Yarnall, Mrs. Helen Abbott Michael, Philadelphia; Dr. Robert H. Alison, Ardmore; Prof. E. B. Wilson, Bryn Mawr; Prof. Lyman B. Hall, Haverford; Mr. Philip C. Garrett, Logan, Phila.; Mr. J. Vaughan Merrick, Roxborough; Mr. Burnet Landreth, Bristol; Mr. Eckley B. Coxe, Drifton; Dr. Traill Green, Profs. James W. Moore, Thomas C. Porter, Easton; Linnean Scientific and Historical Society of Lancaster, Pa.; Mr. Peter F. Rothermel, Linfield; Mr. John F. Carll, Pleasantville; Mr. Peter W. Sheafer, Pottsville; Mr. M. Fisher Longstreth, Sharon Hill, Pa.; Philosophical Society, Mr. Philip P. Sharpless, West Chester; State Library of Pennsylvania; Mr. Andrew S. McCreath, Harrisburg; Naval Institute, Annapolis, Md.; Maryland Institute, Baltimore; Library of the Surgeon-General's Office, Anthropological Society, U. S. Naval Observatory, Smithsonian Institution, Messrs. S. F. Emmons, Albert S. Gatschet, Thomas J. Lee, Garrick Mallery, Charles A. Schott, William B. Taylor, Lester F. Ward, Washington, D. C.; Virginia Historical Society, Richmond; Prof. John W. Mallet, University of Virginia; Prof. Lyon G. Tyler, Williamsburg, Va.; Elliott Society of Science and Art, Charleston, S. C.; Georgia Historical Society, Savannah; University of Alabama, Tuscaloosa; Prof. E. W. Claypole, Akron, O.; Denison University, Granville, O.; Society of Natural History, Cincinnati Observatory, Hon. J. D. Cox, Prof. James M. Hart, Cincinnati; Rev. Henry S. Osborn, Oxford, O.; Dr. Robert Peter, Lexington, Ky.; Athenæum, Columbia, Tenn.; St. Louis Academy of Science; Profs. James B. Angell, Alexander Winchell, Ann Arbor; Gen. William F. Reynolds, Col. William Ludlow, Detroit; Prof. John C. Branner, Little Rock, Ark.; Davenport Academy of Natural Sciences; Iowa University Library, Iowa City; Kansas State Historical Society, Washburn College, Topeka, Kans.; Prof. John L. Campbell, Crawfordsville, Ind.; Chicago Historical Society, Newberry Library, Chicago, Ill.; State Historical

Society of Wisconsin, Madison; Colorado Scientific Society, Denver; Prof. Joseph Le Conte, Berkeley, Cal.; Prof. Daniel Kirkwood, Riverside, Cal.

Accessions to the Library were announced from the K. Böhmische Gesellschaft der Wissenschaften, Prag; K. K. Geologische Reichsanstalt, K. Akademie der Wissenschaften, Vienna, Austria; Gesellschaft für Anthropologie, etc., Deutsche Geologische Gesellschaft, Gesellschaft für Erdkunde, Messrs. Friedländer & Son, Berlin; Senckenbergische Naturforschende Gesellschaft, Naturwissenschaftliche Verein des Reg.-Bez., Frankfurt a. M.; Verein für Erdkunde, K. Leopoldina Carolina Akademie, Halle a. S.; Sociedade de Geografia, Lisbon; Meteorological Council, Society of Arts, Prof. B. Loewenberg, London; Trustees of Prof. James Henry, Dublin; Nova Scotian Institute of Natural Science, Halifax; Natural History Society, Montreal; Theological Seminary, Andover; American Statistical Association, Hon. Robert C. Winthrop, Boston; Museum of Comparative Zoölogy, Prof. Samuel D. Scudder, Cambridge, Mass.; Essex Institute, Salem; Editor of "The Traveller's Record," Hartford; Meteorological Observatory, American Institute of Electrical Engineers, New York; Mr. William John Potts, Camden, N. J.; American Pharmaceutical Association, Wagner Free Institute, Editor of "The Naturalist's Leisure Hour," Daniel G. Brinton, I. Minis Hays, Henry Phillips, Jr., Philadelphia; Pennsylvania Geological Survey, Harrisburg; Prof. Ira Remsen, Baltimore; Treasury Department, Smithsonian Institution, Department of the Interior, U. S. Coast and Geodetic Survey, Hydrographic Office, Anthropological Society, Washington, D. C.; Charles C. Jones, Jr., Augusta, Ga.; State Board of Health, Nashville, Tenn.; Public Library of Cincinnati; State Historical Society, Iowa City, Ia.; Wisconsin Academy of Sciences, Arts, etc., Madison; Washburn College Laboratory of Natural History, Topeka, Kans.; Los Angelos Public Library; University of California, Sacramento; Observatorio Meteorologico-Magnetico Central, Observatorio Astronomico Nacional de Tacubaya, Sociedad Cientifica "Antonio Alzate," Mexico; Museo

Michoacano, Morelia, Mexico; Deutsche Wissenschaftliche Verein, Santiago, Chili.

The death of Gustav Adolph Hirn, Colmar, Alsace, January 14, 1890, æt. 75, was announced.

Dr. Daniel G. Brinton presented a paper on "Etruscan and Libyan Names."

Prof. Houston made a communication on "Muscular Contractions following Death by Electricity."

Pending nominations Nos. 1203, 1204, 1205, 1206, 1207, 1208 were read.

On motion, the Society subscribed to "American Notes and Queries," and ordered the purchase of the three previous volumes.

Dr. Oliver reported the following preamble and resolutions, which were adopted, and the same committee continued and requested to make all the arrangements necessary to carry out the same:

The Committee to which was referred the following preamble and resolution: "Deeming it both honorable and just that we, the present representatives of American Philosophical Society, should show our affection and regard for our illustrious Founder and First President, Dr. Benjamin Franklin, who died on the 17th day of April, 1790, be it resolved that we commemorate his life, his wisdom, his labors and his achievements by proper and fitting ceremonies becoming such an occasion, on the 17th day of April, 1890; the form of the commemoration to be referred to a special committee of five members, who shall be empowered to take all necessary action," presented by Dr. Oliver at the meeting of the Society on the 17th of January, 1890, begs respectfully to submit the following report:

Resolved, That we commemorate in a becoming manner the approaching Centennial Anniversary of the death of Benjamin Franklin.

Resolved, That a series of short addresses upon his life, character and work be delivered before the Society upon this occasion.

The Committee on the Michaux Legacy reported in favor of an appropriation of $150 to assist the expedition of Prof. Heilprin to investigate the forest growths of Mexico and Yucatan; and on motion the amount was granted for the purpose.

The Finance Committee offered the following resolution which was adopted:

Resolved, That J. Sergeant Price, Treasurer, be and he is hereby authorized to sell and transfer three thousand dollars of the loans of the City of Philadelphia now standing in the name of the Society.

And the Society was adjourned by the presiding member.

On Muscular Contractions Following Death by Electricity.

By Prof. Edwin J. Houston.

(Read before the American Philosophical Society, February 7, 1890.)

Accurate data are wanting as to whether death resulting from accidental contact with electric conductors conveying the powerful currents employed in systems of electric lighting or power distribution is, or is not, practically instantaneous. Certain facts, however, are known which show that when the nature of the contacts is such that the discharge passes through the respiratory, the cardiac or the brain centres, that true physiological death, as evidenced by the complete failure of these centres to perform their normal functions, and their inability to afterwards perform these functions, is practically instantaneous.

In cases of death from a lightning bolt, for example, instances are on record where death has been so nearly instantaneous that the bodies have remained so nearly in the positions occupied during life that passers-by have failed to recognize the presence of death.

On the regaining of consciousness lost by a lightning discharge or a contact with an electric conductor, the subject as a rule has no memory of pain or suffering, and in many instances is even ignorant of the cause of the accident.

A fact, however, which appears to disprove that practically instantaneous physiological death follows a powerful electric discharge, should be alluded to. In some instances, it has been observed that the body of the person receiving the discharge showed prolonged convulsive muscular contractions and contortions. The question thus arises, Do such muscular movements necessarily prove actual suffering on the part of the subject? Do they even necessarily prove the existence of life while they are taking place? While, of course, the answer to this question must necessarily be to a certain extent uncertain, the following considerations are offered to show that in all probability such muscular contractions follow physiological death, and are, therefore, unattended by consciousness or suffering.

Two general cases of contact resulting in death may occur, viz.:

1. A momentary contact, where the discharge is only temporary, as in the case of the lightning discharge, or the case of a person falling against the wires and remaining in contact therewith but a few seconds or fractions of a second.

2. A prolonged contact where the current continues to pass through the body for some time after death.

In cases of death by the first class of contacts, no convulsive movements occur. Death results from physiological shock, or possibly from changes in the nervous or muscular tissues.

In the second class of contacts, death in many cases probably occurs practically instantaneously. The question then arises, How can the muscular contractions be explained ?

The classic experiments of Galvani with the excised legs of recently killed frogs prove conclusively that the passage of an electric current causes convulsive muscular movements. The same phenomena, too, have been observed in the human subject, as numerous experiments with the bodies of criminals shortly after their execution have shown.

It would seem, therefore, probable, to say the least, that when the electric current continues to pass through the body of the subject after physiological death has occurred, such convulsive muscular movements may occur, and that, therefore, their existence do not prove suffering.

When a powerful current traverses the body, tetanus occurs, and muscular movements in such parts cease. The nerve loses its sensibility, and, if the current is too strong, changes occur in its structure or composition, either as a result of polarization, or electrolysis, or otherwise, which prevent it from being further affected by the electric discharge. Since such changes presumably occur in cases of death by electric discharges, it would appear that muscular contractions would therefore be impossible after death. A brief consideration of the manner in which an electric current traverses the human body will show that such a conclusion is unwarranted.

When the electrodes of any source are applied to any two parts of the human body, a current passes through the body from the positive to the negative electrode. The density of current that passes, or the current strength per unit of area of cross-section, is different at different parts of the body. Those portions that lie in the paths of least resistance, which, in general, are situated in paths of least distance between the electrodes, receive the denser and more powerful current, while those lying in paths of greater resistance, receive weaker currents. In other words, in the passage of the electric current through the human body, a diffusion of the current occurs.

While, therefore, the nerves and muscles lying in the direct path of a fatal discharge may be almost instantly deprived of their sensibility by the passage of the powerful and fatal discharge through them, the nerves and muscles which lie in the paths of less powerful currents may still retain their power of electric excitation.

It is therefore probable, that in cases of prolonged fatal contact with electric conductors, the ensuing convulsive muscular contractions do not of necessity prove suffering.

I offer these views with some diffidence from the standpoint of an electrician rather than that of a physiologist.

On Etruscan and Libyan Names. A Comparative Study.

By Daniel G. Brinton, M.D.

(*Read before the American Philosophical Society, February 7, 1890.*)

§ 1. *Introductory. Libyan Epigraphy.*

In October last (1889) I laid before this Society a series of considerations drawn from the physical traits of the Etruscans, their customs, arts and language, going to show that they were an offshoot or colony of the Libyans or Numidians of North Africa—that stock now represented by the Kabyles of Algeria, the Rifians of Morocco, the Touaregs of the Great Desert and the other so-called Berber tribes.

So far as I was aware, this opinion had never been advanced before, although it would seem a natural and obvious one. Nor have I yet found that any writer had clearly stated it previously; though I have discovered that occasional earlier observers have been struck with some of the resemblances which so impressed me, and I am glad to add the weight of their testimony to my own. Thus, M. Louis Rinn, Vice-President of the Historical Society of Algiers, after alluding to what he considers a point of resemblance between the Berber and the Etruscan language, adds, "A comparative study of these two peoples would certainly bring into prominence other similarities, yet more remarkable, in their customs, in the forms and designs of their potteries and in their tongues."* M. Rinn quotes the old traveler, Dr. T. Shaw, as suggesting one or more similarities in Kabyle and Etruscan place-names, but he gives no exact references, and a search through Shaw's *Travels* has not enabled me to find the passages.

In the present article, I shall carry out to a limited extent a comparison between the proper names preserved in the oldest Libyan monuments and a series of similar names believed to be genuine Etruscan. I am aware that this is not the way to study the relationship of languages *à fond;* but the material is not obtainable in this country to do more, and if it were, I have not that familiarity

* *Les Origines Berbères. Etudes Linguistiques et Ethnologiques,* p. 196 (Alger., 1889). I regret that I cannot speak favorably of this laborious production; but its author is fantastical rather than scientific in most of his researches. The similarity referred to is that of the geographical name *Tuderta* which I mention hereafter.

with the Punic and Berber dialects with which one should be equipped to approach the question from that more difficult side.

For the Numidian or Libyan epigraphy I have depended upon the *Collection* of General Faidherbe,* and the admirable *Essay* of Prof. Halévy.† Even with these materials I believe more could be accomplished than I have attempted, and the most that I hope from this and my former paper is to enlist the attention of Etruscologists to the possible derivation of the nation from the Libyan stock. These Libyan or Numidian inscriptions, to be sure, date from a long time after the Etruscans had founded their cities in Italy. The oldest of them are probably not beyond 200 B.C., and then nearly a thousand years had elapsed since the formation of the Etruscan commonwealth. We must not therefore expect frequent identities, especially as the Etruscans notoriously borrowed largely the names and terms of their various neighbors. On the other hand, it must be remembered that the Berber is a group of dialects singularly tenacious of its traits, both grammatic and lexicographic. To this day, its tribes are mutually intelligible, from the western boundaries of Egypt to the Atlantic coast, and from the Mediterranean to the Soudan. Therefore it is not incongruous to attempt the explanation of an Etruscan name (assuming that it is of Libyan origin) by the modern Kabyle or Touareg.

A preliminary question of interest is that of the

§ 2. *Etruscan Invasions of Egypt.*

This subject has been brought to the attention of Egyptologists by the supposed references to the Etruscans in the ancient inscriptions, and to Italian archæologists by the evident Egyptian inspiration in some of the Etruscan art remains. I shall sum up briefly the main points of the question.

From the earliest times the movement of the Libyan tribes toward the east is recorded in the annals of the Egyptian monarchy. In the third dynasty—according to the chronology of Mariette some 4200 years B. C.—the incursions of the Temhu (the Touaregs ?) are mentioned. In the eighteenth dynasty (1703–1462 B.C.) the mother of Amenhotep IV. is represented as a blonde with blue

* *Collection Complète des Inscriptions Numidiques* (*Libyques*). Par le General Faidherbe (Paris, 1870).

† *Études Berbères. Essai d'Epigraphie Libyque.* Par J. Halévy (Paris, 1875).

eyes, and bore the name, at once Libyan and Etruscan, of "Taia." She was probably a Libyan by birth.*

The most important general migration of the Libyan tribes seems to have taken place about 1300 years B.C. At that time, as we are informed by an inscription of Meneptah II. on the wall of the great temple of Ammon at Api, the king of the land of *Libu*, by name Mar-ajui, a son of Did, led a great army composed of his own troops and mercenaries from other nations into Egypt, entering near the city of Prosopis. He was defeated with heavy loss, and many thousands of his soldiery were slain.† Among his allies were the "Tursha," who are considered by some Egyptologists to have been the nation called in classic writings, *Turseni* or *Tyrrheni*, *i.e.*, the Etruscans. This identification is rejected by Dr. Brugsch Bey, who ventures the yet wilder theory that they were *Taurians*. Halévy, on the other hand, is inclined to see in this and the other names given in the list of allies merely various Libyan tribes, neighbors of the Lebu;‡ and this is quite probable when we consider the impracticability of large bodies of soldiery being transported across the Mediterranean in that early age. It is possible, therefore, that the "Tursha" were the "Turseni," and that in consequence of this defeat they left their native land and founded the Etruscan colonies on the west coast of Italy—which were commenced about that time.

Dr. Deecke has already pointed out the probability that the *Tuirsa* who attacked Egypt by sea in the time of Ramses III (twentieth dynasty, 980–810 B.C.) were the Turseni or Etruscans. They are represented on the paintings with pointed beards and helmets of Etruscan form.§ The very early signs of Egyptian culture visible in ancient Etruria, on which Deecke lays stress, may be explained by the proximity of the Libyo-Etruscans—the *Tuirsa*—to the Nile valley before they founded their Italian colonies. It is quite sure that the main body of the army of Mar-ajui was composed of the blonde type of the Berbers, as the Egyptian name applied to them on the monuments is *thuheni*, "the light-colored or fair-complexioned people."

* On the presumably feminine termination in Etruscan *aia*, see Deecke in Müller, *Die Etrusker*, Bd. i, s. 475.

† Dr. Brugsch Bey, *History of Egypt*, Vol. ii, p. 129.

‡ *Essai d'Epigraphie Libyque*, p. 170.

§ See his note in Müller, *Die Etrusker*, Band i, s. 70.

§ 3. *The Libyan Alphabet.*

The ancient Libyan or Numidian alphabet, preserved in the *tifinagh* and *tiddebakin* of the Touaregs, was composed of twenty-three letters, five of which served both as vowels and consonants. As in the Etruscan alphabet, all letters could act as either initial or terminal sounds. Two letters are in the Libyan which do not appear in the Etruscan—*b* and *o*. It is a notable coincidence, however, that not only was the former sound usually rendered by the ancient Roman writers by an *f*,* but it is absent or rare in the Ghdames, Rif, Bougie and Mzab dialects of modern Berber.† Evidently the Etruscan in its omission of this phonetic element is brought into closer relations to a large part of the Libyan speech.

Diphthongs, double consonants, guttural and sibilant sounds are of frequent recurrence in Libyan as they were in Etruscan, the former trait being a similarity which separates both from pure Semitic tongues.‡

The most frequent permutations of the Libyan letters, both in the ancient and modern dialects, are as follows:

b into *f*.
k into *x* (guttural), or *ch*.
l into *d*, or *r*.
s into *z*, or *ch*, or *sh*.
t into *d*, or *dj*, or *dh*.
tch into *k*.
ts into *sh*.
th (θ) into *t*.

§ 4. *Names of Divinities.*

The religion both of the Libyans and Etruscans resembled that of most of their neighbors in being a marked polytheism. It is said that more than two hundred Etruscan divinities have been discriminated;§ but I do not find the names of anything like this number. Otfried Müller and Dr. Deecke give about fifty, of which

* "Le changement de *b* et *f* est très fréquent dans les dialectes berbers." Halévy, *Essai*, p. 21. "Le *b* libyque est souvent transcrit par *f* en latin." *Ibid.*, p. 156.

† Basset, *Manuel de langue Kabyle*, p. 6.

‡ Louis Rinn, *Les Origines Berberes*, p. 59.

§ Richard Burton, *Etruscan Bologna*, p. 192.

some are probably Italian or Greek. From among those apparently really Etruscan, I select for comparison the following:

Apulu, or *Aplu,* was the Etruscan god whose fane was upon Mt. Soracte, and who, according to a tradition recorded by Virgil, was the earliest divinity worshiped by the Tuscans.* From the similarity of the name to the Greek Apollo, most writers have considered it a corruption of that word, and the later Etruscans no doubt transferred the attributes of the famous Greek divinity to their national god. But an examination of the ancient Numidian inscriptions discovers a divinity so closely similar that the suspicion is excited that the two are identical, and the resemblance to Apollo a mere coincidence. This divinity bears the name in the Numidian character *Abru,* and is almost certainly identical with the Guanche *Abŏra,*† showing the wide extension of the cult in the ancient Libyan peoples. Halévy thinks it reappears in a Latin inscription, *Ifru augusto sacrum,* found near Constantine.‡ The phonetic changes from *Abru* to *Aplu* are justified by numerous examples in both Etruscan and Libyan, and that this widely worshipped god of the Libyans should be referred to by the Etruscans as the first they adored is very natural.

Culzu; a member of the Etruscan pantheon, represented with torch and shears, a divinity apparently who decided the day of death.§ Allowing for the constant permutation of *l* and *r* in these dialects, Corippus mentions a Libyan divinity of the same name, of whom the Mauritanian chieftian Ierna was priest:

> "Ierna ferox his ductor erat Gurzilque sacerdos."—*Johannidos,* ii, 109.

The idol of the god represented a divinity of horrid mien, suitable to a god of death.

> "Simulacra sui secum tulit horrida Gurzil."—*Johannidos,* vi, 1139.

The derivation of the Libyan *Gurzil* is not very clear; but as the god who decided on the day of death, and cut or shortened the thread of life (for which purpose Culzu holds the shears in Etruscan portraiture), I am inclined to connect both names with the modern Berber verbal *guezzil,* pl. *guezlen,* to be short, *m'gazzıl,*

* The poet has a Tuscan say:

> "Summe deum, sancti custos Soractis Apollo,
> Quem primi colimus."—*Æneid.,* xi, 785.

† Berthelot, *Bulletin de la Société d'Ethnologie,* Tome ii, p. 131.

‡ *Essai,* p. 156.

§ Müller, *Die Etrusker,* Bd. ii, s. 110.

separation, dismemberment, which Newman compares to the similarity of the English *shear*, *shears*, *short* (*Libyan Vocabulary*, p. 50). In the ancient Numidian epigraphy this deity is referred to in the literation *ghrsl* (Halévy, *Essai*, p. 121), and the final *l* seems to be retained in the Etruscan form *culsl* quoted by Corssen.*

Lala, goddess of the moon, probably the new moon, and hence of birth and fecundity. The name seems connected with the Libyan *lal*, to be born, *θalalil*, birth, etc. In Numido-Latin inscriptions, this precise form *Lala* appears (see Halévy, *Essai*, p. 83).

Leucothea, the white goddess. This is the Greek translation of the name of a female divinity much honored by the Etruscans, and especially at Pyrgos, the port of Caere, where a great and beautiful temple was dedicated to her (Müller, *Die Etrusker*, Bd. ii, s, 54–56). The Etruscan form of the name is not given, but in the list of their beneficent goddesses occur the names *malavisχ*, and *melacuχ*, where the initial radical seems to be the same as in the Libyan *amelal*, white, *mellul*, it is white, etc. (Newman, *Lib. Vocab.*, pp. 61, 62). In these, I believe, we may recognize the goddess of Pyrgos. Whether her attribute of whiteness was derived from the sea foam or the morning light, or from some other cause, we have no means of knowing.

Manes, *Mania*, *Mantus*. The *dii Manes* of the ancient Latins are generally recognized to have been derived in character and name from Etruscan antecedents. The derivations of the word *Manes* offered by the later grammarians are as usual merely fanciful and worthless, nor has any acceptable one been suggested by modern writers. I believe it is revealed in the name of an ancient Libyan deity, *Motmanius*. This occurs in a votive inscription found near Constantine—*Motmanio et Mercurio sacrum* (Halévy, *Essai*, p. 157). The name seems to be clearly a compound of Libyan *emet;* aorist, *imūt*, to die, dead, and *emān*, soul,—a lord of the souls of the dead. In the first syllable we recognize the Etr. *mut-na*, a tomb, a place of the dead (see my *Eth. Aff. of Etruscans*, p. 19), and in *Manius* is the Etr. *Manes*, the current meaning of which was "the souls of the dead,"† allied to which was the Etr. name of the god of the underworld, *Mantus*, the goddess *Mania*, and perhaps the

* *Sprache der Etrusker*, s. 610.

† "Die Seele der Hingeschiedenen," Müller, *Die Etrusker*, Bd. ii, p. 98.

goddess often portrayed on Etruscan mirrors with the name *Munθu*, or *Munθχ*, believed by Deecke to be one of the auspicious *Manes* or spirits.

Mars. The old Italic name for this divinity was *Marmar*, which reappears in the Etr. *Mamar-ce*, a personal name, and *Maris*, the name of a divinity shown on Etr. mirrors. One of the months in the Etr. calendar was named from him. This name in the form *Marmar* was quite frequent in Libyan. I need but recall the Libyan general *Marmaria*, the tribe *Marmaridæ*, etc. It also appears in the Libyan inscriptions of Djebel-Thala (Halévy, *Essai*, p. 68). The identification appears therefore complete.

Menerva, the Etr. forms of which are *mnarva* and *meneruva*, is believed to be distinctly a Tuscan goddess whose original vocation was that of a protectress of children; only in later days did she assume the attributes of the Greek Athene (Müller, *Die Etrusker*, Bd. i, s. 46 *sq.*). The name has a strong Libyan physiognomy. The prefix *men* is common in the dialects of that stem, and in the remainder of the name, *arua*, *eruva*, we are close to the modern Kabyle *arau*, pl. *arawan*, child, a meaning most consonant with her original character.

Sethlans. The Etr. compound *Seθre*, or *Set-ria*, is a proper name, the root of which *Set* (*seθ-*) probably reappears in the initial syllable of *Seθ-lans*, the Etr. Vulcan. This initial syllable *set-*, *sed-*, *sit-*, is a common one on the Libyan tombs of the earliest centuries (Inscrips. 77, 105, 128, 216, etc.). One of the Numidian names appears in the Latin form, *Sit-ilia*, and the Libyan *Sit-ila* (Inscrip. 216) is close to Etr. *Seθ-lans*. Halévy suggests its relationship to the Egyptian god *Set* (*Essai*, p. 81); but its origin may as well be from the Libyan root *s't*, now preserved in the Touareg, *is-suhet*, strong, *essahet*, violence, etc.; Kabyle, *set-mara*, by force, by might, etc.

Tina, *Tinia.* This divinity is stated to have corresponded to the Jupiter of the Romans, and his figure often appears on Etruscan mirrors and coins with the symbols of the lightning, the sceptre and the crown of rays. For these and other reasons (set forth in detail by Müller), he is looked upon as "the chief divinity of the Etruscans and the centre of their celestial world."

It must be regarded as a striking example of the permanence of mythologic conceptions that the same deity with the same name is recorded by Corippus as the Jupiter of the Libyans in the sixth century A. D. In his lines referring to the gods they invoked on entering battle, he writes:

> "Mastiman alii; Maurorum hoc nomine gentes
> Tænarium dixere Jovem."—*Johannidos*, Lib. vii, 307.

The name *Mas-timan* is compounded of the common Libyan (and Etruscan) prefix of grandeur *mas*, and *timan*, in which the *n* in *Tina* has changed into *m*, a permutation frequent in the Moroccan (Rifian) dialect of Berber, in which the *mim* of the Arabic alphabet is often substituted for the *nun*.* The terminal *n* in so many of the Libyan names given by Corippus is thought by Halévy to be often an extraneous addition to the native form.†

Turm's, the Etruscan Mercury.
Turan, goddess of love.
Tarsu, a mythical Gorgon.
T'ruisie, a hero god.

In these and similar Etruscan names we appear to be in the presence of the exceedingly common ancient Libyan radical TR, seen in the inscriptions in such names as *Toura*, *Touran*, *Tir-mag*, *Tor-dak*, *Tour-sha*, etc., and in Corippus' poem in *Tor*, *Tur-sus*, etc.

The prefix used thus frequently in both dialects is likely to be a term of reverence, affection or amplification. It does not appear current in modern Berber. In its dialects the syllable means a height, a hill or mountain, *dar*, *adrar* (pl. *daran*); *tareelit*, a hill. The transfer of the idea of physical to social elevation is common to all languages (*son altesse*, his serene highness, etc.), and may be at the base of the meaning here.

Usil, the sun-god of the Etruscans, was portrayed with rays around his head and a bow in his hand (Müller, *Etrusker*, Bd. ii, p. 80). As I have remarked in my previous essay, the Libyan word for the sun at high noon is *ăsl*.

§ 5. *Names of Persons.*

The Etruscans were accustomed to employ both individual and family names, and in some instances all three of the names in use

* Basset, *Manuel de Langue Kabyle*, p. 9.

† "La terminaison *n* est une particularité de la prononciation punique des expressions libyques." *Essai*, p. 121

by the later Latins (prænomen, cognomen, agnomen). The same form frequently appears in different cases as family name and surname. A comparison of such personal names with those found on the sepulchral monuments of the ancient Libyans may lead to some definite results.

Avile is said by Deecke to be one of the most ancient and genuine of Etruscan personal names. It appears both as surname and family name on a number of the oldest inscriptions (see his remarks in Müller, *Die Etrusker*, Bd. i, s. 443). It is also found in the ancient Numidian character as *Avvil* (Inscrip. 215), and in the Numido-Latin inscriptions as *Avilius* and *Avilia* (Halévy, *Essai*, p. 142). These are precisely the Latin forms derived from the Etr. *avile.*

Aules, Aulesa, Aulesla, a very common, pure Etr. prænomen (Müller, *Etrusker*, Bd. i, s. 444). It is exceeding close to that of the Libyan goddess *Aulisva*, which figures in a Latin inscription found near Constantine (Halévy, *Essai*, p. 156).

Betuus, Betua; a Latinized form of Etr. *fetiu, feθiu;* perhaps also *petvia* (Müller, *Etrusker*, Bd. i, s. 477, 486). Probably allied to the Libyan *battus, bahatus*, chief, ruler (Halévy, *Essai*, p. 164).

Cæcina, the family name of the celebrated Etruscan gens of Volterra. The Etr. orthography is *caicna* or *ceicna*, in which the *na* is a usual termination, leaving the root *caic'* or *caeci*. This is similar to the names *kaka, ghaka*, of the Libyan inscriptions Nos. 206, 246.

Fastia, or *Hastia*, a pure Etruscan name, very frequent at times in the abbreviation *fas*, or as *hasθi*. A very common Libyan name is *bas* = *fas, fazth* (Inscrips. 3, 4, 5, 6, 8, etc.). A similar initial syllable is found in Corippus, as has been pointed out by Halévy (*Essai*, p. 24, note).

Lucŭmo, Lucmo, often appears in the Roman historians as the Etruscan name of individuals, but probably means "prince." Its usual Etr. form is *lauχumes.** This is almost identical with the name of the son of Oesalus, king of Numidia, *Lacumaces.*† The radical reappears in the Etr. prænomen *laχu*, which is identical with the Libyan prænomen *laχo* in Inscrip. 185 (Halévy, *Essai*, p.

* Müller, *Die Etrusker*, Bd. i, ss. 337, 496.

† *Livii Historiæ*, Lib. xxix, c. 29.

111). I am inclined to believe it identical with the *leku* tribe of the Libyan enemies of Meneptah I. *

The prefix *Mas*. Throughout the Libyan dialects *Mas* is an initial syllable of many personal names, and was common in the earliest times, applied both to persons and to gentes, *e. g.:* †

Mas-aesyli, an ethnic name.		
Mas-ight,	"	"
Mas-ulis, *or* Musulus, an ethnic name.		
Mas-adkam, a person		(Inscrip. 27).
Mas-wā,	"	(Inscrip. 34).
Mas-oulat,	"	(Inscrip. 31).
Mas-i,	"	(Inscrip. 32).
Mas-sirā	"	(Inscrip. 50).
Mas sivo,	"	
Mas-akra,	"	(Inscrip. 221, etc.).
Mas-ilal	"	

In Roman historians we find:

Mas-inissa, a Numidian king.		
Mas-tumus,	"	prince.
Mas-timan,	"	deity.
Mas-intha,	"	noble.

And numerous other examples.

General Faidherbe calls attention to the frequency of this prefix, and both he and Prof. Halévy are inclined to derive it from a root "to beget," and assign it the signification of "son of," "children of," etc.‡

This derivation is doubtful, as its radical has not such a signification in modern Berber. In the Touareg dialect *mess* or *messi* means ruler, lord, master, and *mas*, a paternal uncle.§ The former significations are the most applicable and fill all the conditions of the employment of this prefix to personal and tribal names.

This same prefix appears with almost equal frequency in Etruscan proper names, especially those of prominent people and families, as the following examples show:

Mas-tarna (Etr. *Macstrna*), the Etr. appellation of Servius Tul-

* Comp. Halévy, *Essai*, pp. 111, 173, etc.

† See Faidherbe, *Collection Complete des Inscriptions Numidiques*, pp. 22, 36.

‡ *Essai d'Epigraphie Libyque*, p. 126.

§ Newman, *Libyan Vocabulary*, p. 196.

lius (see Müller, *Die Etrusker*, Bd. ii, s. 111, note), a title of thoroughly Libyan physiognomy, meaning "great conqueror," from the verbal *irna*, to conquer; *tarna*, supremacy, victory (Newman, *Libyan Vocabulary*, p. 172).

Mas-entius, *Mezentius*, an ancient Etruscan ruler of Caere, said by Cato to have been a contemporary of Æneas (Müller, *Die Etrusker*, Bd. i, s. 109). Deecke believes that the name reappears in family names *mes-i*, *mes-ial*, etc., of Perugia (*Ibid.*, s. 495).

Mus-onii; Latinized form of an Etruscan family name near Orvieto, borne by the writer C. Musonius Rufus. Deecke compares it with the Etruscan names:
Mus'-ni, found near Cortona.
Mus-enial, found near Perugia.
Mus-u, found at Corneto.
All corresponding to *mas*.

Mas-o; Latinized form of Etr. *mas-u*, allied to *mas-ve*, *mas-veniai*, etc. (Müller, *Die Etrusker*, Bd. i, s. 501).

Mat-, *Met.* A frequent initial syllable in Etr. names, as *mat-ves*, *mat-ausnal*, *met-usnei*, *mat-ona*, *mat-ulna*, etc. It is sufficiently common in the Libyan epigraphy as *mat-ti*, *mat-ar*, *met-ut*, etc. Halévy considers it from a root indigenous to Africa, where, in some of the Hamitic dialects, the radical *met*, *mid*, *mutu*, signifies "man" (*Essai*, p. 18).

Tania, *θannia*, *θanna*. This, says Pauli, "is one of the few pure Etruscan feminine prænomens." * It is seen in the name of the wife of Tarquin, "Tanaquil" (Etr. *θanχvil*), and was one of the most frequent of the surnames of the Etruscan women. † It is preserved in the same form in the Touareg branch of the Berber, in which *anna* = mother, and *t* is the feminine prefix. ‡

Tite, *Titeia*, a prænomen rather common in these and allied forms, and considered pure Etruscan. In Libyan epigraphy *did* and *dides* recur in the sepulchral inscriptions. The precise form *tites* appears on various Etr. inscriptions (see Deecke, in Müller, *Die Etrusker*, Bd. i, s. 471). The Libyan prince already mentioned who invaded Egypt in the nineteenth dynasty was Mar-ajui, "a son of Did."

Vel-, *Vul-*, *Vol-*, *Volt-*. These were extremely common Etr. pre-

* *Etruskische Forschungen*, 1882, s. 114.
† See note of Deecke in Müller, *Die Etrusker*, Bd. i, ss. 457–9.
‡ Newman, *Libyan Vocabulary*, p. 197.

fixes, both to personal and place names, as *Vel-aθri*, *Vel-suna*, the Etr. goddess *Vol-tumna*, the family names *Vel-usna*, *Vẹl-ce*, *Vel-imna*, the prænomens *Vel*, *Vel-θur*, and many others.

They occur with equal frequency in the Libyan epigraphy, as *Vol* (Ins. 167, 200), *Volt* (Ins. 146, 148), in *Volux*, son of the Numidian Bocchus (Sallust, *Jugurtha*, 105), etc.

§ 6. *Proper Names from Corippus.*

A. Cresconius Corippus was an African bishop who lived at the court of Justinian, and wrote a description, in good Latin verse, of the successful campaign of Johannes, a proconsul, against the Mauritanians, about 550. His epos, called the *Johannis*, is peculiarly valuable for my purpose on account of the numerous Libyan proper names it contains, defaced no doubt by forcing them into smooth Latin forms, but often recognizable in their radicals.

In comparing them with the Etruscan onomasticon we must remember that nearly 1800 years had brought their changes on Libyan speech since the Etruscan colonists quitted the African shores.

I shall not undertake to do more than present a list of names from Corippus, side by side with others from Corssen's *Sprache der Etrusker*, to illustrate their strong phonetic resemblance and occasional identity. To discover their etymology and signification is a task I must leave to future students.

Comparison of Libyan personal names from Corippus with Etruscan personal names from Corssen:

LIBYAN.	ETRUSCAN.
afun,	*afuna*.
alantas,	*aleθna*.
ancus,	*ancan*.
anestus,	*anes*.
arcan,	*arcenzios*.
azan,	*ezunu*.
bezina,	*felzinal*.
buranto,	*farθana*.
caggun,	*caicun*.

LIBYAN.	ETRUSCAN.
calamen,	*calu.*
camars,	*camals.*
canapus,	*canpnas.*
carcasen,	*carkna.*
cullen,	*clellu.*
cuilan,	*c' lan.*
cusina,	*cusinei.*
gamas-oran,	*camas.*
gantal,	*caneθa.*
ierna,	*herina.*
ilasan,	*lasa.*
irtus,	*hirtunes.*
mas-,	*mas-.*
narti,	*nortia.*
sacoma,	*secune.*
sarzun,	*sertuna.*
s artifan,	*sauturin.*
succur,	*seccu.*
sucrus,	*secis.*
tamazu,	*tama.*
tanadus,	*tanna.*
tanin,	*tania.*
tarincus,	*tarchnas.*
tor,	*tarsu.*
tumudan,	*tumu.*
tursus,	*tursu.*

The word *clan* in the above list appears on a hundred or more Etruscan sepulchral inscriptions. It has been generally translated "son" (see Müller, *Die Etrusker,* Bd. i, p. 502, note of Deecke). Sometimes it appears as *klan,* or simply *cl; clen* is an occasional variation.

In this word the vowel of the first syllable has been syncopated, as Deecke has pointed out was exceedingly common both in pure Etruscan words and those drawn from the Greek (see his note and examples in Müller, *Etrusker,* Bd. ii, p. 333). The full reading should therefore be *kel-an.* This explanation discloses at once the sense of the word by means of the Libyan tongue. There the word *kel* means household, one family, those dwelling in one tent or home. The Etruscan *član,* or *clens,* should be translated "of the home of," "of the family of," or something to that effect; not necessarily a son.

§ 7. *Place Names.*

The place names handed down to us from Etruscan times offer peculiar difficulties in etymology, for it is very likely that the immigrant Libyans who founded the Etruscan State generally adopted the geographical names they found locally current, and only exceptionally applied others from their own tongue. In some Italian examples we may be tempted to recognize Libyan roots. Thus, in *Arbona, Arretium, Arno, Arna* (near Perugia), etc., there may lurk the Libyan *ar,* mountain. This is rendered more probable by the Etruscan name for the Atlas mountains, or their mythical hero Atlas, which was *Aril,* where we can scarcely err in recognizing the root *ar* (Müller, *Die Etrusker,* Bd. ii, s. 113).

M. Rinn believes with Dr. Shaw that the geographical name *Tadertos, Τυδερτα,* is identical with the Berber *taddert,* a village or town of stone houses.* Many Etruscan remains have been discovered there, proving that it was one of their settlements (Müller, *Etrusker,* Bd. i, s. 98).

In the name of the very ancient Etr. city called by the Latins *Caere,* in Etr. *χaire,* we seem to have the Berber *gari* or *gheri,* a fortified town or city.

An extended examination of these place names offers yet greater difficulties than of the personal names, and I shall not undertake it at present.

Should the above comparative notes of Etruscan and Libyan proper nouns indicate a recognizable relationship between the two tongues, other students will soon be found, with larger command of material, to carry out the comparison and to ascertain what closeness of origin a prolonged investigation is capable of revealing.

* As distinguished from *adouwar,* a village of tents. *Dictionaire Français-Berbere,* s. v., village. See also Rinn, *Les Origines Berbères,* p. 195.

Obituary Notice of Charles Albert Ashburner.

By J. P. Lesley.

(Read before the American Philosophical Society, February 21, 1890.)

Born at Philadelphia, February 9, 1854, and graduated at the University of Pennsylvania, June, 1874, Mr. Ashburner was elected a member of the American Philosophical Society January 16, 1880. Proud of this honor, as he justly esteemed it, he took the liveliest interest in the history, the principles and the meetings of the Society, and became the personal friend of its members, all of whom can testify to the vivacity of his zeal for science, to the geniality of his nature, and to his honor as a gentleman. Those of them who cultivated or who practiced geology, whether in its abstract or in its applied forms, will easily join me in testifying to his ability as a geologist. But no one can relate so confidently and precisely his short, brilliant career of student, field-worker, explorer, discoverer and publisher of physical truths in this branch of science, as one to whom he gave his unbroken friendship for nearly twenty years, one who received from him a thousand benefits. My gratitude for his life equals my grief at his death, and any eulogium my fellow-members accord to me the privilege of giving to his memory will seem cold and empty in comparison of his deserts; for by such examples we learn by heart the lesson, that praise of a wise good man must, after all, be left to the good and wise Creator who invented him.

This learned and ancient Society is one of the few that refuse to be chained to the service of the purely material and useful sciences; one of the few that, in these modernest times, still avouch a willingness to discuss the supernatural; to investigate the invisible and impalpable; to philosophize on the functions of soul as well as body; to protect from destruction and oblivion the claims of human virtue to precede wit and work. Therefore we hold to our traditions, and, in our quarterly elections, we prefer to the question: "Is the candidate for membership a genius or an expert?" the more important question: "Is he a just and honorable gentleman?" A genuine respect for Christianity still lingers in this hall of science; and when we place on record a memorial of some member lately lost to our meetings, we recall with more satisfaction the pleasures which his actually admirable character has contributed to our social intercourse than the profit which accrued to us from his contributions to our Transactions and Proceedings, or even than the fame which he may have won for himself and for the Society.

Governed by this, the real genius of our Society, I put in front of all Mr. Ashburner's virtues his virtue itself; in short, his Christian character, his rooted love of his kind, of just dealing, of exact truthfulness, his honesty, his generosity, his amiability, his respect for the rights and sympathy with the wrongs of other men; qualities which, in him, I know by long and close acquaintance with him were not words, but things; not theoretical, but practical; and of these things I could reveal many instances not known to nor suspected by others. He had an exceedingly sweet and gentle nature. Had it not been for these fundamental and innate principles of character his irritable, nervous temperament would have done him and others a world of mischief. His master passion, I think, was the desire of fame; he loved above all things to be correctly understood and well and widely esteemed, but I never knew him to sacrifice either truth or justice to this passion; and I have often had occasion to wonder at the pleasure which he took, in the most child-like way, in the genuine fame of other men, even when they were his competitors. He had the great good fortune of possessing ambition as a virtue and not as a vice; and the line which his ambition took was a conduct in life having for its object the establishment of a universal confidence not so much in his ability as in his trustworthiness. It was successful. All worthy men who knew him well came to the point of trusting him implicitly, and the satisfaction he took in this was touching to those who loved him, it was so naïve, so simple hearted, so truly beautiful.

In this Society, among whose members are so many religious men, I can venture to add that Mr. Ashburner was a religious man without derogating from his reputation as a philosopher. He was a zealous Protestant Episcopalian, and, when a young man, "was an active worker in Trinity Church, West Philadelphia, showing great ability as a teacher of a large men's Bible class; and, when he moved to Pittsburgh, he became at once connected with Calvary Church." I quote these words from *The Churchman* as part of the record of his life. The writer goes on to say: "Here, as elsewhere, and in everything he did, he illustrated how a scientific student can be an earnest Christian believer, and an indefatigable man of business can find time to do Christian work and show an interest in all Church matters. It was characteristic alike of his nature, thoughtfulness and Christian character, that one of his last acts, when death was fast approaching, was to send a contribution to his rector to be used for benevolent purposes; and his devout spirit is equally attested in the fact that he received with quiet joy just before he died the memorial of his Lord's death."

Of all this I know nothing as a churchman and nothing from my personal intercourse with him, for we never broached between us a single bottle of that hot wine, theology; I respecting the genuine spiritual convictions of a young man born and bred in "The Church," and he knowing perfectly that I accepted no creed for more than a human invention, and thought no better of a good man who taught an Episcopalian Bible class than of a good man who sent in an exact record of an oil-well boring. It was quite enough for me to know that he was growing year by year into the likeness of the man Christ Jesus; and for him, that he knew that I knew it. On that basis, all our intercourse proceeded happily. And on that basis, I feel sure, rose slowly and steadily the fine structure of his reputation, capped at last by fame. For he became famous. He became known and respected more widely in the United States and other countries than commonly happens to a man who dies in his thirty-sixth year. Yes, young and famous, worthily so.

Now, what a wonderful, what a mysterious thing it is, that while millions of old men are annually exhaled from the surface of this planet whom nobody a few miles from their temporary resting places ever heard of, and who are no more noticed when they pass away than so many drops of dew disappearing from a field of grass, it should happen that now and then when a young man dies hundreds of eyes are moist with tears and thousands of people express the most sensible and selfish regret. Usefulness is the only explanation of the phenomenon.

This is the American Philosophical Society for the Diffusion of Useful Knowledge. To that title it was born; with that title, it still lives and works. It is not a club. It is not a monastery. It is not a museum of curiosities in human form. It is not a theatre on which the vulgar, selfish passions of the heart can display themselves—vanity, pride, self-interest, dressed in their motley of untruths and antipathies. Its *raison d'etre* was public usefulness; its only claim to permanence is continual usefulness. Genius is a valid claim to its membership, but only on condition of being useful to the world, and doing wrong to no man. Knowledge is a claim to its membership, but only on the conditions of modesty, kindness and usefulness. We philosophers of Philadelphia belong by name at least to a utilitarian school of philosophy. Our motto is *pro bono publico.* Every member of this Society should adopt as the leading principles of his knowledge, *non sibi sed toti.* In Syria, the chief ceremonial was the anniversary celebration of the death of Adonis; this Society should have an annual celebration of the death of the personal selfishness of each and all of its members. Self-sacrifice is a *sine qua non* for usefulness.

Therefore, thinking thus, much as I esteemed Ashburner for his personal, manly and Christian virtues, I admired him most of all for his usefulness, his perpetual and varied usefulness, in so many ways, to so large a number of persons. His restless energy was useful to the old and the sluggish; his masterful will was useful to the young, the reckless and the insubordinate. His accurate methods of investigation, his patient, exhaustive observation of facts, his indefatigable coördination and discussion of them to avoid false generalizations, his dogged perseverance in every attempt to devise the very best apparatus and arrange the very best method for the useful publication of the knowledge he thus won—these made him not only a master of subjects in his branch of science, but a master of less able men, whom he thereby helped largely to educate. But he took special delight and exhibited his greatest skill in "diffusing useful knowledge"—a genuine child of Franklin—a worthy member of this Society. In season and out of season he kept on diffusing useful knowledge, knowing the best ways of doing it. He had not a spark of false pride about it. He never acted or spoke as a savant. He did not in the least know how to speak to the public *de haut en bas*. He went straight in, everywhere, and at all times, for spreading the useful knowledge he had accumulated, much of it by his own discoveries, *pro bono publico*.

Mr. Ashburner was educated at Friends' Central School, the Philadelphia High School and the Towne Scientific School of the University of Pennsylvania. While an undergraduate, he was one of a party who made a survey of Delaware river and bay for Government purposes. His special course in the University was civil engineering, and he was graduated first in his class. He began his professional career in the service of the United States Light House Board. The year following the installation of the Second Geological Survey of Pennsylvania (1874) he was commissioned as one of the aids to Mr. Dewees, Assistant Geologist for the Juniata River district. Mr. Dewees confined his attention to the fossil ore beds, leaving Mr. Ashburner and Mr. Charles E. Billin to make a survey and contour map of the south slope of Jack's mountain and the little valleys and ridges between it and the river. The excellence of this map proved the value of the severe drill they had had in the drawing room of the geological department of the Towne School, and the admirable instruction of Prof. Haupt. Their cross-sections at Logan's Gap, Lewistown, McGeesville, Mount Union, etc., published in "Report of Progress F," in 1878, are among the most perfect and beautiful works of that kind in the literature of our science in this or any other country.

The same kind of work was afterwards carried on by them south-westward into Huntingdon county, as far as Orbisonia and Three Springs. The beautiful maps and sections of this Aughwick division of the district, and the accurate discussion of the cross-faults at those two places, so thoroughly established their reputation as field geologists, that separate districts were assigned to them as independent Assistant Geologists on the survey ; to Mr. Billin, the complicated region of the Seven Mountains, in Snyder, Union, Lycoming, Centre and East Huntingdon counties ; and to Mr. Ashburner, Sideling hill and East Broad Top Coal basin, in West Huntingdon county. Here again his maps and sections showed that he combined the qualities of geologist and artist in the highest degree.

In 1876, he was commissioned to survey McKean county with the Bradford oil region ; and afterwards Elk, Cameron, and Forest counties. Two years were spent in this work, ably assisted by Mr. Arthur W. Sheafer. His report on McKean with many illustrations, including a complete contour map of the county, was published, as "Report of Progress R," in 1880 ; and his second report on the other three counties (RR) in 1885, being delayed by his survey of the anthracite region and the necessity for revisions and additions which he deemed it necessary to make himself.

In 1880, he was commissioned to plan the long-delayed survey of the anthracite coal fields of Eastern Pennsylvania. His plans were approved, and that survey was placed in his hands. He himself selected his corps of able assistants; established his offices at several points of the region; entered into personal relations with railroad and coal companies; made friends and correspondents of all the civil and mining engineers, colliery managers, superintendents, and mine bosses; laid out a general map of the region; planned its division into sheets to be successively published; and gradually, by a wise and skillful system of proof reading of each advance sheet by all intelligent interested parties previous to actual printing, he acquired the entire confidence and respect of the mining community.

The sheets that appeared with his first report on the Panthar Creek basin (the east end of the Southern field, between the Lehigh and Little Schuylkill rivers) showed what was to be expected of this great geological survey. Those of the Northern field (Wyoming basin), of the Eastern Middle field (Beaver Meadow group), and of the Western Middle field (Mahanoy and Shamokin basins) followed during the years 1881 to 1887, when he resigned his commission to accept business relations with Mr. Westinghouse, of Pittsburgh, as geological expert of his companies.

Previous to this, however, Mr. Ashburner had a heavier load laid upon him, for he acted as responsible First Assistant Geologist of the State Survey, and had a general supervision of all that went on in the State, being the trusted adviser and executive officer of the State Geologist. The anthracite survey was finished by his accomplished first assistant, Mr. Frank A. Hill, who resigned with all the other members of the corps, June 1, 1889, the term fixed by the last act of Legislature for the completion of the work of the Survey.

Mr. Ashburner, for two years before his death, was chiefly occupied in visiting and reporting upon supposed new oil and gas regions in Canada and the United States, and also upon gold and copper properties in the Rocky Mountain regions. On his last return from Arizona he fell ill and suddenly died at his home in Pittsburgh, at the age of thirty-six, leaving a wife and two children, and a multitude of ardent friends and admiring acquaintances, to lament an irreparable loss.

His contributions to the current literature of his science may be found in the Proceedings of this Society under the titles: "On Kintzie's Firedamp Indicator," Vol. xxi, p. 283; "Notes on the Natural Bridge of Virginia," xxi, 699; "Remarks on the Recent Publications of the Geological Survey of Pennsylvania," xxii, 86.

He was a member of the American Institute of Mining Engineers from 1875, and one of its managers in 1885, 1886, and 1887; and his papers will be found in its Transactions, entitled: "The Bradford Oil District," vii, 316; "The Bragos Coal Field, Texas," ix, 495; "New Method of Mapping the Anthracite Coal Fields of Pennsylvania," ix, 506; "The Flannery Boiler setting for the Prevention of Smoke," x, 212; "The Anthracite Coal Beds of Pennsylvania," xi, 20; "The Product and Exhaustion of the Oil Regions of Pennsylvania and New York," xiv, 419; "The Geology of Natural Gas," xiv, 428; "The Classification and Constitution of Pennsylvania Anthracites," xiv, 706; "The Geological Distribution of Natural Gas in the United States," xv, 565; "The Geological Relations of the Nanticoke Disaster," xv, 629; "Coal Production in Utah," xvi, 356; "Petroleum and Natural Gas in New York State," xvi, 906; "The Development and Statistics of the Alabama Coal Fields for 1887," xvii, 206; "The Geology of Buffalo, as related to Natural Gas; Explorations along the Niagara River," xvii, 398; "Statistics of Coal Mining and of Miners' Wages in the United States," xviii (*in press*); "Natural Gas Explorations on the Ontario Peninsular" (*in press*). A "Biographical Notice of Captain W. R. Jones, of Pittsburgh," is among his unpublished papers.

But his lasting fame will depend more upon his "Reports of Progress of the Geological Survey of Pennsylvania," and the sheets of the "Anthracite Coal Fields," than upon the admirable generalizations in the papers mentioned above, proofs as they are of the healthy maturity of his native genius for a true and broad synthesis of facts. It was in recognition of the high value of his Reports that the University of Pennsylvania conferred on him the degree of Doctor of Science.

Were I called to enumerate his actual discoveries, I should begin with that of the curious ninety-foot side-throw in the Black Log Mountain gap at Orbisonia, dying out at each end of the fault. It is worthy of special notice as the only cross-fault as yet detected in any of the many mountain gaps of the State, and as throwing a clear light upon the curious system of throws encountered by the Rock Hill Iron and Coal Company in driving their gangways westward, showing that the whole district had been subjected to a warp movement fracturing it in parallel lines at right angles to the strike.

Then I would cite the Three Springs fault in the same district of Southern Huntingdon county, exhibiting the same features, but with a maximum side-throw at the present surface of 1200 feet. In "Report F" will be found his beautiful geometrical construction of this fault in the underground, determining its extent in depth.

I would cite also his discovery of the unsuspected subcarboniferous coal measures in the Pocono (Vespertine) formation, No. X, cut by the East Broad Top railroad through Sideling hill in the same county. The immediate appreciation of the great importance of this revelation, by so young a field worker, was the best evidence of his scientific genius that could be given; and his section of these very curious coal beds at the dawn of the Coal Age has been our guide through a most difficult chapter of Appalachian geology.

Of equal importance to the petroleum industry was his discovery of the increase in thickness of the Pocono formation, overlying the Bradford oil formation, southward into Elk and Cameron counties, for it fully explained the failures of oil-well sinkers to reach the oil horizon which they sought by rule of thumb, supposing that the same number of feet would avail them in all parts of that region.

His determination that the Salamanca conglomerate of New York was much lower in the series than the Olean conglomerate of Pennsylvania was another important contribution to our knowledge.

But his best discoveries were in the Anthracite region. He revolutionized our old ideas of the cross-sections; discovered the most remarkable overlaps and plication faults in the bottoms of the synclinals; and in a word differentiated the simple structure of Whelpley and McKinley into a complicated series of unexpected irregularities; giving precisely that knowledge to the colliery engineers which they most needed.

Another important discovery resulted from his later work for Mr. Westinghouse in the Catskill region of New York, viz., that the great Ordovician (Siluro-Cambrian) limestone formation, topped by the Trenton, was greatly thicker than had been supposed, and consequently that its supposed thinning out from Pennsylvania northward towards Canada was, in a good degree, a mistake. Subsequently he was able to substantiate this important fact over a wider field in the West.

Lastly, I would cite his discovery of the true general rate of rise of the Palæozoic formations from Pennsylvania into Canada West, by his discussion of the recent borings on the south shore of Lake Ontario and the north and south shores of Lake Erie. The slope from Franklin to Erie had been pretty well fixed in 1840; and Carll's measurements had made the rate more accurate; but we have it now in a perfectly reliable form, with a constant that cannot be well altered.

His discovery that some of the western petroleum comes from the drift was one of many minor additions to our knowledge made by this admirable field geologist, who has passed away in his prime, yet so young, leaving us only to regret that our science has not a larger store of them.

Obituary Notice of Henry Simmons Frieze, LL.D.

By James B. Angell, Ann Arbor, Mich.

(*Read before the American Philosophical Society, March 7, 1890.*)

Henry Simmons Frieze, LL.D., was born in Boston, Mass., September 15, 1817, and died in Ann Arbor, Mich., December 7, 1889. He was the son of Jacob Frieze and Betsy (Slade) Frieze. His father, who was a native of Rhode Island, and, during most of his life, a resident of that State, was for several years the pastor of Universalist churches in Massachusetts and in Rhode Island. Subsequently, he became an editorial writer for newspapers in Providence, and in the days when pamphlets were one of the main instruments in political warfare, he was somewhat noted in Rhode Island for his skill as a pamphleteer.

The son was obliged at an early age to gain his own livelihood. He served first as a clerk in Providence, and then engaged in teaching music and playing the organ in Newport. He made a hasty preparation for college, and entered Brown University in 1837. Through his conspicuous musical talent he supported himself during his college course. He graduated in 1841 with the first honors of his class.

He was at once appointed Tutor in Latin, and discharged the duties of that post for three years with eminent success. In conjunction with a classmate he then took charge of the University Grammar School in Providence, and assisted in the conduct of it until 1854. Many of the men who have since been prominent in Rhode Island affairs were trained there either for business life or for admission to college.

In 1854, Mr. Frieze was appointed to the chair of Latin in the University of Michigan, a position which he held to the day of his death. It has always been deemed by the friends of that University a singular good fortune which brought it in its early days so accomplished a classical scholar and so refined a gentleman as Prof. Frieze. He awakened at once a fervid enthusiasm for the studies he taught, and has during his long life exerted a remarkable influence in promoting a taste for literary and æsthetic culture.

He has published editions of Virgil and of Quintilian which have received the warm approbation of our best scholars. He also wrote a volume, which was published in London, on the art-life of the eminent Italian sculptor, Giovanni Dupré. It contained translations of two dialogues on Art by Prcf. Conti, of Florence. Two addresses of his are noteworthy ; one a commemorative discourse on Dr. Tappan, the first President of the University ; the other on the subject of Religion in State Universities, delivered at the semi-centennial celebration of the University, in 1887.

Three times he held the office of Acting President of the University, from 1869 to 1871, from June, 1880, to February, 1882, and from October, 1887, to February, 1888. For fourteen years he was Dean of the Literary Faculty. His reports as Acting President attracted attention as very able discussions of University problems. Especially vigorous was his argument in his Report for 1881 in favor of shortening the college course from four years to three. Probably few men in the country had more carefully considered the questions of University administration, whether in Europe or in America. Several of the very important innovations which have been successfully introduced into the University of Michigan in the last twenty-five years owed their origin to him. Conspicuous among these is the system of admitting students without examination from preparatory schools which have been visited by a committee of the Faculty and approved. The plan has now been widely adopted, sometimes without the precautions with which he guarded it. The introduction of the elective system, the conferring of higher degrees only on examination, and the establishment of a Professorship of Music, found in him an effective advocate.

He was a most attractive and inspiring teacher. He was passionately fond of art, whether painting, sculpture, architecture, or music. He was an accomplished pianist and organist. He lectured on the history of art for many of the last years of his life. His critical judgment of works of art had been cultivated by prolonged residence in Europe. He was a man of sensitive and delicate nature. His modesty was almost a fault. He was the most agreeable of companions and the most faithful of friends. A more refined, gentle, cultured, lovable man, one would seldom meet. Withal he had a most devout spirit. He was almost from boyhood a communicant of the Protestant Episcopal Church, but was in most catholic relations with Christians of every name. He represented the finest type of American scholar, college officer, Christian gentleman.

Obituary Notice of Franklin B. Gowen.

By Richard Vaux.

(*Read before the American Philosophical Society, March 7, 1890.*)

Called to our Federal Capital, in the District of Columbia, by onerous and perplexing professional engagements, Franklin B. Gowen there died on the 14th day of December, 1889.

His life was remarkable. It was a lesson and an example. His mind was of more than exceptional power. His energy seemed exhaustless. A courage that met, without hesitancy, opposition and antagonism, was animated by a temperament so sanguine, that defeat was obscured by the brilliant promise of anticipated success.

Mr. Gowen was devoted to literature, assiduously cultivating his taste for its highest standards, proficient in scientific knowledge, to which he applied intelligent study, and an eloquent, impressive and learned lawyer.

He possessed capacities for the management of great enterprises involving great interests, so that it may be said of him, he was the peer of the distinguished men of his day.

His public speeches were masterly. In the discussion of principles, the treatment of details, grouping the arguments as to each, he brought out the strongest points of his contentions with a forensic ability recognized to be of a high order.

He was capable of augmented possibilities. His memorable and successful effort to maintain the safeguards of imperiled rights and public security attests his force of character, latent till stimulated into action. This statement is not amenable to the criterion of a too florid coloring; it is rather in harmony with the natural tints of his character.

Earnest, aggressive, sanguine, capable, laborious, his capacities and acquirements were forces that demonstrated his powers. It has been said by high authority, that if elsewhere, certainly in Philadelphia, her most prominent citizens are best understood and appreciated after they are buried.

Franklin B. Gowen was born at Mount Airy, near Germantown, in the county of Philadelphia, February 9, 1836. He inherited some of the marked mental and moral traits of his father, whose life in Philadelphia demonstrated his striking individuality.

It can hardly be doubted that what is known as heredity is the outcome of the parents' characteristics in their descendants. Mr. Gowen's character in this respect may be judged by the recognized principles of pathognomy.

Yet in his social relations he was genial, agreeable and attractive. His acquirements rendered him notable in association with cultured and refined society. His information, belle lettres and scientific reading and the charm of his conversation were thoroughly appreciated by his personal friends and associates.

Mr. Gowen was, at an early age, sent to Emmetsburg, in the State of Maryland, to receive the instruction which made the college located there so eminent as an institution of learning.

After marked proficiency in his studies, he returned home and finished them at the Moravian School, at Litez, Lancaster county, Pa.

His youthful training was intended to qualify him for a business life. The first introduction to his proposed avocation was entering the store of Mr. Baumgardner, at Lancaster. Acquiring sufficient knowledge of the business, Mr. Baumgardner sent him to his iron furnace, at Shamokin. All this was prior to his majority, for at twenty years of age Mr. Gowen formed a partnership with a Mr. Turner, for the purpose of mining anthracite coal. This promised well, but in the monetary panic of 1857 the firm failed, with liabilities amounting to some $60,000. Mr. Gowen seems to have been disappointed in his business venture. He then studied law at Pottsville, Pa., with Mr. Benjamin W. Cumming. On the 31st of May, 1860, he was admitted to the bar of Schuylkill county.

To indicate the integrity and energy of Mr. Gowen, he paid in full the liabilities of the firm of Gowen & Turner. In 1862, Mr. Gowen was elected the District Attorney of Schuylkill county. His legal standing being assured, he continued to represent the pleas of the commonwealth in Schuylkill county until his increasing professional business required him to resign that office, and devote himself entirely to his private practice.

Mr. Gowen was the counsel of the Reading Railroad Company in 1864, and in 1867 it became necessary from the increase of his professional duties to remove to Philadelphia. He was then in the thirty-second year of his age. In 1869, Mr. Gowen was elected President of the Philadelphia and Reading Railroad Company.

He reluctantly accepted the position at the request of a majority of the controlling interest in the company. From this period in his life, Mr. Gowen began a career burdened with great responsibilities. The large interests which were involved in the management of this corporation are not easily to be described. It may be said, however, that the holders of the various securities of the company, and those who were engaged in providing the chief traffic of the road, were not usually unanimous in their agreements as to the conduct of its affairs.

From 1869 to 1884, he was President of the company. He then resigned, and in 1886 he was again elected President and served till 1888, when he again resigned.

It was well said of Mr. Gowen's Presidency, that it was "fifteen years of struggle and achievement."

Reference to Mr. Gowen's administration of the business and policy of the Reading Railroad is here out of place.

The interests involved were enormous and the contentions of the parties representing them were inspired by efforts to control the management vested in the executive authority of the company.

The President and the Board of Directors were subjected to the consequences of divergent views and opposing opinions of their constituents.

Mr. Gowen's responsibility was not divisible.

During his Presidency he met antagonisms, hostilities and obstacles that would most likely have overwhelmed a less courageous, able, self-poised and confident administrator. Criticism followed the course he pursued—severe criticism often—but patiently listening, ready to defend himself, he followed out his plans. His views were broad, far reaching and based on what, to his extraordinary comprehension of the vast possibilities of the Reading Railroad, were vital to the permanent triumph of the producing and transporting capacities of this coal-carrying company.

Securing coal fields by purchase, thus owning the sources of supply of freight for the support of the traffic and the augmentation of the earnings, and with the topographical advantages of his line of road, Mr. Gowen conceived that he could place the Reading Railroad beyond the reach of competing rivals.

This much is said in some sort to indicate the character and capacity of Mr. Gowen. And let it be proclaimed that during his management of the company, amid all the contentions it occasioned, in the direction of the policy he regarded as essential for the success, not a word was ever uttered that expressed a doubt as to his spotless integrity.

The Engineering and Mining Journal, of New York, a professional periodical of high standing, in an editorial reference to Mr. Gowen, thus epitomizes his character :

"Mr. Franklin B. Gowen was undoubtedly one of the most admirable men this country has produced. To brilliant ability, eloquence, undaunted courage and an incorruptible honesty which placed him, even with his bitterest antagonist, above the faintest suspicion of doing a dishonorable thing, Mr. Gowen united a winning personality that firmly attached to him all who had the honor and pleasure of his acquaintance.

"His devotion to duty was not lessened when it called for the risk of his life and fortune, and the administration of the immense interests of the Reading Railroad and Coal and Iron Companies was never influenced by his personal advantages, but was always and solely in that of his stockholders. A man of firm convictions and of utter and unconcealed abhorrence of dishonesty in every form, he naturally made many enemies as well as friends, but even his enmities were to his honor.

"Mr. Gowen was a firm and very enthusiastic believer in the immense value of our anthracite coal deposits, and he secured for the Reading Coal and Iron Company the most valuable mineral estate in the world. It is true much of it was purchased with bonds, and this involved an interest account so heavy as to have crippled his companies; but the policy of controlling this magnificent source of future profits, both for the coal company and for the railroad was, when exercised in moderation, a far-sighted and wise one. Mr. Gowen's sanguine temperament may have led him to a larger investment, in undeveloped lands, than was prudent, but there is no question of the immense value of the estate (which covers fully one-half of all the anthracite coal in Pennsylvania), that he purchased for his company, or the moderate cost of the same.

"In the council chamber he was an acute and profound legal adviser; at the bar a pleader of unsurpassed logical force and magnetic influence. Handsome, witty and eloquent, he was master alike of the rapier and the battle ax. After the glamour of his speech had passed away, there remained the convincing strength of his statement.

"These qualities, together with his fearless determination, found, perhaps, their highest exhibition in the victory which he won, at the end of more than three years of patient preparation, over the secret society of murderers which had so long maintained a reign of terror in the anthracite regions. If Mr. Gowen had never achieved anything else, this one performance would have entitled him to the gratitude of mankind."

Operating the coal mines that yielded profit to the railroad, employing large numbers of laborers, supplying the demand for their products, it came to pass that, by violations of law, life and property in the mining localities were put in peril. Arson and murder were committed by members of secret combinations of men in this coal region. Mr. Gowen undertook the suppression of this combination and the punishment of the guilty. He went before the legal authorities of Schuylkill county, indicted the leaders of the "*Molly Maguires*," as this combination was called, convicted them, and some were hanged and others imprisoned. The combination was destroyed and peace followed.

His ability as a lawyer could not be better tested. His personal courage could not have been better proved. Fidelity to public duty and the assertion of the obligation to society by one of its citizens have no nobler attestation.

Mr. Gowen's domestic life was hallowed by his unpretentious religious principles, which were expressed in his communion with the Protestant Episcopal Church.

In his profession he was behind none of the leaders of the bar, for Mr. Gowen ranked among the great lawyers of the country.

His last, or among the latest of his professional achievements, was the decision (March 20, 1890), of the Supreme Court of Ohio, in the case of Rice against the railroads under the Inter-State Commerce Law.

Had Mr. Gowen been tempted by the inducements held out to him to enter political life, he would have attained the distinction of a statesman in that high order of men who made their mark in their time on our history. His extraordinary capacity for orally expressing his opinions, his command of language, his wonderful memory, not needing the aid of written notes to direct the course of his argument, the attraction of his manner and his personal presence would have established his position as an orator.

Less than is here said would have been an injustice to the memory of our lamented colleague. It is at best but a tentative effort, and when the color of the perspective round the prominent figure, which Mr. Gowen became in the circle of the physical scientists of his day, is mellowed by age, then his biography will be the just tribute to his phenomenal character.

Obituary Notice of Leo Lesquereux. By J. P. Lesley.

(Read before the American Philosophical Society, March 21, 1890.)

The venerable botanist and palæo-botanist, Leo Lesquereux, of Fleurier, Switzerland, late of Columbus, Ohio, has been a member of this Society since his election, January 18, 1861. Born in 1806, and dying on the 20th of October, 1889, his long life was full of unusual adventures, and great discoveries.

When a boy, on one of his excursions to find new flowers, he fell from the top of the mountain which walls the Val de Travers on the north. Rolling and dropping from cliff to cliff, a descent of several hundred feet, he was found by his family hanging in the branches of a tree, mangled in every part of his body, and apparently dead; but after lying insensible for several weeks, he recovered health and strength, and continued his boyish explorations as though nothing had happened. The place is in full view of his father's house in Fleurier, and is pointed to by the villagers as Lesquereux's cliff. Just below it to the right the Pontarlier Railway line from Neufchatel to Paris, leaves the Val de Travers and enters the gate-like gorge across which the Swiss stretched their iron chain to keep the marauding Burgundians in check.

This gorge is similar in its general features to that of our Lehigh river from Mauch Chunk upward ; a trench two thousand feet deep cut from north to south across one of the extensive limestone plateaus of the Jura range ; the upper surface of the plateau being occupied partly by reclaimed farm lands and villages, and in part by unreclaimed peat bogs traversed by artificial drains, and quarried periodically for fuel. These peat bogs were the young botanist's favorite tramping grounds ; and he got to know every safe and every dangerous spot on their treacherous surfaces. He made the acquaintance of every flower that grew on them and on the surrounding cliffs. He devised for himself an auger, like a flour inspector's, with an adjustable handle ; and with this tool he investigated the character and structure of the bog, its stratification, the specific gravity of its different layers, the deformation of the sphagnum by pressure, and the rate of its growth. He was the first to determine the true causes and conditions of peat formation ; unconsciously making the first step in the science of the geology of coal.

Going for his education to Neufchatel, his results were not accepted by the naturalists, until, a Cantonal Commission being appointed, Agassiz being one of the commissioners, he was permitted to demonstrate the subject on the surface of the bog itself ; then his theory was accepted. I have in manuscript an autobiography of the earlier portions of his life, and his naïve expressions of satisfaction at this victorious defense of his young scientific work are very amusing. The whole of this manuscript, written for my pleasure three or four years ago, is well worth a place in the published Proceedings of this Society, and I am tempted to enrich from its store of racy details this poor sketch of his most noteworthy career.

When twenty-four years old (1830) he married the daughter of one of Goethe's intimate friends, General Von Wolffskeel, the Baroness Sophia of Eisenach. Three sons and a daughter of this most happy union survive him. His wife would tell how she used to sit on Goethe's knee, while the poet and her father conversed together. The account of his courtship and wedding given in the manuscript makes charming pictures of German life.

Lesquereux had been appointed to a chair in the College at La Chaux de Fonds. But his career as teacher of science was suddenly cut short by an illness which destroyed his hearing. He went for relief to Paris, but was treated by a noted oculist and aurist there with the brutal recklessness customary at that time in the medical profession of that metropolis, and which is not entirely unknown even at the present day. His eustachian tubes were burst, and an inflammation of the brain superinduced which threatened to destroy his sight. When he returned home he became stone deaf, and never heard a sound from that time to the day of his death. In despair he learned the trade of a chaser of the backs of watches, but gradually lost his health and courage and was long nursed by his devoted wife. Then the strength of her admirable character made itself known ; for she practiced her husband's art, and supported the family herself, until he could resume his handicraft. Twelve years he engraved watches and made and tempered watch-springs, a delicate process, the knowledge of which was hereditary in his family.

At the age of nearly forty his fame as a bryological botanist induced the King of Prussia to commission him to examine and report on the origin, growth, size, quality and condition of the peat bogs of that kingdom. Neufchatel the Canton still belonged to Prussia. He had been commissioned by the Cantonal government and had reported on the peat bogs of the Jura. Now he traversed the mountains of Germany, the shores of the North sea and Baltic, and after publishing his report at Geneva, examined the bogs of Denmark, Sweden and Norway, and if I mistake not some of those of Great Britain; but of this I am not sure; and still later those of Canada and the United States; taking into the range of his researches the Dismal Swamp of Virginia and North Carolina; and going out alone, unarmed and deaf, far over the prairies of the West, sleeping on the grass without covering, sometimes several nights in succession.

Lesquereux followed Agassiz, Desor, Guyot and Matile to America in 1848. He settled his family in Columbus, Ohio, where his sons began business on several thousand dollars' worth of watches loaned for this purpose by their father's friends, who took that method of enlarging their trade. Agassiz had promised him scientific employment, but was unable to carry into effect his friendly intentions. The family were at first in great distress; afterwards they prospered; and the father was able to devote the rest of his life to his adopted science. He was always poor; his work always poorly paid; but he was one of the wisest, most cheerful, and most contented of mortals. His modesty ran into self-depreciation; a sentiment sadly reinforced by the physical infirmity which cut him off from easy intercourse with his fellow-men, and made him not only unduly grateful for the salaries or fees which he received for work ordered, but unduly modest in the estimation which he placed upon his work. He reminded me of some gentle wild beast or bird living on the chance resources of nature, patient when he found but little, most thankful when he found anything. But a very noble independence was manifest in all his intercourse with others. His manners were simplicity and refinement embodied and illustrated. His considerateness was best shown by the restraints he imposed upon himself in conversation. His visits even to his best friends were rare and short. He made excuse that it must be a wearisome act of friendship to talk to a stone-deaf man. Yet he was a delightful interlocutor.

Only to those who grew accustomed to conversing with the lips alone did he feel quite free to hold intercourse. He read language by watching the movements of his friend's mouth. When introduced to a stranger, and usually when meeting one of his old friends, the first question was: "Will you speak in German, in French, or in English?" and according to the answer he prepared himself for the conversation. "Did you tell me that your friend Lesquereux was deaf?" said one to me one day. "Yes." "But how is that possible? I noticed him talking French in the most animated manner with his friend just now, and he seemed to hear him as well as you or I could."

With those who wore beards it was more difficult, and he was obliged to beg a repetition of many sentences. But with most persons he carried on conversation in writing, always carrying tablets and pencils with him for that use. Experience had also taught him to gather up all the loose papers on which there were any sentences of the conversation, and throw them into the fire before he left the room, or tear them to pieces if in the open air. So expert was he in interpreting what was said to him, that he usually gathered the whole of a sentence by watching the first few words of it written. He seldom permitted the sentence to be finished. I suppose this quickness was not a mere consequence of his intellectual cultivation, but was one of the many necessities he felt for diminishing what he considered the burden which his infirmity laid on his interlocutors ; he was so delicately generous to others ; and making no distinction at all between the highest and lowest class of man.

Lesquereux took no part in politics. I think they did not interest him. His friend, Agassiz, was a born aristocrat. His friend, Desor, was a democrat of the most pronounced type, and continued to be one of the two most influential leaders of the Democrátic party in the Canton, after the not bloodless revolution which made Neufchatel free of Prussia, until his death in 1886. But Lesquereux's letters to me through nearly thirty years scarcely mentioned the political situations on either side of the Atlantic ; with one exception ; he deeply sympathized with the preservation of the Union, and the emancipation of the slaves.

Lesquereux's religious opinions, if he had any, are unknown to me. But I have innumerable evidences in his letters that he entertained a very remarkable faith in an Overruling Providence, as fixed as it was simple. "I have known what it was to have no bread for my family," he writes in one of his letters, "but the good God has never forsaken me." I am reminded that I compared him to Heinrich Stilling, after reading one of his cheery pages, in reply to some desponding confidences of my own less sure faith. I am sure that not a complaining expression can be found in our long correspondence.

I first met Lesquereux in Schuylkill county, Pa., in the summer of 1851. Prof. H. D. Rogers was revising the Anthracite region for his Final Report. Desor, who had worked with Agassiz in Boston and on Lake Superior, had accepted an offer to study the surface deposits of Pennsylvania ; and Lesquereux, who was employed to provide a report on the Coal plants of the State, sat day after day on the Anthracite tip-heaps, collecting and classifying whatever the roof shales afforded him. His names, descriptions and figures were published seven years later (1858) in the Second Volume of the Geology of Pennsylvania.

His "Fossil Coal Flora of Arkansas" was published in 1860.

His "Fossil Coal Plants of Illinois" appeared in Worthen's Second and Fourth Volumes in 1866, 1880.

His "Tertiary Plants of Mississippi" appeared in Hilgard's Report of 1863.

His "Cretaceous Flora of the Dakota Group" appeared as a monograph in 1874, as a "Report of the U. S. Geol. and Geog. Survey of the Territories" under Dr. Hayden.

His monograph of the "Pliocene Flora of the Auriferous Gravel Deposits of the Sierra Nevada" appeared in 1875.

His "Tertiary Flora" as a monograph in 1878.

His "Cretaceous and Tertiary Flora" as a monograph in 1883.

"The Coal Flora of Pennsylvania and the United States," Report P of the series of geological reports of that State, Vols. i, ii in one, with an atlas in a separate volume, 1880, and Vol. iii, text and plates, 1884, was the fruit of his more or less continuous connection with the State Survey from 1875. He regarded it as the crowning labor of his life, and resumed into it all his knowledge of the flora of our coal measures. Another volume, in preparation at the time of his death, was intended to contain the figures and descriptions of about a hundred new species, some of them of exceptional beauty and interest; and many of which were founded on specimens in the rich private collection of his most intimate friend and fellow-worker, Mr. R. D. Lacoe, of Pittston, Pa., who looked much after the old man's comfort, and frequently entertained him as his guest for days and weeks together, most of the time being spent in examining, comparing and discussing doubtful species and new discoveries.

For his comparisons of foreign species, his three principal correspondents were Schimper of Strasburg, Heer of Zurich, and Count Saporta. Schimper was one of his earliest intimates in botany and he was never willing to consider a question settled until after letter after letter had passed between them. His American studies of the Cretaceous and Tertiary floras of America supplied copious and constant food for botanical correspondence with Heer.

In the earlier years of his residence in the State of Ohio he was employed by Mr. W. S. Sullivant, a wealthy citizen of Cincinnati, a bryologist given to the study of mosses, and assisted him in the publication of many new species. This brought him into intimate correspondence with the well-known bryologist of Philadelphia, Mr. Thomas P. James, a member and officer of this Society. After Mr. James left Philadelphia to reside in Cambridge, Mass., Mr. Lesquereux's botanical intercourse with him was constant and fruitful, and much of the value of the "Manual of the Mosses of N. America," published in their respective names, was due to the zeal with which he thus kept alive those earliest studies of his life. Another of his closest friends was the veteran professor of botany at Lafayette College, Easton, Pa., Thomas C. Porter, who has some amusing anecdotes to tell of their adventures among the rare plants surviving on the banks of the Delaware.

Lesquereux was elected a member of this Society January 18, 1861, and of the National Academy of Sciences in 1864, the year following its constitution by the Senate and House of Representatives of the United States; but his deafness excused him from attendance at the meetings, and his membership was understood to be in honorable testimony to his character. Many other learned bodies in Europe and America also placed his famous name on their lists; among these the Geological Societies of London and Brussels made him a corresponding member; and he continued to be accounted by his *Alma Mater*, the Academy of Neufchatel, one of its honorary professors.

Lesquereux did not attempt further field work after 1884. He was then 78 years old. The last five years of his life were passed in quiet retirement in his cottage on the edge of Columbus, at which books, monograph pamphlets, and specimens of fossil plates for identification or description were constantly arriving from old correspondents and fresh young workers. He began to lament the widowed loneliness and failing brain-power of old age, and predicted his own death from spring to spring. But his strength held out until the end of the summer of last year, after which he existed in an almost insensible condition, and in a few weeks peacefully ceased to breathe.

Description of a New Species of Pteropus. By Harrison Allen.

(Read before the American Philosophical Society, March 21, 1890.

PTEROPUS LANIGERA, sp. nov.

Crown covered with dark gray, unicolored hair. The hairs between the eyes are directed backward, but over the rest of the crown are erect. Face everywhere hairy. In front and below the eye the hair is thicker than elsewhere. On the cheeks and lips the hair is directed downward, while on the horizontal ramus of the lower jaw it is directed backward. The region of the whisker is composed of long, woolly hair of the same nature as that of the crown but of an obscure brown shade, and extends like a collar to the neck. The under surface of the head, therefore, unusually full and woolly. The space between the rami to a point a short distance back of the rictus is of a dark brown.

The side of the neck covered with long, brown, unicolored hair, the same color passing more to the front of the neck than to the back where the shade is of a gray tinge. The base of the prebrachium ventrally is covered with long, woolly hair as on the side of the neck.

The side of trunk with long, silky, unicolored brown hair, the front the same with ashy tips. The middle of the chest is remarkable for exhibiting a pure gray-white spot the size of an almond. In one specimen the hair of the spot is unicolored, and in the other it retains a black-brown base. The infraanal region is the same as the front and conceals the interfemoral membrane.

The back of the trunk measures 35 mm. across, and is covered with dark-brown hair with ashy tips. It becomes more woolly and brown at the rump. Hair of the same texture extends a little beyond the knees on the dorsal surface of the posterior extremities, but is entirely absent from the front. With the exception of a few hairs on the flexor surface of the forearm near the elbow the membranes are naked. Ears a little longer than the muzzle, naked (save a few hairs at the base), ovate, nowhere emarginate.

Palatal rugæ between the molars but four in number.

Skull.—Ecto-pterygoid process with trenchant laminated pedicle which reaches to the anterior margin of the undivided foramen ovale. Post-glenoid process in height equals one-third the anterior and posterior measurement of the glenoid cavity; zygomatic arch curved above the level of the optic foramen. * The sagittal crest elevated, entire. An orbito-frontal foramen lies behind the postorbital process. Frontal bone with scarcely any inflation at the inner border of the orbit and on the vertex.

The maxilla as it lies in the orbit is marked by a tuberosity placed to the median side of the groove which leads to the infraorbital canal. The median border of condyloid process is flat, thin, not robust.

Teeth.—Maxillary incisors not touching; they possess well-defined posterior cingules. The incisorial series but slightly arched. The lateral incisors larger than the centrals and grooved anteriorly. The first premolar in contact with the second. The second premolar with a well-defined palatal cusp. The second molar one-third the length of the first which lies in line with the infraorbital canal and not under the root of the zygomatic process.

The mandibular incisors scarcely separated. The lateral incisors larger than the central but moderately raised above their level. The first premolar larger than the maxillary or mandibular last molar. It almost occupies the interval between the canine and the second premolar. The second premolar with conspicuous lingual cusp.

The maxillary canine on the right side with a rudiment of a postero-lateral cuspule. The maxillary second premolar shows a similar rudiment on the external cusp much the same as in *P. keraudrenii.* The teeth of the left side of the maxilla and those of the mandible are without these rudiments. No antero-basal projection present on the maxillary third premolar.

This species is most closely allied to *P. phæocephalus.* Like it it belongs to the same group of the genus with *P. keraudrenii* and *P. molossinus.* The latter species I have not seen. *P. keraudrenii* is a larger species and quite differently colored. *P. molossinus* agrees closely in size, but differs in distribution and color of the fur. The other species which resemble it in size are *P. rubricollis, P. temminckii,* and *P. personatus.*

* By this expression is meant that when the skull is viewed in profile the zygomatic process lies above the plane of the optic foramen.

Measurements.

Length of head and body	180	mm.
" head	43	"
" thumb	40	"
" second m. c.	47	"
" third "	67	"
" fourth "	67	"
" fifth "	73	"
" forearm	98	"
" tibia	48	"

Habitat, Samoa islands. Type in Ward's Nat. Hist. Establishment, Rochester, New York.*

Description of a New Species of Macrotus. By Harrison Allen.

(Read before the American Philosophical Society, March 21, 1890.)

In Article xvi, extracted from "The Bulletin of the Am. Mus. Nat. Hist.," Vol. ii, No. 3, p. 166, entitled "Notes on a Collection of Mammals from Southern Mexico," by Mr. J. A. Allen, occurs the following statement: "Macrotus Californicus, *Baird.*—Eight skins and skulls, and three additional skulls, all males. Bolanos, Jalisco, July 3, 1889. 'Occurs in immense numbers in the adits and old mine drifts of the Mineral de Bolanos. Of the fourteen captured all were males, whereas in the case of the other kinds of bats taken here females generally predominate' (Audley Buller, MS. notes).

"In the absence of specimens for comparison, it is difficult to say certainly, whether they are the same as the California specimens. Judging by descriptions, they are somewhat darker in color."

I had an opportunity, through the courtesy of Mr. J. A. Allen, of examining two of the specimens of this series, and concurred with Mr. Allen in identifying them as *M. californicus.* The skins were of immature individuals and the parts about the auricle apparently mutilated. The dark cinereous tips of the hair, while in striking contrast with the more northern form of the species, was not thought to be distinctive, since southern variations of other species, as *Artibeus perspicillatus* and *Atalapha noveboracensis*, are known to be differently colored from the northern. The main measurements were the same. But since Mr. Allen published his notes I have carefully soaked one of the skins in dilute spirits and have detected that the apparent mutilations of the auricle were due to distortion, and that the form of the auricle was sufficiently pronounced to warrant a careful examination of the cranium. In response to my request

* I am indebted to Mr. F. A. Ward for an opportunity of examining this interesting form.

Mr. Allen sent to me eight crania for inspection. The characters of these specimens are in many respects quite different from those of *M. californicus.* I have therefore concluded to describe the Mexican species as new in the following language :

MACROTUS BULLERI, sp. nov.

Auricle scarcely longer than head ; the internal basal lobule rudimental and projects about a millimetre beyond the juncture of the interauricular membrane. External basal lobe reduced to a thin ridge which leaves the tragus exposed. Tragus with convex anterior border for basal two-thirds, and an abruptly acuminate apical third. The outer border is straight—apparently without basal notch or lobule.

The nose-leaf without well-defined lower border—scarcely longer than the face. Chin apparently without divided plate.

Skull.—Facial region without depression on the frontal bone ; indeed, it is faintly ridged posteriorly ; region over ethmoid scrolls scarcely inflated. Squamosal portion of zygoma not more than one-half the size of the same part in *M. californicus.* No projection of vertex at occiput, but the entire superior curvature of the head simple. Angle of mandible projects scarcely at all back of the condyloid surface. The two halves of the mandible closer together than in *M. californicus.*

Fur.—On the back the basal two-third is white, the apical third very dark plumbeous, the tip tending to gray. These distinctions are best defined on the sides of the neck. At the middle of the back the gray tip is absent. The colors undergo no variation over the posterior surface of the prebrachium, the humerus, or the rump. On the endo-patagium the hairs are shorter, sparsely developed, and of a fawn color throughout.

On the ventre a disposition exists for the basal two-thirds of the hair to be whiter than the rest of the hair. This is most marked on the sides of the trunk, and is nearly absent from the middle. The apical third is less markedly plumbeous and the tip is more gray than on the back. On the whole the ventre gives the impression of being gray, and the back as being of a dark, sooty hue.

Two immature examples (the distal epiphyses of the metacarpal bones of the third, a fourth, and fifth, manal digits ununited), 2004, 2005 (Am. Mus., N. Y.), from Bolanos, Jalisco, Mexico.

Measurements.

Height of auricle from vertex		7 mm.
"	tragus (slightly distorted)	6 "
"	nose-leaf	7 "
Length of forearm		44 "
1st digit..	m. c.	4 "
	first phalanx	4 "
	second "	2 "
2d digit...	m. c.	45 "
	first phalanx	5 "

Measurements.

3d digit...	m c	32	mm.
	first phalanx	15	"
	second "	15	"
	third "	9	"
	fourth "	4	"
4th digit..	m. c	31	"
	first phalanx	14	"
	second "	11	"
	third "	½	"
5th digit..	m. c	33	"
	first phalanx	14	"
	second "	10	"
	third "	1	"
Length of	femur	15	"
"	tibia	16	"
"	foot	13	"
"	tail	25	"
"	free portion of tail	3½	"

Notices of New Fresh-water Infusoria.

By Alfred C. Stokes, M.D.

(Read before the American Philosophical Society, April 18, 1890.)

Mastigamœba reptans, sp. nov. Figs. 1–5.—Body constantly amœboid, at its apparently greatest extension ovate, depressed, about two and one-half times as long as broad, the pseudopodia few, scattered, lobate, short and unbranched, progression being chiefly by the amœboid expansions of the body; flagellum apical, about three times as long as the extended zooid, only the tip usually vibrating; nucleus not observed; contractile vesicles several, small, scattered; motion commonly very slow, occasionally rapidly and irregularly vibratory. Length of the extended body $\frac{1}{1800}$ inch. Hab.—Pond water with decaying vegetation.

Heteromita fusiformis, sp. nov. Figs. 6 and 7.—Body elongate fusiform, from three to four times as long as broad, widest centrally, tapering thence to both extremities; soft and changeable in shape, having the ability to protrude filamentous pseudopodic prolongations of the body substance, the extremities of these extensions not rarely becoming amœboid and producing a reticulation by the interlacing of the minute branches or by the formation of minute vacuoles; flagella diverse in length, originating close together at the frontal extremity, the anterior one vibratile, less than twice as long as the body, the other trailing and more than twice the body in length; contractile vesicle small, apparently single, situated in the posterior body-half ; endoplasm finely granular. Length of body $\frac{1}{1500}$ inch. Hab.—Standing pond water. Movements rapidly vibratory.

Heteromita triangularis, sp. nov. Fig. 8.—Body ovate or subtriangular, depressed, smooth, twice as long as broad, the anterior border obliquely truncate, sometimes slightly concave, the shorter lateral border often flattened ; the longer convex ; posterior extremity obtusely pointed; anterior flagellum about one-half as long as the body, the posterior or trailing appendage from two to three times the length of the zooid ; contractile vesicle single, posteriorly situated near the longer lateral border ; nucleus apparently represented by a small light spot near the centre of the anterior body-half. Length of body from $\frac{1}{4500}$ to $\frac{1}{3000}$ inch. Hab.—Standing pond water.

Food seems to be engulfed chiefly near the anterior extremity, this region surrounding the particle by an irregular outflow of endoplasm, the zooid then becoming indescribably unsymmetrical in form. The anal aperture is postero-terminal or nearly so.

Macromastix (μακρος, long ; μαστιξ, lash), gen. nov.—Animalcules free swimming, ovate, having three flagella arising near together, one short, antero-terminal and vibratile, two opposite, lateral and trailing ; food engulfed at any point on the surface. Inhabiting standing water.

Macromastix lapsa, sp. nov. Figs. 9 and 10.—Body ovate, about twice as long as broad, the anterior region changeable in shape, that margin rounded and often obliquely truncate, the posterior obtusely pointed ; anterior flagellum short, arising from the centre of the anterior truncation, the lateral appendages trailing, about three times as long as the body ; endoplasm colorless, transparent ; contractile vesicle single, laterally placed near the body centre ; nucleus not observed. Length $\frac{1}{4500}$ inch. Hab.—Standing pond water.

This form is a member of the Trimastigidæ of Saville Kent, and resembles most nearly the *Dallingeria* of the same authority, differing chiefly in the diverse length of the flagella, these appendages in *Dallingeria* being subequal. The lateral flagella of *Macromastix* arise from opposite points nearer the frontal border than do the similar appendages of *Dallingeria*, in the last named form arising from the lateral borders at some distance from the frontal margin, and possessing adhesive power in the distal extremities, nothing of the kind having been observed with the present form. Food is engulfed at any point of the surface.

Trachelomonas cervicula, sp. nov. Fig. 11.—Lorica subspherical, smooth, orange yellow in color ; anterior orifice with a thickened, slightly projecting external border, and produced internally as a straight, cylindrical, chitinous tube about one-third as long as the diameter of the lorica, its anterior border attached around the anterior orifice of the sheath, its posterior or internal margin circular and free, the long flagellum of the enclosed animalcule protruded through this internal, tubular passage, and the body, when completely filling the lorica, surrounding the cylinder as if pierced by it. Diameter of the lorica $\frac{1}{1125}$ inch. Hab.—Pond water.

The species differs from all other known forms by the presence of the internal tubular prolongation. It was collected in some abundance from a sheltered pond in the early part of February, 1890. It is, therefore, probably a vernal Infusorian.

Trachelomonas similis, sp. nov. Fig. 12.—Lorica oval or subelliptical, nearly twice as long as broad, the extremities subequally rounded, the surface irregularly and finely punctate, the aperture produced as an obliquely directed neck-like prolongation, the margin oblique and irregularly denticulate ; color chestnut brown. Length of lorica $\frac{1}{900}$ inch. Hab.—Standing pond water, with aquatic plants.

This approaches most nearly the *T. lagenella* (Ehr.) Stein, which is described as colorless and entirely smooth, neither of which conditions are observable in the present form.

Trachelomonas obovata, sp. nov. Fig. 13.—Lorica obovate, less than twice as long as broad, the anterior border convexly truncate, the posterior obtusely pointed ; surface minutely hispid, aperture slightly projecting, its margin rather more coarsely hispid ; color deep chestnut brown ; flagella twice or more as long as the lorica. Length of lorica $\frac{1}{1125}$ inch. Hab.—Standing water from the pools of early spring.

Trachelomonas spinosa, sp. nov. Fig. 14.—Lorica oval, about one and one-third times as long as broad, both extremities equally and evenly rounded, the entire surface clothed with slightly recurved spines, which are largest at the posterior border ; the anterior aperture produced as a short, smooth, truncate extension ; color brown. Length, exclusive of the spinous processes, $\frac{1}{600}$ inch. Hab.—Pond water, with aquatic plants.

Epipyxis socialis, sp. nov. Fig. 15.—Lorica elongate subcylindrical, from eight to ten times as long as broad, often variously curved and bent, the lateral borders nearly parallel, tapering posteriorly to the subacute point of attachment, the anterior border truncate, usually not everted, sometimes slightly flaring. Length of lorica $\frac{1}{300}$ to $\frac{1}{350}$ inch. Hab.—Pond water in early spring ; attached to Confervæ. Social, occasionally forming radiating, rosette-like clusters composed of fifty or more thecæ, or in irregular fascicles produced by the attachment of from eight to ten loricæ to a single supporting theca.

The colonies formed by the attachment of one or more loricæ to a single theca as a basis of support, would seem to foreshadow the polythecium or compound branching colony of *Dinobryon*, to which *Epipyxis* is closely allied. Groups not rarely occur formed of from eight to ten thecæ basally attached to one and the same supporting lorica.

Epipyxis eurystoma, sp. nov. Fig. 16.—Lorica elongate-vasiform, about three times as long as broad, widest at the anterior aperture, that orifice flaring, constricted near the anterior border, widening subcentrally and thence tapering to the subacute posterior point of attachment. Length of lorica from $\frac{1}{900}$ to $\frac{1}{1000}$ inch. Pond water, attached to various aquatic plants.

Cryptoglena alata, sp. nov. Fig. 17.—Lorica obovate, colorless, less than twice as long as broad, the anterior region widest, the frontal border obliquely truncate ; the lateral margins thinned and projecting beyond the borders of the enclosed animalcule in a wing-like manner, the borders somewhat curved in opposite directions as seen when the Infusorian is examined "end on," or with the anterior or posterior region presenting upward ; posterior border narrowed, obtusely rounded ; the dorsal and ventral aspects apparently encircled by a shallow transverse groove or depression, at times two ; anterior orifice circular, its walls comparatively thick, the two vibratile flagella passing out close to the lateral margins ; enclosed body elongate ovate, granular. Length of lorica $\frac{1}{1000}$ inch ; greatest width $\frac{1}{1500}$ inch. Hab.—Pond water in early spring.

Furcilla, gen. nov.—Animalcules persistent in shape, free-swimming, the anterior border rounded or minutely and centrally pointed, the posterior extremity bifid, the bifurcation remote or approximate ; flagella two, subequal, arising close together from the anterior apex.

The position of this newly instituted genus in a scheme of classification would probably be in the Heteromonadidæ of Bütschli, Goniomonas of Stein and the Amphimonas of Dujardin, having its affinities closer to those of the former than of the latter. Although the single known species of the genius was exceedingly abundant in the infusion, I have not seen the oral aperture in any, neither have I seen any in the act of taking food, nor observed any whose endoplasm contained colored granules or other presumable food particles. I therefore assume, on these negative grounds alone, that the genus should be classed among the Flagellata-Pantostomata of Saville Kent.

Furcilla lobosa, sp. nov. Figs. 18-21.—Body more or less ovate, less than twice as long as broad, or in dorsal and ventral view somewhat horse-shoe-shaped, the posterior region bifid, the bifurcation forming about one-half the entire length of the body, straight, somewhat divergent or slightly and inwardly curved, tapering and their extremities obtusely rounded ; anterior border convex, with a slight central acumination from which arises the two subequal, vibratile flagella; the lateral borders bearing two rounded lobules or conspicuous protuberances, one on each side, oppositely placed and alternating with the elongated furcated region, the body in transverse optic section presenting an unequally quadrilobate outline, but in lateral view more or less ovate with two opposite, lateral, obtusely rounded wing-like projections or protuberances ; flagella exceeding the body in length ; contractile vesicle double, near the centre of the frontal border ; nucleus single, located anteriorly near one lateral margin ; endoplasm granular. Length $\frac{1}{2250}$ to $\frac{1}{1800}$ inch. Hab. A vegetable infusion of decaying Algæ and aquatic plants. Movements rotatory and tremulous.

The body, as far as the prolongation and two lateral protuberances are concerned, is somewhat variable. The latter are, at times, so obscurely developed and are apparently so nearly merged into the anterior body-half that the region becomes subglobose. The posterior prolongations vary in curvature, in their distance apart, and somewhat in their extremities, being at times rounded, at others subacute. The varying direction of the furcation is such that they may slightly diverge, or be so closely approximated that their inner borders are almost in contact and broadly obovate in outline.

Lagenophrys bipartita, sp. nov. Fig. 22.—Lorica subhemispherical, depressed; dorsal surface rounded, ventral flattened, and surrounded horizontally by a depression that gives the adherent margin a projecting aspect as if bordered by a narrow rim, an internal membrane extending as a floor across the lorica at the position of the encircling constriction and dividing it into two unequal parts; posterior border irregularly crenate, the surface obliquely striate or ridged; the anterior valvular aperture small, the valves acuminate. Diameter of the lorica $\frac{1}{250}$ inch. Hab.—Ectoparasitic on *Daphnia*.

This was taken abundantly adherent on the entomostracon mentioned, being observed in a gathering made on January 19, 1890. The winter had been an exceptionally mild one, and this collection resembled collections made in the early spring in the abundance, variety and activity of their microscopic life. Even the entomostraca were burdened by their usual load of infusorial parasites.

This is the only member of the genus in which a dividing membrane has been observed above the region adherent to the supporting object, and acting as a floor on which rests the soft body of the enclosed animalcule. This floor-like structure exists, and is readily demonstrated if the lorica can be detached uninjured from the host, as the writer has several times had the opportunity to do. The enclosed zooid seems to rest on this floor-like partition, being of course adherent at the anterior valvular orifice, as is commonly the structural arrangement with all the observed species. The projecting basal rim has a tendency to become brown, as is so frequently observed in many infusorial loricæ, and its surface is irregularly crenulate. With advanced age it probably changes color entirely.

Podophrya pusilla, sp. nov. Fig. 23.—Body subspherical, pedicle comparatively stout, its length equaling about one-half the diameter of the body; tentacles from twelve to fourteen, irregularly distributed, distinctly capitate, often twice as long as the diameter of the body; contractile vesicle apparently single, situated near the centre of the frontal border: nucleus obscure, apparently subspherical; endoplasm usually finely granular. Diameter of the body $\frac{1}{1050}$ inch. Hab.—Pond water, attached to various aquatic weeds.

Solenophrya oblonga, sp. nov. Fig. 24.—Lorica oblong, very much compressed, less than three times as long as broad, often tapering posteriorly, the lateral borders nearly straight, the posterior margin rounded or somewhat flattened, seemingly by the pressure of the supporting object; anterior margins somewhat convex, not continuous but separated by a narrow interval, the lateral borders enlarged and rounded; tentacles in two antero-lateral fascicles, capitate; contractile vesicle single, small, located near the anterior border; nucleus ovate, slightly curved, placed subcentrally near one lateral border; endoplasm granular, almost entirely filling the cavity of the lorica. Length $\frac{1}{140}$ inch. Hab.—Standing pond water, attached to the rootlets of aquatic plants.

Solenophrya alata, sp. nov. Fig 25.—Lorica, when viewed laterally, irregularly ovate, depressed, longitudinally traversed by five broad, thin, equidistant, perpendicular and anteriorly converging alæ, their free margins irregularly undulate, and their height varying, usually being greatest near their centre; posterior border evenly convex, the anterior narrowly concave and alate. Lorica when viewed from above pentagonal, a longitudinally disposed ala originating from each angle, converging anteriorly and meeting at the summit of the sheath which is apparently continuous across the frontal region; enclosed animalcule almost entirely filling the cavity of the lorica, the tentacles capitate, protruding through the alæ; endoplasm granular; nucleus obscure, apparently ovate and subcentrally located; contractile vesicle single, posteriorly placed near one border. Diameter of the lorica $\frac{1}{530}$ inch, height $\frac{1}{600}$ inch; length of each of the five sides $\frac{1}{818}$ inch. Hab.—Attached to the rootlets of *Lemna*.

Apgaria purpurascens, sp. nov.—Body elongate ovate, longitudinally furrowed, anteriorly flattened, in general outline and aspect resembling *A. elongata;* endoplasm deep reddish purple in color; nucleus double, ovate, the nodules situated in the posterior and the anterior body-halves respectively, and connected by a funiculus; contractile vesicle double, located near the posterior extremity. Length of mature forms $\frac{1}{150}$ inch, the length being from three to four times the width. Hab.—Pond water, and on the lower surface of water-lily leaves, near Minneapolis, Minn.

This beautiful and interesting form was originally discovered by Dr. P. L. Hatch, of Minneapolis, where it was abundant, and specimens were kindly sent to me. From *A. elongata*, which it resembles in general contour, it differs widely in three important particulars: the remarkable deep purplish-pink color of the parenchyma, in the double nucleus with a funiculus connecting the nodules, and in the great size. *A. elongata*, the most nearly related species, is colorless, it has but a single nucleus, and is in size only about $\frac{1}{300}$ inch in length. Reproduction with the form here referred to as *Apgaria purpurascens* takes place by transverse, often somewhat oblique, fission.

Homalozoon (ὁμαλος, flat; ζωον, body), gen. nov.—Animalcules free-swimming, hypotrichous, soft, flexible and elastic; elongate, much depressed, the anterior border obliquely rounded, thickened and abundantly supplied with trichocysts; oral aperture terminal, very expansile; no differentiated neck-like prolongation; ventral surface flattened, entirely ciliated.

In the *Annals and Magazine of Natural History* for August, 1887, the writer described an Infusorian under the name of *Litonotus vermicularis*, relegating it to that generic group with much doubt and hesitation. In the *Journal of the Trenton Natural History Society* for January, 1888, the diagnosis is republished without comments, and without any expression of that doubt as to its proper position which was still felt by the writer. Recently another Infusorian closely related to the one here referred to, but differing from it specifically, has confirmed the opinion that the former must, with the latter, be denied admission into the genus *Litonotus*, and perhaps into the family Litonotidæ. The forms differ from the typical *Litonotus* in the absence of the neck-like prolongation, in the absence of the rounded and often conspicuously elevated dorsum, and especially in the position of the oral aperture, which in *Litonotus* is ventrally situated near the base of the neck, while in *Homalozoon* it is exactly apical and terminal. The Infusorian therefore formerly described by the writer under the name of *Litonotus vermicularis* is here transferred to the generic group now proposed for the reception of the two allied forms.

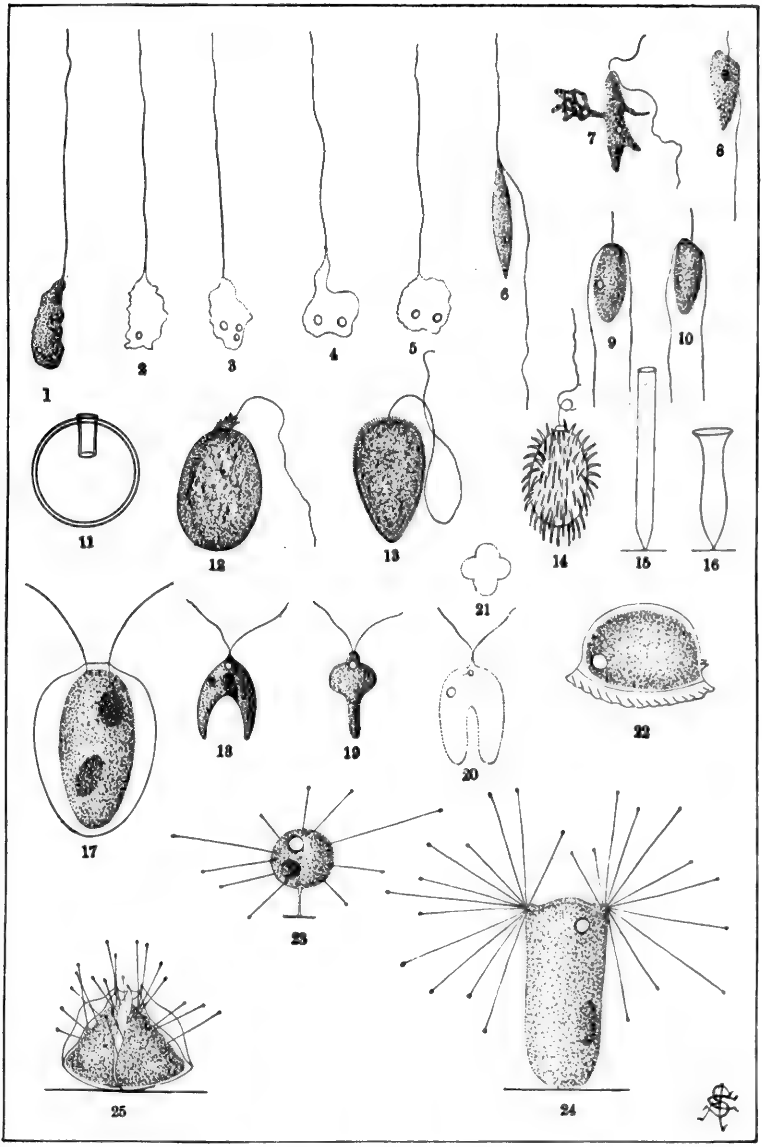
Homalozoon vermiculare, Stokes.—*Litonotus vermicularis*, Stokes, *Ann. and Mag. Nat. Hist.*, Aug., 1887 ; *Journ. Trenton Nat. Hist. Soc.*, Jan., 1888.

Homalozoon flexile, sp. nov.—Body elongate, from twelve to fifteen times as long as broad, widest centrally, tapering to the obtusely pointed posterior extremity, and to a slight anterior constriction beneath the thickened and obliquely rounded frontal border ; cilia short and fine, arranged in longitudinal lines on the flattened ventral surface ; dorsal aspect bearing numerous, minute, hispid setæ ; trichocysts within the frontal extremity abundant and conspicuous, a few scattered throughout the anterior region ; contractile vesicles from twelve to fifteen, arranged in a series near one lateral border ; nucleus long, narrow, band-like, variously curved ; endoplasm usually granular. Length of body $\frac{1}{165}$ to $\frac{1}{110}$ inch. Hab.—Pond water, with aquatic plants.

This resembles *Homalozoon vermiculare* in contour, but differs in size, in the number of contractile vesicles, and especially in the form of the nucleus and the absence of a keel-like ridge traversing the dorsal aspect.

EXPLANATION OF THE PLATE.

Fig. 1 to 5. Various forms assumed by Mastigamœba reptans.
" 6. Heteromita fusiformis.
" 7. " " with amœboid protrusions.
" 8. Heteromita triangularis.
" 9 and 10. Two forms of Macromastix lapsa.
" 11. Trachelomonas cervicula. An empty lorica.
" 12. Trachelomonas similis.
" 13. Trachelomonas obovata.
" 14. Trachelomonas spinosa.
" 15. Epipyxis eurystoma. An empty lorica.
" 16. Epipyxis socialis. An empty lorica.
" 17. Cryptoglena alata.
" 18. Furcilla lobosa.
" 19. " " lateral view.
" 20. " " a variety.
" 21. " " transverse optic section ; diagram.
" 22. Lagenophrys bipartita.
" 23. Podophrya pusilla.
" 24. Solenophrya oblonga.
" 25. Solenophrya alata.



Fresh-water Infusoria.—Stokes.

The Asiatic Affinities of the Malay Language.

By C. Staniland Wake.

(*Read before the American Philosophical Society, April 18, 1890.*)

The existence of a connection between the language of the Malagasy and that of the Malays is so evident that all matters relating to the latter people are of importance, as bearing on the question of the origin of the natives of Madagascar.

The Malays would seem to be first mentioned in the Chinese annals, which refer to the existence, between the years 618 and 939 of our era, of eighteen small States, probably Shan, in Further India, *north of the country of the Malays.* The Shans, to whom the Siamese are closely allied, were therefore preceded in that region by not only the Burmese, who are probably related to the Naga tribes, but also the allied Chams and Malays, whose affinities would be rather with the Mongolian peoples of India, now represented by the Kolarian tribes. This view is evidently supported by the statement of M. Vivien de Saint-Martin that there is a general and primitive relationship between the "innumerable ramifications of the non-Aryan race of India and Indo-China." The Rev. Dr. Mason and other writers have found a similarity between the language of the Môn of Tegu and that of the Mundakols of Chutia Nagpur, and Dr. Latham states that the Malay language is connected with the Môn, and therefore also with the Kolarian dialects of India. He associates with them, as belonging to the same group, the language of Cambodia. Mr. Cust agrees in allowing a relationship between Môn and Cambodian, but he classes the Malay language as a distinct family. Prof. A. H. Keane affirms, on the other hand, that the Khmer of Cambodia has nothing in common with the Kolarian except a few verbal resemblances through the Talaing, and that the Malay is "unmixed in structure and fundamentally related to the Cambodian." If we test these statements by reference to the numerals of those languages, we find that the Khmer differs from Malay and agrees with the Kolarian dialects. This is shown by the following table:

	Khmer.	Kolarian.			Malay.
		Talaing.	Hos.	Sontal.	
1.	muy	mooa	mi	mia	satu
2.	pir	ba	bara	baria	dua
3.	bey	pee	apia	pia	tiga
4.	buon	paun	apania	ponia	ampat

The Malay numeral *ampat*, four, is probably derived from the Kolarian, but some of the others are evidently of Dravidian origin. This is true doubtless of *satu*, one, which appears to be connected with Brahui *asit*, one, in Dravidian *or-u*, the r and s being interchangeable. The Malay numerals *dalapan*, eight, *sambilan*, nine, and *sapula*, ten, are certainly connected with the Dravidian. Dr. Caldwell remarks* that the classical Tamil grammars teach that *pattu*, ten, may in certain connections be written *pahdu*, from *pag-u*, to divide, which corresponds to *pagudi*, classical Tamil *pâl*, a division. Thus the ancient Tamil *orupukadu* is *oru pahdu*, one ten. We have here the explanation of the Malay *sapula*, which likewise means "one ten," the word *pula* being evidently connected with the Dravidian numeral. The Malay word *sambilan*, nine, has a similar explanation. Dr. Caldwell explains the Tamil *onbadu*, nine, in Malayalam *ombadu*, as compounded of the ordinary Dravidian *or*, one, and *padu*, ten, and as having the meaning of "one from ten." The Malay *sambilan* has the same sense, and is compounded of *sa*(*m*), one, and *pula* (bilan), ten. Dr. Caldwell applies to the Dravidian numerals the rule "characteristic of the Scythian languages," that they "use for eight and nine compounds which signify ten minus two and ten minus one." This rule applies, as we have seen, to the Malay numeral nine, and it does so also to *eight*. Thus *dalapan* is compounded of *dua*, two, and *pula*, ten; as in Telugu *enimidi*, ten, meaning "two from ten," is formed of *eni*, two, and *midi*, which is really identical with *padi*, ten.

Prof. Keane refers to the Indo-Pacific numerals as common elements in the Malay and Polynesian languages; he points out that in the Samoan *sefalu*, ten, we have a reduplication of the "enunciative particle," "the expression being really equivalent to *sa-sa-falu*, 'a one-ten.'" He says further that "the needless repetition shows that the original sense has long been lost: a further proof of the vast antiquity and independence of the Sawaiori [Polynesian] tongues." Prof. Keane adds that as the "common elements in the Indo-Pacific languages are organic and not borrowed," these languages "form a linguistic family in the same sense that the Aryan or Semitic are linguistic families." The evident connection between the Malay and the Dravidian numerals throws doubt, however, on that conclusion. Prof. Keane refers also to the Polynesian word for five, *lima*, which he supposes to have originally meant hand, as it still usually does, and he states that "this meaning is lost in Malay, Javanese, Malagasy, etc., where *lima*, retained as a numeral, has been replaced in the sense of hand by *tanghan*, *tahan*, etc." So far, however, from the Malay having exchanged *lima* for *tanghan*, the probability is that it never used the former word in the sense of "hand;" as *tanghan* or an allied form is thus used by the Asiatic peoples to whom the Malays are most closely related. This view is not inconsistent with the remarks on the numeral "five" in the Dravidian languages made by Dr. Caldwell, who suggests that it might be derived from *kei*, in Tamil a hand. Probably

* Grammar of the Dravidian Languages, p. 248, 1875.

the Dravidian word for hand, in Gond *kaik*, as well as the numeral five, *saighan* in Gond, and the Malay *tanghan* are derived from a common root meaning "hand." It is noticeable that in Samoan the word *lima* is not used in speaking of a chief's hand. This is *'a 'ao*, in other Polynesian dialects *kakao*, which is the original form, and is evidently allied to the words just referred to. The origin of the word *lima* is probably to be sought in the languages of Cochin China, in which the numeral five is *naru* or *laru*, unless it is derived from the Shan dialects, which have the word *mu* or *mi* for "hand." The Malay would seem to have taken its numerals "two" and "three" from the same source as that to which it was indebted for the word *tanghan*. In the Tungus languages "five" is *tonga*, or a slightly differing form of this word, and in the same languages we have *dzur*, *dzhoua*, *dyul*, *dyur* for "two," and *ela*, *gilang*, *ilan* for "three," answering to the Malay *dua* and *tiga*, which in Polynesian become *lua* and *tolu*.

The consideration of the numeral systems of the Malay and Cambodian does not support the conclusion that these languages are of the same family. Prof. Keane refers, however, to a feature possessed by both of them, which he considers so peculiarly distinctive as of itself alone almost to be sufficient to establish their common origin. This is the use of identical *infixes*.* It should be noted, however, that this important feature is not met with in the Polynesian dialects, which employ a prefix† instead, although it is found in all the true Malayan dialects, and is especially frequent in those of the Philippine islands. Prof. Keane does not give the origin of this "Malayan feature," as it is termed by the Rev. L. Dahle, who first pointed out its presence in Malagasy. It is somewhat difficult to understand how the use of infixes can be universal in Malay, but nct be met with in Polynesian, if, as Prof Keane supposes, those languages form one family with the "polysyllabic untoned languages of Indo-China," which the Malays are said to have acquired. If the Polynesian and Cambodian languages belong to the same family, that feature must either have been developed after their separation or have been acquired by the latter from a foreign source. When we consider that the use of infixes is essentially Malayan, we are tempted to believe that it has been taken by the Cambodian from the Malay or an allied language, such as the Cham. The latter opinion is supported by certain other characters of the Khmer tongue. This is classed by Mr. Keane with the "polysyllabic untoned languages," and rightly so inasmuch as the Khmer is pronounced *recto-tono;* although the same word has several significations, the sense of the phrase alone giving the true signification. According to M. Moura, however, the Cambodian language is really monosyllabic. He says expressly, "like all the languages and idioms spoken in our days by the peoples of the extreme East, the Cambodian is a monosyllabic language."

* Prof. Keane says that the infix is always the liquid *m* or *n* or *mn*, with or without the vowels *a*, *o* with *m*, or *a*, *i* with *n*.

† The Samoan *prefix* is *mo*.

He adds, "in books of poetry, theology and even sometimes in ordinary language, a certain number of polysyllabic words are found, but these words are generally of Sanskrit or Pali origin, and prove nothing against the general character of the language." M. Moura cites various words which have been derived from the Pali, and which could be indefinitely added to. He states that they have been shortened, so as to reduce them as much as possible to the monosyllabic form, "which is one of the distinctive features of the genius of the Khmer language." If this language is in reality monosyllabic, Prof. Keane's argument, based on its polysyllabic character, cannot be sustained, but even if M. Moura is wrong, we must conclude that the Khmer has been indebted for certain of its features to the Malay rather than the reverse.

As to the verbal relationship between the Khmer and Malay languages we may judge from the comparative vocabularies contained in M. Moura's work. Of the 124 words there given only twenty-four are the same in those languages, of which sixteen are however the same also in Cham, which has thirteen other words common to it and Khmer alone. It appears, therefore, that Cham is more nearly related to Khmer, judging from their vocabularies than is Malay. This agrees with the fact of the early communication between the Khmers and the Cham. Moreover, Malay and Cham agree in thirty-three instances out of the 124, showing a closer relation between these two languages than exists between either of them and Khmer. That all these languages include both Kolarian and Dravidian elements is shown by reference to the short comparative vocabulary appended to this paper. Those elements have, however, been derived from different sources. M. Moura would, indeed, seem to think that the language as well as the written character of the Cambodians is derived from the Sanskrit and Pali, and it has no doubt obtained its foreign element chiefly from the north. The Malay, on the other hand, is fundamentally related to the Kolarian and the allied Mongolian languages, and its Dravidian element has been obtained from the south. This feature occupies a more important position in Malay than Dr. Caldwell appears to allow. When referring to the Dravidian word *kıpp-al*, a ship, he says that the Malay word for "ship" is kapâl. He adds, however, that "this has probably been borrowed direct from Tamil, and forms one of a small class of Malay words which have sprung from a Dravidian origin, and which were introduced into the Eastern archipelago, either by means of the Klings (Kalingas), who settled there in primitive times, or by means of the Arab traders, whose first settlers in the East were on the Malabar coast, where the Malayálam, the oldest daughter of the Tamil, is spoken." Reference has already been made to the Dravidian origin of some of the Malay numerals, to which may be added that the affix *tu* in Malay *satu*, one, appears to be only the neuter formative *du*, which, according to Dr. Caldwell, is contained in various shapes in the first three Dravidian numerals. Moreover, the Malay *sa*, like the Dravidian *oru*, one, is used as the indefinite article. Other verbal agreements could be mentioned, but I will refer to only one other example. Dr. Caldwell states that *tî* is the classical Tamil word for "fire," but that the more commonly used word is *neruppu*, in Telugu *nippu*. Here we have, no doubt, the origin of the Malay *api* (in Samoan *afi*), which in Cham takes the form *apui*. Dr. Leyden long since pointed out that the language of the Malays contains a great number of Tamil, Malayalam and Telinga words which are not found in Sanskrit or the allied Indian languages, and particularly "a variety that are only to be found in Telinga," the vernacular of the ancient kingdom of Kalinga.*

*Asiat. Researches, Vol. x, p. 171.

		Khmer.			Cham.		
1	Bird	sat hȯr	*Dravidian*	kôr-i	chim po	(see *Egg*)	
			Persian	khor-os(cock)			
2	Dog	chhkê	*Tibetan*	khyi	asau	*Sanskrit*	swan
			Hindi	kootha		*Kolarian*	sétâ
3	Ear	trachick	*Tibetan(Sok)*	khikhé	tanhu	*Naga*	tenhaun
			Kolarian	khetway		(see *Malay*)	
4	Egg	pong	*Yeniseian*	ong	bo	*Kolarian*	pito
5	Eye	phnek	*Dravidian*	kank	mata	*Kolarian*	met
		panék	*Hindi*	ānkh		*Mon* (Tegu)	mot
6	Female	nhi	*Dravidian*	henn-u	benai	*Dravidian*	pen,henn-u
7	Fire	phlung	*Kolarian*	sengel	apui	*Dravidian*	nippu
8	Fish	trey	*Kolarian*	hai	akan	*Kolarian*	haku
						Burmese	kha
9	Foot	chung	*Tibetan*	kango	takai	*Kolarian*	kata
			Mon (Pegu)	jaing			
10	Hand	day	*Kolarian*	tih	tangun	*Yeneseian*	hanga
			Dravidian	kei			
11	Head	kabal	*Sanskrit*	kapâla	akak	*Dravidian*	kuk
			Dravidian	tala		*Burm.* (*Sak*)	akhú
12	Horse	sē	*Tibetan*	ta	asè	(see *Khmer*)	
			Sanskrit	aswa			
13	House	ptea	*Drav.*(Gond)	erpa	sang	*Tibetan*	nang
14	Man	menus pros	*Pali*	manut	orang lokay	*Kolarian*	koro, lokka
			Sanskrit	manusha			
15	Moon	ke ?	{ *Burmese*	la	bulan	*Kolarian*	lerung
			{ *Shan*	len			
16	Mouth	mot	*Kolarian*	tamode	chebuoi	? *Yeneseian*	hohui. bu-
			Bengali	mukh			[khom
17	Nose	chrèmo	*Mongolian*	khamar	adung	*Yeneseian*	hang
			Siamese	tamua			
			Sanskrit	ghrana			[ma, elu-mbu
18	Ox	ku	*Sanskrit*	go (cow)	lama	*Dravidian*	eruma, er-
19	River	tanla	*Dravidian*	kole	sungai	*CochinChina*	song
			Nepaul	khola		*Mongolian*	uhung(wa-
20	Serpent	{ pos	*Nep.*(Tharu)	sapa	ala	(see *Malay*)	[ter)
		{ sbĕk (skin)	*Dravidian*	pab, pavu			
21	Sky	mik	*Siamese*	mic	langik	*Kolarian*	sengil (fire)
			Burmese	mo			singi (sun)
22	Star	pakai	*Drav.*(Gond)	binka	bintang	*Dravidian*	binka
23	Stone	thma	*Mon* (Pegu)	tmauon	botau	(see *Egg*)	
24	Sun	thngai	*Kolarian*	singi	haray	*Mongolian*	nara
		tangai	(see *fire*)			*Sanskrit*	sûrya
25	Water	tenk, tak	*Kolarian*	dah	ea	*Dravidian*	yer
			Mon (Pegu)	dai			
26	Wood	chhu	*Dravidian*	chettu (tree)	kayou	*Dravidian*	chettu,gida
	1	muy	*Kolarian*	mia	sa	*Dravidian*	or-u
						Brahui	as-it
	2	pir	*do.*	baria	dua	*Tungusian*	dzur, dyur
	3	bey	*do.*	pia	klau	*Tungusian*	ela, gilang
	4	buon	*do.*	ponia	pac	*Kolarian*	ponia, apa-
	5	pram ?	{ *Tonkin*	lam	lému	*Tonkin*	lam [nia
			{ *Annam*	nam		*Annam*	nam
	6	pram muy			nam	*Tungusian*	nungun
	7	pram pil			tuju	*Dravidian*	edu, yetu
	8	pram bey			dopan	(two from ten)	
	9	pram buon			samlan	*Dravidian*	onbadu
							(one from ten)
	10	dap	*Dravidian*	padu	saphu	*Dravidian*	oru padu
			Tonkin	tap			(one ten)
			Hindi	das			

		Malay.			Samoan.		
1	Bird	burang tarbeang			manu	*Fiji*	manumanu
					moa (fowl)	*Khmer*	mon (fowl)
2	Dog	anjing	*Dravidian*	nây	uti, maile	*Fiji*	koli
		asu (*Java*)				*Singhalese*	balla
3	Ear	talinga	*Naga*	telanno	taliga	*Fiji*	daliga
			Arakan (Kumi),	kano			
		kana (*Java*)	*Singpho*	kana			
			Sanskrit	sila (stone)			
4	Egg	talor	*Dravidian*	kal (stone)	fua	*Fiji*	vua (fruit)
			Koreng	talo (stone)			
5	Eye	mata	(see *Cham*)		mata	*Fiji*	mata
6	Female	botina	(see *Cham*)		fafine		
7	Fire	api	*Dravidian*	nippu	afi		
			Thai	fai			
8	Fish	ikan	(see *Cham*)		i'a		
9	Foot	koki	*Kolarian*	kata	vae	*Dayak*	pai
			Tibetan	kango		*Fiji*	yava
			Permian	kok			
10	Hand	tangan	(see *Cham*)		lima	? *Siamese*	mu
					'a'ao (chief's)	*Fiji*	liga
11	Head	kapala	*Sanskrit*	kapâla	ulu		
		ulu	*Dravidian*	tala			
			Arakan (Kumi)	alú			
12	Horse	kudo	*Dravidian*	kudirei			
			Yeneseian	kut			
13	House	ruma	*Dravidian* (Gond)	roon	fale		
			Arakan (Kumi)	úm			
			Kolarian	ora			
14	Man	orang koki	(see *Cham*)		tane, tugata	*Fiji*	tagane, tamata
15	Moon	bulan	(see *Cham*)		ma-uli, ma-sina	*Fiji*	vula
16	Mouth	mulot	(see *Khmer*)		gutu	*Fiji*	gusu
			Arakan (Kumi)	amoká		*Singhalese*	kata
17	Nose	hidong	(see *Cham*)		isu	*Fiji*	ucu
						Sanskrit	nâsa
18	Ox	lambu	(see *Cham*)				
19	River	sũngei	(see *Cham*)		vaitafe	(see *Water*)	
20	Serpent	ulor			gata	? *Siamese*	ngu
		kulet (skin)	*Dravid.*	tol			
		uli (skin *Bugis*)					
21	Sky	langet	(see *Cham*)		lagi	*Fiji*	lagi
22	Star	bintang	(see *Cham*)		fetū	(see *Khmer*)	
23	Stone	botu	*Kolarian*	pito (egg)	fatu	*Fiji*	vatu
24	Sun	mato hari	(see *Cham*)		la	*Fiji*	siga
						Kolarian	singi
25	Water	ayor	(see *Cham*)		vai	*Fiji*	wai
					taufa (chief)		
26	Wood	kayu	(see *Cham*)		la'au	*Fiji*	kau (tree)
			Eskimo	keiyu			
	1	sátu			tasi	*Malagasy*	iray, isa
	2	dúa			lua	*do.*	roa
	3	tiga			tolu	*do.*	telo
	4	ampat	(*Bugis* apa)		fā	*do.*	efatra
	5	lima			lima	*do.*	dimy
	6	a'nam			ono	*do.*	enina
	7	tújoh			fitu	*do.*	fito
	8	delápan			valu	*do.*	valo
	9	sambilan			iva	*do.*	sivy
	10	sapúloh			sefulu	*do.*	folo

Stated Meeting, February 21, 1890.

Present, 23 members.

President, Mr. FRALEY, in the Chair.

Letters of envoy were received from the Nova Scotian Institute of Natural Science, Halifax; Museum of Comparative Zoölogy, Cambridge, Mass.; Department of the Interior, Washington, D. C.

Letters of acknowledgment were received from the Naturwissenschaftlicher Verein, Bremen (129); Entomological Society, Brooklyn (130); University of the City of New York (130); Prof. Henry M. Baird, Yonkers (130); Dr. Charles C. Abbott, Trenton, N. J. (130); Dr. F. A. Genth, Prof. Lewis M. Haupt, Dr. George H. Horn, John Marshall, Hon. Henry Reed (130), Prof. John A. Ryder, Philadelphia (125, 130); State Historical Society, Topeka, Kans. (130); University of California, Prof. John Le Conte, Berkeley, Cal. (130); Mr. George Davidson, San Francisco, Cal. (130).

A circular from the Sociedade de Geografia, of Lisbon, embodying a protest against the English aggressions in Africa.

The Section für Naturkunde des Œsterreichen-Touristen Club was placed on the Society's exchange list to receive Proceedings from No. 130.

Accessions to the Library were announced from the Geological Survey of India, Calcutta; K. K. Sternwarte, Prag; Anthropologische Gesellschaft, Vienna; Verein für Erdkunde, Metz; Statistika Central Byrån, Stockholm; Prof. Lorenzo M. Billia, Turin; Societé D'Ethnographie, Ministerè des Travaux Publics, Mr. Henry Carnoy, Paris; Royal Society, London; Mr. William H. Whitmore, Boston; Harvard University, Cambridge, Mass.; Yale University, New Haven; Astor Library, New York; State Museum of Natural History, Albany; Historical Society of Pennsylvania, Editor of "American Notes and Queries," Dr. George H. Horn, Mr. Henry Phillips, Jr., Philadelphia; Johns Hopkins University, Baltimore; War Department, Department of the Interior, Washington, D. C.; Rev. Stephen D. Peet, Mendon, Ill.; State Historical Society of Wisconsin, Madison; State University of Iowa, Iowa City.

Prof. John A. Ryder presented his photograph for the Society's Album.

Prof. Lesley read an obituary notice of the late Charles A. Ashburner, D.Sc.

The Proceedings of the Board of Officers and Council were submitted.

Pending nominations, Nos. 1203, 1204, 1205, 1206, 1207 and 1208 were read, spoken to and balloted for.

Prof. E. D. Cope made some observations on the gigantic chincilla of North America, *Casteroides ohioensis.*

The annual report of the Trustees of the Building Fund was presented.

Prof. Cope offered the following resolution, which, he stated, was intended to supersede the one presented by him to Council at its meeting last week, and by it deferred until its next stated meeting:

> *Resolved,* That the Proceedings of the Society be issued whenever an amount of matter is ready for press which will make seventy-five pages of text.

On motion, the resolution was referred to the next regular meeting of the Board of Officers and Council.

The Committee on Accommodations reported progress and was continued.

All other business of the meeting having been finished, the Tellers reported the result of the poll to the President, who thereupon declared that the following gentlemen had been duly elected members of the Society:

No. 2175. Hon. James T. Mitchell, Philadelphia.
No. 2176. Samuel Timmins, Arley near Coventry, England.
No. 2177. Prof. Robert W. Rogers, Haverford College, Pa.
No. 2178. Prof. Henry Willis, Philadelphia.

And the Society was adjourned by the President.

Stated Meeting, March 7, 1890.

Present, 10 members.

Mr. Richard Vaux in the Chair.

Prof. Henry Willis, a newly elected member, was presented to the Chair and took his seat.

Correspondence was submitted as follows:

Letters accepting membership from Prof. Robert W. Rogers and from Prof. Henry Willis, Philadelphia.

Letters of envoy were received from the Museo Nacional de Buenos Aires; Royal Statistical Society, London.

Letters of acknowledgment were received from Sir J. W. Dawson, Montreal (130); University of Pennsylvania (129, 130), Mrs. Helen Abbott Michael (130), Prof. Henry D. Gregory (130), Philadelphia; Maryland Historical Society, Baltimore (130).

A letter from the Department of State in reference to certain MSS. in the possession of the Society was ordered to be filed.

A letter was read from E. Frank Carson, requesting the loan of the Society's Hall for an approaching reunion of the Rittenhouse family, to be held April 8, 1890, being the 168th anniversary of his birth; and also requesting that the Society should be represented on the occasion, which, on motion, was referred to the President with power to act.

Accessions to the Library were reported from the Académie des Sciences, Cracow, Austria; Section für Naturkunde, Ö C., Vienna; Verein für Lübeckische Geschichte und Alterthumskunde, Lübeck, Germany; Société Hollandaise des Sciences, Harlem, Holland; Philological Society, Cambridge, England; Rousdon Observatory, Devon, England; Geological, Royal Statistical Societies, London; Geological and Natural History Survey of Canada, Montreal; Harvard University, Cambridge, Mass.; Mr. Charles J. Hoadley, Hartford, Conn.; Prof. Robert W. Rogers, Philadelphia; Wyoming Historical Society, Wilkes-Barré; Johns Hopkins University, Baltimore;

U. S. Coast and Geodetic Survey, Bureau of Ethnology, Interstate Commerce Commission, Washington, D.C.; Kansas Academy of Science, Topeka; University of California, Berkeley; Observatorio Meteorologico-Central, Mexico; Museo Nacional de Buenos Aires, S. A.

Mr. Phillips exhibited and presented to the Cabinet of the Society a bottle of "Earthquake sand from the Geysers at Summerville, S. C., August 31, 1886."

Mr. Vaux read an obituary notice of the late Franklin B. Gowen.

An obituary notice of the late Henry S. Frieze, LL.D., by Hon. James B. Angell, was presented by the Secretaries.

The death of Martin B. Anderson (formerly of Rochester, N. Y.) was reported as having taken place at Lake Helena, Florida, on February 26, 1890 (born February 12, 1815).

Prof. Barker exhibited to the Society four stellar photographs taken by Prof. Pickering, Director of the Harvard College Observatory, as a part of the Henry Draper Memorial. The photographs were of the spectrum of the star β Aurigæ, and showed the K line single in the first set and double in the second, although taken only about seventeen hours apart. This result appears to show that this star is binary, its components revolving about each other in somewhat less than four days. From the displacement of the components of the K line, the change in wave length and the velocity of motion may be calculated. Prof. Pickering finds this velocity to be 150 miles per second. The distance apart of the components he estimates to be eight million miles, and their joint mass about 2.3 times that of the sun. Since the spectrum method of detecting binary stars is independent of distance, it must always have an advantage in detecting such stars over the telescopic method.

Dr. Brinton offered the following resolution, which was adopted:

Resolved, That the Committee on the Commemoration of the Death of Franklin be instructed to select all speakers on that occasion from members of the Society, and if engagements of others have already been made, that they be informed that owing to alterations in the plan of the commemoration, the thanks of the Society are tendered them, but their attendance will not be expected.

Dr. Horn offered the following resolution, which was adopted:

Resolved, That a Committee of three be appointed by the President to examine an oil portrait of Prof. S. F. Baird by Mr. H. Ulke, report on its desirability, and, if favorably, to solicit subscriptions for its purchase at a price not exceeding $200, for the gallery of this Society.

The President subsequently appointed as such Committee, Dr. George H. Horn and Messrs. J. Sergeant Price and William A. Ingham.

And the Society was adjourned by the presiding member.

Stated Meeting, March 21, 1890.

Present, 30 members.

President, Mr. Fraley, in the Chair.

Prof. Robert W. Rogers and Mr. Talcott Williams, lately elected members, were presented to the Chair and took their seats.

Correspondence was submitted as follows:

Letters from Hon. James T. Mitchell and Mr. Samuel Timmins accepting membership.

A circular from the University of Toronto, requesting donations to its library, to replace the one destroyed by fire on the 14th of February last; on motion, the Librarian was directed to forward to it such of the Proceedings of the Society as could be sent.

A letter from the Naturforschende Gesellschaft in Emden, Hannover, thanking the Society for its letter of congratulation on the late celebration of the seventy-fifth anniversary of its foundation.

A letter from the Trinity Historical Society, Dallas, Tex., asking for autograph letters.

A letter from the *Societas linguam universalem scientiarum ac negotiorum ancillam fundantium Internationalis.*

A prospectus of the "Antananarivo Annual," published in Madagascar.

The Museo Michoacano, Morelia, Mexico, was placed on exchange list from No. 96.

Letters of acknowledgment (Transactions, xvi, 3) were received from the Boston Public Library; Museum of Comparative Zoölogy, Cambridge; American Antiquarian Society, Worcester; Buffalo Library; Astor Library, New York; Library U. S. Military Academy, West Point; New Jersey Historical Society, Newark; Pennsylvania Hospital, Franklin Institute, Library Co. of Philadelphia, Historical Society of Pennsylvania, Philadelphia; State Library of Pennsylvania, Harrisburg; U. S. Geological Survey, Washington, D. C.; University of Michigan; State Historical Society of Wisconsin, Madison; University of California, Berkeley.

Letters of acknowledgment (Proceedings, 130) were received from Prof. William P. Trowbridge, New York; Mr. Inman Horner, Philadelphia; Colorado Scientific Society, Denver; Central Meteorological Observatory, Mexico; Deutscher Wissenschaft Verein, Santiago de Chile.

Accessions to the Library were reported from the K. K. Zool.-botanische Gesellschaft, Vienna; Verein zur Beförderung des Gartenbaues, Berlin; Dr. Paul Topinard, Paris; Royal Institution, Dr. Benjamin W. Richardson, London; Hon. John Canon O'Hanlon, Dublin; Massachusetts Bureau of Statistics of Labor, Boston; Mercantile Library, Drs. Daniel G. Brinton, F. A. Mühlenberg, Mr. Henry Phillips, Jr., Philadelphia; Editor of "American Journal of Philology;" Legation de la Republica de Costa Rica, C. A.; Chief of Engineers, Department of State, Washington, D.C.; Museo Michoacano, Morelia, Mexico.

A photograph of the alleged Runic characters on Mananas island, near Monhegan, Maine, photographed and presented by Prof. J. F. Rothrock, Philadelphia.

A letter from Rev. F. A. Mühlenberg, D. D., accompanying his donation of the botanical note books of his grandfather, Rev. Henry E. Mühlenberg, a former member of this Society, and the letters to him of Rev. Christian Fr. Denke, a Moravian missionary.*

Botanical Journals, etc., by Dr. Henry E. Muhlenberg; born Nov. 17, 1753, died at Lancaster, Pa., May 23, 1815; presented to the American Philosophical Society, of which he was a member, by his grandson, Dr. F. A. Muhlenberg, March 21, 1890:

1. Botanice.
2. Book of descriptions, without title.
3. Plants not determined, according to Linnæus' System, etc., 1788.
4. Folia plantarum Lancast. and a catalogue of the plants of North America, 1808.
5. Tage Buch, 1784.
6. Tage Buch, 1785.
7. Noten Buch, 1785.
8. Tage Buch, 1786–89.
9. Catalogus arborum et fruticum Americæ Septentrionalis.
10. Cryptogamia Lancastriensis, 1791.
    - I. Filices.
    - II. Musci.
    - III. Fungi.

    contains, also, Lichens Lancastriensis, etc.

* There is no autobiography in existence of Christian Fr. Denke; but, from information gained from conversations with Denke and others, a biographical sketch of Christian Heinrich Denke was published in "Nachrichten aus der Brüder Gemeinde," 1841, Heft iii, pages 467–477. (The name *Heinrich* is either a mistake, or possibly Denke may have been baptized Christian Friedrich Heinrich. I have not yet examined the baptismal records in Bethlehem). Denke was born at Bethlehem, Pa., September 8, 1775, and was sent to Nazareth Hall in 1785, remained there after his father's death, and afterwards was appointed one of the teachers. In 1797, he resolved to become a missionary among the Indians. After having been ordained Deacon in Bethlehem, he left May, 1800, with Heckewaelder for Gosen on the Muskiugum, remained here until August, studying the Delaware language, and then went to Fairfield in Upper Canada, commencing in June, 1801, his labors among the Chippeways. He translated into the Delaware language various parts of the Bible, of which the Epistles of St. John were printed. In 1803, he returned to Pennsylvania, married August 7, at Lititz, Anna Maria Heckedorn, went back to Canada, 1804 to Youngquakamick, 1807 to Pettquoting, then back to Fairfield. After the burning of Fairfield in autumn, 1813, he fled to Delawaretown. In September, 1815, he began to build New Fairfield, but returned to Bethlehem in 1818. Receiving a call as pastor to Hope, in the Wachau, he reached Salem, N. Car., in summer, 1820; in 1822, he became pastor at Friedberg, but retained charge also of the small congregation in Hope. His wife died in 1828, and September 12, he married Marie Steiner. 1832, he retired from his spiritual labors, and intended to again devote his time to botany and other branches of natural science. 1834, symptoms of dropsy appeared; his right side was paralyzed in November, 1837, and he died at Salem, January 12, 1838.

JOHN M. MAISCH.

11. Agrostographia Pennsylvaniæ, etc.
12. Gräser, die bei Lancaster wild wachsen oder die ich sonst auf meinen inländischen Reisen bemerkte.
13. Plantæ cryptogamicæ Lancastriensis, etc.
14. Fungi Pennsylvaniæ, Mediæ, etc., 1793 et annù seq.
15. Monographien von Gewächsen von Lancaster, 1790, Vol. i.
16. Monographien plantarum Lancastriensis, Vol. ii.
17. Descriptio plantarum ex alies partibus Americæ Septentrionalis, incepta a 1792.
18. Sammlung von Beiträgen zur Kenntniss der Natur, 1785. With observations on agriculture.
19. Fortsetzung meines Journals von Jahren 1799–1806.
20. Botanical Journal, 1807–1815, to May 20, three days before his death.
21. Flora Lancastriensis, 1790.
22. Letters, etc., of the Rev. C. F. Denke, Moravian preacher and missionary, and one of the early botanists of America.

Prof. Lesley read an obituary notice of the late Leo Lesquereux.

The death was announced of Rev. Daniel R. Goodwin, D.D., Philadelphia, on March 15, 1890, in the seventy-ninth year of his age.

On motion, the President was authorized to appoint a suitable person to prepare the usual obituary notice.

Mr. J. Vaughan Merrick was subsequently appointed by the President.

The death of Dr. Gustav Weil, Heidelberg, September 10, 1889, æt. 71, was also announced.

The Secretaries presented for the Proceedings the two following papers by Dr. Harrison Allen: "Description of a New Species of Macrotus" and "Description of a New Species of Pteropus."

New nomination 1209 was read.

Dr. Horn, from the Committee on the Portrait of Prof. Baird by H. Uhlke, reported it now at Earle's Galleries in this city, and to be a good painting. On motion, the Committee was continued.

Dr. Oliver, from the Committee on Franklin Celebration, reported progress.

The President of the Society reported that he had conferred with the writer of the letter to the Society respecting the Rittenhouse celebration (March 7, 1890), and that he was of the opinion that such a use of the Society's Hall as was therein requested, was not expedient.

Dr. Brinton asked as a question of privilege what action the Committee on the Franklin Celebration had taken on the Society's resolution passed at the last meeting.

Mr. Biddle, of the Committee, stated it had been carefully and respectfully considered, and that after two meetings it had been laid over until the next meeting.

Dr. Horn offered the following preamble and resolution:

Having been present at the meeting of March 7, and voting in the affirmative, I move to reconsider the following resolution passed at that time:

Resolved, That the Committee on the Commemoration of the Death of Franklin be instructed to select all speakers on that occasion from members of the Society, and if engagements of others have already been made, that they be informed that owing to alterations in the plan of the commemoration, the thanks of the Society are tendered them, but their attendance will not be expected.

The motion was seconded by Dr. Brinton, and the question was discussed by Messrs. Horn, Brinton, Oliver, Biddle, Morris, Vaux, Martindale, Potts, Cope, Lesley, and Greene.

The question being put it was agreed that the Society should reconsider the original motion.

The original motion then being put, by a *viva voce* vote was not agreed to. On which the ayes and nays being demanded the resolution was voted on and not agreed to by 26 nays to 2 ayes.

Dr. Jayne offered the following resolution, which was agreed to:

Resolved, That the Secretaries be requested to communicate with the Lords Commissioners of the Admiralty with a view to obtaining as a donation the Reports on the Voyage of the *Challenger*. And, further, should such application prove unsuccessful, that the Committee on Library should procure the same by purchase.

And the Society was adjourned by the President.

No Meeting of the Society was held on April 4, 1890, it being Good Friday.

April 17, 1890.

The One-hundredth Anniversary of the death of Benjamin Franklin was commemorated at Association Hall, by the Society. Addresses were delivered as follows:

A Short Biography of Dr. Franklin, by John Bach McMaster, Professor of American History in the University of Pennsylvania; "His Literary Labors," by G. Brown Goode, Assistant Secretary of the Smithsonian Institution, at Washington; "His Scientific Work," by Prof. J. W. Holland, Professor of Medical Chemistry and Toxicology in the Jefferson Medical College; "His Association With the Society," by Frederick Fraley, LL.D., President of the Society; "His Diplomatic Services," by Prof. Henry M. Baird, Professor of English Literature and Greek in the University of the City of New York.

A full account will be published in Proceedings, No. 133.

Stated Meeting, April 18, 1890.

Present, 14 members.

President, Mr. Fraley, in the Chair.

Correspondence was submitted as follows:

Letters of envoy were received from the Australasian Association for the Advancement of Science, Sydney; Societas Pro Fauna et Flora Fennica, Helsingfors; Observatoire Astronomique et Physique, Tashkend; Physikalische Gesellschaft, Berlin; Bureau des Longitudes, Paris; Bath and West of

England Society and Southern Counties Association, Bath; Meteorological Office, London.

Letters of acknowledgment were received from the Royal Society of New South Wales, Sydney (129); Academie Royale Danoise des Sciences, etc., Copenhagen (128, 129); Natural History Society, Montreal (129, 130); Sociedad Cientifica "Alzate," Mexico (129, 130).

Letters of acknowledgment (130) were received from the K. K. Central-Anstalt für Meteorologie, etc., Wien; Naturforschende Gesellschaft, Emden; Naturwissenschaftliche Gesellschaft "Isis," Dresden; Dr. Julius Platzmann, Leipzig; Société Linneenne de Bordeaux; Société de Borda, Dax; Société d'Anthropologie, Profs. Abel Hovelacque, Léon de Rosny, Rémi Siméon, Paris; Geological and Natural History Survey, Ottawa, Canada; Mr. Talcott Williams, Philadelphia; Prof. S. P. Langley, Washington, D. C.; California Academy of Sciences, San Francisco.

A letter of acknowledgment for diploma was received from Prof. Dr. Hugo Von Meltzel, Koloszvar, Hungary.

A letter of acknowledgment, Transactions, Vol. xvi, Part iii, was received from the San Francisco Free Public Library, San Francisco, Cal.

A letter from Daniel F. Wolf, suggesting that the tombstone of Franklin should be re-lettered and a bronze tablet placed on the graveyard wall with a suitable inscription.

The following letter from M. P. Massion (Notaire, Boulevard Haussmann, 58, Paris, France) was read:

P. Massion,
Notaire,
Successeur de son père
58, Boulevard Haussmann.

Paris, le 31 Mars, 1890.

Monsieur le Président:

J'ai l'honneur de vous informer qu'aux termes de son testament déposé en mon étude, Monsieur Auguste Carlier, décédé en son domicile à Paris, rue de Berlin, N°. 12, le 16 Mars courant, a légué à la Société Philosophique de Philadelphie, dont il était membre, une somme de vingt mille francs. Cette Société en fera l'usage qu'elle jugera convenable pour l'aider dans ses travaux.

Quand cette somme pourra être mise à votre disposition, je vous en aviserai.

Veuillez agréer, Monsieur le President, l'assurance de mes sentiments distingués,

MASSION.

MONSIEUR LE PRÈSIDENT DE LA SOCIÉTÉ PHILOSOPHIQUE, PHILADELPHIE.

On motion, the letter was referred to the Committee on Finance, and the President was requested to prepare and transmit a suitable answer to the same.

Accessions to the Library were reported from the Royal Society of New South Wales, Australian Association for the Advancement of Science, Sydney; Société des Naturalistes, Kief; Observatoire Astronomique et Physique, Tashkend; Societas Pro Fauna et Flora Fennica, Helsingfors, Finland; K. K. Naturhistorisches Hof-Museum, K. K. Geographische Gesellschaft, K. K. Geologische Reichsanstalt, Wien; Gesellschaft für Erdkunde, Physikalische und Physiologische Gesellschaft, K. P. Akademie der Wissenschaften, Berlin; Mr. A. Radcliffe Grote, Bremen; Oberlausitzer Gesellschaft der Wissenschaften, Görlitz; Mr. Aug. Nilson, Gefle, Sweden; K. Danske Videns Rabernes Selskab, Copenhagen; "Flora Batava," Leyden; R. Istituto, Lombardo, Milan; Accademia Reale delle Scienze, Turin; Corpo delle Miniere, Servizio Geologico, R. Accademia dei Lincei, Rome; R. Istituto Veneto di Scienze, Lettre ed Arti, Venice; Société Historique, etc., du Cher, Bourges; Société de Borda, Dax; Académie des Sciences, etc., Dijon; Sociétés d'Anthropologie, Zoologique de France, Bureau des Longitudes, Paris; Société des Antiquaries de la Morinie, Saint-Omer; R. Academia de la Historia, Madrid; Commission des Travaux Geologiques de Portugal, Lisbon; Bath and West of England Society, and Southern Counties Association, Bath; Philosophical Society, Cambridge, Eng.; Meteorological Council, London; Mr. Horatio Hale, Clinton (Ontario), Canada; Museum of Comparative Zoölogy, Cambridge, Mass.; Essex Institute, Public Library, Salem; American Antiquarian Society, Worcester; Rhode Island Historical Society, Providence; Commissioners of the State Reservation at Niagara, Albany; Academy of Sciences, Dr. J. S. Newberry, Mr. J. Bleecker Miller, Messrs. Ivison, Blakeman & Co., New York; Mr. Franklin Leonard Pope, Elizabeth, N. J.; Academy of Natural Sciences, Mercantile Library, Messrs. Edwin A. Barber, W. C. Blelock, D. G. Brinton, E. D. Cope, Walter M. James, Henry Phillips, Jr., Philadelphia; Maryland Academy of Sciences, Baltimore; U. S. Coast and Geodetic Survey, Fish Commission, Geological Survey, Bureau of Education, Smithsonian Institution, Secretary of War, Dr. Albert S. Gatschet, Hon. Charles O'Neill, Washington, D. C.

Mrs. Jane Rittenhouse Wilson presented a cornelian said to have been formerly worn by Dr. Benjamin Franklin, of which she gave the following account:

Benjamin Franklin, during his attendance at the Convention that adopted the Declaration of Independence, wore a certain watch chain on which was a cornelian charm.

This chain and charm he gave to a personal friend, a veteran of the war of 1812, named Daniel Leman, who gave it to his friend,

MRS. JANE RITTENHOUSE WILSON,

One of the Rittenhouse family.

The following deaths were reported:

M. Louis A. C. Carlier, Paris, March 19, 1890, æt. 87.

Mr. Frederick Graff, Philadelphia, March 30, 1890, æt. 73.

On motion, the President was requested to appoint suitable persons to prepare the usual obituary notices.

A paper on "Fresh Water Infusoria," by Dr. Alfred C. Stokes (Trenton, New Jersey), was presented through the Secretaries.

A paper on the "Asiatic Affinities of the Malay Language," by C. Staniland Wake, was presented by the Secretaries.

Pending nomination No. 1209 and new nominations Nos. 1210, 1211 and 1212 were read.

The Committee on Extended Accommodations presented the following Report:

PHILADELPHIA, April 16, 1890.

The Committee on Extended Accommodations, appointed January 17, would respectfully report,

That they have carefully considered the various propositions referred to them; and after due deliberation, concluded to request from J. M. Wilson, Esq., Architect, plans for the alteration of the present building, such as would render it completely fire-proof, harmonize with its surroundings, and provide for the Society's present needs as well as its prospective ones for a period of at least twenty years to come.

He has submitted the accompanying plans and proposal, the adoption of which we would recommend: and therefore offer the following resolution:

That the Committee on Extended Accommodations be continued and empowered to enter into negotiations for alterations to the present buildings in accordance with the plan now submitted.

W. P. TATHAM,
RICHARD VAUX,
FREDERICK FRALEY,
J. CHESTON MORRIS,
Chairman.

A discussion ensued upon the subject, in which Messrs. Morris, Hays, Baker, Dudley, Vaux, Tatham, Potts and others took part.

Dr. Hays moved that the subject be made the special order for the next stated meeting and that notice thereof be put on the meeting cards.

Mr. Vaux moved that the subject be considered at a special meeting, to be held on next Friday (April 25), and that notice should be placed on the meeting cards, and further that the Librarian should place on the cards the words "the plans can be examined at the rooms of the Society."

Mr. Vaux's motion was carried *nem. con.*

On motion, the Treasurer was authorized and empowered to satisfy a mortgage of William J. Norris for $4000, the same having been paid off.

And the Society was adjourned by the President.

Special Meeting, April 25, 1890.

Present, 27 members.

President, Mr. FRALEY, in the Chair.

No Secretaries being present at the time of calling the meeting to order, Mr. J. Sergeant Price was chosen as Secretary *pro tem.*

The object of the meeting, as ordered at the last meeting of the Society, was announced, and Dr. J. Cheston Morris, Chairman of the Special Committee on Extended Accommodations, made a detailed statement of the changes proposed to the building and exhibited and explained the plans for the same. Mr. Price made a statement in regard to the rights of the Society to the property and read the various Acts of Assembly bearing on the subject.

The resolution from the Committee on Extended Accommodations, submitted at the last meeting (April 18), came up for consideration as follows:

Resolved, That the Committee on Extended Accommodations be continued and empowered to enter into negotiations for alterations to the present building in accordance with the plan now submitted, or such modifications thereof as may be suggested by the Committee or its architect.

After discussion and debate, the resolution was adopted by a vote of 21 to 5, and the yeas and nays being called the vote stood as follows: 21 to 5.

On motion of Mr. Vaux, it was resolved that the Committee be directed to proceed with the business authorized by the Society to be done by it.

And the meeting was adjourned by the President.

Stated Meeting, May 2, 1890.

Present 14 members.

President, Mr. FRALEY, in the Chair.

Correspondence was submitted as follows:

The annual program of the R. Academia Nederlandica, *ex legato Hoeufftiano*, for 1891 was presented.

Letters of envoy were received from the K. P. Meteorologisches Institut, Berlin; Mr. Clifford P. MacCalla, Philadelphia; Smithsonian Institution, U. S. Coast and Geodetic Survey, Washington.

A letter of acknowledgment (Transactions xvi, 3) was received from the Geological and Natural History Survey, Ottawa, Canada.

Letters of acknowledgment (129) were received from the K. K. Sternwarte, Prag; Drs. Friederich Müller, Dionys Stur, Edward Suess, Vienna.

Letters of acknowledgment (130) were received from Drs. Friederich S. Krauss, Vienna; Naturforschende Gesellschaft des Osterlandes, Altenburg; Naturhistorische Gesellschaft, Hannover; K. Sächsische Gesellschaft der Wissenschaften, Leipzig; Verein für Vaterländische Naturkunde, Würtemberg; Royal Society, Royal Meteorological, Royal Astronomical Societies, Linnean Society, Society of Antiquaries, London; University Library, Cambridge, England.

The Tokyo Anthropological Society was placed on the exchange list to receive Proceedings from 119.

A letter from Mrs. Harriet Maxwell Converse (New York city, N. Y., April 28, 1890), soliciting subscriptions for a monument to Red Jacket, was read.

The following letter was read:

1325 WALNUT STREET.

TO THE HONORABLE FREDERICK FRALEY, AND THE MEMBERS OF THE AMERICAN PHILOSOPHICAL SOCIETY:

Gentlemen :—I have the honor to offer for your acceptance, the portrait of my brother, the late Henry M. Phillips, formerly a member of your Society, in whose memory The Prize Essay Fund was established.

Very respectfully,

EMILY PHILLIPS.

PHILADELPHIA, May 1, 1890.

On motion, the Society accepted the gift and requested the President to express its thanks for the same.

Accessions to the Library were reported from the Société de la Litérature Finnoise, Helsingfors; Naturforscher-Verein, Riga; Société Malacologique de Belgique, Bruxelles; K. K. Geologische Reichsanstalt, Vienna; K. P. Meteorologische Institut, Physikalische Gesellschaft, Gesellschaft für Anthropologie, Ethnologie, etc., Messrs. M. Friedländer & Sohn, Berlin; K. Gesellschaft der Wissenschaften, Göttingen; Voigtländische Alterthumsforschende Verein, Hohenleuben; Biblioteca N. C. V. E., Rome; The Boletin Meteorológico, Madrid; Public Library, Salem, Mass.; Yale University, New Haven; Engineers' Club, Mr. C. P. MacCalla, Philadelphia; U. S. Coast and Geodetic Survey, Smithsonian Institution, Washington, D. C.; Leander McCormick Observatory, University of Virginia; Mr. William Harden, Savannah; Society of Natural History, Cincinnati; Historical Society, Mr. Philip C. Frieze, Chicago; Iowa Academy of Sciences, Des Moines; University of California, Berkeley; California Academy of Sciences, San Francisco.

The President announced that he had appointed Mr. William P. Tatham to prepare the obituary notice of the late Frederick Graff, and that the appointment had been accepted.

The death of James McClune (Philadelphia, May 1, 1890, æt. 83) was announced.

Dr. Bonwill, through the Secretaries, presented a paper entitled "Geometry and Mechanics Deny Evolution."

Pending nominations Nos. 1209, 1210, 1211 and 1212 were read.

The Committee on the Purchase of the Baird Portrait reported progress and was continued.

And the Society was adjourned by the President.

Stated Meeting, May 16, 1890.

Present, 22 members.

President, Mr. FRALEY, in the Chair.

Correspondence was submitted as follows:

Letters of envoy were received from the Observatoire Physique Central, St. Petersburg; Royal Observatory, Greenwich; Literary and Philosophical Society, Liverpool.

Letters of acknowledgment were received from the Institut Egyptien, Cairo (128, 129, 130); Bureau des Longitudes, Paris (126); Library of the University of California, Berkeley (126, 127, 129, 130).

Letters of acknowledgment (130) were received from Societas pro Fauna et Flora Fennica, Prof. Otto Donner, Helsingfors, Finland; Comité Géologique de la Russie, Observatoire Physique Central, Prof. Serge Nikitin, St. Petersburg; K. Zoologisch Genootschap, Amsterdam; K. Zoologisch-Botanisch Genootschap, The Hague; Bataafsch Genootschap der Proefondervindelijke Wijsbegeerte, Rotterdam; Prof. Dr. Japetus Steenstrup, Copenhagen; Société Vaudoise des Sciences Naturelles, Lausanne; K. Bibliothek, Berlin; Verein für Erdkunde, Dresden; Editor of "Cosmos," Mr. A. Des Cloezeaux, Comte Hyacinthe de Charencey, St. Maurice-les-Charencey, Paris; Royal Dublin Society, Dublin; Cambridge Philosophical Society, Cambridge, England; Dr. John Evans-Hemel, Hempstead; Yorkshire Geological and Polytechnic Society, Chevinedge, Halifax, England; Royal Institution, Local Government Board, Dr. Joseph D. Hooker, Sir John Lubbock, London; Mr. Joseph S. Harris, Philadelphia.

Accessions to the Library were reported from the Linnean Society, N. S. Wales; Anthropological Society, Tokyo; Société Impéreale des Naturalistes, Moscow; Physikalische Central-Observatoriums, St. Petersburg; Prof. Hugo von Meltzel, Dr. M. Faths, Kolozsvár, Hungary; Société de Physique, etc., Geneva; Ronsdon Observatory, Devon; Royal Observatory, Greenwich; Literary and Philosophical Society, Liverpool; Rhode Island Historical Society, Providence; Cornell University, Ithaca; Editor of "The Nation," New York; State Librarian of New Jersey, Hopewell; Zoölogical Society, College of Physicians, Franklin Reformatory Home for Inebriates, Mr. Henry Phillips, Jr., Philadelphia; Johns Hopkins University, Baltimore; National Academy of Sciences, Mr. Lester F. Ward, Washington, D. C.; Elisha Mitchell Scientific Society, Raleigh, N. C.; University of Alabama, Tuscaloosa; Prof. James B. Angell, Ann Arbor; Public Library, Peoria, Ill.; Geological Survey of Missouri, Jefferson City; Commissão Geographica Geologica, S. Paulo, Brazil.

Pending nominations Nos. 1209, 1210, 1211 and 1212 were read, spoken to and balloted for.

The proceedings of the Board of Officers and Council were submitted.

The Secretaries reported that the paper presented by Dr. Bonwill at the last meeting of the Society should appear, if at all, in the Transactions and not in the Proceedings.

On motion, the President was authorized to appoint at his leisure a committee of three members to examine and report upon the same.

Prof. Cope made a communication on "The Dinosauria of the Laramie Formation," illustrating the subject with many fossil specimens.

Prof. Ryder presented a paper entitled "On the Origin of Sex through Cumulative Integration and the Relation of Sexuality to the Genesis of Species."

On motion of Mr. Tatham, the Society adopted the following resolutions:

Resolved, 1. That whenever the Committee on Extended Accommodations, charged with the alteration and improvement of the building, shall have perfected the plans and specifications for the same and have had a contract prepared for the execution thereof, the President and Treasurer of the Society shall be and are hereby authorized to execute such contract under the corporate seal of the Society.

Resolved, 2. That said Committee, in conjunction with the Curators and the Committee on the Hall, be authorized to rent a suitable place or places to which to remove the Library, Portraits and other Collections and to have such removals effected in such manner as will secure the property from injury, and to continue the insurance thereon against loss by fire, and also to rent a suitable room in which the Secretary and Librarian can transact the business of the Society until the Hall can be reoccupied.

Resolved, 3. That the Treasurer be authorized to make payments upon the contracts for the alterations and improvements and of other expenses incident to the removal.

Resolved, 4. That the Librarian of the Society be added to the aforesaid Committee as a member thereof.

The following resolutions, offered on behalf of the Trustees of the Building Fund, were adopted :

WHEREAS, The American Philosophical Society, at a meeting held on October 5, 1866, did adopt a preamble and resolution setting forth that it was "expedient for the security of the books and property of the Society there should be erected a fire-proof building," and did thereby also provide for the appointment of Trustees of and the raising of money for a Building Fund and to "continue to invest and reinvest all principal, interest and income of said fund until this Society shall determine to build for itself a fire-proof building, and make commencement thereof, and then to pay to the Treasurer of the Society out of the proceeds of such investments such sums as the Society shall from time to time direct to be paid to him for that purpose."

AND WHEREAS, The Society, on April 25, 1890, after having had plans for the alteration of their Hall submitted to them, authorized and empowered their Committee on Extended Accommodations to enter into negotiation for alteration of their present building in accordance with the plans then presented, or such modifications of them as might be suggested by the Committee or its architect.

AND WHEREAS, The said plans have been so modified by the Committee as to make said Hall a fire-proof building; therefore, be it

Resolved, That the Trustees of the Building Fund of the American Philosophical Society be directed to pay to the Treasurer of the Society out of the proceeds of the investment held by them such sums as will be necessary to pay for the addition and improvement to the present Hall of the Society, so as to make it a fire-proof building.

Resolved, That the Trustees of the Building Fund of the American Philosophical Society are hereby authorized and directed to sell and dispose of the City Loans and other securities held by them, and to make and execute the necessary transfers and assignments thereof so as to vest in the purchasers a full title to said securities.

The Committee on the Franklin Centennial Commemoration reported that it had duly taken place, and presented bills amounting to $258.93, which were ordered to be paid, and on motion the Committee was discharged.

The Special Committee on the Purchase of the Baird Portrait reported progress and was continued.

The Society adopted the following resolution reported from Council:

Resolved, That hereafter 250 copies of "separata" of papers published in the Proceedings be furnished to the author if requested by him, and that Council recommends that the Society should request the Secretaries to inquire how far it would be practicable in the present state of its finances to adopt a resolution to issue the Proceedings more frequently than at present.

All other business having been finished, the Tellers counted the ballots cast for the respective candidates and reported the result to the President, who declared the following to have been duly elected to membership in the Society:

2179. Prof. George S. Fullerton, Philadelphia.

2180. Robert Patterson Field, Philadelphia.

2181. Rev. Heman L. Wayland, D.D., Philadelphia.

2182. Charles Godfrey Leland, London.

And the Society was adjourned by the President.

The Origin of Sex through Cumulative Integration, and the Relation of Sexuality to the Genesis of Species.

By John A. Ryder.

(Read before the American Philosophical Society, May 16, 1890.)

General Considerations.

A careful survey of the living world leads to the conclusion that sexuality has been, in all probability, one of the many results of the operation of the forces of evolution. A further examination of the evidence discloses the fact that sexuality has arisen very gradually and only through an extensive series of very gentle progressive and successive steps. These steps seem to have had a definite sequence and to have been accompanied by such a gradual complication of means, that it seems highly probable, indeed certain, that in many instances, a given higher grade of sexuality has grown out of the preceding one. This serial superimposition of means to serve apparently more advantageous ends proceeds according to fixed rules or laws, apparently determined by the already attained structural complication and physiological activities of organisms, and in conformity with the controlling conditions offered by their surroundings.

A still further examination of the data of sexuality leads to the conclusion that the methods of it which may be observed in the vegetable and animal worlds have proceeded along two parallel but distinct lines of progress. Both have ended in the achievement of the same result, namely, viviparity or the production of offspring in an advanced state of development, before the latter is set free from the parent to begin an independent existence for itself. An acorn is as truly a product of viviparous development as an infant human being. The elaborate process of organic evolution through which it has been possible to develop the one, is just as wonderful as in the case of the other.

The end-result of the achievement of viviparity has been to enable forms so produced to survive with far more certainty, and to begin their struggle for existence with a greater chance of success than if the complex series of processes of germ-development, in these cases, had to proceed to the same stage without the elaborate means of protection afforded by the parent. This is so obvious that it seems hardly necessary to call attention to the significance of the gradual complication of sexual processes. Yet, as one finds the subject usually dealt with, sexuality seems to be regarded, by the majority of writers, as an ultimate fact, and as such, incapable of interpretation in more general terms.

That sexuality has an important bearing upon some of the most important questions in evolution, no thoughtful biologist would probably doubt. Notwithstanding this, there have been few serious attempts made to grapple with the problem of "sex." Many of the attempts which have been made have failed because of the way in which the fundamental question, sex itself, was ignored. Most of the speculations in relation to sex have been content with determining the effects of self and cross-fertilization, and have accordingly dealt with some of the consequences of already achieved sexuality, but have thrown no light whatever upon the probable origin of sex itself.

Without questioning the high value of the results of such experimental investigations, the question of the origin of sex is probably nearly or quite beyond the pale of experimental inquiry, in virtue of the fact that even the lowest organisms in which sexuality is manifested, are already so persistently adapted to a certain habit of life, and are consequently so fixed in organization that experimental investigation looking to a modification of their reproductive processes through artificial interference is quite impossible within the limits of a single life-time devoted to experimental research. We shall accordingly have to examine the phenomena of sexuality as we find them, and upon careful analysis and comparison try to reach such conclusions as seem to be warranted by the evidence.

Since sexuality leads to processes of discontinuous growth in the production of new beings or offspring, it is of the utmost importance that this very important fact should be kept in mind from the start. That it has a significance there can be no doubt, when considered in connection with the manner in which germs are produced in the various types. The manner in which such discontinuity is effected varies within wide limits and is associated with other preliminary processes, such as the formation of fixed colonies of animal organisms and the multiplication of axes or branches in the vegetable kingdom. One of these two processes is, in fact, usually the prelude to the occurrence of the process of the dehiscence of the definitive sexual elements in a great variety of forms.

When the one process, namely, that of continuous growth of the parent organism, ceases, the reproductive process seems to recur, so that sexual genesis and growth seem to be opposed to each other, as has often been pointed out. The impossibility of otherwise adding or integrating more tissue through the incorporation of more nutriment to a structure already finished, or fully developed, at least for the time being, leads apparently to the recurrence of sexuality. The expression of sexuality is accordingly largely, if not wholly, dependent upon nutrition, and it is from this fundamental standpoint that it will be dealt with here.

It will be equally important to consider the peculiar characteristics of sexual cells. In almost all biological works it is asserted that the germ-cells of multicellular forms are in all respects, at first, morphologically identical with the other undifferentiated cells of the parent body. While this statement is true of the young germ-cells, it is untrue of nearly all mature germ-cells. The latter, in their mature condition, present us with form-elements, either of a size greatly in excess of those of the rest of the body or others which are, invariably within the limits of the animal kingdom at least, smaller than any of the cells of the parent organism. The significance of this fact must also be constantly borne in mind, as well as the equally important one respecting the usual morphological equivalence of myriads of the smaller or male germ-cells and a single large or female germ-cell, in the majority of higher forms.

This frequent, indeed usual, lack of equivalence of the male and female reproductive bodies has been almost entirely ignored by many authors, and has led, as the present writer is convinced, to erroneous interpretations of some of the most important phenomena of subsequent development. The peculiar function of growth of the female cell and its specialized method of segmentation, after the initiation of development, has apparently contained little of significance for the great majority of biologists. Segmentation of the oösperm, as the fertilized egg is termed, is a matter of course with the majority of embryologists, whose work begins with the institution of segmentation and not with any apparent anxiety as to the origin or cause of the thing which segments, and which does little else for a considerable space of time. While the high value of the work done through careful embryological research is to be properly appreciated and is so appreciated by no one more than by the present writer, I believe that embryological teaching and investigation should begin with a consideration of the probable causes which have led to the production of the fully developed and united elements which are usually the subject of the embryologist's study.

The universal occurrence of sexuality amongst all plants and animals, except amongst the very lowest forms, is surely evidence enough, if any were needed, that somehow sex must have been a most important factor in biological development. To say that sexuality was developed solely for the purpose of inducing variability or of favoring fertility and vigor through crossing does not suffice in the face of the evidence presently to be offered. When the defenders of the view, that sexuality was developed in order to favor variability and cross-fertilization, are asked to give any probable reason for the origin of sexuality, the causes alleged are such as have seemed, to the present writer at least, so unsatisfactory that they are hardly worth serious attention.

What, then, was the origin and meaning of sexuality? What were some of the causes which may be reasonably supposed to have been operative in inducing sexual differentiation? Was sexuality differentiated for any purpose, or was its development merely the result of the operation of natural causes? These are some of the questions that the present writer has set before himself to answer, with such light as may be derived from the facts in the present state of our knowledge.

The value of this attempt at an approximation to an answer to these questions must be determined by the judgment of those most competent to form an opinion and the value of the results as a working hypothesis in the hands of such persons.

If, as the writer believes, sexuality has been the means through which morphological complexes or organisms of all sorts, animal and vegetable, have been built up, that alone would be a sufficient reason for a renewed discussion of the subject. If, moreover, the evolution of sexuality, through natural causes, has not only been one of the most important agents in evolution of all the multicellular types past and present, but also the means through which the first possibilities of individual variability, fertility and morphological capability were greatly augmented, it is exceedingly desirable that the evidence upon which such claims are based, should be presented. Finally, if sexuality has led to consequences as far-reaching as these, it is also obvious that its claim to consideration, as a factor in biological evolution, is, perhaps, quite as great as that of the principle of natural selection, to the elucidation and demonstration of which Darwin devoted the best years of his life with a singleness of purpose which has been rarely equaled.

That so strongly expressed a characteristic as sexuality, in both the animal and vegetable kingdoms, should have been developed for mere reproduction, is completely disproved by the data of sexuality themselves. It is clear that sexuality becomes more specialized with the progress of the structural complication of organisms, yet external influences may lead to the suppression of fully developed sexuality. It has been most conclusively proved, that if a species is artificially cared for, in a word, cultivated, as in the case of plants, it may be indefinitely reproduced by means other than those of sexuality. It is even probable that partial or complete sterility has been so induced in not a few plants cultivated for their fruits. The only remaining effect, if effect it can be called, is the impotent fructification of the ovules, whereby the fleshy esculent mesocarp of the ovary or fruit is stimulated to growth and development, for which alone the plant is valued by its cultivator, man. But, so far as I am aware, it has not yet been even proved that such fertilization is necessary.

If parthenogenesis can and does occur in *Cœlobogyne* and in *Saprolegnia*, there is no reason why, even in highly developed monocotyledons, such as the astonishingly productive Banana, in spite of its sterility, should produce indefinitely, through a kind of abortive parthenogenesis and as a result of its great vigor, its succulent but seedless fruits.

If the progressive differentiation or the gradually more intensified expression of sexuality means anything at all, in both plants and animals, beyond providing for mere reproduction, it must mean something of far more utility to species than to provide for variability alone. If the gradual acquirement of viviparity in both animals and plants has any significance, it includes not only a provision for variability, but also achieves the far more important end of providing greatly increased chances for the survival of the thus protected germs or viviparously produced young.

That the young of such forms are more susceptible to the altering influences of outer conditions than the adult is conspicuously established by the evidence drawn from comparatively complex forms. It is well known that the normal alga-like, filiform protonema of *Sphagnum* may, in some cases, become a flat thallus if grown upon a solid, moist substratum. And doubtless, corresponding modifications may be otherwise induced in the further development of its sexual offspring, but of this I know of no direct proof.

That it should have been assumed that sexuality provides for variability is not strange. If one considers the problem of variability from morphological and physiological points of view, the evidence is wholly in favor of the conclusion that increased complexity would favor variability. That sexuality has increased the complication of its attendant processes there cannot be the slightest doubt. If the results have become more complex as viviparously developed germs were evolved, not only would the capacity of those germs to vary be increased in virtue merely of such increased complexity, but the offspring of two parent individuals, differing even very slightly, would also have to be added as a factor favorable to variation.

Unfavorable to some forms of the doctrine of rejuvenescence or that view which regards sexuality as a means of rejuvenating certain cells by means of conjugation or the act of fertilization, are the facts which prove that, in the vegetable world at least, growth may go on indefinitely without the recurrence of sexuality, and with increased, rather than with diminished, vigor. I need only to cite the Banana which has been asexually propagated by cuttings for centuries. The significant and persistent vigor through twenty centuries of a Dracæna, or Dragon's blood tree, is also of interest in this connection. The persistent growth of the asexual generations of tree ferns in the present age and of the gigantic Lepidodendrons and Equisetums of the carboniferous period, shows that conditions of life have much to do in maintaining the vigor of such asexual generations.

Senility, or impairment of vigor, does not then seem to result from continued growth, as is shown by these facts, and this conclusion is equally well established by the facts which are known in relation to the reproduction of the Cyanophyceæ, Schizomycetes and the yeast plant.

This unimpaired vigor seems to be associated with the continuous production of new axes in the higher plants, or with continuous fission of cell-units in the lower ones. In animals, on the other hand, this vigor shows itself most pronounced in the colonial forms (cormi), or in such as are specially nourished, as the Queen Bee or ant-queen of Termites, amongst Anthropods, and amongst which these animals are also the longest lived, and where it finds expression partly, at least, in parthenogenesis. The astonishing vigor of the fertile parents of these forms is largely determined by their abundant nutriment.

The genesis of sexuality, upon final analysis, will probably be found to be a purely physiological question, in the discussion of which the energies represented by the cytoplasm of the egg on the one hand, and its nucleus and that of the spermatozoan on the other, will have to be considered. This will, however, represent only the germinal or embryological side of the problem, which takes no cognizance of the preëmbryonic history of the germinal elements before the latter are set free from the parent. The attempt to formulate the laws of sexuality without examining into the preëmbryonic history of the germinal elements must necessarily end in failure and disappointment. The generative forces at work within the parent organisms are nicely adjusted, or in a state of equilibrium with those which are concerned in the conduct of the ordinary physiological activities of the parent body. It is, therefore, imperatively necessary to consider the question of sex not simply as one involving embryological data, but rather as embracing the sum total of physiological energies of the parent organisms, and where the sexes are separate these energies must be considered as represented in the species by the sexually differentiated individuals composing the latter.

It will be obvious to those who have kept pace with the growth of physical science, that sexuality may be thus brought more nearly within the dominion of purely physical laws. In other words, sexuality is a question involving the discussion of matter and its energy of motion, and should be so treated if it is expected to reach conclusions which are in harmony with the genius of modern science.

That such a project may be accomplished in the present state of our knowledge may well be doubted, yet there is ample reason to warrant making an attempt to clear the ground for further work in that direction.

The attempt to trace the ways in which one form of reproduction gave place to a more complex one in the next higher type is beyond the scope of the present paper. To consider this question adequately would require a far more extensive acquaintance with the facts than is possible at present. In plants it would require a consideration of the modifying effect of the evolution of a mechanical supporting system and the correlative modifications which this must have induced in the sexual processes, since the evolution of powerful supporting axes, which were capable of indefinite growth, dichotomy, and consequent multiplication of fertile apical axes enabled the plant to multiply the possibilities of the production of male and female prothalli, or of protected and attached macrospores and dehiscent microspores. Not only this, but aërial currents would now become available, as the plants become taller, in carrying the microspores, or male prothalli, as pollen grains, from one flower to another. Finally, this was supplemented by flying insects, which, it is fair to assume, first began to visit the plants for the sake of their microspores or pollen as food. Later, as these insects began to set up irritations in the flowers, there is reason to think that the surfaces which they habitually abraded would, if wetted with saccharine solutions regurgitated by such visitants, begin to pour out additional nectar or saccharine matters in obedience to well-known rules of ormotic action. That such a result would happen is, at any rate, strongly indicated by the experimental results obtained by my colleague, Prof. W. P. Wilson, in wetting abraded surfaces of leaves with saccharine solutions. The elaboration of sweets so begun would be a stimulus, causing the insect world to become still more interested in the flowers, and such may have been the further effect of the new diet upon insect life as to be directly responsible for the evolution of those wonderful insect communities developed amongst the honey-loving hymenoptera or bees. The further consequences of entomophilous traits developed by plants must react in other ways, probably through epinasty and hyponasty, in modifying the shapes of flowers, while protandry, a natural consequence of the earlier maturation of the andrœcium, as a lower whorl of the flower, would eventually tend to establish cross-fertilization, through insect agency, as an imperative necessity, and not wholly, perhaps, because cross-fertilization meant the production of a more vigorous offspring.

The gradual evolution of sexuality by slow stages in plants is now so well understood, that it is not necessary to enter into the details which may be found in any standard botanical text-book. It is sufficient to indicate that the transition from asexuality to female macrogonidia and male microgonidia is effected by mere differentiation of cells as respects their size. From naked oöspores to carpospores is the next step, with microscopic flagellate male elements. Finally, the prothallus appears, first, with both oöspheres and antherozoids; then the prothalli themselves become distinguished as small male and large female ones; then the female prothallus is no longer at once detached, but becomes covered in, while the minute male prothallus still dehisces, but finally becomes partially parasitic upon the stigma where it vegetates and throws out a hollow process, which serves to convey the now highly modified antherozoid to the ovicell. The prolonged adherence of the female prothallus to the parent axis enables the next important step to be taken in the evolution of the seed containing a viviparously produced embryo provided with a store of nutriment and protective envelopes.

In this way the superimposition of more and more successful means of reproduction seems to have occurred in plants, tending also to secure the final victory of the phanerogams over all other rivals in the struggle for existence, largely through the evolution of viviparity as supposed above. How much of this success was due to the principle of overgrowth or cumulative integration, which made rapid, continuous assimilation and growth possible through the evolution of a mechanical supporting system, is hard to tell, but it doubtless was quite as important a factor as natural selection itself.

Similar conclusions are borne in upon the zoölogist in a study of the reproductive processes in the animal world. From asexual fragmentation and consequent multiplication, the advance to larger and smaller, or female and male elements, was a gradual one, with or without hermaphroditism. Then came hermaphroditism with large female and small male germs, then maleness and femaleness, as characterizing distinct individuals of the same species. Finally, protective processes were developed, accompanied by ovulation, followed by parental care, such as incubation, nidification, gestation with or without placentation, and at last, in the highest forms, lactation was developed.

These processes seem to have grown up as if superimposed upon each other, just as it can be shown that the progress of embryological ontogenetic development has followed as a consequence of the superimposition of one morphological complication upon the immediately preceding one, and often as a consequence of direct adaptation. Similarly, the inclusion of the germ tracts, as morphological advances shut off the gut-pouches from the archenteron, became more decided. The complexity of the outlets for the reproductive products, at first by way of the nephridia, as these were fused into a serially connected system, became more marked, the sexual products were now discharged through the passages serving also for the emission of the urinary secretion. Finally, this passage became divided lengthwise, so as to serve for the separate discharge of the urinary and sexual products, until at last the lower end of the reproductive channel became modified into a brood chamber or uterus for the viviparous development of the young, accompanied with sexual intercourse, now rendered possible by the further modification of the extreme outer portions of the reproductive passages and the parts immediately adjacent to them.

Pari passu with the higher development of the reproductive processes the fertility of the female became absolutely reduced, partly in consequence of the precocious overgrowth of the female germs through a primary suppression of the tendency to spontaneous segmentation of such germs, as will be more fully illustrated later. This reduction in the fertility of the female gonads is also doubtless correlated with the increased chances of the survival of the offspring produced by the more protective methods of reproduction, while the material diverted from ovogenesis, to carry on the formation of secondary egg-envelopes, incubation, nidification, gestation, placentation, lactation and other parental care, also reacts directly upon fertility, while the great lengthening of the period of fœtal and infantile development, tends to still further reduce the possibilities of rapid reproduction. The recurrence of the seasons tends to make the reproductive periods annual in all forms except the lowest asexual, and the highest form, man, who lives under approximately uniform artificial conditions of his own creating. There is, therefore, a widespread tendency toward a reduction of the fertility of most forms below what it would be if there existed uniformly favorable conditions throughout the year, due solely to the recurrence of unfavorable annual periods.

The fertility of the male, or rather his functional activity, may be affected in a corresponding manner by the seasons, but the absolute fertility of the male as compared to the number of germs produced is invariably greater than that of the female, usually by many thousandfold. This greater male fertility depends upon the minute size and rapid production of male elements through the breaking down of protova—spermatogonia—and the rapid integration of chromatin or nucleoplasm as will be shown later. Such a rapid and abundant production of male elements may be one of the causes leading to the persistent pursuit of the female by the male, and one of the causes of the genesis of sexual passion as interpreted farther on. Sexual passion, which accompanies the highest forms of reproduction, finally becomes functional in this intricate series of superimposed processes as a means tending to maintain the fertility of all the females of a species at its highest point of efficiency, and thus reacts as an aid in the survival of species. The superabundant fertility of the male renders the possibility of the conjugation of the male and female elements more certain, under the favor of the various devices which have been evolved to effect that process, and thus again be the means of assuring reproduction and the survival of the species.

The necessary correlation of the male and female is probably secondary. In my view, that the flagellate forms are the oldest, since they are certainly the simplest and minutest, the male element represents, morphologically, a perpetuation of the most primitive form of organized existence. Through cumulative integration the germ elements, which would otherwise have tended to break down into flagellate germs, have, on the contrary, been impelled to grow to large dimensions as ova, through the rapid access of nutriment to them, which probably prevented their cytoplasm from having time to elaborate nucleoplasm and chromatin, and thus become male in character. The male element is certainly the most ancient, the female is a secondary and later product of evolution. The correlation of the male and female was, therefore, secondary; the male elements represent, morphologically, the primordial asexual type. The primitive representative of the male element was at one time "maternal," through simple fission and a capacity for growth; it became "paternal" through conjugation. Sexuality was the outcome of the unequal growth of germ-cells of the same species, induced by the self-regulative influences exerted by internal physiological conditions operating under the influence of varying external conditions. The determination of the sex of an embyro has depended in some way upon a tendency, early established through some internal equilibration of the forces of growth, in response to outer conditions of nutrition, etc. There is no conclusive evidence tending to show that the sex of an embryo is predetermined in the egg; on the contrary, much evidence exists tending to show that the sex of an embryo may be influenced by an increase or diminution of the supply of food.

It is a curious circumstance to note that many writers on sex seem to have failed to see that the sexual cells of multicellular forms were functionless, in that they exercise no physiological function which is essential to the life of the parent organism. In that such functionless cells could not disintegrate their substance through the active metabolism which obtained in respect to all the other cells of the body, in consequence of the action of the principle of cumulative integration or assimilation beyond the current physiological needs of the body, they must either increase enormously in size and become ova, or run down as a result of rapid karyokinesis into minute male elements which are rapidly dehisced and set free. It is this exemption of the germ-cells from the disintegrating effects of active or functional metabolism which has given the first impulse to the accumulation of yolk and the overgrowth of the spermatogonia, ending in the production of the ovum and the essentially female condition. The apical position in many plants of the female germ is significant in this connection, no less than the fact observed by Mr. Meehan, that in conifers the female flowers are produced at the apex of the tree and by the most vigorous shoots.

The Origin of Karyokinesis, the Significance of the Polar Bodies, Variability, Sexual Passion and Sex in Relation to the Genesis of Species.

It is a remarkable fact that in the lowest forms of life no evidence of karyokinetic changes has ever been noticed. Spores are produced within the body of the parent individual by the direct fragmentation of the slightly more chromatophilous or deeply staining portion of the parent plasma that fills nearly the whole of the latter, so that it is still not possible to speak of a nucleus in contradistinction to a cell-body of cytoplasm in these organisms. These facts tend to show that in such very low forms there is still a want of mobility of the plasma itself as well as a lack of differentiation into nuclear and cytoplasmic matter.* Is or is not the want of a differentiation of cytoplasm associated with the absence of karyokinetic phenomena? There is much reason to assume that it is from the consideration of a great variety of facts, mainly those observed in the earlier stages of development of higher sexually produced forms.

The main argument in favor of such a view is the circumstance which has fallen under the eyes of every investigator, that the karyokinetic phenomena are most pronounced in the earlier stages and on a larger scale than in the later stages when the cells become smaller. This is either associated with a larger proportional amount of cytoplasm or it is independent of it. So far as observation has extended, the facts of early segmentation tend to favor the first alternative of the foregoing proposition. Another body of facts is equally favorable to such an interpretation, namely, that of spermatogenesis. It is true that many forms of spermatogenesis are known where karyokinesis is maintained up to the time that the spermatic elements are beginning to form, but there are many other cases known where this is not the case and where during the later stages of spermatogenesis leading to the fragmentation of the spermatogonia there is no evidence of accompanying karyokinesis. These facts tend to show that, with the gradual diminution of the amount of investing cyto-

* De Bary, in his Lectures on Bacteria, affirms that a nucleus is wanting in the Schizomycetes, and the only case where these forms have been known to exhibit amœboid movements, so as to throw out processes, is that described by Prof. Samuel G. Dickson, of this city; at least I have been unable to find any other instances of the kind described. There appears to be little cytoplasm in these forms, so that these organisms correspond mainly to the nuclei of the cells of higher types.

plasm, the process of karyokinesis or movement of the fragments of chromatin is finally restricted to such an extent, from the want of a cytoplasmic field, that nuclear movement is at last rendered impossible.

Much as the lengthening of the spermatozoön resembles a diastolic phase of karyokinesis, there is no evidence that the elongation of the male element preparatory to being set free, can be identified in any case with such a final karyokinetic diastolic phase. If this were so it might be supposed that the momentum of karyokinesis, in this case, had reached a potential state or condition of tension ready to exhibit itself as segmentation, as soon as there was a large enough cytoplasmic field, as in the cytoplasm of the egg, in which the opposite condition of systole could occur, and thus bring back the nucleus to a condition of equilibrium.

While the foregoing conclusion cannot be assumed, it may be assumed that the male cells, in undergoing their rapid multiplication, do acquire a certain karyokinetic momentum predisposing them to set up segmentation in other functionless plasmic bodies—ova—which they may enter. Yet, as we have seen, karyokinesis is not always an accompaniment of spermatogenesis, a condition which may arise, as supposed above, from the gradual diminution of the cytoplasmic field.

The method of evolution of spermatozoa is not uniform in all cases. In *Ostrea edulis* there are rarely individuals in which spermatogenesis approximates that of *O. virginica.* Then, rarely, intermediate forms occur between this and the normal form, where large masses of chromatin are formed by direct elaboration from the nuclei of elements which cannot be regarded as other than ova. In the latter case the metabolism which leads to the development of spermatozoa is clearly carried a step further than in ovogenesis, because the huge masses of chromatin imbedded in the ova from which the nuclei of the spermatozoa are formed are very certainly developed *after* the stage is reached which answers to that of the mature ovum. The male condition is reached therefore in this last case after the female, and is an outgrowth of the latter consequent upon the development of large masses of chromatin in the egg and its direct fragmentation into the nuclei of spermatozoa. In those cases where the spermatozoa are developed more directly from smaller cells which never reach the dimensions of ova, we have a totally different case, and one which indicates a protandrous tendency. The other case where the male condition depends upon the previous development of a fully differentiated female state of the germ-cells obviously corresponds to a protogynous condition.

The formation of chromatin in the last case does not proceed as a result of metabolism and growth following a rapid series of karyokineses alternating with periods of rest, but follows the formation of a female nucleus in which a rapid endogenous formation of chromatin first occurs, followed, as it increases in bulk, by the extrusion of the chromatin from the parent nucleus into the surrounding cytoplasm, where it breaks up into small masses which are later separated in large groups as the nuclear basis of large coherent clumps of spermatozoa.

Clearly, then, the amount of chromatin in relation to the amount of cytoplasm varies all the way from an almost inappreciable quantity in the nucleus of the true egg to a very great quantity in proportion to the cytoplasm in the egg which produces a large quantity of chromatin from its nucleus to provide the material for the nuclei of the multitudes of spermatozoa to which such an egg gives rise.

Maleness, therefore, in the case of *Ostrea edulis* is certainly, and probably in all other forms, a condition where the chromatin preponderates over the amount of cytoplasm, while, conversely, femaleness is characterized by the preponderance of cytoplasm over chromatin or nuclear matter ; that is to say in the sexual elements only.

Such a preponderance is not simply relative, it is absolute as respects the one or the other of the primary germ-constituents. It is also a fact that the amount of chromatin or nucleoplasm in an egg-nucleus, when nearly mature, is in excess, as expressed in volumes, by at least four times that of the chromatin contained in the mature male element of the same species. Does this last fact signify anything in reference to the expulsion of the polar bodies? It probably does if the interpretation of the polar bodies presently to be offered is true. And that that interpretation probably is true or more nearly true than any other yet offered, will become clearer as we proceed, since it imports nothing into the discussion of the data which is not in conformity with the facts of continuous growth or which must be brought in in order to save previously suggested hypothesis. It postulates only continuous growth under the condition of an excess of nutrition beyond that required in the secular exhibition of the physiological activities of living forms. It supposes that this excess is somehow influenced in one of two ways, that is, it is either preponderatingly converted into chromatin or preponderatingly into cytoplasm.

If mainly into cytoplasm, the process may go on until the cytoplasm itself may tend to run down chemically into the more stable conditions of oils, or yolk granules and tablets consisting of simpler molecular units. This last process may go on until an enormous yolk is developed which is composed of inert or immobile nutritive matters, while the active cytoplasm itself may become small in amount and reduced to a relatively small volume.* Such a process never occurs in the male. Here karyokinetic processes keep the upper hand (not necessarily katabolic ones, or those leading to destructive metabolism), and the result is that the male element tends to be reduced in dimensions with no katabolically simplified contents, such as are met with in many eggs, but, on the contrary, consisting mainly of plasma in a highly anabolic condition as chromatin.

How these differences on the sexual elements are produced is not known, but it is certain that they must be produced by the action of the physio-

*This is so clearly in its general features a katabolic process, that it is impossible to see how Geddes and Thomson can reconcile this with their hypothesis that the egg is anabolic, while the male element is essentially katabolic (see their work, "The Evolution of Sex," New York, 1890.)

logical activities of the parent organism modified or swayed toward maleness or femaleness, through some series of correlated influences which are self-regulated in some way through nutrition, in the struggle of the parts of the parent organism with each other for their allotment of nutriment.

So far, the evidence tends to indicate that the egg is a repressed condition of maleness. That is, the high anabolic condition of the male element is the consequence of unimpeded growth resulting in rapid segmentation, while the female element is in some respects katabolic with an unimpeded growth of its cytoplasmic constituents accompanied by a repression of the capacity for segmentation.

The peculiar conditions of growth of the egg, and its usual trait of great size, constitute probably the real essence of the meaning of sex, as a means of favoring, in an increased ratio, the survival of offspring.

The preponderance in the actual volume of the chromatin of the egg, over that of the spermatozoön, expresses a physiological differentiation not reached by the latter so much more quickly matured. This might be due to the fact that the cytoplasm in the male element is smaller in amount than that of the egg, and may be coördinated or physiologically controlled by less chromatin. On such a basis the hypothesis of Minot and Balfour might be rehabilitated in part, but not on the erroneous basis of sexuality as they supposed, but upon the far more significant one of physiological differentiation or division of labor.

Maleness is characterized, in the male element, by the absence of a cytoplasmic field in which nuclear motion or karyokinesis can occur. With this in the male element goes an inability, after sexuality is fully established, to maintain further nutrition and growth without the help of the female element.

Femaleness, on the other hand, is characterized by the presence of an enormous cytoplasmic field in the midst of which there is placed a large nuclear body containing proportionally to its envelope of cytoplasm a very small amount of chromatin. Such a germ is incapable, except under the antecedent stimulus of exceedingly vigorous processes of growth, as in the case of parthenogenesis, of spontaneously beginning and maintaining an orderly process of karyokinetic movement leading to further metabolism growth and development, unless "fertilized" or fused with the male element.

The tendency in the male cell is towards a preponderance of chromatin, in the female cell towards a preponderance of cytoplasm. The elaboration of the chromatin in the male clearly takes place in some cases at the expense of cytoplasm; the elaboration of cytoplasm in the female is possibly at the expense of chromatin, and certainly at the expense of the prolonged exercise of the function of the latter as an essential part of the egg nucleus.

These processes in the two sexes admit of further contrasts. The cytoplasm is mobile and amœboid and the immediate instrument of intussusception of new material. The chromatin, on the other hand, while appearing to centrally control this process, is never immediately, but only mediately involved in its execution. No cases are recorded where the chromatin shares directly or immediately in the process of digestion or intussusception of new matter, except possibly the Bacteria or Schizomycetes.

The female cell previous to final maturity has been involved in the accumulation of the cytoplasm; in this process its chromatin has been indirectly involved and has increased in volume proportionally. This same fact is illustrated in the increased dimensions and complexity of the nucleus as growth in cytoplasmic dimensions increases in even such simple forms as *Amœba*, as may be clearly seen in Leidy's monograph upon the Rhizopods of North America, where the changes in the relative proportions and arrangement of these substances are fully illustrated in the progress from the young to the adolescent stages.

There is therefore ground for the belief that there is a certain minimal proportion of chromatin necessary for every cell which is necessary to maintain its physiological integrity. In the egg cell the chromatin must share in the constructive metabolism involved in the prolonged growth necessary to mature the ovum. It is not improbable that this function of sharing in constructive metabolism and not in that of karyokinesis has rendered the egg incapable of spontaneous segmentation, unless it be the product of a tremendous energy of growth and conditions of assimilation, as in the case of parthenogenetic ova.

Not only the chromatin, but also the whole of the rest of the nucleoplasm of the egg, is probably, like that of any other physiological differentiated cell of the parent body thus rendered in most cases incapable of undergoing immediately the spontaneous changes necessary to cause the beginning of development.

The equilibration of forces leading to the growth of male and female elements, respectively, in the parent organism is in some way self-adjusted or self-regulated. It is probably true that in many cases there is good reason to assume that the eggs are more favorably situated in reference to supplies of nutriment than the spermatogonia, or conditions subsist which tend to repress spermatogonial segmentation.

Such a view may be fortified with a great host of facts drawn from the relations of the male and female reproductive organs, in many forms, to the sources of nutriment. In many cases the ovaries are clearly in a more direct and favorable relation to the sources of supply of nutriment than the testes, as in many Bryozoa, for example. Or the source of supply of nutriment for the reproductive organs is more remote for the testes than it is for the ovaries, as is actually the case in many forms, notably a large proportion of mammals where a *descensus testiculorum* supervenes. Or, in other cases, the surplus nutritive matters are competed for within the organism by structures which are usually described as belonging to the category of the secondary sexual characters. Or, in another very large class of data, we have evidence tending to show that the ovum is placed under conditions of growth, or is encapsuled within a porous basement membrane—the zona radiata—so as to favor from every point on its surface its cumulative growth in bulk, rather than its cleavage or segmentation within the parent, which would end in its breaking up into male elements. The male elements, on the other hand, are not encapsuled, at least in a very large proportion of cases, and are free to grow in another way without an intracapsular repression of karyokinetic processes. It would be an easy matter to cite multitudes of facts in support of the argument here offered, though I am aware that strong counter-arguments might be produced, yet I do not believe that they are anything like as weighty as the affirmative evidence.

Again, all the facts tend to prove that the recurrence of male forms in parthenogenetic types is associated with a decrease of the supply of nutriment and a slight lowering of temperature.

How do these facts comport with the data in our possession respecting the manner of development of the characteristic male plasma or chromatin? We find that after a certain limit of size has been attained by the egg or spermatogonium in *Ostrea edulis* that the evolution of chromatin begins and with this process the production and freeing of spermatozoa. It looks as if the chromatin or characteristically male plasma required a longer time for its elaboration than the cytoplasm, which is in consonance with fact. In other words chromatin can be formed only from previously elaborated cytoplasm, and the latter when its sources of nutriment are cut off or diminished tends, in virtue of its freedom from any functional duty in the parent body to be built up into a still more complex molecular form, as chromatin. Or the struggle of cells in the gonads for nutriment may tend towards the male condition provided all take part, and spermatozoa result; if only a few take part in the struggle, under encapsuled or other conditions unfavorable to the elaboration of chromatin and karyokinesis, the female or large celled type of germ is formed.

That something of this nature must occur is evident if we contemplate the problem from the purely morphological side, but with the physiological aspect of the matter still in view. The chromatin is primitively the most central element of the plasmic contents of the cell. It is the most homogeneous of all cell contents; it is least like an emulsion of any of the cellular constituents. In that it is the most distantly removed from the periphery of all the cell-contents and the latest to appear when developed in great quantity from the nuclei of egg-like spermatogonia, it is the highest and latest product of cellular metabolism. It is therefore clear that the element of time is to be considered, and that chromatin or the most characteristic plasmic basis of the male element is the end-product of the untrammeled exhibition of the energies of functionless or sexual protoplasm. It is upon this ground that it is safe to assume that the male element is the primary one and that the female element is secondary and has arisen through a repression of the processes which lead to the metamorphosis of cytoplasm into chromatin. The male state is therefore the oldest; the female the youngest. The male state also as represented in the spermatic body tends to revert to the most ancient form of all free mobile organisms, namely, the flagellate Schizomycetes. The tendency towards maleness is therefore also to be identified with a universal tendency of all organisms to recapitulate the most ancient and primitive of living conditions when organisms existed only in watery or fluid media. The further generalizations that all organisms tend to recapitulate the primæval monadiform condition is also fully justified, and that the really primordial type of the germs of all living forms is a flagellate cell and not an ovum. This will become clearer, as it will be later shown that the ovum is secondary and is really a germ which has been arrested in its attempt to reach the flagellate condition, and that the polar bodies are merely the expression of an expiring tendency in the egg to revert to the male or primæval flagellate condition.

The genesis of sexuality itself is merely incidental to the continuous processes of growth manifested by all living forms. It is an outgrowth of self-regulated processes of nutrition and of the repulsion of accumulations of surplus nutriment to parts of the organization of multicellular forms where it is not in the way of the other physiological activities. This is the real significance and origin of the process of the isolation of germinal matter. It is not a "device" or an "expedient" specially contrived for the preservation of the immortality of "germ-plasma," which was not first "set aside" in Metazoa, as held by Weismann, but which began to be pushed aside and out of the way in Protozoa, as many facts show even as low down in the scale as Amœba, thus placing Lendl's criticisms of Weismann upon the basis of fact.*

We have seen that the female and male germs can be actually contrasted only on the ground that they are constituted of two kinds of plasma in different proportions. We have also seen that the chromatin presumably preponderates in the lowest living forms, which are also universally asexual but capable of the most prodigious rates of multiplication owing to rapid growth of their substance (mainly chromatin-like) under favorable conditions. These lowest forms are also flagellate, probably universally so under certain conditions. In the next stage of evolution the tendency is for certain cells to grow to a large size and then break down into flagellate spores which are alike and constitute the germs of the species. The next stage is where certain of these enlarged cells break down into flagellate spores of unequal size, the larger become female and the smaller male and incipient sexuality is developed. The process may even begin with the conjugation of similar binucleated individual cells, as in ciliate Protozoa, but there again the production of the spermatic plasma

* In this connection see Brass, "Die Zelle das Element der Organischen Welt," pp. 63–65. Leipzig, 1889. Also Lendl, "Hypothese über die Entstehung von Soma- und Propagations-Zellen." Berlin, 1889. Also Lillie E. Holman, "Observation on Multiplication in Amœbæ." Proc. Acad. Nat. Sci. Philad., pp. 346–348, 1886. Leidy's "Rhizopods N. America," where the chromatin balls of the nuclei are figured as being expelled from the nucleus and the animal presumably as germs.

or chromatin proceeds in a way which may be compared to an endogenous or intraplasmic fragmentation of the chromatin substance, part of which is probably not functional as the nucleus, so that even here the germinal matter is "set aside" contrary to the assumption of Weismann, who only finds such a process taking place in Metazoa. These binucleated forms have one macronucleus functional and another sexual micronucleus which is not functional in the ordinary life processes of the species. It is this latter which multiplies and grows at the expense of the cytoplasm of the parent cell, so as to form not only the material for the new micronucleus but also that of the new macronucleus, the old macronucleus when exhausted being disintegrated and absorbed by the cytoplasm. In this case the process of conjugation signified a reconstitution of the exhausted macronucleus, a process which always occurs in some forms only when the cytoplasm of the parent is free from unelaborated and non-assimilated constituents. An excess of chromatin and nucleoplasm is produced, part of which becomes the functional nucleus and part is thrust aside as a quiescent functionless body, the micronucleus. When conjugation occurs it acts as a stimulus, causing the rapid growth and division of the micronucleus at the expense of the cytoplasm of both individuals which are not feeding during this process. The reconstitution of the nucleus is therefore to be interpreted in terms of continuous growth and as a physiological process which is directly adaptive under the conditions of morphological differentiation attained by these organisms. The reciprocal fusion of one of the nuclear bodies produced by a subdivision of the micronucleus is to be understood in the way which will be indicated later.

The death and loss of the power of coördination of movement shown by the cytoplasm of lower unicellular forms, when the nucleus with its chromatin is removed, simply demonstrates the transcendent physiological importance of the nucleus as a directive centre. This view is also sustained by the fact that ultimate nerve terminations in the Metazoa are lost in some cases within the nucleus. The effects produced by the artificial removal of the nucleus in impairing the power of growth and reproduction are due to the destruction of the physiological equilibrium between the chromatin and cytoplasm as well as the morphological integrity of the individual. It does not necessarily mean that the nucleus is the reproductive agent, but rather that this highest end-product of protoplasmic metabolism is the central object for which the investing cytoplasm labors. Neither can, probably, become the centre of reproductive energy or the energy of growth in absolute independence of the other, notwithstanding the fact that there is an apparent absence of the nucleus in Monera, while the cytoplasm is reduced to a minimum in Schizomycetes.

The conjugation of ciliated Infusoria therefore becomes plainly a process wherein the nucleus has the usual reproductive function through division of labor coupled with an adaptive arrangement by which a physiological substitution of an old for a new nucleus is effected, while the act of conjugation is merely the stimulus through which the active functions are diverted into another channel ending in the metabolism of both individuals manifesting itself in the production of a larger amount of fresh chromatin, capable of taking upon itself the work of the former nucleus, a part being pushed or "set aside" as a functionless surplus ready to be stimulated to growth through conjugation. Maupas' theory of senescence may therefore be regarded as in the highest degree probable, in that in those cases where conjugation has long been in abeyance the stimulus of growth leading to the production of an abundance of chromatin has been absent. From this point of view the Infusoria present a most specialized type of reproductive activity in which the cytoplasm and chromatin have never been freed or separated from each other as marking independent sexual states in which these two cellular constituents have preponderated, as the female and male respectively. In other words, the Infusoria are practically oösperms which are reciprocally stimulated to reproductive activity through the act of conjugation.

The ovum of the Metazoa is in the same case with the Infusoria, but behaves differently because it is purely an ovum. Here the polar bodies are to be regarded as exhausted chromatin or nucleoplasm with a decidedly male tendency in that the cytoplasm investing them is usually small in amount. The polar bodies are to be regarded as representing not only the disintegrated macronucleus but also the disintegrated fragments of the first or preparatory stages of division of the micronucleus. While the products of the fusion of the pronuclei of Infusoria again contrast with the fusion products of the pronuclei of Metazoa, in that they are at once divided into a functional or physiological and a functionless or reproductive nucleus. In the Metazoa the separation of reproductive functions from the other physiological ones is effected through cell-division and does not coëxist in two nuclei lying side by side in the cytoplasm of the same cell.

Nevertheless, there is reason to believe that the chromatin of the egg is partly exhausted, as it is in the Infusoria, and must be got rid of in part in order to regenerate the remaining chromatin through a process of growth accompanied by active karyokineses. This exhaustion supervenes upon the prolonged exercise of its physiological function in building up a large amount of investing cytoplasm under conditions which have interfered with the normal segmentation of the whole into cells no larger than those of the rest of the body. The characteristic overgrowth of the ovum beyond the size of its companions in the body of a Metazoan, is the real ground of the specialization of the egg through which it may be supposed that part of its nuclear matter has been exhausted through prolonged exercise of the physiological functions of the nucleus. It will be seen that this view is similar to that of Weismann, but it is more specific. Accordingly the degree of specialization of an ovum must influence the extent to which its nucleus is exhausted. Parthenogenetic ova are for obvious reasons to be regarded as less specialized than those which are not parthenogenetic. This hypothesis therefore fits in well with the fact of the decrease of the number of polar bodies in the eggs of many parthenogenetic forms, in which the period of growth of the eggs is often shortened, and where the physiological function of the chromatin in the constructive metabolism of the egg is exerted over a less prolonged period. The result is that the exhausted chromatin or nucleoplasm which is to be expelled from some parthenogenetic ova is just half that of the other type requiring fertilization. Such a separation and regeneration leave enough chromatin or nucleoplasm behind to initiate development by beginning a spontaneous and continuous fission of the egg without the access of the male element. This I believe, however, to be only a partial explanation of the causes leading to the expulsion of the polar bodies, since the genesis of the ovum itself remains unexplained. The specialization of the ovum and its hypertrophy as a cell is connected in another way with the operation of the processes of continuous growth, and with the evolution of the primæval form of germs which were unquestionably flagellate. That the ovum is the most specialized cell of the two kinds of sexual cellular types found in Metazoa there can be no doubt.

If it is true that the only thing that stands in the way of the development of any cell of the body into a germ is its physiological and morphological specialization, then the egg with its mass of cytoplasm in excess of that of any cell in the body is certainly a morphologically and physiologically specialized cell-unit. The expulsion of the polar bodies brings it back to an unspecialized condition, in which its nucleus (the female pronucleus) no longer bears any imprint of its former physiological specialization which it had acquired during the elaboration of its bulky mass of cytoplasm.

The history of the spermatic body, or cell, is exactly the reverse of the preceding. If protandrously developed, karyokinetic or fissive processes go on more rapidly from the start than processes of growth through constructive metabolism and spermatozoa result. If the spermatic body is produced through a protogynous process and from large cells simulating ova, the fissive tendency again finally obtains the upper hand, but only after a certain maximum size of the female cells is reached, when they may be recognized as ova. The tendency towards maleness is thus constantly against any persistence of a condition favoring constructive metabolism in the direction of the elaboration of cytoplasm. In fact, so rapidly does the fissive process go on, that the nuclei of the spermatic or male cells have no opportunity to acquire any physiological function, such as that enjoyed by the nucleus of the egg. The tendency in the male cells is rather to intensify the tendencies of metabolism towards the elaboration of chromatin only, carrying the latter process so far that little or no field of cytoplasm finally remains in which fission or nuclear movement can occur; nay, many instances are known where even the remaining remnant of the cytoplasm is cast off from the spermatozoön previous to maturity, this being in exact contrast again with the extrusion of a part of the egg's chromatin as polar bodies. The rapidity of the successive processes of fission in the course of the development of the male cell is such as to give its quiescent nucleus, in its restricted cytoplasmic field, a karyokinetic momentum, so to speak, which will be expressed as segmentation as soon as it is fused with the female pronucleus in a large cytoplasmic field, in the egg, where karyokinesis or nuclear motion again becomes possible.

In the same way the tendency towards developing a karyokinetic momentum must occur in the egg, owing to the limited number of rapidly successive karyokineses in the expulsion of the physiologically differentiated chromatin in the form of the polar bodies, which may themselves manifest subsequent spontaneous segmentation, or even make abortive unions with spermatozoa, which are abortive only, probably, because of the small size of the cytoplasmic field. If the results of Hertwig and Boveri in fertilizing non-nucleated fragments of the cytoplasm of the eggs of Echinoderms are correctly reported, it is certain that the spermatozoön is in a condition of karyokinetic tension, which lacks only a cytoplasmic field in which to find expression as segmentation.

The views here developed also harmonize with what is known of the behavior of the nuclei of conjugating *Infusoria*. It is only the *micronuclei* or *paranuclei* which enter into the reciprocal conjugation. The macronuclei or functional centres of control of the physiological energies of these animals never enter into the process, but are disintegrated and lost in the cytoplasm, while some of the new micronuclei now formed become, after conjugation and reciprocal fertilization, the new functional or physiological nucleus, and one or two remain, for the time being, at least, as passive, and probably functionless, micronuclei.*

It may be supposed by some that the foregoing account is merely a recapitulation of Weismann's hypothesis respecting the significance of the polar bodies. Not so; Weismann's very elaborate and artificial methods have no charm for me. He is continually trammeled by his own cumbersome hypothesis of a germ-plasma. But he is probably right as far as assuming that the first polar body represents chromatin of a "histogenetic" character, but I should say in a totally different sense from that which he implies. I should also agree with him that it is expelled in order that the egg may revert to its unspecialized condition, but again in a widely different sense from that which he holds.

Unfortunately for Weismann, he renders his hypothesis utterly improbable from the necessity of working out a second hypothesis to account for the expulsion of the second polar body, in order to save his first unfounded assumption respecting the immortality of the germ-plasma. That doctrine, driven to its logical conclusion, leads ultimately to the molecular disintegration of the vast series of ancestral plasmas, finally present in the egg in the course of a vast series of generations. Accordingly the only way to save his hypothesis was, as soon as certain parthenogenetic

*In this I follow the recent researches of Maupas: "La Rajeunissement Karyogamique chez les Ciliés." Arch. Zool. Exper. et Generale. 2e Ser., Tome vii, Nos. 1 and 2, 1889. Pp. 149–320 *et seq.*

eggs were discovered by him, to expel only one polar body; to make use of this new fact in such a way as to make the expulsion of the second polar body in perfectly sexual forms, remove a certain proportion of the ancestral germ-plasma, else, in time, the subdivisions of the ancestral plasmas would ultimately be so great in number as to destroy, by repeated division, the molecular integrity of the molecules representing such ancestral plasmas. Unfortunately for such an hypothesis, Nature does not work through foresight and does not anticipate such difficulties, and he is unable to produce the slightest evidence that she does. Organisms do not possess the power to foresee the remote consequences of their processes; they respond directly to conditions, or not at all.

The logic of this argument of Weismann is exactly similar to that used by Balfour in reference to the polar bodies in his "Comparative Embryology" (i, p. 63), when he says "that the function of forming the polar cells has been acquired by the ovum for the express purpose of preventing parthenogenesis." This implies that the egg possesses foresight of harm coming to it through falling into a parthenogenetic habit! And when Weismann proceeds to elaborate his necessary hypothesis of a reduction of ancestral germ-plasmas, and says "this *must* be so," he seems to forget altogether about the probably self-regulating physiological factors controlling the dimensions of cells and their proportions of chromatin and cytoplasm.

The same difficulty was perceived in a somewhat different form and very pointedly alluded to as fatal to the hypothesis of pangenesis, as early as 1878, by Prof. J. Clerk-Maxwell, in his article, "Atom," in the third volume of the "Encyclopædia Britannica," p. 42.

Lately, however, Platner's discovery that in *Liparis dispar* parthenogenesis occurs with the extrusion of *two* polar globules, is sufficient to render Weismann's hypothesis as to the significance of the second polar body thoroughly untenable.

There is clearly nothing left but to suppose that the polar bodies are an expedient through which the egg returns to a condition of equilibrium different from what it possessed prior to their expulsion. We have no warrant whatever for assuming that this return is other than automatic or comes from other than self-regulated impulses arising within the ovum. Such impulses are very probably merely a manifestation of the attempt to recur to and maintain a continuous process of growth, in the course of which the production of polar bodies is only an incident.

The physiological impulse from within which effects this equilibration works, if my hypothesis has any value, as if certain parts of the egg were to be excreted. In fact, if the hypothesis that the huge mass of cytoplasm represented by an egg is a highly differentiated cell-product, resulting from a very prolonged activity extending sometimes over many months, or even years, of the nucleus and its chromatin, while the spermatic body is produced in a much shorter period, it must necessarily follow that the controlling central nuclear body of the egg would undergo a corresponding greater specialization and differentiation than that of the spermatozoön.

This view then satisfactorily accounts for the expulsion of the polar bodies and also gives some indication of the significance of the reduction of the cytoplasm of the spermatozoön or its complete loss, if we regard the egg and spermatozoön as antipodal expressions of a physiological process of evolution, which has resulted in forming bodies which are complementary to each other in every physiological trait which they present.

Since spermatozoa, also, are very often produced from what are manifestly ova, by the breaking down of the latter and the augmentation of their chromatin, it is clear that the spermatic body is a product derived from the egg by carrying its cleavage farther either by means of the direct or indirect method, but while still attached to the parent or nourished by it. From this consideration it follows that the egg and spermatic body are not homologues before the final maturation of the former. It is, therefore, useless to expect to find any structures thrown off by spermatozoa which are complementary, in the sense implied by Minot and others, to the polar bodies of the egg.

As I have been led to the views expressed above by following a totally different path from Weismann, and as I reject his hypothesis of the physiological isolation of the germ-plasm on the basis of fact, as shown elsewhere,* as incapable alike of proof or of serving a better purpose than a much simpler hypothesis, it seemed best to continue the argument upon the lines begun in earlier papers.

It may, however, be well to point out here that what Weismann means by his "histogenetic" or "ovogenetic" nucleoplasm, I distinctly limit to the genesis of the huge cytoplasmic field or cytoplasm and yolk of the ovum. The egg membranes are basement membranes and it is difficult to say what share the egg had in their formation except in lower forms, so that they are of far less consequence in this discussion than Weismann supposes.

Another point is that parthenogenetic ova are certainly smaller than the fertilized ova of the same species, in some forms, though this is not always the case. This fact, however, is in accord with the hypothesis of the polar bodies set forth above. The mode of feeding the queen bee † shows, also, that parthenogenetic eggs, or those capable of developing in that way, are probably produced through the expenditure of less energy in the parent organism than those which develop only in the sexual way in strictly sexual forms. The connection of these facts with the explanation offered of the expulsion of the polar bodies is so obvious that it hardly needs to be indicated.

It has been made clear that the overgrowth of the egg has resulted in its specialization, but the question still remains, What led to such an over-

* "A Physiological Hypothesis of Heredity and Variation." *American Naturalist*, pp. 85–92, xxiv, 1890.

† Cheshire, "Bees and Bee Keeping," Vol. 1, pp. 82–85.

growth of the ovum? This, I believe, may be answered on the supposition already to some extent elaborated that the egg is an abortive attempt at the production of an overgrown spermatogonium which is set free before it has been fully matured, as a result of the precocious determination of superabundance of surplus nutriment to it.

This has been due to forces operating within the parent organism; how, we are still unable to clearly state. If this is so, then the specialization of the egg is accounted for and the expulsion of the polar bodies may be approached from another point of view, namely, that of their morphological equivalence to spermatozoa, since they represent largely the characteristically male plasma in their chromatin. The egg is, therefore, specialized in so far as it is an abortive spermatogonium, and the number of polar bodies, produced as abortive spermatic elements, represent its degree of specialization. The consequent reduction of the chromatin in the egg nucleus may then also be compared with the processes of spermatogenesis in which a certain minimal size of the chromatin mass of the egg is reached, which now makes the ovum the exact homologue of the spermatozoön, but with an enormous cytoplasmic body fitted for the exhibition of active karyokinetic movements and an elaborate series of successive and finally simultaneous karyokineses.

In this way it may be supposed that the peculiar advantages offered for the survival of a species through sexual processes may be realized.* But such advantages were developed not as the result of any foresight, but as a consequence of the action of the principle of overnutrition ending in the production of spermatogonia which failed to segment or break down into male elements before they were freed from the parent. In this way it may be supposed that the ovum itself arose, but that it was a later phase of development than that of the flagellate male germs, which type still prevails in asexual or very primitive forms. This gives us the real grounds for the evolution of the ovum; accounts for its specialization, for the reduction in volume of its chromatin to that of the male element through the expulsion of the polar bodies, through which it also again becomes the immobile overgrown, but exact morphological homologue of the spermatazoön. The specialization which the ovarian egg has attained as an overgrown spermatogonium also makes it certain that the cells expelled as polar bodies represent the energy in part which has been expended, and which is signified by the great size of the ovarian egg. These products of specialized development must be got rid of so that this part of my hypothesis respecting the polar bodies is a necessary corollary of the first part developed in the earlier portion of this paper.

The impulse towards the expulsion of the polar bodies comes from within, upon the advent of an adequate stimulus, and the tendency is to run down towards the male condition from the egg, but such a result is prevented from proceeding far by the small original amount of chromatin in the egg which prevents the formation of more than two cleavages, on the

* "Origin and Meaning of Sex." *Am. Naturalist*, June, 1889, pp. 501–508.

average, when the chromatin is reduced to a volume equivalent to that of the chromatin in a single spermatozoön of the same species. The tendency towards the expulsion of polar bodies is therefore probably self-regulative as soon as a certain minimum in the size of the chromatin masses is attained. The impulse leading to such a result arises from the presence of a large cytoplasmic field sensitive to external stimuli, but in that such a field is cut off from further possibility of growth by detachment from the parent organism and incapable of further growth except through the stimulus of its chromatin, and in that no more of the latter is for the time being elaborated after detachment, it is clear that the cleavages which give rise to the polar bodies are self-limited in number by conditions arising within the egg, and as a consequence of the specialization of the latter as a cell, and in the sense that it differs from primitive types of cells as a consequence of its method of protected growth within the parent.

Why, however, should the polar bodies be so small? Why does not the egg divide equally? This may be answered on the ground already assumed that the chromatin is yet neither male nor female, but tends universally to be reduced to male dimensions even in the egg. The cytoplasm being the most abundant in the egg and the chromatin in the spermatozoön, it is clear that totally different physiological characters must be offered by the two elements. This, in fact, is the essence of the meaning of the term specialization as applied to them, and involves the conception of wide differences in the modes in which physiological energy has worked to produce them, respectively. If the yolk is abundant, the cytoplasm, at one pole of the egg where nuclear cleavage occurs most readily to form the polar bodies, is reduced to a thin layer or disk. This, in many cases, is the condition under which polar bodies are produced so that a great inequality in the size of the cleavage products must result. Later, when the egg nucleus is reduced and can return to a deeper position in the egg, it can gain control of a still larger cytoplasmic field, which is still further enlarged by the advent of a fresh male chromatin and cytoplasmic element. When the male and female elements finally unite there is a complete readjustment of the equilibrium between the cytoplasm and chromatin centres, because the introduced male is capable of taking control of a still larger cytoplasmic field and may even at times overtop the female, as in the case of *Rhynchelmis* described by Vejdowsky. The two together now regain control of the cytoplasmic field of the egg, but cut off from direct dependence upon the parent, so that a new cycle of changes can go on in a new way, and instead of running down towards the male condition, normal segmentation goes on which ends in the formation of a new being under the impulse of the tendencies towards continuous growth under new conditions. The cases of egg and spermatozoön are clearly merely specialized states of chromatin and cytoplasm and their separated and united conditions are merely phases of a continuous process of growth under widely differing conditions which are ushered in as the results, first, of an incipient and complete exclusion from the parent (formation of polar bodies and spermatogenesis), and, secondly, as the results of their union as complementary bodies through which a new development is initiated. Their reciprocal saturation of each other also prevents polyspermy and is self-regulative, just as all of the processes of development will ultimately be found to be, and as we have seen good reason for believing must be the case in respect to the polar bodies.

Finally, on our hypothesis it may be said that the chromatin and cytoplasm in the egg bear a certain proportion to each other, regulated in the ovary. The effort to adjust this relation further after the ovum is free (usually) ends in the expulsion of the polar bodies, which represents an effort at the production of male cells, since the egg as a protovum is invariably the prelude to the production of spermatozoa. The ovum precedes the spermatozoön in the order of time, and the latter must be produced from the former. Protogyny is, in the widest sense, therefore universal, since it is only ova-like bodies which can break down into spermatozoa in which chromatin preponderates. But this may be further qualified by the statement that protogynous tendencies greatly developed must finally themselves lead to the development of an ovum with a large cytoplasmic field. Or, in other words, a condition is reached in which great cytoplasmic specialization is attained, so that the expulsion of the polar bodies may be regarded as the expiring effort of protogyny to produce spermatozoa.

If this is so, why do not all ova develop parthenogenetically? Simply because these spermatic elements—polar bodies—are not completely matured or developed, and while the transmitted energy of growth is insufficient. The remaining body with its reduced chromatin is now, however, the equivalent of a spermatozoön but with an enormous cytoplasmic body. It is complementary to the male element in that it is physiologically receptive, and food through karyokinesis for further processes of segmentation. But how about parthenogenetic ova? Why do these develop and why do some of these develop two polar bodies? Here we often, if not always, have, as already supposed, a greater momentum of growth, with frequently a smaller mass, protogyny is not so markedly developed, and the tendency towards maleness and cleavage is therefore inherently greater. If now new relations or rather want of former modes of nutrition of the cytoplasm supervenes after oviposition, the momentum of growth tending to segmentation, received from the parent even after the expulsion of the polar bodies, is still sufficient, so that the so-called female pronucleus is able to proceed under these new conditions to take possession of the cytoplasmic field and initiate normal development under new and independent conditions, through segmentation, leading to the formation of an embryo. If these views are correct, parthenogenesis is the vanishing point of maleness and femaleness, yet, in some cases, its energy is so great that it sometimes, even then, ends in maleness as seen in the development of drones amongst bees, thus illustrating still further the tendency in some cases to run down to the male condition.

If these conclusions will hold universally, there is good ground for believing that in the gradual evolution of protogyny the cytoplasmic field, in which rapidly successive segmentations were possible, was also evolved. If this is true, then sexuality itself arose as the consequence of protogyny starting in parthenogenesis. The primary and secondary sexual characters of multicellular forms were also probably the outgrowth of secondary and adaptive processes consequent upon the effects wrought as here supposed through protogyny and the evolution of a large cytoplasmic field. The origin of sex at any rate hinges upon the decision of how the disproportion between the chromatin and cytoplasm arose in the sexual products of the two sexes respectively. Upon its last analysis this problem must resolve itself into purely physiological factors.

These views are in accord with the first part of this paper, though it may at first seem that the theory that the egg expels polar bodies because of its specialized nature is not well founded. What there is in favor of such a view is, that it harmonizes with the morphological and physiological data of ovogenesis, and the conjugation of Infusoria. In any event, it is certain that if ova represent an incompleted effort to produce spermatozoa, it is very certain that they are specialized in so far as this effort has been realized as supposed, in the formation of polar bodies and a large volume of cytoplasm.

Consequently ova may be regarded as incompletely differentiated spermatogonia. The undoing of this specialization whereby the egg becomes the morphological equivalent of spermatozoön so far as its chromatin is concerned brings us back to essentially the same basis as was followed in the first part of this paper.

Experimental evidence shows that the process of fertilization is self-regulative and restricted to a single spermatozoön. Indeed, one might infer from the evidence of the phenomena of fertilization that such must be the case, and that the ingress of the spermatic element, in sexual forms, is a consequence of the exhaustion of the power of continuous growth, as shown in the abortive effort at spermatogenesis in the extrusion of the polar bodies. A consequence, however, following because of the appetency of the spermatozoön to set up a segmentation in the cytoplasm which should end in a continuation of the process of spermatogenesis set agoing by the expulsion of the polar bodies. Yet, this does not occur, and, as we have seen, a good reason can be assigned why spermatogenesis does not go on indefinitely after being initiated by the extrusion of the polar bodies. Equally good reasons can be assigned why the method of nuclear movement is changed after the entrance of the spermatozoön. On my view this is wholly due to the sudden advent of wholly new conditions, since about the time of the ingress of the spermatozoön the egg is not only cut off from its supply of nutriment and is now an isolated being the whole of the cytoplasmic field of which is at the mercy of the combined action of the pronuclei, while the preparatory equilibrium resulting from the extrusion of the polar bodies has been attained beforehand.

The new external conditions constitute a continuously acting series of stimuli provoking the action and reaction of the chromatin, achromatin, and cytoplasm upon each other, as has been rendered probable by the studies of Boveri and Watase. The isolation of the egg makes it independent; its cleavage products now cohere and the whole plan of its fragmentation depends upon its using every particle of its cytoplasm as reciprocally nutritive material for the maintenance of the integrity of the whole.

Maturation is truly the proper name for the process of the extrusion of polar bodies, and it may be that in some cases the polar bodies may be large enough to merit the name of protova, especially the first one, and that a large enough cytoplasmic field may exist around its nucleus to attract spermatozoa. Yet the polar bodies are nevertheless to be regarded as abortive attempts at the production of spermatozoa.

It may also be that the male condition characterized by the assumption by the elements of that sex of a monad-like flagellate form, is really an attempt at the recapitulation of the most ancient ancestral monadiform condition. In the female we have seen that the attainment of such a condition is abortive, but enough is left in the disguise of the polar bodies to represent a reminiscence of the lowest phase of organic evolution.

We have now recapitulated all the important and difficult queries that have arisen in regard to the meaning of the polar bodies, which we also now see probably have a phylogenetic significance.

The evolution of complicated apparatus and processes for the emission of the sexual products, when mature, is only an accessory and a secondary consequence of the continuous series of processes described above, and which has also proceeded *pari passu* with the divergence in the morphological and physiological characters of the products of the two sexes. The primary sexual characters and probably also the secondary ones have been evolved in response to the all-important requirement of most efficiently disposing of the sexual products. The habit of copulation itself must have so arisen, and the stimulus effecting the discharge of the sexual products finally acts through the sensorium and through the reciprocal contact of the nerve terminations in special dermal tracts concerned in copulation in the two sexes.

In this way it must be supposed that eventually the sexual passion became intensified as the provisions for effecting the union of the sexual cells became more elaborate, and as the parent-body became more and more differentiated and specialized to take a more and more important share in this process. The presence of the germ cells has undoubtedly reacted upon the soma or parent body so as to intensify the tendency towards a greater differentiation of the primary sexual organs, and this through the sensorium and its sensory terminals.

It is interesting to reflect that the tendency to a repression of the male traits in the ovum has been manifested in the adult organization of the two sexes in Metazoa. The assertion of some writers to the effect that the female is merely a retarded stage of the development of the male may be correlated with the singular and suggestive contrasts between the egg and spermatozoön.

The evolution of sex and the evolution of sexual love or passion are inextricably intertwined. The history of the one is the history of the other. There are many reasons leading to the conclusion that the earliest and lower forms of sexuality were never in the past and are not now impelled to conjugate by anything akin to the gratification of passion such as is met with amongst the higher series of animal forms. Sexual passion is the outgrowth of a gradually developed and increased capacity for experiencing pleasurable sensations by the parent body or soma which is the producer or bearer of the sexual products. The high specialization of the sexual processes in higher forms has also unfortunately led to the possibility of their perversion. No sexual perversion is possible amongst lower forms where the essence of sexuality is the mere concrescence or conjugation of sexual cells. Courtship, violence towards and pursuit of the female, sexual love, etc., are the consequences of the evolution of a soma or parent body, which is the mere carrier of germ-cells, but which is capable of experiencing exquisite pleasure in the consummation of the sexual act.

The intromission of an erectile organ covered with highly sensitive nervous end-organs into the genital passages of the female is the appetency for the sexual elements to conjugate reflected upon the soma. Copulation and the development of erectile or other sensitive intromittent and reciprocally coadapted primary sexual organs must have been due to the effect of use, since disuse, as in castration, affects the development of the parts, while abnormal activity, under favorable conditions, is said to increase their development. This view is sustained by the evidence in both plants and animals; in both the devices for effecting conjugation of the sexual elements and developed in the most gradual manner, until, in plants, the pollen-grains, with the help of various secondary adaptations, such as their morphological development, insect agency, the wind, etc., are evolved into true intromittent organs answering to the function of a penis in the form of a growing pollen-tube, stimulated to growth by nutriment supplied by the stigma and carrying the very minute, elongate, male chromatin element in its very narrow passage to the ovicell of the ovary. In the same way the male intromittent organs of animals have been developed from a mere cloacal papilla, or a low-grooved fleshy erectile process to a highly differentiated and excessively complex penis with, in some cases, an elaborate series of rosettes and flanges covered with a thin integument with highly sensitive terminal sensory nerves, that are in reflex connection with the higher parts of the sensorium and through the lumbar region of the spinal cord with the testes, spermatic vesicles and accelerator urinæ and other muscles which they may throw into spasmodic contractions in order to compress the vesiculæ and cause the emission of the male elements in the act of coition. Similar actions result in the female which affect the peristaltic contraction of the oviducts, the enclosure of the ovary by the fimbriæ leading to conditions favorable to the emission of the egg at the time of coitus.

In animals, the provisions for rendering the male elements more efficient are thus rendered more perfect. There is not wanting evidence that the glans penis may serve as a sort of piston, fitting closely against the sides of the vaginal passages so as to prevent the regurgitation and loss of the semen. In mice I have observed that in those which have recently been in coitus, the uterus is actually distended with semen. These contrivances, many of which are of the most singular conformation, as that of the pig, for example, probably serve the purpose of more efficiently carrying the seminal matter into the genital passages of the female where they are to subserve the essential purposes of reproduction. At any rate, the wonderful contrivances in the higher plants serving the purpose of efficient fertilization are no more remarkable than those in the higher animals, the study of which has been singularly neglected by physiologists.

In the lowest types of living forms there is nothing which suggests in any way the gratification of passion. The mere tendency towards conjugation of animals and plants without nerves cannot be identified with an appetency arising from any pleasure experienced in such conjugation. There are at first no provisions made for conjugation except such as the accident of contiguity of the conjugating elements as the germinating spores of Myxomycetes, the intracellular spores of *Hydrodictyon*, etc. When the process is so primitive as this, there is no evidence to show that it is anything more than the expression of the cessation of one order of things at the termination of one set of external conditions giving place to a new order of things under the stimulus of a new set of outward conditions more favorable to growth. Under this view of the case the incipiency of conjugative phenomena is simply the expression of a readjustment of the processes of growth under the influence of more or less favorable conditions of life. The physiological traits of that life are expressed in the mode of molecular aggregation and constitution of the cellular unit or units composing the individual. Its tendencies are to increase the mass of the individual by processes of integration of new matter in the course of which such new matter becomes molecularly identical with that of the organism engaged in such integration, a process commonly expressed by the term assimilation.

The consequence of such newer integrations are that still other integrations are possible, under favorable conditions, on a much larger scale than the first ones. The increased power to make continuously more and more extensive and rapid integrations of identical molecules is possibly in some way due to the increase of mass and surface and the consequently increased capacity to liberate energy, or to perform work in a still more active integration and assimilation of molecules.

The Malthusian principle therefore rests, in its last analysis, upon a chemico-physical basis. It is probably, therefore, not an unjustified assumption to state that the acquisition of an increased mass in organic bodies leads to an increased capacity to integrate and assimilate still further additions to the original organized mass, and that if this process could go on indefinitely without the intervention of death and a necessity for oxygen, the earth might be gradually transformed, in so far as its available materials held out for such a purpose, into a few organized individuals. Such a supposition is, however, absurd, since such masses, even were their growth possible, would finally become helplessly immobile from their own weight; such a process would be self-destructive and incapable of indefinite maintenance.

If, however, the principle that successive increments in the mass of organized bodies, carries with it the implication that such increments imply their capacity to increase more and more rapidly, under favorable conditions, or as it may otherwise be expressed, are thus enabled to grow, in virtue of such an inherent property, far beyond the bulk of their original germinal mass, then this deduction must form the basis upon which the phenomena of growth, reproduction and sex must finally be interpreted. This principle affords also the physico-chemical or physiological reason for the foundation of the Malthusian principle that the production of organisms would if unchecked outrun the available food production for a certain section of such organisms, as an aggregate—namely, the animal world.

The foundation of the principle of Malthus and of the Darwinian principle founded upon it, therefore lies within the domain of ultimate biological physics or the molecular dynamics of organized bodies. The mainspring of the principle of natural selection, upon final analysis is not itself a choice between two things but an inevitable consequence of the innate molecular habit of living matter, if I may so express myself. It is physical in that the chemical and physiological laws under which growth or molecular integration can take place are themselves resolvable into physical laws which can be coördinated under the principle of the conservation of energy.

This physical principle of continuous and continuously augmented integration and the consequent increase of the mass of living bodies is the primary conditioning factor of growth by intussusception of similar molecules. It initiates the struggle for existence, as the struggle due to motion and the attraction of stellar bodies, maintains the latter in their harmonious relations in space.

This principle must, however, be further qualified in that the properties of the molecular integrating factors of living organisms differ very widely. Some forms (vegetal) under one set of conditions can integrate new and more complex assimilable molecules by recombining binary compounds; other forms—animals—can assimilate only such new ternary molecules or such as are very nearly similar to their own, while a third form, the sexual, is probably the highest expression of this integration of similar molecules in that here the molecular differences are zero or nearly so, and at most goes no further than molecular differences, having their origin in the individual traits of either of the two parents. The last or sexual form of integration or intussusception also occurs, *en masse*, and without any reciprocal sacrifice of molecular identity. This last form of organic molecular integration is therefore effected with the least expenditure of energy on the part of the sexual elements themselves which are involved. Sexuality according to this view as expressed primarily in conjugation is a sort of refined hunger, in which neither the "eating" nor the "eaten" expends but a minimum of energy in a process of reciprocal assimilation. It is a hunger in which the sense of "taste" in the vulgar, anthropomorphic sense is unknown ; it is an affinity developed possibly through the attraction of identical molecular aggregates for each other.

The principle of cumulative molecular integration is similar in some respects to the cumulative principle operative in organic structural evolution, through which a superposition of adaptations results, not necessarily as the consequence of selection but as the result of the morphological and physiological necessity of conforming in the next step of morphological and physiological complication to that which had preceded it. Many instances in illustration might be cited, such as the annular placenta of the ovum necessarily conforming to the easiest possibility of internal contact with a tubular uterine canal. This principle has been responsible for much that has happened in organic evolution, but it is again dependent in curious, circuitous ways upon the still more primary principle of cumulative integration, overgrowth of organisms, or their capacity to grow beyond their own bulk at certain points, as implied by Haeckel.

The highest form of cumulative integration ending in an overgrown and abortive spermatogonium, which is the equivalent of the egg, together with its further expression in the production of spermatozoa which have had their cytoplasmic field reduced, leads to a condition where the one becomes helpless without the other. It also presumably leads to the evolution of an appetency or affinity of the male for the female element in that the one possesses what the other does not, and in that they are produced in similar organisms or those of the same species their idioplasmic constitution must be very nearly the same, except for the morphological differences which characterize them. These differences are again the preponderance of nucleoplasm in the one or the element immediately concerned in growth and the physiological integrity of the living cell, and the preponderance of cytoplasm in the other, which is the medium in which free nuclear motion, karyokinesis, and consequent growth is possible. The affinity so developed through cumulative integration by the divergent processes of ovogenesis and spermatogenesis ends in what I shall term *reciprocal integration* without loss of molecular identity, or in what is usually termed "fertilization."

The advantages offered by such a process is that it provides for the development of metazoan or multicellular embryo, which is without the need of immediately feeding, but which is enabled to reach a certain self-helpful morphological complication before it begins the struggle for existence for itself. It provides a large cytoplasmic field in which rapidly recurrent successive and simultaneous karyokineses can take place under the guidance of the inherited tendencies resident in the nucleoplasm and cytoplasm of the combined germs. The one sex appears to supply the field for segmentational activity, the other the segmentational impulse itself. In other words, sexuality is the expression of the action of the principle of the physiological division of labor, extended so as to involve two kinds of individuals of the same species, or two different functionless parts of the same individual, as in hermaphrodites.

There is no convincing evidence that the male induces variability. The argument from hybrids is of little value. The tendency to an equilibrium as the consequence of close interbreeding or of continued promiscuous interbreeding is the same, and is to be interpreted as the result of the constancy of the mode of growth of the average individual which must finally result, following from the average of hereditary characters which are finally thus transmissible. As soon as slightly differing forms are crossed the karyokinetic equilibrium is disturbed and variability ought on *a priori* grounds to ensue. To saddle the induction of variability upon the male does not seem to be demonstrated, as the factors involved are too numerous to enable us to decide what ones are important and what are unimportant.

A view which has far more in its favor is that a large oösperm, interpreted as above, with a large cytoplasmic field, is inherently more liable to vary its karyokinetic processes through very slight variations in the external influences than a small or a parthenogenetic one. That sexuality, taken in the widest sense, is responsible for variability is probably nearer the truth. That the oösperm, with its large cytoplasmic field, is the real arena in which variability disports itself, may be taken for granted. It is also very evident that the evidence derived from the development of monsters is clearly in favor of such a view. Monsters are developed only when the early stages of development are karyokinetically disturbed, as is well known. Moreover, there is no hard and fast line between monstrosities and variations of a less and less monstrous character until those of an almost imperceptible and unimportant character are encountered. That the tendency towards variability is more marked in the young than in the adult stages of fixed and slightly variable types of Metazoa may be regarded as a truism, and must be considered the foundation of these views.

In that temperature affects the rate of karyokinetic processes, it is clear that inequalities of temperature simultaneously affecting different points on the surface of an egg would affect the rate of segmentation of the cells of such different points and thus induce variability. A single karyokinesis disturbed or impeded on one side of an embryo must disturb all subsequent ones. A mechanism so delicate as this of karyokinesis may also be interfered with in other ways. It seems almost self-evident that where karyokineses become simultaneous and rapidly successive there must be a greater inherent probability that variations should be induced through disturbances of the karyokinetic processes.

Latterly much discussion has taken place regarding rejuvenescence and the relation of the process of fertilization to a supposed renewal of the youth of the sexual cells. It may be suggested that the sexual cells probably never grow old from the causes which act upon the other cells of the body to render them senile, and it may be that the real ground for a theory of rejuvenescence lies not in fertilization itself but in the fact that the sexual cells are functionless and have not been belabored with physiological duties in the parent body. Where they are produced annually, as in many animals and in all plants, they are also the youngest cells of the parent body, while the spermatozoa, produced in some animals at hourly intervals, are still younger, or more youthful. The male cell is therefore the most youthful, the least functional and the one most disposed to exhibit its activities of growth under favorable conditions with the greatest energy, though not necessarily in the sense that such a display of greater energy would be favorable towards provoking variability, except as provided for by the cytoplasmic field of the ovum or female element.

It has also been pointed out that the first cleavage of the oösperm corresponds to the future median plane of the embryo or to the line dividing the future hypoblast from the epiblast. But there are still other relations which connect these phenomena with the fore and aft disposition of the body of the parent. It is a matter of common knowledge that the Infusoria when undergoing division divide either lengthwise or crosswise. In fixed forms—*Vorticella*—the division occurs lengthwise of the parent and in conformity to the mode in which the future individual is related to the colony by its base. In many free forms the division is crosswise, and it is a singular fact that the end of the hinder individual next to the posterior end of the anterior one becomes the future anterior end of the hindmost one. These two forms of division have been developed adaptively and in conformity with very different conditions in the two cases. Why should the end of the young Paramœcium next the foremost or parent individual become its anterior extremity preferably to the other one? Does this not indicate that use and habit may have had an influence in giving the plasma of both a bias which extended to the soma of the posterior bud and which expresses itself in this peculiar polar conformity to that of the anterior parent individual, which is more somatic in its character?

Numerous other forms, such as *Volvox*, illustrate the same tendency of the axis of the young to conform to the axis of the parent. In Fishes the embryos of *Batrachus tau*, which are attached to a fixed substratum after the rupture of the egg-membrane, by the adhesion of the yolk sack to the latter, show that, at the time of deposit, *the future axis of the whole brood of embryos was predetermined in the body of the parent.* That this must be so may be concluded from the astonishing fact that the heads and tails of a whole brood conform in direction, within a degree or two, to a common axial plane. How was such an astonishing conformity to a common axis brought about, if it was not developed in the ovary of the parent before oviposition? If this is true then the axis of the parent and the polarity of her body, as expressed in its fore and aft extension, exerted such an influence upon the brood as to impress such a polar tendency, and transmit it directly to every egg matured in her body. If this is true, then the parent body does transmit characters directly to its offspring, Weismann, Lankester and other deluded skeptics to the contrary notwithstanding. Here is a whole brood of young fishes, fixed to the surface upon which they were hatched, every one of which conforms, to within a degree or two, to lines running parallel to each other in a common direction. Does or does not either parent transmit this; since one or the other must do so, how is it done, and why is this not proof that the soma of the parent transmits certain polarities, and those of the most important character, directly to the germ-plasma from which the embryos are developed? The case here is just as clear as in the case of Vorticella or Paramœcium; they are in exact conformity, so that we have here once more direct evidence of the untenability and absolute falsity of some of Weismann's deductions as to the non-transmissibility of acquired characters.

In a similar way, how is the polar conformity of the chick in the egg to the axis of the parent bird to be accounted for? Though in this case the axis of the embryo lies constantly at right angles to that of the parent as the ovum descends through the oviduct. Equally striking are the constant relations of the embryo Rabbit, in the uterus up to the tenth or twelfth day, at right angles to the axis of the parent body. The same is true of the Cat, Dog, Mouse, Rat, and other forms. The same principle also holds in Arthropods, where egg-tubes are formed and where there are also constant anterior and posterior poles of the eggs developed, which bear a constant relation to those of the parent. Here are bodily habits directly transmitted which involve nothing like a change of structure; does the germ-plasma accomplish this, or does the direct influence of the mother's organism accomplish this remarkable result? For me the latter alternative seems to be the only explanation.

Similarly the phenomena of budding in Salpa, as worked out by Brooks and Seeliger, tend to establish the same conclusion, namely, that the polarities of the immediate parent influence those of the offspring directly. It looks as if the bodily functions of the parent either impressed themselves as if from a distance, or through the pole of the germ most directly in a nutritive relation to the parent upon the still unconscious germinal matter giving it these tendencies to conform in these curious ways to the polarities of the parent organism. It is also tolerably clear that the so-called "promorphology" of the egg is preceded by a still earlier morphological history, which has been scarcely more than touched by students of the Metazoa. The direct influence of the source of the nutriment supplied to the growing embryos is probably indicated in these singular examples, no less than in the fact that the polarity of young, viviparously developed aphides corresponds to the fore and aft polarities of the parents. Or, as in the case of the ovarian leaflets of the ovary of the lamprey, the micropyles are found to be invariably turned towards the vascular core of the leaflets, and consequently towards the sources of nutriment and oxygen. In this last case also, these factors have determined the position of the future germinal or animal pole, and consequently the point on the egg where development shall begin.

The points which have thus far been elaborated tend, in a general way, to support the conclusion that, in the production of ova and spermatozoa, both have arisen from a common basis. The lowest forms, we certainly know, tend to multiply without attendant karyokinetic processes, probably, as suggested, because a cytoplasmic field or arena in which nuclear movement is possible, is wanting. In the lowest Monads sporulation results in the breaking up of the parent body into infinitesimally minute germs, which are, presumably, composed in the main of chromatin or nucleoplasm, a conclusion which comports with the fact now ascertained, that the chromatin or nucleoplasm of lower forms, if deprived of its envelope of cytoplasm, may regenerate it. Overgrowth of mass, so as to form a large cell-body composed of cytoplasm, is unknown amongst the very lowest forms, which are also flagellate. In the next step (*Nostoc*), the overgrowth of certain cells means that they are incapable of development. In the next step, the conjugation of overgrown cells, with those in which nucleoplasm preponderates, restores the power of growth or the power to integrate cytoplasm anew, or, as in Infusoria, conjugation stimulates the production of nucleoplasm through the constructive metabolism of the investing cytoplasm.

All of this evidence tends to prove that maleness, or the condition of the flagellate spore, is the primitive one as already stated. Since the very lowest animal forms are likely to preserve some reminiscence of the primitive processes leading up to animal sexuality in its most generalized form, it will be desirable to appeal to the evidence offered by such forms. The Amœba is undoubtedly animal in nature, but notwithstanding the persistence and frequency with which it has been studied, much still remains to be learned of its life history.

Leidy has shown that, in certain forms of Amœba, the nuclei tend to multiply after reaching a certain size, and through a tripartite division without karyokinesis. One of these nuclei is then transported to near the surface, where it bursts and allows the balls of chromatin adherent to its walls to escape into the surrounding water, presumably as germs, but he did not trace their history. If this should prove to be a true case of sporulation, it would prove that in the Amœba there are conditions which favor the production of chromatin, and that the germinal matter or nucleoplasm is "set aside" in the nucleus from which it is expelled.

Mrs. Lillie Holman's observations (*l. c. supra*) also tend to show that a conjugation may occur where one Amœba swallows another and then disgorges it. The disgorged one then comes to rest and becomes encysted; it then discharges upwards of two hundred spores, since the further results of the development of the latter were observed the next day in the same "life-slide" as very minute young Amœbæ.

Brass* has given a more circumstantial account. According to him the body of the Amœba after encystment undergoes at least superficial subdivision into cells. The cyst then bursts or opens at one point and these superficial cells escape from the cyst as minute flagellate monads, which soon lose their flagella, becoming at the same time again amœboid and settle upon objects over which they creep about as did their parent, of which they are a fragment. They now also feed very actively, grow rapidly and soon become the counterparts of the parental organism, which gave rise to them by fragmentation. A somewhat similar history has been worked out by Haeckel for *Protomyxa*, and Weldon has reported the detachment or escape of small germs from the body of *Pelomyxa.*

We have the spermatogonium typified in this peculiar method of fragmentation of the Amœba, especially as described by Brass. It is an overgrown cell breaking down in part, but first elaborating more chromatin, just as a spermatogonium does. The overgrowth in mass of the parent cell is due to cumulative integration. The flagellate offspring represents the spermatozoa produced by a spermatogonium in a multicellular form, but with this difference that a spermatozoön cannot withdraw its flagellum and begin to feed. Such a flagellate germ of a higher multicellular form must then perish if it is not nourished in some other way. The only way in which it can be nourished is to blend with the cytoplasmic body of another abortive but hypertrophied spermatozoön—the ovum, as supposed above. In other cases, mammals and birds, it is known that the spermatozoa or flagellate germs of the male die if not kept at the same temperature as the parent body. They are not adapted to continue to live in the cold medium in which the flagellate germs of an Amœba would at once begin to feed and grow.

The flagellate or wandering germs of the Amœba are wandering in habit, probably because they inherit an organization favorable to vagrancy from still lower monad-like creatures. And this wandering habit is doubtless advantageous to the young Amœba, as they are thereby scattered so as to be placed where food is more plentiful, at any rate, the offspring of one parent Amœba do not, as a consequence, fall into a heap at one place so as to come into such close competition with one another for food.

Such vagrant habits would be of advantage to the germs of almost any species and they are certainly of use in many cases in that they favor the distribution of a species. In the case of the male germs of higher, in fact, of all forms, this vagrant habit becomes useful in effecting their distribution, and at last of aiding them to find the egg and the micropyle, if such is developed, through which they enter the ovum. So that here again we find that a habit which has at first thought apparently no preëminent

* "Die Zelle, das Element der Organischen Welt," pp. 63–65, Thiéme, Leipzig, 1880.

value or importance in the very highest forms, but which has such an importance in lower ones, may serve a very different purpose in higher types, that is, to find the female element so as to combine with it, which, of course, would be an advantage to the species. In this example, we find an illustration of change of function, or rather the use of an old function in a new way, illustrating also the principle that, any further advantageous step in evolution avails itself of the service of the next preceding one in the order of time, or rather, the latter is apt to thus become a stepping-stone to farther progress, as is shown in this instance.

The parallelism of the Amœba before breaking up into flagellate germs, with a spermatogonium in a higher form is, however, complete, and it is from this basis that further criticisms and suggestions may now proceed.

Geddes and Thomson, in their suggestive work on sex,* have attempted to identify the evolution of the female germ or ovum with a tendency to develop a leaning towards constructive metabolism or anabolism, while the male germ exhibits the reverse tendency or towards destructive metabolism or katabolism. So far as the directly palpable facts are concerned which lie upon the surface, these conclusions of Geddes and Thomson would seem to be justified. There is apparently nothing in them which conflicts, at first thought, with the facts of morphology and physiology. Yet, I believe that the prime conclusion of these authors is capable of further analysis, and consequently that it is not as important as it appears to them, nor is it strictly and entirely true in a physiological sense.

The growth of an egg we will admit requires constructive metabolism to extend over a longer period than if the germ were male. While it is true that growth represents the expenditure of a certain amount of energy in the form of metabolism, it is by no means clear that the energy of growth required to produce a number of male elements equal in volume to an egg is any greater in the one case than in the other. It may be said that there must necessarily be more cell divisions or karyokineses in the case of a given volume of male elements than in the female, but this goes for nothing in that it cannot be shown that the metabolism or energy expended in building up and segmenting the one is any greater reckoning the additional and usual formation of an egg membrane in the egg (which is wanting in the other element), than in building up the large mass of plasma in the ovum. But in some eggs there is no egg membrane. Even then the process of spermatogenesis is not strictly to be compared with a disruptive metabolism or katabolism; on the contrary, as an end product of cytoplasmic activity, the male cell is in the main the highest achievement of constructive metabolism as represented in its preponderant nucleoplasm. The lowest forms of life have apparently a greater capacity for the development of nucleoplasm or chromatin-like substance, than the cells of higher animals, but even there, as in higher forms, there is the best evidence that the cytoplasm is the real agent in the production of the nucleoplasm; the latter grows, as we know, at the expense of the former.

* "The Evolution of Sex," New York, 1890.

The processes of metabolism, it is true, are carried a stage further in the production of flagellate germs and male elements than in the female, but it is not towards a lower plane of molecular structure, but towards a higher one than in the female germ. It may be said that metabolism is controlled by the nucleoplasm or chromatin, in that the volume of the one increases with the volume of the other as in a growing Amœba. An insufficiency of nucleoplasm would render a cell inert and incapable of coördinating its large cytoplasmic field, as experiment seems to demonstrate. The continuous processes of growth therefore ending in the expulsion of the polar bodies bring about such a stage of cytoplasmic inertia, in which the process of fertilization and the concomitant access of a highly complex and anabolic male element would restore the balance between the cytoplasm and the nucleoplasm. The "katabolic tendency" of the male element is more apparent than real; it has a greater capacity for katabolic change than the female as measured by the relative volume of its nucleoplasm, but absolutely it has far less because of its small size as compared with the whole ovum. The question of the genesis of sex is not to be disposed of in quite so simple a way as is done by Geddes and Thomson, or in a sentence. These authors have missed the essence of the matter in that they have not noted the essential distinction which exists between the egg and the spermatazoön, nor the transcendant importance of the process of cumulative integration. The cytoplasm preponderates in the one, while the nucleoplasm preponderates in the other. No reason for this has been assigned by these authors. Is not the evolution of a larger amount of nucleoplasm than is contained in the egg, as must happen were it to break up into spermatozoa expressive rather of preponderant anabolism than of preponderant katabolism? Is also the greater mobility of the male element an expression of a specially katabolic tendency? Is not its mobility due to an inherited tendency in part, derived from its most remote flagellate ancestor, and partly to its small size, form, mode of genesis and molecular structure?

The contrast between the modes of production of the male and female elements in *Ostrea edulis* is typical. The difference appears to lie *solely* in the fact that, in the case of the egg, the *whole* of the overgrown spermatogonium is expelled, but is not a mature ovum until after the expulsion of the polar bodies; in the expulsion of the male elements only a *part* of the spermatogonium is expelled, this process being accompanied beforehand by the elaboration of an excessive amount of chromatin by the mother nucleus of the spermatogonium, this chromatin serving to form, in the main, the nuclei of the multitudes of spermatozoa so set free. In that the chromatin used in the development of spermatozoa is formed at the expense of the cell body of the spermatogonium, there is an almost exact equivalence in the plasma that remains as the cell body of the ovum, so far as the metabolism expended in its production is concerned. The essential difference seems to me to lie not so much in any supposed diatheses which are more or less anabolic as in a difference in the functional properties of the plasma of egg and sperm, developed as a consequence of the physiological division of labor in the cell between cytoplasm and chromatin. The former is the immediate agent of intussusception, the latter controls and coördinates the processes of the former. The one is produced in a confined place tending to repress segmentational activity or nearer abundant supplies of nutriment. The other is produced in open cavities which admit of the free escape of sex products, or in regions, or at times when the determination of pabulum is less abundant than in the case of ova. Looking over the arrangement of the reproductive organs and their relation and proximity to the nutritive system, in many forms these views will be found to have much evidence in their favor. Nevertheless there is no evidence in favor of the one process being more katabolic than the other. They are equivalent, only that in the ovum there is a repressed segmentational tendency, in the spermatogonium an unrepressed one. The tendencies are towards the male or primitive monadiform condition in both, only that secondary physiological influences are repressive in the female and irrepressive in the case of the male element. Segmentation into spermatozoa is hindered in the egg, favored in the case of the spermatogonium. Yet despite this there is not the slightest evidence that the results in the two cases are not equivalent so far as the expenditure of energy is concerned.

The real difference in the result lies in this, that in the female element there is an enormous cytoplasmic field in which simultaneous and successive nuclear movement can take place leading to the realization of a coherent process of development instead of an incoherent one such as occurs in the breaking down of the spermatogonium into spermatozoa. The process in the one case is cohesive, in the other disruptive and self-destructive. The tendency then in the female is towards morphological integration, in the male towards morphological disintegration, but upon the common basis of the spermatogonium.

The real gain of this is not in the absolute bulk of the embryo simply, but in that such an embryo may become self-mobile and self-helpful in spite of its size. Herein lies the true significance of sex and of the cumulative process initiated through the repression of the primitive segmentational tendency of the spermatogonium. An embryo thus developed can go through an entire and elaborate cycle of embryonic development without requiring to take food at all and attain to a self-helpful, self-mobile condition.

It is therefore obvious that in such a process of repression of segmentation of the spermatogonium there has been a distinct advantage gained in the struggle for existence, in that such a spermatogonium could directly become the means by which a rapid or saltatory process of evolution could be accomplished, resulting in the evolution of larval forms. From such a stepping-stone the hypertrophied spermatogonium—ovum—other advances were possible, especially in the direction of variation, since such rapid simultaneous and successive segmentations would provide the most extensive possibilities for variation. This must be true upon the simple ground of the theory of permutations, since every cell added to the aggregate of a segmenting germ must increase its capacity to vary. This gives not simply a capacity to vary as if variation were fortuitous, but as a consequence a capacity of adaptation which is proportionately and demonstrably greater during their earlier stages, a circumstance again in conformity with the fact that all living metazoan types have diverged directly from the ovum, as is proved by their ontogeny.

The reproductive cells, as stated in a previous paper by the writer,* are functionless, so far as being of any service to the parent body producing them is concerned. The only function they have in relation to the parent body, is to lead a pseudo-parasitic existence at the expense of the surplus nutriment elaborated by the parent organism; but these pseudo-parasitic generative cells are themselves the products of the continuation of the processes of cellular growth and fission of the parent plasma.

Being functionless, the reproductive cells of both sexes also tend to revert to the most primitive form of reproduction, namely, to break down into spores, as illustrated by the bodily fragmentation of the majority of lower forms into spores, or the multiplication of the nuclei of some of these forms at the expense of their cytoplasm.

In the male this reversion and breaking down into spores is most complete in the evolution of a spermatogonium, in the female it is incomplete in that the reproductive cells are in some way prevented from breaking down either by excess of nutriment or proximity to nutriment under enclosed or encysted conditions, which tends to be overcome at about the time the eggs are set free or after that time, as expressed in the expulsion of the polar bodies. The female individual may therefore be regarded in the light of a male organism in which the excessive tendency to sporulation has been repressed or retarded. The female state of all higher forms may be regarded as a suppressed or retarded male condition.

This repression of the male condition within the parent body leads however to a process of cumulative growth in the ovary or female gonad which expresses itself as the continued increase of the volume of the spermatogonium, leading to the evolution of a large amount of cytoplasm. After detachment of the hypertrophied spermatogonium, as an ovum, the source of supply in the form of nutriment is cut off, and whatever karyokinesis now goes on must proceed at the cost of a small amount of nucleoplasm, which soon exhausts itself so far as any exhibition of the energy of growth is concerned in the production of the polar bodies. After the expulsion of the polar bodies the egg is probably able merely to so adjust its internal forces so as to prevent the ovum from disintegrating.

In this condition the egg is incapable of further growth and in that the spermatic body from a fully developed spermatogonium, developed in the male is alone capable of reinforcing the exhausted female nucleus, so as to let loose the potential energy, for the time being, stably locked up in

* "Origin and Meaning of Sex," *Amer. Nat.*, 1889, pp. 501–508.

the cytoplasm or cytoplasm and yolk of the hypertrophied female spermatogonium or ovum, it must have access to the latter.

The egg before the expulsion of the polar bodies is a spermatogonium, after that and exclusive of the polar bodies it is the exact homologue of the spermatozoön in that its nucleoplasm is now reduced to the volume of the nucleoplasm of the male element of the same species.

The male spore is however so specialized as an organism in nearly all forms that it is incapable of nourishing itself. Clearly, the only way it can do so is to find lodgment in a body whose molecular constitution is as nearly as possible similar to itself, otherwise its identity must perish in that it would either be digested or in some way absorbed, neither of which fates befall it in the egg, as we know from observation. That body in which it can find lodgment is the female spore or germ of its own species, in which it is not only not digested but is taken in as a partner literally, since it completely fuses with the female centre of control hitherto coördinating and maintaining the integrity of the cytoplasm.

But as soon as this fusion of the starved spore—male element—and the overgrown female element happens, the further changes which now take place must proceed in the presence of the stimulus of abundant nutriment (represented by the cytoplasm of the egg) for the male; but this is not all, the egg is now detached and cannot be nourished for a time, and its career of development is now also profoundly influenced by such all important new conditions as the surrounding oxygen affords for renewed metabolism, under the new free condition, all of which taken together makes for a tendency towards a new mode segmentation which tends to recapitulate the growth of the parent form.

The process of fertilization is probably more like one in which there is a reciprocal blending of two living bodies in which there is no loss of identity of either in that their essential molecular constitution is exceedingly similar. Reciprocal digestion does not occur since the organization of both germs would be sacrificed if such a process were to occur. So far from that the organization of both germs is in a sense maintained, and we have in the blending of male and female elements the paradox of two cells becoming one without the sacrifice of organization in either during the process of fusion. It is therefore manifest that the application of the term mutual or reciprocal digestion as attempted by Rolph and maintained by Geddes is wide of the mark and not descriptive of the process at all. "Fertilization" is really the highest and most specialized form of molecular integration, and is itself the highest phase, and a consequence of the universal principle of cumulative integration, which underlies all continuous growth which in turn must end, on account of the requirements demanded by the surroundings, in discontinuous growth, the production of unlike germs by the same species, and consequently in sexuality.*

* The theory of the polar bodies developed in this paper remains to be put to the test. I find that the nuclei of the spermatozoa of *Ostrea edulis* take up the methyl green while the nuclei of the spermatogonia take up the saffranin from a solution of those two dyes

The causes of the "setting aside" of the "germ-plasma have acted directly and in an adaptive manner." "Nature is no spendthrift but takes the shortest way to her ends." Weismann assumes that the reproductive cells are "set aside" as the consequence of the action of the principle of the physiological division of labor. The cause of the physiological division of labor he attributes to the "action" of "natural selection." Is this true?

Taking one of the lowest forms of reproductive activity as illustrated in *Volvox* we find that the germ-cells are not yet constantly or definitely localized except that we may say that they arise in the posterior hemisphere of the colony. Examining *Volvox* from the standpoint which recent knowledge has afforded, it is clear that the anterior pole is differentiated to a degree not attained by the posterior pole. This differentiation clearly stands in a definite relation to the greater action of the light on the anterior pole from the germinal condition onwards through life. It also stands in a definite relation to the differentiation of the anterior pole as the directive and phototaxic one in the course of the execution of the motions of the whole organism rotating on a definite axis.

Furthermore, the organism when at rest, as it frequently is at the surface of the water, has the upper pole turned towards the light, and under these circumstances is it not to be supposed that the lower pole, which is the heavier on account of the presence of the large germs, would gravitate into its inferior position? I do not see how such an admission is to be avoided. If this is so the tendency once begun would tend to be intensified, since those peripheral cells which began to be receptive to the surplus nutriment elaborated by the whole organism would tend to maintain that tendency and the heavier they grew the more constantly they would tend to turn the anterior pole, where the largest "eye spots" are found upward towards the light. This would give the light an opportunity to maintain the specialization of the anterior pole as the photophilous one, and thus intensify its phototaxic tendencies.

The anterior pole would then be most active in its reactions to light, the posterior one least so as is actually the case. The evolution of the physiological differentiation of *Volvox* can therefore be directly traced to the action of the principle of overgrowth or overnutrition reacting under the influence of gravity upon the equilibrium of the colony so to adjust it that the colony will be uniformly acted upon generation after generation in the same way upon the upper pole. This would be an all-sufficient cause of the physiological differentiation or the real cause of the physiological

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mixed together. Balbiani has obtained somewhat similar results with the testes of Elasmobranchs and Mammals, using picrocarmine and methyl green. If the polar cells are abortive male elements they should have a greater affinity for methyl green than the female pronucleus. If such results were secured my hypothesis would obtain micro-chemical verification. Indeed, I am inclined to think that the fact which I have observed, that the one pole of the dumb-bell-shaped chromatin mass in the nucleus of the immature egg of *Ostrea* stains with methyl green, while the other pole stains with saffranin is distinctly in favor of my interpretation.

division of labor observed. This process of morphological specialization in *Volvox* is therefore not necessarily due to natural selection alone.

There are still other reasons why the physiological specializations in *Volvox* have proceeded along the lines they have. It may be asked why the germ-cells tend to bulge inwards as they enlarge into the jelly which fills the cavity of the colonial sphere. Why do they not bulge outwards?

To this it may be replied that light, oxygen and food react from the exterior of the colony. The mobile protoplasm through which supplies of nutriment come, must be most exterior. The katabolic running down of the accumulated nutriment matters into less mobile coarse granules which need and consume less oxygen, requires that these materials shall be pushed inwards where they will not obstruct respiration.

In this way, upon the ground of physiological anatomy and the reaction of the incident surrounding forces, the process of the "setting aside of the germ-plasma" in *Volvox* can be fully accounted for without appealing for an instant to natural selection. There is clearly nothing further needed.

It might be said that "natural selection" would favor only those individuals which did not have the germ-cells bulging outwards, because they could not so conveniently rotate or move forwards. Yes, but *Volvox* does not, in the first place, continuously rotate. In the next place, even if "natural selection" did work the wonders claimed for it, it is clear that the explanation here suggested is one which involves no waste of the forces of growth or of individuals, but is operative in virtue of the continuity of the processes of growth, besides it meets the requirements equally well with the hypothesis of natural selection.

The natural selectionist will next appeal to the morphology of *Volvox* in some other direction and ask, How was the hollow sphere evolved? This, in its turn, is clearly and purely adaptive. The growth of the original colonies, which were doubtless evolved from such as broke down into planogametes, grew directly into larger multicellular aggregates which would directly arrange their cells so as to derive the greatest advantage from the surroundings and in attaining that adjustment, the globular form was assumed, in that it offered the maximum opportunity for oxygen, food, etc., in the form of a hollow sphere with the gametes joined by protoplasmic bonds. The selection of the pattern of the form of the whole organism is thus traced to internal forces acting in direct response to outer conditions and not as the result of a murderous process of "selection" and "survival of the fittest." *

But this is not all, if the argument applied to the driving inward of the

*The method of segmentation itself must be regarded as a necessary adjustment of the cleavage planes in such wise, as to divide the large globular ovi-cells into approximately equal parts continuously. An adjustment of this sort effects the equal reduction of all the cells resulting from segmentation, and keeps them below a dimension or mass which outruns the surface to an extreme degree, since according to the Leuckart-Spencer principle beyond a dimension of six, mass begins to rapidly exceed surface and bring about conditions unfavorable for respiration and metabolism.

accumulated products of assimilation in order to avoid the peripheral obstruction of respiration the same argument can be applied to the localization of the germinal matter at the posterior pole. Suppose an ancestral Volvocine form still in a condition when it had not yet began to permanently cohere into a spherical colony. Suppose further; that when its maximum dimensions of growth had been nearly attained all its cells were so nearly alike that the differences would be extremely slight between them. But suppose them to be even very slightly different enough in size to respond to an equilibration of the colony by gravity at the surface of a still pool on a quiet sunny day. The upper cells would undoubtedly be stimulated into a slightly greater assimilative activity than the lower ones away from the light and shaded by the upper ones. The assimilated materials would not only be repelled towards the lower pole by this activity of the protoplasm of the upper pole, but would actually gravitate towards that pole. We thus see that, analyze the physiological data in whatever manner we please, there finally remains no warrant for the hypothesis that the germ-plasma is set aside in special cells for the express object of maintaining the continuity of the processes of reproduction. This apparent setting aside of germinal matter is itself the consequence of the necessary mode of the correlated action of physical agencies, ending in cumulative integration through continuous growth, and is clearly not the result of any elaborate selective process.

The running down katabolically of some of the assimilated or stored germinal matter is proof of its loss of function and uselessness to the parent organism except in so far as such cells are a repository for such materials. There is therefore no conclusion open to us but that one which assumes that the motive force of all these elaborate correlations in such a simple multicellular organism * are the results of the indirect action under cosmical conditions, of the principle that living matter tends to increase in bulk beyond the actual physiological requirements of its secular existence.

Summary of Conclusions.

1. Cumulative integration or assimilation beyond the current needs of the parent organism seems to have arisen as a consequence of the physical properties of "living" matter, as manifested in metabolism or the characteristic continuous disintegration and integration of such matter. It is a property of "living" matter which is a consequence of its molecular constitution; if so, "living" and the continuity of molecular change through metabolism is a physical process, differing only from ordinary chemical processes in its complexity, continuity and capability of self-maintenance under certain conditions; its most important consequence is continuous growth.

* The researches of Overton and myself have proved beyond doubt that Volvox is not a protozoön or protophyte as erroneously supposed by Lankester and Bütschli.

2. The law pointed out by Leuckart and Spencer that beyond the sixth dimension above unity mass outruns surface, may be regarded as in some way operative in hindering the growth of cells, through cumulative integration, beyond certain dimensions, in order that they may carry on respiration, nutrition, in a word, metabolism, most efficiently, under ordinary cosmical conditions. The average of cellular dimensions varies in different forms. So does the molecular constitution of living matter, giving rise to idioplasms.

3. The continuity of growth is maintained through cumulative integration, the continuous reduction in mass of "living" matter is effected through segmentation in some self-regulated way, presumably according to the Leuckart-Spencer principle.

4. The growth of the lowest forms of living beings is effected in the main or ends principally in the production of a single kind of living matter. In higher forms, in which the cells are also generally much larger, two kinds of living matter are developed in very unequal proportions. In the first case when division occurs, due to growth, there is little or no reaction between the two kinds of living cellular substance and division is direct or without karyokinesis. In the second case there is a reaction between the two kinds of living matter which is expressed most strongly as karyokinesis, or nuclear motion on the one hand and the development of fibres on the other radiating from or converging upon the nucleus.

5. The effect of cumulative growth of the cell-mass has been to finally produce a preponderating quantity of plasma which invests the primitive nuclear plasma or chromatin with a thick envelope; this envelope is known as the cell-body or cytoplasm, and also provides a *field* or space in which the action and reaction of the two kinds of living matter found in the cells of higher forms may display itself as karyokinesis. The plasmic space in which this occurs may be called a *cytoplasmic field*.

6. The action and reaction between the two kinds of plasma controls the order and direction in which the phenomena of growth take place, but in conformity to certain dimensions and earlier relations of the cytoplasmic field to its sources of nourishment.

7. The effect of the forces at work in cumulative integration is to augment mass, the effect of the action of segmentation so as to effect a readjustment according to the Leuckart-Spencer principle, is to bring about discontinuity of growth or reproduction through fission.

8. The asexual method of reproduction seems to have been purely a consequence of the operation of forces under the laws of cumulative integration and the law of Leuckart and Spencer, under varying conditions, and to have led to a continuously repeated division of living matter, as fast as it was formed into small masses, through direct processes of fission, composed at first almost wholly of nucleoplasm or chromatin.

9. As cytoplasm began to be developed more abundantly there seems to have been developed a tendency for the products of segmentation to cohere. We may therefore distinguish very sharply these two kinds of segmentation as *disruptive* and *coherent.* But the greater development of cytoplasm was itself a consequence of cumulative integration, which proceeded so fast that its products could not be converted into nucleoplasm or chromatin with sufficient rapidity so as to be in a condition to fall apart as small cells as a consequence of the action of the direct process of fission. The evidence for this is the fact that the nucleoplasm or chromatin, in higher forms, is derived by constructive metabolism from cytoplasm and is the end-product of the latter.

10. The secondary evolution of a cytoplasmic field led to a process of divergent evolution or in the production of two kinds of cells, the most primitive or ancestral of which was poorly provided with cytoplasm, while the secondary form was provided with a thick cytoplasmic envelope.

11. The primitive minute form of cell is to be identified as the asexual one, which afterwards became "male," while the large overgrown type of cell, loaded with cytoplasm and its secondary products, is to be identified as "female" or as a cell on the way towards disruption into male cells, which tendency it still betrays in the process of extrusion of polar bodies. The arrest of this process of fragmentation in the case of such large cells loaded with cytoplasm, led to the evolution of the ovum from the spermatogonium or such a cell as was primarily destined to produce male cells as a result of its further fission.

12. The male state is therefore the primitive one, and in the prodigious fertility of the male represents the primordial, asexual, flagellate types. The female cell is a secondary and derived form developed after a cytoplasmic field has been evolved and after cell-aggregates began to become coherent.

13. This differentiation was primarily due to cumulative integration, or assimilation beyond the current needs of the organism ; the female cells to which this overgrowth was diverted have tended to grow far beyond the average dimensions of the other cells of the body of the parent, and this excessive size is proof that they have in some way lost the power to undergo spontaneous segmentation, except in the case of parthenogenesis. Cumulative integration is consequently responsible for the evolution of the asexual, sexual and parthenogenetic modes of reproduction.

14. Ovarian egg and spermatozoön are not homologous ; ova after extrusion of polar bodies are the homologues of spermatozoa. Ovarian ova and spermatogonia are, in many cases, exactly homologous.

15. The expulsion of the polar bodies and detachment of the egg from the parent exhaust its power of continued spontaneous growth except in case of parthenogenesis.

16. The male cell as a consequence of the reduction of its cytoplasmic field at last became incapable of further independent development.

17. The male and female elements became reciprocally attractive to one another (sometimes through the production of certain chemical substances in the vicinity, Pfeffer), and in that their idioplasm is less different from one another than that of other cells there is no bar to their fusion, which is also favored by the fact that in the male cell with its preponderant chromatin there is now an attraction or need developed for more cytoplasm similar to its own diminished quantity, while conversely there is a similar need or attraction developed in the egg for additional chromatin in consequence of its preponderating cytoplasm. This leads to the highest form of cumulative integration through direct fusion of the male and female elements, or what I shall call reciprocal integration without loss of molecular identity, or as it is commonly called, to "fertilization." "Fertilization" is a reciprocal restoration of the equilibrium between the chromatin or nucleoplasm and the cytoplasm of both ovum and spermatozoön, this takes place not with accompanying molecular disintegration but by the actual fusion of both elements without the sacrifice of the molecular identity of either. Mutual digestion is not possible, for both elements are already composed of similar molecules. This molecular similarity constitutes the means through which the hereditary traits and tendencies of the male and female are transmitted.

18. The accumulation of cytoplasm in the egg through cumulative integration has enlarged its cytoplasmic field beyond that of any cell of the parent body. The result is that when "fertilization" occurs or fusion with the male cell, a series of segmentations are set up in this mass which are independent, and under the influence of new conditions, lead to the continuation of growth as the development of an embryo. This development is rendered directly possible only in virtue of the fact that there is a large cytoplasmic field in which nuclear motion and growth can take place in three dimensions temporarily without access of nutriment, while the resulting segmentations are coherent and tend to take place in such order and relation as to produce a being similar to the parent. The aggregation of large masses of segmentable plasma through the operation of cumulative and reciprocal integration has enabled the products of such simultaneous and successive segmentations to cohere and remain a multicellular aggregate, and to lay the foundation and become the direct cause of all metazoan and metaphytic organization.

19. The augmentation of the mass of the egg through cumulative integration and the development of the oösperm through reciprocal integration, has rendered possible the development of embryos without need of other nutriment during the preliminary or larval stages of ontogeny, thus leading also to the evolution of all larval forms, through processes of direct adaptation.

20. The achievement of the multicellular condition is probably to be

traced to the secondary evolution of a cytoplasmic field, sexuality also having so arisen at about the same time. The multicellular or coherent condition produced new and more complex morphological relations leading to the manifold differentiation of physiological functions in relation to diversification of surroundings, thus introducing a new and powerful cause or capacity for variations and adaptations under such diverse conditions. It is in the highest degree probable that the evolution of a cytoplasmic field and of sexuality, which depends upon the former, first rendered variability possible.

21. Cumulative integration in the vegetable led to the process of cumulative integration in the animal world and to the overproduction of germs or young in both of these kingdoms of life. The rate of increase thus became augmented in a geometrical ratio, as supposed upon the Darwinian hypothesis, which on the basis of the theory of the struggle for existence and the process of natural selection so evoked, accounts for the preservation through survival and inheritance of valuable or advantageous variations which first arose as supposed above. Cumulative integration is regarded as the primary cause of morphological differentiation under the stress of diverse conditions, as well as of the geometrical ratio of increase of individuals and consequently of the struggle for existence. The effects of the struggle for existence have however been modified through the already attained morphological differentiation of many forms in that the nature of further possible modifications have been in some cases very clearly determined by the character of those which have immediately preceded the last modification. This principle of cumulative adjustment through which superposition of adaptations occurs, is the law of cumulative morphological differentiation.

22. The only cells in multicellular forms which are absolutely otherwise functionless are the germ-cells. They alone, therefore, can become the vehicles for the transmission of all the traits of the parent in higher forms. They are the only cells of the body which, by any stretch of the imagination, can be supposed to possess the recapitulative power manifested in ontogeny.

23. In that the germinal cells are never belabored with any physiological function in the parent body, except cumulative integration, they are also the only ones which lead the charmed life of a perpetual youth. Upon this peculiarity of germ-cells depends rejuvenescence through reproduction, and the maintenance of the maximum vigor of the species.

24. In that maximum vigor of growth concentrated upon apical or nearly acropetal cells in plants determines their sex, and in that this seems to hold in great measure in Algæ and Fungi, and in that the gradually deeper inclusion of germ-cells and germ-tracts in animals is clearly a consequence partly of further morphological development, as well as of the effect of the repulsion of the functionless germ-cells into positions where

they are out of the way of interference with the exercise of the functions of the rest of the cells of the body, we have some clews to the reason why germ-cells are "set aside," not as the consequence of a *foreseen* (by the organism or natural selection) necessity for their isolation, *a la Weismann*, but as a consequence of the continuous action of cumulative integration ending in continuous growth, sexuality, morphological and physiological differentiation under the stress of surrounding conditions to which adaptive responses must as continuously be made.

25. With the evolution of the multicellular condition and sexuality, through cumulative integration, sexual correlations and interdependences between plants, insects and air-currents were evolved, as supposed in the text, while in animals sexual passion was evolved in the progress of sexual evolution. These factors became the motive forces which sustained the process of reciprocal integration or fertilization at its maximum of efficiency, and thus provided for the continuous rejuvenescence of living forms.

26. "Maternal" and "paternal" are relative terms. There was a time when asexual reproduction, through fission without karyokinesis, was effected by forms which were morphologically male. When individuals became developed in which the physiological functions of the individual were so adjusted automatically through a correlation of those functions as to impede the production of chromatin or nucleoplasm, presumably through the too rapid action of cumulative integration, cytoplasm was produced in a preponderating measure, the spermatogonia were hypertrophied and discharged before complete maturation as ova. In this way femaleness arose, and as "sex" thus became reflected in the physiological tendencies of the individuals of a species, some became male and others female. This carried the principle of the physiological division of labor beyond organs and extended it to individuals of the same species. The female, let me repeat, is a repressed male state.

27. In the production of female germs (ova, oöspheres) there occurs a prolonged process of integration of plasma so as to increase the volume of the cell-body, under conditions different from those obtaining in the production of male elements. In the production of male elements (spermatozoa, antherozoids), on the contrary, an actual process of elimination of cytoplasm often occurs, so as to reduce the latter to a minimum, and leave little remaining except the nucleus and its chromatin. The modes of production of the male and female elements, therefore, stand in the most extreme contrast to each other. The male state, on account of its prodigious fertility and the flagellate type of its products, is to be regarded as a reversion to the asexual method of reproduction as respects the physiological methods involved and the morphological character of the elements produced.

28. Reciprocal integration or sexual conjugation, otherwise "fertiliza-

tion," is an asexual method of reproduction superimposed or blended with another in which the last evolved sexual element has been hypertrophied as an ovum. The exhaustion of the central controlling mass of nucleoplasm or chromatin after expulsion of the polar bodies, together with the great size of the egg, has rendered it passive. The recurrence of the minute flagellate condition as "male" has rendered the male element active.

29. Male and female "sexual" products were at first and still continue to be dehisced as useless products of overassimilation or as a consequence of the cumulative action of integration, after further recapitulative growth in the form of new axes or individuals, growing in organic union, as in colonial organisms, became impossible, due to crowding, the culmination of seasonal growth or the morphological specialization leading to definite or constant formal individuality.

30. The "setting aside" of germ plasma must therefore be attributed to the direct action of cumulative integration, and cannot logically be considered as a "device" through which the immortality-isolation of germinal matter was to be achieved as a purpose or end.

31. Continuity of growth as continuously maintained through the physical capacity for living matter to increase its mass, was the primary factor in divergent evolution. The first step which it effected in adaptation was the necessity for segmentation either with or without karyokinesis, according to the law of Leuckart and Spencer. As soon as coherent, successive segmentations became possible, the first stage of which is seen in *Volvox*, the first step of morphological differentiation also conformed directly to the requirements of external conditions in that a blastula form was assumed which gave the maximum of surface in combination with the simplest form of coherence which could be developed through successive and simultaneous coherent processes of cleavage.

32. Sexuality, parthenogenesis, the extrusion of the polar bodies, larval development and the direct divergence of all higher types from the oösperm, are some of the effects of continuous growth as caused by continuous cumulative integration working under diverse conditions and the capacity to make direct adaptive responses.

33. The available evidence tends to show that sex is not predetermined in the egg, but is dependent upon internal conditions and correlations of metabolic activity within an embryo, so that sex may very often be influenced directly by the regulation of the food-supply long after development has begun.

34. The polar bodies are a phylogenetic reminiscence of the asexual or male flagellate state. There is not the slightest evidence to show that they are other than one of the manifold effects of continuous growth impelled to proceed as supposed above. They can certainly not be identified

as a "device" intended to prevent parthenogenesis, as supposed by Balfour, nor is it established that one of them is extruded "ovogenetic" plasma, while the other is *conveniently* extruded to save Weismann's ancestral germ plasma from molecular disintegration!

35. The divergence of type from the oösperm was determined by variations in the surrounding conditions, the effects of which could not be reflected upon the germinal matter set aside through the continuous action of cumulative integration, resulting in continuous growth, except through the action of the concurrent metabolism so affected. Metabolism under diverse conditions was therefore the only source through which the idioplasms of species could be developed, through which the continuity of the phenomena of inheritance is maintained.

36. The principle of continuous growth through cumulative integration, its rhythmical interruption through the "setting aside" and dehiscence of the useless sexual elements, the evolution of a cytoplasmic field, the direct adaptation to their surroundings of colonial aggregates of cells resulting from the coherent segmentation of masses of plasma resulting from reciprocal integration, the necessarily cumulative superimposition of adaptations upon one another, have been, in the main, the materials upon which natural selection was dependent in order to become operative in biological evolution.

37. The view that the female is preponderatingly "anabolic" and the male "katabolic," as held by Geddes and Thomson, cannot be sustained on the basis fact, since it is readily demonstrated that the male element represents a higher product of constructive metabolism than the female.

38. The most important result of the evolution of sexuality is the physiological process of nuclear substitution through reciprocal integration or "fertilization," thus blending and superposing matter and energy from two sources and causing the latter to be potentially stored. Hunger has brought about the material overflow, the divergence of the sexual elements from a common basis has ended in the production of countless adaptive modifications and the evolution of "species," while the accessory devices favorable to conjugation which have been slowly and adaptively evolved have led to a gradually intensified expression of passion and love, which have become important motive forces in the drama of evolution at large.


HIS EXCELLENCY B. FRANKLIN L.L.D. F.R.S. PRESIDENT OF PENNSYLVANIA, & LATE MINISTER OF THE UNITED STATES OF AMERICA AT THE COURT OF FRANCE.

THE AMERICAN PHILOSOPHICAL SOCIETY

Founded May 25, 1743
Incorporated March 15, 1780
First Occupation of Hall November 21, 1789

Proceedings

commemorative of the

CENTENNIAL ANNIVERSARY

of the

Death of Benjamin Franklin

April 17, 1890

Committee of Arrangements

Charles A Oliver *Chairman*

Henry Phillips Jr — William John Potts

Arthur Biddle — William H Greene

7, 1890, Dr. Oliver reported the following preamble and resolutions, which were adopted, and the same committee continued and requested to make all the arrangements necessary to carry out the same:

The Committee to which was referred the following preamble and resolution: "Deeming it both honorable and just that we, the present representatives of the American Philosophical Society, should show our affection and regard for our illustrious Founder and First President, Dr. Benjamin Franklin, who died on the 17th day of April, 1790, be it resolved that we commemorate his life, his wisdom, his labors and his achievements by proper and fitting ceremonies becoming such an occasion, on the 17th day of April, 1890; the form of the commemoration to be referred to a special committee of five members, who shall be empowered to take all necessary action," presented by Dr. Oliver at the meeting of the Society on the 17th of January, 1890, begs respectfully to submit the following report:

Resolved, That we commemorate in a becoming manner the approaching Centennial Anniversary of the death of Benjamin Franklin.

Resolved, That a series of short addresses upon his life, character and work be delivered before the Society upon this occasion.

On the 17th day of April, 1890, at 8 P.M., the Society and its invited guests assembled at Association Hall, in the city of Philadelphia, and Mr. Talcott Williams, introducing the speakers, made the following remarks:

Mr. President and Associates of the American Philosophical Society, Ladies and Gentlemen, and last, but most honored of all on this occasion, the descendants of Dr. Franklin: Few words of mine are needed to explain the occasion of our meeting or to refer to the men who are to address you. None are necessary to recall him or the memory of his death. We assemble not to widen his fame—an impossible task—but to deepen and display our loyalty to our founder and first head. This anniversary itself falls in a week thick sown with memory. It was but two days since that there was commemorated in this city, the anniversary which rounded out twenty-five years since the death of the first American of this century.* To-night we meet in recognition of one hundred years which have elapsed since the death of the first American of any century.

For us all the death of Lincoln still brings senses of loss for a leader taken away with his work unfulfilled, his mission unaccomplished. For none in the generation which stood by the open grave in which were buried the hopes of one section and the sorrow of both, can "the lilacs bloom with blossom of mastering odor" without thought that "the sweetest, wisest soul of all our days and lands" passed away when the task of retribution was over, and before the office of reconciliation began. To-night, as a century ago, the death of Franklin can only remind men that he left no task unaccomplished and no aim unfulfilled. In the supreme prosperity of his life nothing became him like its leaving. *Felix opportunitate mortis*, not like the Roman of old, in death escaping evil to come, but leaving countless and completed good behind. Death, for other men, lays the corner-stone of that fabric of appreciation and honor which posterity erects. For Franklin the hands of death set in place the cap-stone of the great structure which noble deeds had raised in honor, whose fame we cherish and whose shadow the descending years of a century still lengthen and prolong.

It is not our task to-night to magnify his deeds or add to his praises. In the presence of a career like his, eulogy is an impertinence and praise presumption.

* The Twenty-fifth Anniversary of Abraham Lincoln's death was celebrated in Philadelphia by the delivery by Walt Whitman of his address on the subject, April 15, 1890.

We assemble but to ratify and record the final judgment of a century. One hundred years ago, when this Society called upon one of its members to commemorate his life among them and his labors for man, it was possible to ask of a single speaker* to express the world's estimate of Benjamin Franklin. To-night that great monument of his achievements which death completed when no man's effort could add aught to it, has cast so broad a shadow across one hundred years, that no one, however able, can compass its breadth within the circumference of his intellectual horizon. Along whichever of the many paths that Franklin traveled to greatness, lesser men may wearily plod to-day, each is still aware, however high he may ascend, that his experience is too narrow and his vision too short to know and survey all the field of Franklin's achievements in the past or their fruits in the present. One hundred years ago, we heard one speaker; to-night we listen to five. For this occasion this Society has summoned here the biographer of Franklin; it has called upon the historian of the land in which he served his country abroad; upon the man of science; upon one both the man of science and letters, and lastly, to represent the civic and associated acclivities in which Franklin was engaged, upon the President of this Society. From this jury, thus constituted, presenting the garner of all the manifold fields which Franklin sowed to rich fame for himself and richer harvest for others, we hear summed up to-night the verdict of the century. This finding, which but ratifies the earlier presentment made by that greater jury which includes the civilized world,

* After the death of Franklin, Dr. William Smith was appointed by the American Philosophical Society to pronounce a eulogy upon the founder.

will have its full and ultimate record in the volume which this Society will transmit to learned societies through the world. It will give the acts and the character which have placed Franklin alone in all history as the one man who inspired the enthusiasm of France and satisfied the sober judgment of the English-speaking race—the solitary and unique figure in our history or in any history whose work and fame and name is alike honored, cherished and loved by the two opposing streams whose conflict is the history of twenty human centuries—the Latin and the Teuton.

Many biographers have emulated the record in which Franklin, all too briefly, told the story of his early life. We have to-night with us the only one of these biographers who has set in life and light those dreary past Revolutionary years, when as in those now passing and passed the high tide of war had ebbed and uncovered endless corruption when, as to-day, the State must be served and saved, if served and saved at all, while the clash of party and the din of faction drowned the nobler voice of principle. In describing that period when the hands of Franklin guided to its last, its final, its eternal abiding place the corner-stone of constitutional liberty, and all the morning stars of heaven sang together with joy as the pillars of organic law arose above the foundations of freedom, our historian has described the character and achievements of Franklin in a passage which will be cherished and remembered with the like utterances of Jeffrey and of Mackintosh; of Brougham and of Brancroft. He resumes to-night the task which he there began. I need not introduce, I need only present to you, the youngest and most widely read of American historians, John Bach McMaster, who will give you

A Short Biography of Benjamin Franklin.

Benjamin Franklin began his career, at Boston, as the youngest son in a family of seventeen children. The day of his birth was January 6, 1706. But, long before he died, the Gregorian calendar came into use in the English colonies and changed the date of his birth to January 17. As the boy grew up his parents attempted to determine his career. His mother was anxious to see him a minister. The boy was resolved to go to sea. The father tried hard to make him a tradesman, took him round among the carpenters and bricklayers, the joiners and the tanners to see which trade he liked the best and ended by binding him over to an elder brother to learn the trade of a printer. The apprenticeship did not long endure. The two made up an ill-mated pair. From disagreements they passed to insults. Insults led to quarrels. Quarrels to blows, and with blows they parted. The one to drag out an humble existence. The other to become the most illustrious American of his day.

Unable to find any work in Boston, Benjamin took packet for New York. Faring no better there, he crossed the bay to Perth Amboy, made the journey from Amboy to Burlington on foot, and, early one Sunday morning in October, 1723, reached this city. Here he found work and, in time, fell in with William Keith who governed Pennsylvania for the children of Penn.

Keith sent him to Boston to urge his father to buy him a press and some type. The father refused, and Keith sent him on a yet more foolish errand to London. When he set sail he believed he was to have letters of introduction and letters of credit, that he was to buy types, paper and a press and come back to America a master printer. When he reached London he found Keith a knave and himself a dupe.

His life at London forms the crisis of his career. None of the wise maxims of "Poor Richard," none of the prudence displayed in his "Advice to a Young Tradesman," none of the just principles set forth in after years in his moral essays then served to guide him. He wasted his substance. He kept bad company. He misused money entrusted to his care. He wandered from printing house to printing house, thought for one while of setting up a swimming school and for another while of wandering over Europe on foot. From this life he was turned by a merchant whose acquaintance he made on the long voyage to London, and who now gave him not advice but a situation. With him Franklin returned to Philadelphia, and at twenty began to keep books, sell goods and learn the secrets of mercantile affairs. He was indeed fast becoming a merchant when his employer died and he once more went back to the trade of printer.

For a time he was foreman in the shop of Samuel Keimer. But the two soon quarreled and Franklin with the aid of a friend established the "New Printing Office in High Street near the Market." From that hour prosperity never deserted him. At twenty-six he had bought out his partner, paid his debts, married a wife, and opened a shop that defies description. There were to be had imported books and legal blanks, paper and parchment, Dutch quills and Alleppo ink, perfumed soap, Rhode Island cheese, live geese feathers, Pahia tea, coffee, very good stock, and cash for old rags. Before he was forty-two he had founded one of the best newspapers, published the most famous almanac, and owned the best paying printing house in the thirteen colonies, was postmaster-general, and had written pieces which it is safe to say are the only pieces written by Americans in that age and read in ours.

And now this Yankee tallow-chandler's son, having raised himself, by a strict adherence to the maxims of "Poor Richard," from poverty to wealth, from obscurity to power, proceeded to violate one of the most often inculcated. "Shoemaker," says "Poor Richard," "stick to your last." "A rolling stone gathers no moss." "Keep thy shop and thy shop will keep thee." But Franklin now sold his shop, his newspaper, his almanac, and gave his time to the study of science. So well was the time spent that, before he was fifty, he had made discoveries and written papers that made him world-famous, secured for him membership in the Royal Society of London and won for him the Copley medal.

While the whole scientific world were thus doing him honor, he suddenly abandoned his studies, went back to politics and was once more loaded with public duties. His townsmen elected him Assemblyman. The home government appointed him Postmaster-General of the colonies. The Assembly sent him with its Speaker to hold a conference with the Indians at Carlisle; then to the Albany conference where he presented his famous Plan of Union; and then to represent the province in England.

The five years he now passed in England were the closing years of what is commonly known as the French and Indian War, but what might with more fitness be called the struggle for expansion. On his return to Philadelphia, in 1761, he seems for a time to have thought of quitting politics, living at his ease, building a fine house, studying electricity and writing a book on the "Art of Virtue." But the conspiracy of Pontiac, the massacre of the Conestoga Indians by the men of Donegal and Paxtang, and the bitter pamphlet war that followed drew him again into politics. Once more he entered the Assembly, became the leader of the Antiproprietary party, and, having lost his seat in the bitter contest that followed, was a second time sent to represent the colony at London. His business was to present a petition to the king asking that Pennsylvania be taken from the Penns and made a royal colony. But he had not been there many weeks when the Stamp Act passed, the contest for independence began, and, in the exciting times that followed, the petition went unheeded.

Having little to do, Franklin now passed his time in writing pieces on American affairs for the English newspapers, and in defending in many ways the cause of the colonies. It was during these years that he republished a London edition of the "Farmer's Letters," that he brought out "The Votes and Proceedings of the Freeholders and other Inhabitants of Boston," that he sent over the "Hutchinson Letters," and underwent the memorable examination before the Privy Council.

For the part he took in the Hutchinson affair he was deprived of his place in the post-office and was soundly abused by the English press. In the midst of this abuse parliament passed the Boston Port Bill, the Massachusetts Bill, the Transportation Bill and the Quebec Act; the first Continental Congress met and the revolution began in earnest. As the news of each act of resistance came over, the position of Franklin became daily more dangerous and unpleasant. For a time his work seemed ended. He shunned the court, went no longer to the houses of the ministers and kept away from the office of Lord Dartmouth. Indeed, he was about to come home when news that Congress was to meet detained him. From that Congress came the Declaration of Rights, and, having presented this to Lord Dartmouth, Franklin set sail for Philadelphia, March 21, 1775, and landed on the 5th of May at home.

He had been abroad ten years and six months. During these ten years many and great changes had taken place. Old friends were gone. New faces met him on every street. The growth of the city, the spirit, the prosperity of the people amazed him. But the greatest of all changes were in his own family. His wife was dead. His daughter was married. His son, a strong loyalist, was estranged by politics. Happily, no time was given him to feel these changes, for he was instantly involved in public affairs.

The day after he landed he was chosen a member of the Continental Congress, took his seat four days later and served for fourteen months, was on eleven committees, was made Postmaster-General, was sent on one mission to Washington at Cambridge and on another to Arnold at Quebec; was dispatched, after the disastrous battle of Long Island, to confer with Lord Howe; and, in September, 1776, was sent out to join Arthur Lee and Silas Deane in France.

There he was received as no other man has ever been received. He became the sensation of the hour. Everything that he said, everything that he did, everything that he wrote was quoted and read all over France. His bust was set up in the royal library. Medallions of him appeared in the palace of the king. His face was to be seen on rings, on bracelets, on the covers of snuff boxes, hats, coats, canes were all "*à la* Franklin." Nor was his diplomatic success less noticeable. He concluded the treaty of alliance with France, the treaty of amity and commerce, negotiated loans for great sums of money, and, in 1783, signed the treaty of peace with Great Britain. In 1785, old and loaded with honors, he came back to Philadelphia. Yet his career was far from ended. The people made him a member of council and the council and assembly made him President of the State, and while President, the people sent him to the convention that framed the

Constitution of the United States. He was now in his eighty-second year and at the height of his fame. Every ship brought him letters from the most renowned men Europe could produce. Not a traveler came to America but he turned aside to see Dr. Franklin. Pamphleteers did him honor in fullsome dedications. Towns were proud to bear his name. No newspapers ever mentioned him without some grateful remark. He was the venerable Dr. Franklin, "our illustrious countryman and friend of man," "the Father of American independence." To his house came regularly the Philosophical Society, the Abolition Society, the Society for Political Education.

Thus surrounded by friends and admirers, the closing years of his life passed quietly away. He died on the 17th of April, 1790. To say that his life is the most interesting, the most uniformly successful yet lived by any American is bold. Yet it is strictly true. Our country has, indeed, produced many men who have gathered greater fortunes; who have been more successful as philanthropists; who have made greater discoveries in physics. But it has produced none who have acquired greatness in so many ways, or have made so lasting an impression on the mass of his countrymen. His face is known all over the world. His writings are to be read in every tongue. His maxims are in every man's mouth. His name is all over the United States bestowed on counties, on towns, on streets, on societies, on corporations. The lightning rod and the papers on electricity give him no mean place among men of science. The Autobiography, "The Way to Wealth," the Bagatelles entitle him to a place among our men of letters. But his success was greatest as a statesman and his name is bound up with many of the most famous documents of our Revolutionary history. Indeed, it is the only one which appears alike at the foot of the Declaration of Independence, at the foot of the treaty of alliance with France, at the foot of the treaty of peace with England and at the foot of the Constitution under which we now live.

In introducing Mr. Frederick Fraley, the President of the American Philosophical Society, Mr. Williams said:

In all the long list of achievements which make the biography of Franklin read like the history of his country, nothing has proved more useful or lasting than the societies and associations which he established. Born in a land whose countrymen have a genius for organization, he had himself supreme aptitude for this work and was equally at home in drafting the Constitution of a fire company or of a Nation. Transmitted to his descendants in one generation after another, the exercise of a like power has given this city institutions of the highest value, the last of which, of the utmost importance to a manufacturing city, owes its origin and success to one of his descendants, whom sex and sex alone debars from membership in our Society.* Of all the societies which Franklin organized, the American Philosophical Society has proved the most conspicuous, the best known in the field of science and, we may modestly believe, the most useful in the service of his and our country. I have the high honor of introducing its President, who will address you upon

* Among other institutions in Philadelphia, the Philadelphia City High School was established, in 1831, by A. D. Bache, LL.D., a grandson of Dr. Franklin, and the Pennsylvania Museum and School of Industrial Art owed its foundation in 1876 and its growth afterwards, principally to the efforts of Mrs. E. D. Gillespie, a great-granddaughter of the philosopher.

Benjamin Franklin's Association with the Society.

It is difficult for me to realize that I stand here to-night as the representative of the American Philosophical Society briefly to present to you Dr. Franklin as the founder of that Society, as the spirit which influenced its life, as the one who crowned its career with the scientific honors of the day in which he lived; the Society that has endeavored to perpetuate his memory by an adherence to the principles which he incorporated in its origin and which have been faithfully, I think, preserved by his successors.

The origin of the American Philosophical Society may be traced to that junto which Franklin established in the city of Philadelphia when he was about twenty-two or twenty-three years of age, for the promotion of useful knowledge. His associates, with himself, prosecuted their studies and their deliberations with such success that it influenced, no doubt, all of their careers, but especially the career of Benjamin Franklin. He never forgot his early introduction to the kingdom of knowledge and he went on year by year with the great idea in his mind and memory that a part of his life-work was to be found in the establishment of a great Society having for its object the promoting of useful knowledge. In the year 1740 he issued his proposals for the formation of such a Society and labored sedulously for its accomplishment, sketching out the objects that it should pursue, the duties that its members should perform, their applications to science and to each other, and, aware that there must be a pilot to steer the ship and a man to keep the log, was not ambitious to be president of the Society, but took upon himself the humble office of its secretary. He performed the duties appertaining to that office with such fidelity and success that it reached a considerable point of influence in its existence. Then the jealousy of the times and the jealousy of Franklin led to the establishment of another Society claiming part of the title of the American Philosophical institution established by Franklin and the attempt to carry on an opposition society to his, with great damage to both, and with the result that about the year 1768, the gentlemen composing those institutions, finding that both could not survive, that there was not room enough in the city of Philadelphia for two institutions of the sort—happily coalesced, and on January 2, 1769, Benjamin Franklin was elected President of the associated institutions and continued to be reëlected for twenty-one years, from 1769 to 1790, without any opposition on the part of any member of the institution.

Our friend, Prof. McMaster, has given you a brief but admirable biography of Franklin's life, telling the story of his birth, of his early education, of his trials, and of his triumphs. In his connection with the American Philosophical Society you will recognize all the traits we have seen so skillfully delineated and which have marked the institution that bears the stamp of his creative genius, which has been influenced throughout its existence by his spirit, and which to-day, as our friend, Mr. McMaster, has told you, has its correspondents throughout the whole of the world of science, has upon its list of members distinguished scientific men of every country, representatives of all the departments of science in cities of the United States, and is preparing still to go on, carrying forward the good work that Franklin founded, that has been so successful in the hands of his successors, and we are hoping that Franklin's shadow will always be within view to guide the destinies of the Society to new honors and to new triumphs.

The minutes of that early Society that he founded in 1742 are still in existence in the beautiful handwriting of the philosopher, and its pages are turned over year by year by visitors to the halls of the Society; who tracing in the lines which he there wrote, realize to a certain extent the character of the man, the carefulness with which he did everything, and whether he turned his attention to the curing of smoky chimneys, or to the invention of an improved fire-place, or to drawing the lightning from the heavens and demonstrating its identity with electricity, or in proposing new theories of light and heat, or in encouraging the manufacture of large sheets of paper, or in his correspondence with the distinguished members of the Society—in all these things his connection with the American Philosophical Society illustrates the character of the man and the institutions which he founded in Philadelphia, cognating their purposes for the promotion of useful knowledge and which still remain and flourish among us in the types of the library company of Philadelphia, the old University of Pennsylvania, the Philadelphia Contributionship for the insurance of houses against loss by fire, the establishment of the first fire engine company of Philadelphia. Whether we look for him in the fields of philosophy or in the walks of business, or in works such as the framing of declárations of independence, constitutions or treaties, the admirable character of Benjamin Franklin is impressed upon every one of these things to which I have referred. And especially has his character been impressed upon the foundations, the traditions, the applications of the American Philosophical Society. That Society honors him as its founder and participates in honoring him in all those illustrations of human character to which our historian, Mr. McMaster, has referred and which have crowned our country with so much honor, with so many blessings and with such useful instruction to rising generations.

In introducing Mr. G. Brown Goode, Mr. Williams said:

American science owed its foundation and its first great discovery to a master of English style. The example of Franklin has never been forgotten by the scientific men of America. The record of their work has often become a part of the literature of their land. The clarity of their style has matched the brilliancy of their discoveries. It has been especially true of the Smithsonian Institution, which owes its endowment to the liberality of a private citizen, a liberality whose infectious example ought to attract new additions to his useful gift, that it has maintained in its registers of advancing knowledge, the dignity as well as the accuracy of science. A Henry and a Langley both remind us that the ability to make great discoveries may well be joined with the capacity to give them adequate expression. Representing a scientific institution with these traditions, Mr. Goode has come to be naturally selected to speak of the attainments of a man of science in the field of letters. With much of Mr. Goode's labors we are all familiar. The literature of our woods will never be complete without including the pages of Audubon, and the full record of our seas begins with the work of Goode. To this research, whose fruits are known to many, he has added labors in the field of early American literature whose results we hear to-night. As representing at once, organized science and literary research, I have the honor to introduce to you, Mr. G. Brown Goode, of the Smithsonian Institution, who will speak upon

The Literary Labors of Benjamin Franklin.

When the New World sent Franklin to Europe, England and France received him, without question, as the equal of their own greatest men. Lavoisier, Turgot and Raynal, Buffon, Rousseau and Condorcet were his admirers, Gibbon, Hume, and Adam Smith, Kames, Robertson, Bentham and Priestly, his friends, while to the poet Cowper praise by him atoned for all the carpings of the critics.

When he first met Voltaire, in the hall of the French Academy of Sciences, the two old men saluted affectionately, amid the tears and the applause of the spectators, and it was proclaimed through Europe that Sophocles and Solon had embraced.

His colleague, John Adams, by no means the most ardent of his admirers, said of him :

"His reputation was more universal than that of Leibnitz or Newton, Frederick the Great or Voltaire, and his character more beloved and esteemed than any or all of them. Newton had astonished, perhaps, forty or fifty men in Europe; for not more than that number, probably, at any one time had read him and understood him, and these being held in admiration in their respective countries, at the head of the philosophers, had spread among scientific people a mysterious wonder at the genius of this, perhaps the greatest man that ever lived. But *his* fame was confined to men of letters. The common people cared nothing about such a recluse philosopher. Leibnitz's name was still more confined. Frederick was hated by one-half Europeans much as Napoleon is. Voltaire was considered as a vain and profligate wit, and not esteemed by anybody, though admired by all who knew his works. But Franklin's fame was universal. His name was familiar to government and people; to kings, courtiers, nobility, clergy, and philosophers, as well as to plebeians, to such a degree that there was scarcely a peasant or a citizen, coachman or footman, a lady's chambermaid or a scullion in the kitchen who was not familiar with his name, and who did not consider him as a friend of human kind. When they spoke of him, they seemed to think he was to restore the golden age."

In a nation of three millions, he was first in every field of action, as printer, publisher, editor, and humorist—in political economy, administration and statesmanship, in science, philosophy, diplomacy, and in literature. He stands to-day a colossal figure in the world's memory, his popularity in no wise lessened by lapse of time, and Americans still wonder at his stature, seemingly unable to measure the extent of his greatness. In Europe he is still thought the first of Americans, the most perfect embodiment of the spirit and genius of his country, and its one great writer who lived before the days of Irving.

His easy-going freedom of speech, his liberal views on theological questions and his irreverence, coupled with a certain coarseness, almost Rabelaisian, in his early writings, have lessened his popularity among educated Americans. Then, too, the subjects of which he wrote—the current political issues, the manners and morals of every-day people, common abuses and how to do away with them, passing events and their lessons, household economies, and the like—although they gave him a great popular audience, were not of the kind best fitted to call forth the admiration of his literary contemporaries.

His choice of subjects was, nevertheless, the best evidence of his preëminence. "Great men are more distinguished by range and extent than by originality. A great man does not wake up on some fine morning and say, 'I am full of life, I will go to sea, and find an Antarctic continent; to-day I will square the circle; I will ransack botany, and find a new food for man; I have a new architecture in my mind; I foresee a new mechanic power.' No; but he finds himself in the river of thoughts and events, forced onward by the ideas and necessities of his contemporaries. He stands where all the eyes of man look one way, and their hands all point in the direction in which he should go. The church has reared him amidst rites and pomps, and he carries out the advice which her music gave him, and builds a cathedral needed by her chants and processions. He finds a war raging; it educates him by trumpet, in barracks, and he betters the instruction. He finds two counties groping to bring coal, or flour, or fish, from the place of production to the place of consumption, and he hits on a railroad. Every master has found his materials collected, and his power lay in his sympathy with his people, and in his love of the materials he wrought in." *

The spirit of the hour was Franklin's constant inspiration, and his writings were a legitimate result, the natural outgrowth of his activity in all matters of public concern. Admirable in themselves, their chief interest is nevertheless due to the fact that they form so complete a record of the deeds and the personal character of their author.

"Though he was a voluminous writer and one of the great masters of English expression, Franklin wrote habitually with a single eye to immediate practical results. He never posed for posterity. Of all the writings to which he mainly owes his present fame, it would be difficult to name one which he gave to the press himself or of which he saw the proof. Yet he never wrote a dull line nor many which the century of time has robbed of their interest or value. What-

* Emerson.

ever he wrote seems to have been conceived upon a scale which embraced the whole human race, as well as the individual or class to whom it was specifically addressed, the one evidence of true greatness which never deceives nor misleads. If he wrote to his wife, it was, more or less, a letter from every husband to his wife; if to his daughter, it was a letter that any daughter would be pleased to receive from her father; if to a philosopher or statesman, there was always that in the manner or matter of it which time cannot stale, and which will be read by every statesman and philosopher with the sort of interest they would have felt had it been addressed personally to them." *

The gathering of "Frankliniana" has become of late years a favorite pursuit of book lovers, and there are many excellent private collections besides the magnificent assemblages of his printed books, manuscripts and imprints in the public libraries of Boston, New York, Philadelphia, and Washington. The pioneer in this movement was Prof. Justin Winsor, who, in 1869, established a Franklin Alcove in the Boston Public Library, for the reason, as he said at the time, "that Franklin is to Boston what Shakespeare is to England."

A complete library of Frankliniana, including not only the books by him and about him, but also the products of his press, would embrace nearly two thousand separate units. Such a collection would possess a very great value in money. †

Several bibliographies of Franklin have been printed. One

* Bigelow's Preface to Franklin's Works.

† One of his imprints, the translation of Cicero's "Cato Major," in good condition, has sold for $200. A complete series of "Poor Richard" would be almost priceless. Of the twenty-six numbers, the Pennsylvania Historical Society had, when Ford's book was printed, only sixteen; the Lenox Library, seventeen; the Library Company of Philadelphia, twenty-one; the Congressional Library, thirteen; and the American Philosophical Society, one, which, however, is the first. Of the issues of 1734 and 1735 none are in the possession of any of these libraries.

of the most serviceable is that of Sparks in the latter part of his tenth volume. Another is the admirable one of Lindsay Swift, printed seven years ago by the Boston Public Library. The latest and fullest is the "Franklin Bibliography," of Paul Leicester Ford, a very stout octavo volume of nearly five hundred pages, which is intended mainly for the collector and is a minute and exhaustive catalogue of the variations of every possible bibliographical unit.

In this are cited nine hundred and ninety-seven titles, arranged as follows:

I.	Books and pamphlets wholly or partly written by Franklin.	1–600
II.	Periodicals and serials containing writings of Franklin....	601–618
III.	State Papers and Treaties, in forming which Franklin aided.	619–633
IV.	Works containing letters of Franklin....................	639–709
V.	Pseudonyms used by Franklin.	710–784
	Works relating to, written to, or dedicated to Franklin.	790–1002
	In addition to these there are named in the accompanying Reference List other publications, relating in part to Franklin, to the number of..................................	508

Of the six hundred titles given by Ford in his list of books wholly or partly written by Franklin, there are only about ninety which represent distinct efforts of authorship, even though prefaces, notes in books written by others, and broadsides be counted. The remaining titles relate to reprints, advertisements, and hypothetical publications of which no copies are known to exist.

Franklin's literary remains may be classified as follows:

1. The Autobiography—from 1706 to 1757.
2. Poor Richard's Almanac, in twenty-six annual issues, 1732–58, culminating in "Father Abraham's Speech at the Auction."
3. Essays upon Manners, Morals and the Science of Life, including the so-called Bagatelles, in all sixty titles or more.
4. Tracts and Papers upon Political Economy, Finance, and the Science of Government; in all about forty titles.

5. Essays and Tracts, Historical and Political, concerning the American Revolution and the events which immediately preceded and followed—1747-1790.
6. Scientific Papers—from 1737-1790; in all 221 titles and nearly 900 pages, octavo.
7. Correspondence, Diplomatic, Domestic and Literary—1724-90; in all, some twelve hundred letters, while many still remain unpublished.

THE AUTOBIOGRAPHY.

The autobiography, prepared between the ages of sixty-five and eighty-three, is one of the most remarkable books ever written. It was intended for his son, and certain intimate friends, and was not published until after the death of its author, and was never printed as it had been written until a few years ago, when, in 1874, Mr. John Bigelow issued a correct version from the original manuscript, which by marvelous good fortune had fallen into his hands, while Minister at the Court of France.

The autobiography has passed through at least one hundred and seventy editions, and has been translated into German, French, Danish, and Spanish.

To understand it properly, the reader should use Bigelow's edition and none other—for its editor, with admirable skill, has supplemented Franklin's own narrative, complete in itself up to 1757, by a series of extracts from his letters and other writings, so that it is told in the philosopher's own words, and is complete almost to the day of his death.

During the twenty-eight years of his residence abroad, from 1758 to 1785, he was in constant correspondence with the governments he represented, and with his friends, who were numerous and to whom he wrote at length and with great freedom.

"To his protracted expatriation," writes Bigelow, "we owe this fact, that there is scarcely an important incident in Franklin's life which is not described by himself in his memoirs, or in his correspondence; and it is to this vast treasury of sterling English, which seems to have been almost miraculously preserved from incalculable perils by sea and by land, that the legion of his biographers have been indebted for what has most contributed to render their writing attractive.

"I am not aware that any other eminent man has left so complete a record of his own life. The part of which, from the nature of things, could not be preserved in correspondence —his youth and early manhood; his years of discipline and preparation—has been made as familiar as household words to at least three generations, in those imperishable pages which, in the full maturity of his faculties and experiences he prepared at the special in tance of his friends, Le Veillard, Rochefoucault, and Vaughan. From the period when that fragment closes until his death, we have a continuous, I might almost say, a daily record of his life, his labors, his anxieties, and his triumphs, from his own pen, and written when all the incidents and emotions they awakened were most fresh and distinct in his mind.*

THE ALMANAC.

Franklin's Almanac is interesting in itself, but far more so in its effects on the history of American letters and American life. It was the beginning of our American periodical literature, the first successful serial, the pioneer of the great army of magazines and reviews which, even now, stand in the place of public libraries to the great majority of our people.

Franklin's was not a monthly, or even a quarterly; it was an annual magazine of instructive and entertaining literature.

* "Life," p. 6.

He was the most experienced of American journalists, the editor and principal contributor of the *New England Courant*, when, in 1723, it threw Boston into tumult, and, in 1729, founder of the *Pennsylvania Gazette*, for more than half a century the leading newspaper in the New World. He fully appreciated the possibilities of periodical literature in America and established, in 1741, a monthly called "The General Magazine and Historical Chronicle for all the British Provinces in America," * an effort which failed because the country was not yet ready.

The Almanac was to the people of that day, what the weeklies and monthlies have become to their great-grandchildren. Franklin began to print it in 1732, and it soon became a necessity in every household from New England to the Carolinas, and made the name of "Poor Richard" famous all over the world. Within twenty-five years, at least a quarter of a million copies of this treasury of homely wisdom had been distributed throughout the colonies.

Franklin wished that his Almanac should be a vehicle for conveying instruction among the common people, who bought scarcely any other books. He, therefore, filled all the little spaces between the remarkable days in the calendar with proverbial sentences, chiefly such as inculcated industry and frugality as the means of procuring wealth and thereby securing virtue; "it being," as he said, "more difficult for a man in want to act always honestly than it is hard for an empty sack to stand upright." Finally he brought together in a connected fabric, all the best of the sayings of Poor Richard for twenty-five years, in the form of the harangue of a wise old man to the people attending an auction. "Father Abraham's Speech," "The Way to Wealth," or "La Science du Bonhomme

* Six numbers of this periodical were printed.

Richard," as this composition was variously called, touched by its simple wisdom, responsive chords in the hearts of all simple-minded people.

Its influence was amazingly great. No one was better able than Franklin to judge of its extent, no one less likely to exaggerate it.

Writing about it, in 1788, he said:

"The piece, being universally approved, was copied in all the newspapers of the continent; reprinted in Britain on broadsides, to be stuck up in houses; two translations were made of it in French, and great numbers bought by the clergy and gentry to distribute gratis among their poor parishioners and tenants. In Pennsylvania, as it discouraged useless expense in foreign superfluities, some thought it had its share in producing that growing plenty of money which was observable for several years after its publication." *

Ford's bibliography shows that since it was written, one hundred and twenty-three years ago, "Father Abraham's Speech" has been reprinted about three times for each year. Seventy or more separate editions in English have appeared, fifty-six in French, eleven in German, and some in Italian. It was printed in Danish at Copenhagen (1801, 1820); in Catalan at Montroulez (1820) and Morlais (1832); in Greek in Paris (1823); in Dutch at The Hague (1828); in Portuguese in Paris (1828); in Bohemian at Teshen (1838); in Welsh in London (1839); in Spanish at Caracas in Venezuela (1858); in Russian at St. Petersburg (1809), and in Chinese at Peking (in 1884), as well as in Polish and the phonetic characters.

Ford is quite justified in saying that it has been oftener printed and translated than any other book from an American pen.

* Autobiography, Bigelow edition, i, 250.

THE ESSAYS.

Franklin's essays represented his most finished work. Among them indeed are the only compositions written with a distinctly artistic purpose. Many years after his death a small, thin portfolio was found among his papers. On its cover was written "BAGATELLES," and within were fifteen or more of his own favorite essays. These were prepared for the entertainment of that brilliant circle of friends in Paris, in whose meetings the venerable author took so much delight. Among them were many of his most graceful and witty productions —such as "The Morals of Chess," "The Dialogue between Franklin and the Gout" and "The Ephemera."

The Bagatelles were written when he was over seventy. In some of his satires, half a century earlier in date, as for instance "The Speech of Mistress Polly Baker," he exhibited equal force and skill, though a wit less mellow and refined and a style less polished through familiarity with French literature.

His essay writing began when he contributed to his brother's newspaper in Boston a series of satirical letters signed "Silence Dogood"—which are highly praised by those who have read them. "So well," says McMaster, "did the lad catch the spirit, the peculiar diction, the humor of his model, the *Spectator*, that he seems to have written with a copy of Addison open before him."

Seven years later he prepared for a Philadelphia newspaper, *The Mercury*, a series of essays under the title of "The Busy Body." This was his first effort in a strictly literary direction. Some admirer has described them as being written "after the manner of the *Spectator*, but more readable."

Although the critic of to-day may not fully agree with this judgment, he cannot fail to be pleased with the graceful, easy flow of the words, and at the same time, interested in the evidences of the young printer's extensive and intelligent acquaintance with the best of English books.

After he became owner of the *Pennsylvania Gazette* he wrote for it essays in the same vein, many of which have been reprinted in recent editions of his writings.

Some of the essays were humorous or satirical, others related to religious and moral subjects and the economy of life, others still to the current events of the day. Among them was an admirable exposition of what was then known about earthquakes; and this, published in 1737, was his first contribution to scientific literature.

When he was living in England he constantly wrote for the press, and among his productions at this time were a number of papers, which although an essential part of his political writings, should also be included in that carefully-edited collection of Franklin's essays for which the world has been expectantly waiting for a hundred years. Among the best are the "Receipt for Diminishing a Great Empire," and the "Remarks Concerning the Savages of North America," written in Paris a few years later, which rank among the most brilliant of political satires.

HIS DOMESTIC AND LITERARY CORRESPONDENCE.

Franklin was the brightest and most charming of correspondents, and there is not one of his letters which is in the least degree dull or formal.

Over 1200 are printed by Bigelow, and they make up at least nine-tenths of the bulk of his literary remains. Many of them are little essays, and should be included in every edition of his short papers. In no connection are they more readable than as arranged by Mr. Bigelow* to form a part of the autobiography. "To be fully understood and appreciated," writes Bigelow, "they (as well as all the rest of his writings) should be read in chronological order and by the light of current events, for every one of them was as much the product of its time and circumstances as the fruits and flowers of a garden are of their respective seasons."

Though the signature is always "B. Franklin," the writer is sometimes the statesman, sometimes the shrewd, practical tradesman, sometimes the philosopher, sometimes the inventor concerned with mechanical details—now the philanthropist, now the wily diplomat, again the loving husband and parent, interested above all things in the affairs of his own little family, again the brilliant man of the world, gossiping with Madame Helvetius or the Abbé Morellet.

"His letters," said John Foster, "abound in tokens of benevolence, sparkling not unfrequently with satiric pleasantry, but of a bland, good-natured kind, arising in the most easy, natural manner, and thrown off with admirable simplicity and brevity of expression. There are short discussions relating to various arts and conveniences of life, plain instructions for persons deficient in cultivation, and the means for it; condolences on the death of friends, and frequent references, in an advanced stage of the correspondence, to his old age and approaching death. Moral principles and questions are sometimes considered and simplified; and American affairs are often brought in view, though not set forth in the diplomatic style."

It would seem impossible that the man who wrote at times so seriously and devoutly could have been also the author of the so-called "Suppressed Letters." Between the ages of fifteen

* Bigelow's "Franklin," i, p. 21.

and eighty-five, however, a human character has time for many transformations.

TREATISES UPON POLITICAL ECONOMY.

At the age of twenty-three, in 1729, Franklin published his "Modest Enquiry into the Nature and Necessity of Paper Money"—perhaps the earliest treatise on finance and currency written in America.

This pamphlet was written at a time of public crisis, and for a definite purpose, which was successful. It was the first of a series of political essays, published from time to time in the sixty-two years of life which remained to its author—each with some useful end in view, and each without exception productive of some definite result.

Edmond Burke was wont to say that when Franklin appeared before the British Parliament, he was like "a master examined before a parcel of school-boys," and Charles Fox declared that the ministry on that occasion "were mere dwarfs in the hand of a master."

Persuasive and convincing as were his spoken words, the power of the man was even more evident when he took up his pen to write upon topics of public interest. His political papers, however, have little meaning at the present time except to students familiar with the history of the days to which they belong, though read in connection with the story of his life they have a very great interest of their own.

In 1751 appeared "Observations Concerning the Increase of Mankind and the Peopling of Countries"—to which it would appear that Adam Smith in later years was indebted for suggestions, and which led Malthus to write his great "Essay on Population."

Franklin wrote other useful treatises, "On the Laboring

Poor," on "The Principles of Trade," on "Luxury, Idleness and Industry," on war, privateering and the Court of the Peers, and many kindred topics. None of his economical treatises were so original or so influential as the two which were first written. The last in the list, however, "On the Slave Trade," although finished only twenty-four days before his death and at the age of eighty-five, is as full of vigor and fire as his best efforts of a quarter of a century previous. It contains the speech of Mehemet Ibrahim in the Divan of Algiers, which Lord Jeffrey declared was not surpassed by any of the pleasantries of Arbuthnot or Swift.

POLITICAL WRITINGS.

Franklin's first political treatise was written in 1747.

The war between Great Britain and France, which was at that time in progress, was thought to have brought the American colonies into great danger, and the governor of Pennsylvania anxiously labored to prevail upon the Quaker Assembly to pass a militia law and to make other provisions for the security of the province. To further this project, Franklin wrote and published a pamphlet, entitled "Plain Truth," which had a sudden and surprising effect, and resulted in a few weeks in the organization of a colonial militia of over ten thousand men. This was the beginning of the conversion of the inhabitants of Pennsylvania from the Quaker doctrine of submission to that of defensive warfare, and had a most important influence upon the future of America.*

*Bigelow says of this pamphlet:

"Substituting the words 'United States' for Pennsylvania, it is as timely to-day as when it was written. Though we are at peace with all nations, we have many times as many lives and many times as much property exposed, while our defenses are relatively inferior to those which Franklin denounced nearly a century and a half ago as unpardonably deficient" (Bigelow's "Franklin," Vol. ii, p. 39).

"Plain Truth" was followed by several other tracts in relation to the struggle between Pennsylvania and the Proprietary Government in the hands of the Penn family. The most influential was that called "Cool Thoughts on the Present Situation of our Public Affairs," printed in 1764, which was a masterly argument in favor of a change from Proprietary to a Royal Government.

During his residence in England before the Revolution, and in France during its continuance and afterwards, Franklin wrote much. One of the most important of his early papers was that printed in London in 1760, entitled "The Interest of Great Britain in Regard to Her Colonies," a protest against the proposal that Great Britain should give up Canada to the French, and receive instead the Island of Guadaloupe in the West Indies.

So strong a paper was this that Burke, in replying to it, said of its author: "He is clearly the ablest, the most ingenuous, and the most dexterous of those who have written upon the question, and we may therefore conclude that he has said everything in the best manner that the case would bear."

These, however, together with his more extensive treatises upon the condition of affairs in the new Republic, belong to the statesman Franklin, rather than to Franklin the man of letters. Together with his diplomatic correspondence they make up fully half of his published works.

SCIENTIFIC WRITINGS.

Franklin's scientific writings were voluminous. Sparks reprinted 63 papers on electricity, filling 302 pages, and 157 on philosophical subjects, making 578 pages—in all 220 letters and 880 pages—which is a remarkable showing for a man so constantly occupied with private and public business.

His scientific papers are written in a style peculiar to their author—lucid, convincing, never wearisome. "A singular felicity of induction guided all his researches, and by very small means he established very grand truths. The style and manner of his publications on electricity are almost as worthy of admiration as the doctrine they contain. He has endeavored to remove all mystery and obscurity from the subject. He has written equally for the uninitiated and for the philosopher; and he has rendered his details amusing and perspicuous, elegant as well as simple. Science appears, in his language, in a dress wonderfully decorous, best adapted to display her native loveliness. He has in no instance exhibited that false dignity by which philosophy is kept aloof from common applications; and he has sought rather to make her a useful inmate and servant in the common habitations of man, than to preserve her merely as an object of admiration in temples and palaces." *

Perhaps the most judicious estimate of Franklin's qualities as a man of letters is that by John Foster in the *Eclectic Review* for 1818.

"It is unnecessary to remark," he writes, "that Franklin was not so much a man of books as of affairs; but he was not the less for that a speculative man. Every concern became an intellectual subject to a mind so acutely and perpetually attentive to the relation of cause and effect. For enlargement of his sphere of speculation, his deficiency of literature, in the usual sense of the term, was excellently compensated by so wide an acquaintance with the world and with distinguished individuals of all ranks, professions and attainments. It may be, however, that a more bookish and contemplative employment of some portion of his life would have left one deficiency of his mental character less palpable. There appears

* Sir Humphrey Davy.

to have been but little in that character of the element of sublimity. We do not meet with many bright elevations of thought, or powerful, enchanting impulses of sentiment, or brilliant, transient glimpses of ideal worlds. Strong, independent, comprehensive, never remitting intelligence, proceeding on the plain ground of things, and acting in a manner always equal to, and never appearing at moments to surpass itself, constituted his mental power. In its operation it has no risings and fallings, no disturbance into eloquence or poetry, no cloudiness of smoke indeed, but no darting flames. A consequence of this perfect uniformity is, that all subjects treated appear to be on a level, the loftiest and most insignificant being commented on in the same unalterable strain of calm, plain sense, which brings all things to its own standard, insomuch that a great subject shall sometimes seem to become less while it is elucidated and less commanding while it is enforced. In discoursing of serious subjects, Franklin imposes gravity on the reader, but does not excite solemnity, and on grand ones he never displays or inspires enthusiasm."

Although his works fill ten stately volumes, Franklin never wrote a book for publication.

The "Autobiography" was intended solely for the pleasure of his intimate friends. The sayings of Poor Richard were prepared for his yearly Almanac, with purely utilitarian ends in view. His scientific discoveries were announced, with few exceptions, in letters to his friends, who printed them without his knowledge or consent.

His political papers appeared in the newspapers and reviews, in letters, or prefaces, and in occasional pamphlets. Some of his brightest and most finished essays were set up and printed by his own hand, as broadsides, on a little printing-press which he had in his apartments while Minister to France.

The matter-of-fact character of his early writings was largely due to his surroundings and to the people for whom he wrote. When at leisure in the society of cultivated people he soon yielded to their influence. His famous essay on the "Way to Wealth," for example, was written soon after his visit to Virginia and a somewhat intimate association with General Braddock and his staff. The first, and incomparably the best, part of his "Autobiography" was written at the time of his most intimate connection with English literary society and while visiting at the country home of the Bishop of St. Asaph. The witty Bagatelles were produced in the midst of a brilliant Parisian circle.

His contributions to science were the result of a period of voluntary seclusion and temporary respite from business cares which he had learned by his frugality and industry while printer and publisher.

After he had acquired literary fame, he made use of it to promote the welfare of his country. A French writer, describing, in 1872, the events of nearly a century before, said:

"The coming of the famous American to Paris caused a profound sensation. Everybody wanted to see the author of the 'Almanach du Bonhomme Richard;' his mind was compared to that of Cato, and his character to that of Socrates. Franklin knew full well how to take advantage of the impression which he had produced upon a nation so impressionable as were the French, always ready to place their lives and their wealth at the service of a noble principle, and, following the example of Lacretelle, he decided to serve as ambassador not to a court but to a free and generous people."

He was by instinct a scholar and by inclination an author. He loved books for themselves. He became a vegetarian at the age of sixteen that he might buy them.

Some one has called attention to his "remarkable affinity for superior people." His affinity for the best of books was also remarkable, and no one was ever more sensitive to their influence. In the "Autobiography" he mentions the books which, as a boy, he liked to read, and it is easy to trace the effects of each upon his subsequent life.

His literary style, though founded principally upon a thorough study of the *Spectator*, gave evidence at a very early day, of intimate acquaintance with Bunyan, Defoe, Plutarch, Rabelais and Xenophon. His philanthropic tendencies were shaped and strengthened by Cotton Mather's "Essays to do Good," and his administrative faculties by Defoe's "Essay upon Projects." Shaftesbury and Collins strongly influenced his theological opinions. Locke's "Essay on the Human Understanding" moulded his habits of thought, as did also the "Memorabilia" of Xenophon.

Franklin has been called the founder of modern utilitarianism, but it is unjust and ungenerous to place this estimate upon his character. He knew the world in which he lived, and the people for whom he wrote. His aim was to produce immediate and practical results. His precepts were written for the unthinking, the inexperienced and the selfish. Poor Richard was a kindergarten teacher.

In his advice in regard to the treatment of the aged, for example, he reminded his readers that they would themselves in their own last years need care and indulgence, but he also first appealed to motives the loftiest and tenderest. Whoever studies Franklin in a generous spirit, will find no lack of generous thought and principle.

Like Socrates, Franklin estimated the value of every action by its utility. Moral utility was to him, however, the highest test of value. He believed that the promotion of universal happiness, by the prevention or mitigation of evil, was man's highest function. "He seems," says Weems, "to have been all eye, all ear, all touch, to every thing that affected human happiness," and he died with his eyes fixed upon "the picture of Him who came into the world to teach men to love one another. On his death-bed he often returned thanks to God for having so kindly cast his lot of life in the very time of all others when he would have chosen to live for the great purposes of usefulness and pleasure."

Is there in history a more touching memory than that of Franklin awaiting the coming of death, the venerable sage, the pride and glory of his own land, the admiration of Europe, making excuses for the moanings which were occasionally forced from him by the severity of his pains—afraid that he did not bear them as he ought, while he observed his grateful sense of the many blessings he had received from the Supreme Being, who had raised him from small and low beginnings to such high rank and consideration among men.

I have already said that nothing was further from his thoughts than to obtain for himself literary fame. He took no care of his own writings, and made no effort to secure the publication of them. And still, a century after his death, he stands prominently forth as the only great literary man of America in colonial days and in the first fifty years of the Republic.

No one who has held in his hand a copy of Franklin's edition of Cicero's "Cato Major" can doubt that the man who made it had the soul of an artist. No one who has read his tender and exquisitely graceful preface to this beautiful edition can question that he had the heart of a poet, and the touch of a master of letters.

When twenty-five he founded a great public library, the earliest in America, that others as well as he might enjoy the companionship of books.

Books were always in his mind and by his side. He compared his own life to a book. At the age of eighty-three he wrote:

"Hitherto this long life has been tolerably happy; so that, if I were allowed to live it over again, I should make no objection, only wishing for leave to do, what others do in a second edition of their works—correct some of my *errata*."

His "Autobiography," written in the same spirit, noted the "errata" in its author's career with true printer's interest, as if he were scanning a bundle of proof sheets. He did not conceal them, but marked them so that all could see, frankly confessed his errors, and did what he could in atonement.

Jefferson desired that his monument should declare that he was the author of the Declaration of Independence and the founder of a great university. Franklin, in his will, sought no higher title than that of *printer*. A maker of books he had been for three-quarters of a century, and a friend and lover of literature even longer. The epitaph, written by his own hand for his tomb, which can never become trite by repetition, is full of the spirit of the great printer.

"THE BODY
OF
BENJAMIN FRANKLIN,
PRINTER,
(LIKE THE COVER OF AN OLD BOOK,
ITS CONTENTS TORN OUT,
AND STRIPT OF ITS LETTERING AND GILDING,)
LIES HERE FOOD FOR WORMS,
YET THE WORK ITSELF SHALL NOT BE LOST,
FOR IT WILL, AS HE BELIEVED, APPEAR ONCE MORE,
IN A NEW
AND MORE BEAUTIFUL EDITION,
CORRECTED AND AMENDED
BY
THE AUTHOR."

In introducing Dr. J. W. Holland, Mr. Williams said:

It is sometimes forgotten in Philadelphia, and it is never remembered in Boston, that while Franklin became a Bostonian without being consulted, he employed the first exercise of his mature judgment to become a Philadelphian, and remained so to the end of his days. It is a happy coincidence that in commemorating the scientific labors of the man who, like another Prometheus, stole from heaven the vital spark which has given light to man and life to modern science, this Society has selected one of the many representatives of science in this city which it owes to the attractions it offers for a career rather than to the opportunities it furnishes as a birthplace. Dr. J. W. Holland represents an institution which has given to him, as it had before to a distinguished predecessor, the field for displaying in the East a learning and skill attained and acquired in the West. Like Dr. Gross, he has added one more to those men of mark in medicine whose work began in Kentucky, but the knowledge of whose labors is bounded by no one State. In dealing with the scientific work of Franklin, the physician is as much at home as the electrician. His great discovery in the field of the latter was more conspicuous, illuminating the ignorance of ages by a single flash of lightning. His discoveries in hygiene were numerous, useful and remain to-day serviceable. I take pleasure in introducing to you Dr. J. W. Holland, of Jefferson Medical College, who speaks upon

The Scientific Work of Benjamin Franklin.

The scientific labors of Franklin were not limited to any particular period nor any special field. Various branches of natural philosophy, in almost every year of his middle life, were illuminated by his discoveries, inventions and speculations. As an editor and man of business, science occupied part of his leisure, and in later life, when engrossed with public affairs, he sighed for opportunity to follow these favorite pursuits.

In presenting a sketch of these varied and fruitful labors, chronological arrangement will not serve so well as one based upon their general character. Looked at in this way his principal works are seen to fall into a few groups such as labors in sanitary science, in the art of navigation, in meteorology, and in electricity. It will be readily conceded that in the limits allotted this subject, it would be vain to attempt an extended analysis of all the philosophical productions of his fertile genius. It is possible, however, to give some impression of their variety and utility.

The science of maintaining health is rightly regarded as of very modern growth and even now its importance though constantly insisted on by its votaries is far from being generally recognized. The sound judgment of Franklin led him to consider it as a weighty matter whether it involved smoky chimneys or the water supply of a great city. His sanitary labors pertain to the person, to the house, and to the city. About that very common disturbance of health usually called "catching a cold," many fallacies still linger though Franklin did some forcible writing to remove the popular errors. He perceived what doctors nowadays all recognize that while among the causes of acute catarrh, exposure to cold was one, the most important was a predisposition due to impaired strength from any cause whatever. Too little exposure to fresh air inducing depressed vitality might thus figure as a cause. His essay on this topic with some alterations would make a good sanitary tract, even after the lapse of more than a century.

It was his constant habit to try to see all things little and great just as they are, and when he spoke of them to give a truthful report. When the time came for him to resort to spectacles to correct old sight, he found that the glass which served for society would not answer for reading. Naught that interested him was he content to look upon as if in a fog. But many things must be outlined dimly unless he carried two pairs of spectacles and changed them as the occasion demanded. To obviate this difficulty, he invented what is known as the bifocal or Franklin lens, the upper half of which was adjusted to distant objects and the lower for near view, as in reading. By changing the direction of vision through this one pair of glasses an elderly artist can see equally well the landscape one moment and his canvas the next. Franklin asserted that he understood French better by their help as they enabled him, while at table to see distinctly what he had on his plate and at the same time to note the expressive facial movements of persons who sat opposite. In the hundred years no change was made from the original form until recently. Now, instead of dividing the lens in equal halves by a horizontal line, two perfectly centred lenses of different sizes are cemented together. The larger, having two-thirds the size of the entire glass, is devoted to objects beyond arm's reach, and the smaller at the bottom suffices for reading. This invention must be considered as something better than a convenience; it takes rank with devices for maintaining health. When the imperfect eye makes frequent effort to see things without properly adjusted glasses, in sensitive persons eye-fatigue may induce various reflex nervous symptoms.

To those allied departments of domestic hygiene, ventilation and warming, he was the first one to give anything like adequate heed. On many occasions he urged the need for ventilation to prevent that personal vitiation of air indoors which depresses the energies and causes stupor and dull headache. Mr. Small, a London surgeon, credits him with being the first who observed that respiration communicated to the air a quality resembling the mephitic gases of caves, and further, that a noxious character was imparted by the volatile effluvia of persons enclosed in rooms. Franklin attached considerable importance to the use of open chimneys for the extraction of the vitiated air by the upward draught. While in London he was consulted on the ventilation of the House of Commons and recommended that the personal atmosphere surrounding the members might be carried off direct by having outlets in a part of the benches on which they sat connected with exhaust flues. The merit of the suggestion is shown by the fact that a similar provision has been introduced into the new Johns Hopkins Hospital which embodies the most approved methods of sanitary construction. Connected with the benches in the waiting rooms, and beneath each bed in the wards are grates through which the personal atmosphere passes out to the draught of a chimney.

Inseparable from the requirement of ventilation and subservient to it is that of the heating arrangements. In this matter he made a great stride by the invention of the stove that bears his name. This stove was invented to economize fuel by regulating the air supply to it and by providing large metallic surfaces for warming the air of the room. In a hundred years, from Franklin's idea many shapes have been evolved, all traceable to the original. His name is usually given the variety provided with open grates, but there can be no doubt that the original embodied also the principles of the now widely used "air-tight" stoves to which his directions are perfectly applicable. One of the advantages claimed for the stove was that it was a refuge from the nuisance of smoky chimneys. At that time the true principles of chimney construction had not been worked out so that a perfect chimney was the exception and open fire-places not an unmixed luxury. To beguile the tedium and discomfort of a seven weeks' voyage across the Atlantic, Franklin set down his observations and recommendations and gave them to a suffering world as his famous pamphlet on the "Causes and Cure of Smoky Chimneys." Having applied his accurate eye and judgment to these common-place things and having made scientific publications of mark concerning them, he had the satisfaction of knowing that by his plans for perfecting chimneys, for getting the most heat from fuel and for securing wholesome currents of air in close apartments, he had dispelled much ignorance and enhanced the sum of human comfort.

That Franklin was foremost in all public measures, for founding a hospital, advancing popular education, lighting and paving streets, and organizing fire companies, is generally appreciated, but it is not so widely known that he took steps in his will to improve the water supply of this city. Having noticed the tendency of well water in old cities to grow gradually unfit for use, he foresaw that in time a change to a better protected source would be necessary to the public health. In his last will he provided that at the end of a hundred years, if not done before, the corporation of this city should employ a bequest in bringing by pipes the water of Wissakickon creek to the town. After a hundred years, his beloved city is confronted with the same difficulty in another shape. The wells having fulfilled his prophecy have been abolished and the waters of the Wissahickon many years ago brought into service have in turn come under suspicion. What an imperial gift, if some millionaire, emulous of Franklin's example, with far greater means, should see fit to dedicate his money to provide for the people a purer drinking water, when the unfitness of the present source shall be duly recognized!

Having made eight voyages across the Atlantic at a time when it took at least a month, he had opportunities for studying the art of navigation. What he saw joined to what he learned from experienced seamen and his own wide reading lead him to inferences that have helped to master the difficulties and perils of the sea. Although early Spanish navigators were aware of the existence of the Gulf stream, so little detailed knowledge was available that up to Franklin's time the currents of the Atlantic were looked upon as hindrances rather than helps to transatlantic commerce. Franklin noticed the higher temperature marking out the Gulf stream, took many thermometric observations, and made a chart of it with a view to guide navigators in the route between England and America. He first advised that systematic use be made of the trade-winds and the ocean currents, and showed how it could be done. From the Chinese he got an idea which he was the first to urge upon the western ship-owners. He worked out the crude hint to its best form—that of dividing a ship into separate chambers by water-tight partitions so that a leak in one would not affect the others. It was not until quite recent years that this device has been put in practice with the desired results. A demonstration of its utility was seen lately in the accident that happened to the steamer *City of Paris*. Even when two of her compartments were flooded, she bore up for four days and a half, bringing her ship's company of more than a thousand souls safely into port.

The recorded experiences of ships during the last few years have fully established the efficacy of another notion of Franklin's. Thanks to his emphatic endorsement the previously known power of oil to still troubled waters is now generally employed to smooth the breaking waves when they threaten the safety of a vessel.

The occurrence of a north-east storm of unusual violence provoked those inquiries which led to his discovery of the backward course of storms and to a theory which had a marked influence on the development of meteorology. His explanation of the Aurora Borealis as a phenomenon of atmospheric electricity was at once accepted as adequate, though in its details it has since been modified to meet the demands of advancing knowledge.

In one of his charming letters to a lady correspondent he first made note of the remarkable variation in the absorptive power for the sun's heat shown by cloths of different colors. According to his suggestions, the principle has been applied to agriculture and to the clothing of armies. Under the fostering hand of the national government during this century there has been developed from his initial inquiry in navigation the admirable work of the hydrographic office. Its pilot charts are the lineal descendants of the one Franklin drew. It is not claiming too much to say that his observations on the north-east storm were the first noteworthy contribution to the science upon which is based the predictions of the weather bureau.

The present time has been called "the Age of Electricity." To estimate fairly the significance of Franklin's electrical researches in this day of the telephone, the dynamo-engines, the electric light, and the electric railway, it must be remembered that one hundred and fifty years ago not only was there no telegraph, but the magnetic, chemical and motor powers of electricity were not even dreamt of. It was fifty years before Galvani published his account of the convulsions produced in a frog's leg by the contact of dissimilar metals. Volta was just five years old. To what is now an open book full of wonders which every school-boy can read without obscurity or hesitation, naught but the preface had appeared. That preface dates from three centuries before Christ, when Thales of Miletus drew attention to the curious property of attraction developed on rubbing amber. The Greeks explained this by the theory that friction evoked the animating soul of the amber which seized upon light particles near it. For nearly two thousand years there was no substantial addition to knowledge until Gilbert discovered that glass, sealing wax, sulphur, and other substances could also be electrified. Then fifty years elapsed before a rude machine was made from which vivid sparks could be drawn. After another fifty years the resemblance between these zigzag sparks and the lightning flash was commented on. The first chapter was fairly opened when the discovery of the Leyden jar enabled the experimenter to imprison the fiery spirit and perform many remarkable tricks with it. At this time Franklin had reached middle life and retired from business with an independent fortune. He gave his scientific enthusiasm a free rein with the Leyden jar and the frictional machine. With the aid of his Philadelphia collaborators many ingenious experiments were devised. Their joint study proved so fruitful that in the course of six years they advanced the science of frictional electricity more than the rest of the world had done in two thousand.

It was this chapter which, according to Goethe, had been handled better than any other in modern times. For illustration of an admirable scientific method, let us glance at the steps of Franklin's research. First, his attention was taken with the marvels of the rubbed glass tube. These were enhanced by the storage properties of the Leyden jar. With three friends who had the same infection, he formed a coterie for mutual suggestions and encouragement. They constructed their own machines and with them made new demonstrations of attraction and repulsion, and of the power of electricity to produce light, heat, mechanical violence, nervous shock, and even death. The brilliancy of these experiments depended mainly on Franklin's discovery that the electricity of the Leyden jar was stored up on the glass, and that by increasing the extent of excited surface the energy was proportionately multiplied. The power thus obtained made it appear highly probable that the difference between the spark and the lightning flash was one of degree. Having discovered the property of pointed conductors to cause a silent and harmless discharge he next charged an artificial thunder-cloud made of Leyden jars, and with a small pointed rod conducted away its energy without noise or violence. From the truth thus established, he deduced the conjecture that sharp metallic rods fixed at the highest point of buildings would draw away quietly the charge of an approaching thunder-storm. A similar contrivance brought the atmospheric electricity within the reach of his experiments, and its identity with frictional electricity was fully demonstrated. His conjectures put to the test gave to the service of humanity the lightning-rod, accounted the most brilliant application of science that had been known up to that time.

In a hundred years, but little has been added to what Franklin revealed concerning the electricity of friction. Volta's electrophorus with his condenser and Holtz' induction machine are the only important additions to electrostatics that have since been made. The marvelous progress of this century in the adaptation of electricity as a useful agent are developments of chemical and magnetic electricity forms unknown until after Franklin's death. His apt and simple theory of an electric fluid, the excess or lack of which caused positive and negative action, held sway for so many years that to this day its nomenclature is retained in spite of defects revealed by recent advances in knowledge. The splendid results of investigations made in our time call for a broader conception which shall include Franklinism, Galvanism, and Faradism, with those manifestations of energy at a distance which seem to place electro-magnetic induction in the same category with light and other radiant forces.

But Franklin's fame as a philosopher who worked for the improvement of man's estate shall remain amid all the theoretical changes of the future. It shall remain because it rests upon the enduring truths he first laid bare; because it was builded with sound inductive methods; because it is guarded by the grateful memories of mankind. Cheerfully then let us commemorate the day of his death. It was the day when his intelligence should at last be released from "its muddy vesture," when, as he expressed it, he should be free to roam through some of the systems Herschel has explored, free to satisfy his curiosity concerning worlds he did not know.

In introducing Dr. Henry M. Baird, Mr. Williams said:

The connection of Franklin with France lay deeper than the accident of events or the needs of his native land. Of all our greater men in the last century or in this, the expression and cast of his genius alone was Gallic. He shared with Voltaire the capacity for using the highest literary form to enlighten the humblest reader or confute the keenest partisan. In his journalism, he prefigured the homely familiarity and the familiar humor which is alike the might and the weakness, the strong tower and the open pitfall of the American newspaper in this century. But in all he wrote and in much that he did, he foreshadowed that apprehension and appreciation of form for wit's sake which yearly draws us as a nation nearer to the critical standards of France in art and in letters. The historian of France therefore approaches the diplomatic career of Franklin acquainted not only with the environment in which he discharged his great services, but aware of the men and the models, the method and habit of thought which profoundly influenced the conscious and unconscious development of Franklin from the man of business into the man of science, and from the man of science into the man of affairs. To the historian of the Huguenots, the chronicler of the great Cardinals, the deep and unsparing student of the causes which prepared in France the field in which Franklin won his last and closing triumphs, these triumphs have a meaning and interpretation lost on other men. I need not remind you that our next speaker ascends this platform with this special equipment for his work in treating of the diplomatic services of Franklin, and I feel equal honor and good fortune in introducing to you, as the last speaker of the evening, Dr. Henry M. Baird, of the University of the City of New York, who will speak upon

The Diplomatic Services of Benjamin Franklin.

I have been asked to address you on the subject of Dr. Franklin's diplomatic services—a department of activity in which our great compatriot, and the founder of this Society, conferred upon his country and upon humanity benefits not inferior to those by which, as a scientific discoverer, he brought the whole world into his debt.

In the address of welcome made to Benjamin Franklin, upon his return from his last mission to Europe, the Assembly of this Commonwealth, by the mouth of its Speaker, the Hon. John Bayard, greeted him with these words: "We are confident, sir, that we speak the sentiments of this whole country, when we say that your services in the public councils and negotiations have not only merited the thanks of the present generation, but will be recorded in the pages of history to your immortal honor." *

We are here, Mr. President, to set the seal of the concluding years of this nineteenth century to the fulfillment of the prophecy made over one hundred years ago, by the enthusiastic voice of Franklin's contemporaries.

The diplomatic services of Benjamin Franklin are naturally to be referred to two periods; and the dividing line is the outbreak of the American Revolution. In the first period, his efforts were directed towards England, and his aim was to obtain for his countrymen, as citizens of the great British empire, the acknowledgment of rights inalienably theirs by reason of their birth.

In the second period, the claims of the colonists of North America having been practically denied, the energies of his

* "The Complete Works of Benjamin Franklin." Edited by John Bigelow (New York, 1887). ix, 248.

mind were turned in the direction of France, and his heroic and persistent exertions were put forth to secure, first, the recognition and help of that land, and then, with that help, the complete independence of the United States and their admission into the sisterhood of nations. Both departments of his activity, both fields of labor, elicited strenuous, concentrated, conscientious exercise of all his prodigious intellectual powers, and both were worthy of them. Yet viewing his diplomatic services as a whole, the latter part stands out prominent, as indeed the consummation of a life of singular utility to the public.

The English mission laid the foundation, broad and firm, of Franklin's fame as an able negotiator; his mission to the Continent reared on this abiding substructure a stately edifice adorned with imposing columns and entablature—in which, if I may be permitted to carry out the same figure, the aged philosopher's warm and enthusiastic attempt, in the name of humanity, to mitigate the horrors of all future wars, constituted the graceful cornice—a supreme and enduring tribute to the kindly instincts of his nature, of which it may truthfully be said: "*Finis coronat opus.*"

The richest and best fruits of man's intellectual and moral growth are found in the autumn of life, when the warm and mellowing rays of the sun have done their work, and nature gathers to itself the combined results of the entire year. Franklin's noble achievements as a diplomatist were accomplished in his later manhood and in his old age. He was past his fifty-first birthday when he sailed for England upon his first mission; he lacked less than six months of being four-score years old when he returned from his mission to France. The intervening twenty-eight years had been spent abroad in the service of his country, with the exception of two short intervals, the one of less than two years, the other of about eighteen months.

And what had he accomplished, when, with hair blanched by age, he at last returned to his native land and to the city of his choice, after so long an expatriation?

It is not with diplomacy, especially with services of the kind that Dr. Franklin rendered, as it is with the career of the military hero. If the great negotiator also has his triumphs, it is not always easy to lay the finger upon all the particular movements by means of which his bloodless victories are won. None the less do all his carefully laid but unobtrusive plans tend unerringly to the great result.

The first mission to England, though extending over not less than five years, is of subordinate interest to us now; because of the complete change that has since obliterated the political issues then regarded as momentous.

As agent for the colony of Pennsylvania, Dr. Franklin was sent to endeavor to obtain redress of wrongs sustained at the hands of the proprietaries. Subsequently appointed agent by other colonies—Massachusetts, Maryland, Georgia—his duty included vigilance respecting their interests also. The negotiation was long, tedious, dreary. We cannot tell how an obscure and unknown American, acting as a commissioner of distant provinces, would have fared at London in those times. Even Dr. Franklin, with all the great prestige of his scientific renown, did not find his position a bed of roses. The British government had evidently no very exalted opinion of the importance, present or prospective, of his gracious majesty's transatlantic plantations. Procrastination, proverbial vice of courts, had full sway. The months that Franklin was kept waiting for an answer to his petitions, were, doubtless, not altogether wasted by one who had mastered the rare art of putting the fragments, the very crumbs of time, to profitable use in the study of nature's hidden mysteries; and an abode in the midst of the most learned and appreciative scholars England could boast, was not altogether destitute of attractions. Yet the diplomatic gain—the admission in particular of the right of the colonists to tax the lands of the proprietaries, soon to be proprietaries no more—seems trifling in view of the great events shortly to happen. And still the shrewd negotiator had gained something valuable. He had gained an insight into the cardinal doctrine of the current creed of the court. For had he not heard a minister of state, Lord Granville, propound the tenet that the king's instructions to his governors in America were the law of the land, and that the king himself must be regarded as "the legislator of the colonies?" This was a strange view to Dr. Franklin, who had always supposed that the right tc make the laws was vested in the provincial assemblies, with the king's approval. And he significantly tells us: "His lordship's conversation having a little alarmed me as to what might be the sentiments of the court concerning us, I wrote it down as soon as I returned to my lodgings."*

It was not many years before it was the turn of others to take alarm at the practical assertion of the same dangerous heresy.

Respecting Franklin's second period of residence in London as a negotiator, it is not too much to say, that it brings into the clearest relief the rare capacity of the great American statesman. True, he did not attain the goal of his hopes. He was not successful in bringing the crown and people of Great Britain to a better mind, in settling the relations of the colonies to the mother country upon a lasting basis of justice and equality; in obviating the necessity of that sundering of ties which Dr. Franklin himself was reluctant to admit to be

* Autobiography (continuation) in Works, i, 296.

unavoidable, and in averting the dreadful resort to war between men of the same blood. But he did succeed in the next best thing, for he brought into the clear light of God's sunshine the righteousness of the struggle that was forced upon the colonies, by demonstrating the impossibility of obtaining redress for their wrongs from an obstinate king, from an unreasonable and prejudiced parliament, from a people that because they inhabited the mother country had fallen into the strange mistake of imagining themselves to be not subjects but governors.* For, as Dr. Franklin wrote to Lord Kames, "every man in England seems to consider himself as *a piece of a sovereign* over America; seems to jostle himself into the throne with the king and talks of *our subjects in the colonies*." †

Two scenes of dramatic interest illustrate this mission—both almost too familiar to students of history to need more than a passing notice, both, however, too characteristic and too essential to a clear understanding of the marked personality of the man who was their hero, to be left altogether without mention. The first of these is that remarkable examination before the House of Commons, so often described, so often the subject of unconcealed wonder on the part of historical writers, when for hours Dr. Franklin answered the various questions addressed to him both by friends and by political opponents, with a readiness, a calmness, an aptness, that have rarely been equaled, perhaps never excelled. While it seems too much to say that his replies to the interrogatories of his friends were altogether unpremeditated, the admirable promptness and skill with which he met the inquiries sprung upon him by adversaries, afford conclusive evidence of the breadth of his information upon American topics, and, not less, of the

* Works, iii, 486, 487.

† *Ib.*, iv, 2, 3.

singular equipoise of a mind so nicely balanced as to respond instantly to the demands of the moment, yet so firmly settled as to be proof against every attempt to disturb or disconcert.

If this famous episode was well calculated to exalt Dr. Franklin to the highest pinnacle of political reputation as yet attained by any American subject of the king of England, it scarcely surpassed in interest another occasion of the same eventful period.

It was in February, 1766, that Dr. Franklin appeared before the Commons to submit to the long but respectful examination of which I have just spoken. It was nearly eight years later (in January, 1774) that the venerable sage, the man whom the world of letters and the world of science delighted to honor, was subjected, in the presence of the Privy Council, to an attack as scurrilous as it was indecent. There is no need that I rehearse the familiar tale of the Hutchinson Letters and the storm their publication aroused. That Dr. Franklin's part in the transaction was fully justifiable, can scarcely fail, I think, to be the unanimous verdict of impartial men. But the fury of the party whose secrets were unmasked so unexpectedly, can scarcely be imagined. Of that fury the scandalous occurrence in the Cockpit of Westminster (on the 29th of January, 1774) was the direct and disgraceful consequence. The government's very purpose in summoning Dr. Franklin was to insult him; and had it been in the power of malice to affix ignominy to a great and virtuous man, the vituperative address of the solicitor-general, Mr. Wedderburn, might have compassed that end. As it was, during the whole time that this unseemly flood of abuse was poured upon his devoted head, Dr. Franklin, to use the account of an eye-witness (Dr. Bancroft), "stood conspicuously erect, without the smallest movement of any part of his body. The muscles of his face had been previously composed, so as to afford a placid, tranquil expression of countenance, and he did not suffer the slightest alteration of it to appear during the continuance of the speech, in which he was so harshly and improperly treated." *

A man conscious of the integrity of his purpose and the innocence of his actions can well afford to wait for vindication. And Dr. Franklin had not very long to wait. Not quite a year had elapsed—it was Wednesday, the 1st of February, 1775—when Lord Sandwich, in opposing in the Upper House the conciliatory measure introduced by the Earl of Chatham, seeing Dr. Franklin a few feet distant leaning upon the bar, went out of his way to express his belief that the plan under consideration was not that of any British peer, but of a person whom he saw before him, one of the bitterest and most mischievous enemies the country had ever had. In reply to whom Lord Chatham, not content with accepting the sole responsibility for the authorship of the project, proceeded to eulogize the great philosopher in these memorable words: "I make no scruple to declare that, were I the first minister of this country, and had I the care of settling this momentous business, I should not be ashamed of publicly calling to my assistance a person so perfectly acquainted with the whole of American affairs as the gentleman alluded to, and so injuriously reflected on; one whom all Europe holds in high estimation for his knowledge and wisdom, and ranks with our Boyles and Newtons; who is an honor, not to the English nation only, but to human nature!"

"I found it harder," modestly remarks Dr. Franklin in reporting the incident, "I found it harder to stand this extravagant compliment than the preceding equally extravagant abuse, but

* Works, v, 311.

kept as well as I could an unconcerned countenance, as not conceiving it to relate to me." *

And what shall I say of the importance of the services of Benjamin Franklin at the court of Versailles?

His good American friends had contented themselves with a brief enjoyment of his society at home. Little more than a year after his return from London, they voted, in Congress assembled, his dispatch to Europe, this time to France, showing scant consideration for his three-score years and ten, or for any natural desire he might have for a longer furlough from the diplomatic service. Barely had he, as a representative of Pennsylvania, affixed his name to the Declaration of Independence, before he was chosen to discharge his new and responsible functions. He reached Nantes early in December, 1776. Before Christmas he was in Paris.

He came at a critical moment. It cannot be affirmed that, without the help of France, the thirteen American colonies would not ultimately have achieved their great purpose. There is much in a courage that will admit into its vocabulary no such word as failure. Stout hearts convinced of the righteousness of the cause for which they battle, possess a great reserve of power. Unflinching resolve has learned the secret of enlisting time and opportunity as allies, and when most prostrate rises, with Heaven's help, to renew a strife which in the end must be crowned with victory.

But the American contest would have been longer, more painful, more enduring in the injuries inflicted, had it not been for the kindly intervention of France. And that intervention Benjamin Franklin secured. Humanly speaking, there was no one else that could have secured it. He was the foremost American of his time; in fact, he was the only

* Works, v, 498.

American that could claim a world-wide reputation. Even Washington was little known in Europe. Younger than Franklin by twenty-six years, he had as yet accomplished little to bring to the notice of foreigners those transcendant qualities, that commanding personal character, which years of arduous war amid trials, discouragement, and even occasional defeat, were to put to the proof. But Franklin, the man of science, the brilliant discoverer in a new and attractive realm of investigation, was known by all. His name was upon all lips. The very fact that he had come to France to advocate the cause of the new American republic conciliated for that cause the favor of great and small. And with the favor came a conviction that the side Franklin espoused would be certain to win. For, changing somewhat Turgot's celebrated line, was it not self-evident that the hand that "snatched the thunderbolt from heaven" would prove competent to wrest "the sceptre from tyrants?" Thus it came to pass that soon, according to M. Lacretelle, "no one any longer conceived it possible to refuse fleets and an army to the countrymen of Franklin."* Or, as M. Mignet, most terse and philosophical of modern French historians, has put it, "The sight of Franklin, the severe simplicity of his dress, the refined kindliness of his manners, the alluring spell of his wit, his venerable appearance, his modest assurance, and his resplendent fame, brought the American cause altogether into fashion."†

But it was not solely, nor chiefly, the reputation already gained by Dr. Franklin, that made his mission to France so productive of good to his native land. There was a wide field for the exercise of his ingenuity, for the display of his shrewd

* "Histoire de la France pendant le dix-huitième siècle," v, 86.

† "Vie de Franklin, Mémoires de l'Académie des Sciences Morales et Politiques de l'Institut de France," vii (1850), 396.

common sense, and of both dexterity and tact, in those dark days when nothing reached Europe but reports of losses, retreats, disasters to the patriots. Money was to be obtained, and that from the coffers of a monarch himself well-nigh bankrupt. A great state must be induced to enter the strife upon the seas with the most formidable of maritime powers. A friendly shelter must be found in hospitable ports for American vessels that scoured the shores of Great Britain and brought in the prizes taken to be condemned and sold.

With the joyful news of the surrender of General Burgoyne came the first rays of sunshine, presage of the complete dispersion of the thick clouds hitherto enveloping the political skies. Then it was that the king of France definitely consented to enter upon a treaty of alliance with the United States. That was indeed, as M. Guizot justly styles it, "a triumph of Franklin's diplomatic ability."* Henceforth, if the great American envoy's labors did not diminish, if instead they rather increased as the slow years of the contest dragged along, at least the firm conviction of approaching triumph made tolerable even that enormous load of responsibility which rested upon his shoulders. Others, it is true, were associated with him, at the Hague, in Madrid, and elsewhere—John Adams, John Jay, and others, whose services are deserving of everlasting remembrance. They, too, displayed true patriotism, whole-souled devotion to the cause of liberty, and rare skill in negotiation. They might not have enjoyed the opportunities for training in the school of diplomacy which had fallen to the lot of the British envoys with whom they were called upon to deal, but they proved themselves adepts in the science of persuasion and generally discomfited their rivals. As Dr. Franklin somewhat quaintly states it, not without a tinge of

* "Histoire de France," v, 346.

raillery, when writing to his English correspondent, William Strahan, once more his friend, after the conclusion of the war: "Your contempt of our understandings, in comparison with your own, appeared to be not much better founded than that of our courage, if we may judge by this circumstance, that, in whatever court of Europe, a Yankee negotiator appeared, the wise British minister was routed, put in a passion, picked a quarrel with your friends, and was sent home with a flea in his ear."* And if good Jonathan Shipley, Bishop of St. Asaph, had primary reference to the ability of Franklin himself in dealing with the French and English ministers, the remark held good also of his worthy associates: "The event has shown that, in their own arts, you were not inferior to the ablest of them."†

Yet, while others were associated with him in the honorable work, and right nobly discharged their part, it was after all, Dr. Franklin that was chiefly looked to to represent the United States in Europe entire, as it was he alone that could sustain the credit of the country when Congress in its desperation was issuing drafts which it provided the envoys with no means of honoring, and when the advances of money imperatively needed for the maintenance of the American cause must be wrung by judicious insistance from a government, not so much reluctant, as unable to meet all the demands upon its purse made by its impecunious ally.

At last perseverance met with its reward. The king of England was compelled to acknowledge the autonomy of his revolted colonies, and, on the 30th of November, 1782, in conjunction with John Adams, John Jay, and Henry Laurens, Dr. Franklin signed the provisional articles. Ten months later, he

* Letter from Passy, 19 August, 1784, Works, ix, 53.

† Letter from Twyford, 27 November, 1784, Works, ix, 280.

was associated with Adams and Jay in concluding the definitive treaty.

To the consummation of the hopes of all patriotic Americans, the wise efforts of Franklin and his fellow-diplomatists had contributed as truly, perhaps as substantially, as had the martial exploits of Washington and his companions in arms. And it is as honorable to the wisdom as it is to the reverent spirit of those great men, that both Franklin and Washington ascribed their success to the favor of God who is the friend and avenger of the oppressed. I quoted, a moment ago, the somewhat boastful terms in which Dr. Franklin was pleased to describe to William Strahan the triumphs of American diplomacy at European courts. I must be permitted here to reproduce these sentences by which he next proceeds to qualify what might well otherwise be viewed as too arrogant a claim. "But, after all, my dear friend," he says, "do not imagine that I am vain enough to ascribe our success to any superiority in any of those points. I am too well acquainted with all the springs and levers of our machine, not to see that our human means were unequal to our undertaking, and that, if it had not been for the justice of our cause and the consequent interposition of Providence, in which we had faith, we must have been ruined. If I had ever before been an atheist, I should now have been convinced of the being and government of a Deity! It is He who abases the proud and favors the humble. May we never forget His goodness to us, and may our future conduct manifest our gratitude." *

It cannot but be regarded as an interesting circumstance, that Dr. Franklin's last diplomatic service should have been rendered in the interest of our common humanity; that in the treaty with Prussia, which it was his last official duty to sign

* Works, ix, 53.

on the eve of his departure from Paris, were embodied those philanthropic provisions that are destined, we hope, to mark the era of a higher and purer civilization.

Much as Dr. Franklin had had to do with the prosecution of war, forced thereto by the circumstances of the hour, he was preëminently a man of peace. "I am of opinion," he once wrote to the banker, Le Grand, "I am of opinion that there never was a bad peace, nor a good war."* He hoped great things from the spread of intelligence and especially of mutual forbearance. Hence he rejoiced when Louis XVI, by his edict of toleration (1787), took the first step toward undoing the mischief wrought by Louis XIV's gigantic blunder in revoking the Edict of Nantes. "The *arrêt* in favor of the *non catholiques*," he wrote from Philadelphia, "gives great pleasure here, not only from its present advantages, but as it is a good step towards general toleration, and to the abolishing, in time, all party spirit among Christians, and the mischiefs that have so long attended it. Thank God, the world is growing wiser and wiser, and as by degrees men are convinced of the folly of wars for religion, for dominion or for commerce, they will be happier and happier." †

Meanwhile, as the prospect of the entire abolition of war was yet very dim and shadowy, Dr. Franklin regarded it an end well worth laboring for to reduce as much as possible the attendant horrors. Two of these—*privateering* and the *cruel treatment of prisoners of war*—he set himself to remove.

He had written frequently and decidedly in condemnation of privateering, which he stigmatized as a remnant of the ancient piracy, and argued that though accidentally beneficial to particular persons, it was far from profitable to the nation

* Works, ix, 298.

† Letter to M. Le Veillard, Philadelphia, 8 June, 1788. Works, ix, 481.

that authorized it. It was a lottery in which some might draw prizes, but the whole expense exceeded by much the aggregate of individual gains. Besides, in addition to the national loss of so many men during the time they have been engaged in robbing, the agents in the nefarious work become unfit for any sober business after a peace, and "serve only to increase the number of highwaymen and housebreakers." The financial disaster that sooner or later overtakes even the most prosperous of those taking part in it, Franklin regarded as "a just punishment for their having wantonly and unfeelingly ruined many honest, innocent traders and their families, whose subsistence was employed in serving the common interests of mankind."*

In accordance with these humane views, Dr. Franklin desired to insert in the treaty of peace with Great Britain an article abolishing privateering in all future wars. To this end he drew up a proposal, which he enclosed to his old friend, Richard Oswald, the British commissioner, shortly after they had signed the "provisional articles." In the accompanying letter he wrote: "I send you also another paper which I once read to you separately. It contains a proposition for improving the law of nations, by prohibiting the plundering of unarmed and usefully employed people. I rather *wish* than *expect* that it will be adopted. But I think it may be offered with a better grace by a country that is likely to suffer least and gain most by continuing the ancient practice, which is our case, as the American ships, laden only with the gross productions of the earth, cannot be so valuable as yours, filled with sugars or manufactures. It has not yet been considered by my colleagues, but if you should think or find that it might be

*Propositions relative to privateering communicated to Mr. Oswald, Passy, 14 January, 1783, Works, viii, 246. See also, *ib.*, ix, 88, 89.

acceptable on your side, I would try to get it inserted in the general treaty. *I think it will do honor to the nations that establish it.*" *

Dr. Franklin was right, but, finding no favor with the government of Great Britain, the proposal was declined. Its author, however, did not despair. A few years later he had the satisfaction of being able to write to M. Leroy : "I rejoice to hear that the difference between the emperor and your country [France] is accommodated, for I love peace. You will see in the treaty we have made with Prussia some marks of my endeavors to lessen the calamities of future wars." Accordingly we find near the close of that document, signed as I have said by Dr. Franklin, as one of the three commissioners appointed by Congress, just before his return, an article—it is the twenty-third—almost identical in its phraseology with that which he had, two years before, offered to Mr. Oswald for consideration. In it occur these memorable words : "And all merchant and trading vessels employed in exchanging the products of different places and thereby rendering the necessaries, conveniences and comforts of human life more easy to be obtained and more general, shall be allowed to pass free and unmolested; and neither of the contracting powers shall grant or issue any commissions to any private armed vessels, empowering them to take or destroy such trading vessels or interrupt such commerce." †

Not only so, but, in a succeeding article, the attempt is made further to mitigate the sufferings entailed by war by provisions of the most kindly character, stipulating in great detail what shall be the treatment of prisoners. They shall not be sent

* Works, viii, 245.

† Text in "Treaties and Conventions concluded between the United States of America and other powers since July 4, 1776" (Washington, 1889), 905, 906.

to distant and inclement countries, to the East Indies or to any other parts of Asia or Africa, nor confined in dangerous prison-ships or prisons, nor put into irons, nor bound, nor otherwise restrained in the use of their limbs. Both officers and common soldiers shall be furnished with daily rations equal in quality and quantity to the rations given to soldiers and officers of the same rank in the army of the captors; and their quarters and barracks shall be not less roomy and comfortable than those enjoyed by the troops of the party in whose power they are.

Still further to invest these new improvements in international jurisprudence with all possible sanctity, the following clear statement is made, every line of which bears the marks of Dr. Franklin's clear and judicious pen: "And it is declared, that neither the pretense that war dissolves all treaties, nor any other whatever, shall be considered as annulling or suspending this and the next preceding article; but, on the contrary, that the state of war is precisely that for which they are provided, and during which they are to be as sacredly observed as the most acknowledged articles in the law of nature or nations."*

This was an appropriate ending of Dr. Franklin's diplomatic services, a real gain for humanity achieved by a philosopher in whose eyes no acquisition, either of his own or of others, was so precious as that by means of which the common store of comfort and happiness was enhanced. Again it had been the great fame of the founder of this Society that insured him success in the field of international negotiation. For with such a man the States and monarchs of the Old World deemed it an honor to treat. The ambassador of Gustavus III, of Sweden, was not only directed to make advances for a treaty

* Treaties and Conventions, 906.

with the United States—Sweden being the first power in Europe which voluntarily offered its friendship without being solicited—but was charged to tell Dr. Franklin that the king had so great esteem for him that it would be a particular satisfaction to his majesty to have such a transaction with him. Dr. Franklin is himself our informant, nor does he conceal the pardonable gratification which he felt at hearing the flattering assurance, adding: "I have perhaps some vanity in repeating this; but I think, too, that it is right that Congress should know it, and judge if any use may be made of the reputation of a citizen for the public service." *

The diplomatic career of Dr. Franklin closes with the year 1785, when he went home not indeed to enjoy rest, as he had fondly hoped, but to a change of scene and of employment. And here, in the city of his adoption, death overtook him rich in years, in honors, and, what he prized more, in the memory of valuable benefits conferred upon his country and upon mankind. Such men are few in any age; their number is not great in all the combined centuries that together make up the short life of our race upon this planet.

It is only meet that we should cherish their names with respect, and gratefully hand down to posterity the story of their honorable and meritorious deeds.

Upon the close of the last speech, Mr. Williams said:

I am instructed by the Committee, which I represent in closing this commemoration, publicly to express the appreciation of the Society for the attendance of its

* Franklin to Secretary Livingston, Passy, 25 June, 1782, Works, viii, 109.

guests and for the words of its invited speakers. A hundred years ago, the honor and commemoration of Franklin at the end of a century was confidently expected by our predecessors, whose example we follow to-night with this tribute in memory of his death. With increasing confidence, with enlarging hope for the future, in abiding certainty that whatever another century may bring it can add only increasing fame to his memory, we commit our discharge of this duty to our successors a century hence, in the complete and comfortable assurance, that their commemoration, like our own, will find assembled again the descendants of Franklin, this Society, its members, its invited guests, and eloquent voices to commemorate his memory and again record his fame.

PROCEEDINGS

OF THE

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HELD AT PHILADELPHIA, FOR PROMOTING USEFUL KNOWLEDGE.

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Obituary Notice of Daniel Raynes Goodwin, D.D., LL.D.

By J. Vaughan Merrick.

(*Read before the American Philosophical Society, November 7, 1890.*)

It is impossible within the limited compass of a memoir like this, to present a complete picture of the life and character of a man so pure, so strong, so gifted, so impressive in his influence upon the world in which he lived, as those of the subject of this sketch.

Many of the circumstances which moulded his earlier years have sunk into oblivion, and through the passing away of his contemporaries cannot be revived. We must be content therefore to gather up the fragments which remain, and to fill out the outlines with the more abundant records of later years.

Daniel Raynes Goodwin was born, April 12, 1811, in North Berwick, Maine. His father, Samuel Goodwin, was a farmer who also owned and worked two mills at the Falls of Negutaquis, on the outskirts of the town. He was a sensible and good man, who, after rearing a family of nine children, died in 1855 at the age of ninety-two. His mother was Anna Gerrish, who survived her husband about one year. On both sides Mr. Goodwin inherited sterling qualities; on the father's side had been men of mark for integrity, courage and patriotism, and on the maternal side, college-bred men for generations. The homestead was so situated as to present meagre advantages for school education. The nearest neighbor lived nearly a mile distant, and the nearest school-house, which was opened only about ten weeks each year, was still farther off. In those days, in New England, sparsely settled and poor, except in the cities and towns, school advantages were few, and were pursued under many drawbacks and hardships. Wherever possible they were supplemented by home teaching. Fortunately in this case, the eldest sister performed this office during the winter evenings. When fifteen years of age, he was sent to the Academy at South Berwick, and later on to Limerick Academy. In 1828, then seventeen years old, he entered Bowdoin College, at Brunswick, Me., and notwithstanding his limited preparation, he speedily took and maintained throughout his college course, the first place for scholarship, as well as for natural powers. It is stated by Rev. Dr. John Lord, one of his schoolmates at Berwick Academy, that his class were all older than himself, yet that he at once took the lead, and being ahead of his teacher in classics, really taught himself Greek and Latin. He adds that he (Mr. G.) had great precocity of talent in every study to which his attention was turned, and was regarded as a sort of intellectual prodigy by teachers and scholars alike. He graduated at the head of his class at Bowdoin, in 1832, and was appointed master of the Academy at Hallowell, Me.; soon after which, in 1834, he became a member of the Theological Seminary at Andover. In 1835, he was called from Andover to Bowdoin, his Alma Mater, as tutor under the late Henry W. Longfellow, professor of modern languages. Soon after assuming the duties of this position he was elected to succeed that eminent man, who had resigned the chair. Some faint conception of his abilities and attainments can be drawn from the fact, that such a choice should have fallen upon a man of only twenty-four years of age. Diffident of his own powers, however, and resolved to fit himself more thoroughly for his post, he at once proceeded to Europe and spent nearly two years, studying the structure of the language and the literature of Spain, France, Italy and Germany, and maturing his knowledge of philology, which then and always was with him a favorite study, and one in which his intellectual powers were strengthened and polished. In 1837, he returned and became an active member of the Faculty of Bowdoin. It is the testimony of Mr. Nehemiah Cleaveland, in his history of that institution, that "As a teacher and governor, he was assiduous, fearless and most efficient, inculcating by example as well as precept a liberal culture. Possessing a mind singularly active, clear and comprehensive, with great acumen and power of analysis, it is not strange that metaphysical and moral science largely attracted his regard." Nor were his sympathies and abilities confined in their exercise to his merely professional affairs. It is the remark of Prof. Egbert C. Smyth, the son of a brother professor, who lived near and was a boyish admirer of Prof. Goodwin, that the two colleagues were associated in many objects of public concern outside of college duties; and the same authority mentions his admirable conversational powers, the memory so unfailing and inexhaustible in its resources, the crystal clearness of his thought, the aptness of his words, his cheerful and spirited manner. He speaks also of the engaging gifts of his wife (Mary Randall, daughter of Samuel and Hannah Merrick) to whom he had been married in January, 1838. With her, his delightful home had been established; and from it the two professors would "habitually walk together to their eleven o'clock recitations; or from time to time plant together elms and maples which with their own hands had been dug up in the forests." In this charming home, a perpetual fountain of knowledge and life, Prof. and Mrs. Goodwin lived for many years, subsequently transferring it to another house in Brunswick; rearing there a family of children, the oldest of whom, Anna Harriet, now the wife of Benjamin Vaughan, of Cambridge, was born in November, 1838. Subsequently were born three daughters: Julia, and Lucy, who died in infancy, and Mary, now the widow of the late Dr. William Canfield Spencer, U. S. A. (grandson of the late Chief Justice Spencer, of New York), and two sons: Henry, who died in 1861, and Harold, at present an attorney-at-law, residing in Philadelphia.

Another witness of this home life at Bowdoin describes it as "simple, unconventional, orderly, refined, and Christian."

Mr. Goodwin, besides his professorship at Bowdoin, held, for fifteen years, the post of Librarian to the College; doubtless a most congenial office, bringing him into close companionship with the books he loved so well; and to the College students, who profited by his learning, and by his enlightened power of guidance in their reading and research, offering a priceless boon. Nor were the students the only ones who benefited by his presence in this capacity. He was making at this time a strong mark in literature by contributions to various reviews, articles upon subjects germane to his chair, or upon the results of his studies in philology and history. That these labors were not exhausting, was due to his power of intense and active exercise of mind without special effort. To his trained powers such writings were recreation.

The play of his fancy, the lucidity of his style, and the fullness of his knowledge, which were displayed in these and subsequent papers (a list of which is appended), make one regret that, from the pressure of other avocations, he could not contribute to literature more extensive works. One of his contemporaries in Berwick Academy, who followed his subsequent career with the deepest interest, and is well qualified to express an opinion on such a subject, says that if he had devoted his attention to philosophical and metaphysical inquiries he would probably have attained a fame unexcelled, perhaps unequaled, by any living scholar.

The services he rendered in Brunswick to the public schools were conspicuous. Before the introduction of the graded system in the town, he was a member of the School Board; and by his efforts the strong opposition to the change from the old methods, involving legal embarrassments, as well as a modification of public opinion, was in great measure overcome. The contest was carried to the Supreme Court, and proving successful there, the issue resulted in great advantage to public education in the State. One who is familiar with this period of his life speaks in terms of hearty admiration of "his generous and self-sacrificing labors in this cause."

During his residence at Brunswick, it was the custom of the members of the Faculty to sally out when a disturbance among the students occurred, and personally to arrest offenders. On one of these occasions, Prof. Goodwin was severely injured by a student who threw oil of vitriol into his face, occasioning great suffering, and marking him for life:

although, happily, he escaped without permanent injury to his sight. This was not the result of any special animosity against him, but the dealing of a blow to the Faculty as a body, against whom the resentment of the attacked students was aimed. The result of this untoward event was an abandonment of the old, undignified method of quelling disturbances, as well as a widespread sympathy for the sufferer, and indignation against the offender.

His connection with the Protestant Episcopal Church, of which he afterwards became so distinguished a member, began during this period of his life. He was confirmed in 1842, at Gardiner, Me.; and this circumstance, coupled with his prominent position in the college at Brunswick, was probably one of the considerations which induced Bishop Henshaw, at that time acting Bishop of Maine, to send there, in 1843, a missionary to establish a church. Mr. Goodwin at once took up the duty assigned him of aiding this missionary in forming a nucleus for a parish; although, in so doing, he placed himself in apparent antagonism to other religious influences then prominent in the college, and ran counter to the traditions of the place, as well as to correspondingly strong convictions of at least some of his colleagues. They feared the effect upon the college, of introducing the services of a communion, which was at that time the object of considerable prejudice in the State, and, indeed, in New England. Mr. Goodwin's character and influence, however, made his advocacy of the new enterprise a tower of strength; for he was universally loved and respected by Faculty and students. No event of his life displays more clearly the fortitude, the calm and steady principle with which he gave himself to the support of an unpopular movement, and of what seemed at the time a forlorn hope; and these characteristics are visible throughout his life. In 1847, he was ordained Deacon, and in the following year a Priest of the Church.

At length his career at Bowdoin closed, when, in 1853, he was called to become President of Trinity College, at Hartford; acting, also, as one of the Professors, at first, that of Modern Languages, and, subsequently, of Moral and Intellectual Philosophy.

His presidency occurred during a difficult crisis in the affairs of the college, the history of which will, perhaps, be hereafter produced. It may, however, be said, that his influence was successfully exerted to raise the standard of its requirements and of its discipline, and to promote clear and honest work among its students.

One who was under him in those days (Bishop Niles), referring to the singular majesty of his character and his power of interesting his pupils, says that "he has known bright but indolent men look forward with eagerness to the President's recitation hour, in Butler's Analogy and Whately's Logic; from which far more was learned than by the study of formal logic under any other man." There was, however, as we are told by the same authority, another side of his character, not less strongly marked, which gave a brilliant lustre to his memory; that "mirthfulness and general enjoyment of what was really bright and clever in literature, in persons, in social and domestic life," which made him, in his own home, the centre of a group of young people, delighting himself and them with witty things of all kinds.

With such characteristics, it is easy to believe, that when called to a more prominent position, he carried with him the general and earnest regrets of Faculty and students at the severance of the tie. While still at Hartford, he was in 1855 honored by his Alma Mater with the degree of D.D.

In 1860, he was elected by the Trustees of the University of Pennsylvania to be Provost of that Institution, and immediately moved to Philadelphia, in which city, in West Philadelphia, he resided till his death. The University was at that time housed at Ninth and Chestnut streets, now the site of the post-office, and although venerable in age, was but the germ of its present self. As yet it had only the Collegiate, Medical and Law Department and a very limited staff of professors. Here also his duties were of a mixed character, including besides the government of the College, a professorship (Intellectual and Moral Philosophy) which brought him into close contact with the students.

Immediately prior to his election, the University had been for some months subsequent to the resignation of Provost Vethake, in temporary charge of the Vice-Provost, the late Prof. John F. Frazer.

It had, however, been among the traditions of the University until Provost Vethake's incumbency, that it should be in charge of a clergyman, and the Trustees, in pursuance of this policy, selected Dr. Goodwin as his successor.

His inaugural address marked a new era in the history of the University, and he at once assumed a commanding position in the Faculty and among the undergraduates. The favorable impression then produced, was confirmed and strengthened, as the daily intercourse of College life showed him to be at once rigorous in the performance of his duty and in exacting the same qualities from the young men under his charge, while they found him kind and genial upon personal contact within and without the College walls.

When, in the judgment of the Trustees, it became expedient to enlarge the scope of instruction, by adding to the liberal and classical courses, a scientific department, Dr. Goodwin feared that the change would not prove successful under the conditions then existing; and this feeling, it is supposed, influenced him in retiring from his office in 1868, when called upon to become Dean of the Philadelphia Divinity School.

It is the testimony of all who were conversant with the history of the Institution during his eight years' incumbency, that he produced a lasting and most valuable impression upon the characters of the students, leading them to habits of concentration of mind and of exactness of expression, the influence of which has been of the highest value in their subsequent career.

Upon his retirement the University testified its sense of his abilities and learning, by conferring the honorary degree of LL.D.

In 1862, Doctor Goodwin became Professor of Apologetics in the Philadelphia Divinity School, which was organized that year. The title of this chair was changed to Systematic Divinity, in 1865, and so remained, he holding the office till his death. In 1868, upon leaving the University of Pennsylvania, he was made Dean of the Divinity School and retained that position till 1883, when advancing years and somewhat impaired health, coupled with the removal of the Institution to a distance from his home, compelled his withdrawal. For these duties he was preëminently fitted.

A record of the events of his life would be most incomplete, without particular mention of his labors in the Church of his love, rendered especially in her councils, both Diocesan and General. Except in one instance, St. Gabriel's, Windsor, Ct., where he remained some three or four years, he never assumed a permanent Rectorship, but was, at intervals, temporarily (sometimes for months together) in charge of parishes. This fact, and his long connection with educational interests, together with his great ecclesiastical learning and power as a debater, were undoubtedly prime factors in making him, for so long a period, a leader in the governing bodies of the Church. As early as 1853, he was sent by the Diocese of Maine to the Triennial General Convention meeting that year. From Pennsylvania he was sent in 1862, to the first Convention held after his removal to that Diocese, and continuously thereafter until that of 1889, the last one previous to his decease; thus being a member of that august assembly for ten successive sessions. At the same time he was a member of every Annual Diocesan Convention for thirty years. He promptly attained and kept throughout this period in both, a commanding position and leadership in that school of Churchmanship to which his sympathies tended (the Low Church or Evangelical party). And apart from this, his manifest qualifications for the post, caused his election or appointment in both bodies on the "Committee on Canons," and for many years past, to the chairmanship thereof. As this Committee shapes all legislation, and suppresses a multitude of proposals for revision or change, its chairmanship demands not only great learning and clearness of conception, with aptitude in debate, but also great conservatism. All these qualifications found their realization in Dr. Goodwin. Independently of the duties arising out of these positions, it is probable that few, if any, important measures brought forward in either House, failed to receive his close attention and criticism. Indeed, he suffered no resolution presented to the House to pass, without a close analysis of its phraseology and of its possible results. His support or opposition was always of weight, and in the Convention of the Diocese it was apt to be decisive.

His influence in the Diocese was further conspicuously shown by his long service as Chairman of the Standing Committee, a body which acts as constitutional advisor of the Bishop, and, in his absence, as a substitute, so far as concerns his administrative powers.

To attempt an analysis of the character of so remarkable a man, is a task peculiarly difficult; his qualities were of so varied a nature, and presented strength in such apparently opposite directions. Irradiating his whole life, was the power of Christian faith. This was, undoubtedly, its dominating influence, the keynote of his nature. Gentle and courteous to a high degree, sympathizing and consolatory to those who were suffering from trial and loss, a lover of children, his heart was womanly in its tenderness. But in the defense of right, in the attack upon vice, in the public debate upon policy, in the attempt to redress evil, whether in Church or State, he was strong and uncompromising. When measures involving ecclesiastical opinion were under discussion, he was thoroughly alert, quick to point out what he conceived to be weak points in the armor of his opponents, sharp and decisive in piercing them, unwilling to surrender the slightest advantage or to adopt any compromise.

In debate "he thought upon his feet," and it was wonderful to hear him touch upon some point in a speech or a resolution, to which his attention had just been directed, dilate upon it, unfold all its possibilities, pursue its results to their legitimate end (and sometimes, perhaps, beyond it), until nothing was left of his antagonist or of the obnoxious measure. All this time there would be no hesitation; every word would be the exact expression of his thought; the logical process was perfect, the effect overwhelming. Such self-command is rarely seen combined with such learning and logical power. Familiar with many languages, ancient and modern, a close student of their structure and the derivation of their words, these words were his weapons; the exact scope and weight of each being carefully appraised, their relation to each other as carefully measured. He used them with telling effect, and was quick to point out where others failed to appreciate their true intent. In conversation, this power of his was displayed in quite a different way. A keen humorist, he delighted in word-play, and heartily enjoyed the sallies which resulted from an encounter of wits.

But a perfect knowledge of the qualities of different weapons would be worse than useless, were it not for an enlightened power of selecting and employing them. So the philologist is not necessarily a wise reasoner. Herein, then, lay Dr. Goodwin's great power in moulding legislation, that possessing such knowledge, his clear and highly trained reasoning powers made him a logician of the highest order. In his speeches there was a singular freedom from an attempt at eloquence or at display. He was not intent on moving the imagination of his hearers, or persuading them to his side; rather to drag them with him by the irresistible force of his reasoning.

As an educator, which, after all, was the vocation in which most of his life was passed, one of his former pupils—himself now well advanced in years, and qualified by his own well-earned standing to judge fairly—Rev. C. C. Everett, says that he possessed in those days two distinctions which contributed to his success. One was that "he taught; that was something more rare in those days, in all colleges, than now. His hour was crammed full of information. This was chiefly in regard to the derivation and affinity of words; though the beauties and the meaning of the work studied had their place." The other distinction was "his habit of inviting the students to his house to tea." By this means, adopted in advance of his times, but now happily imitated, he became familiarly known to those committed to his charge, and gave them the advantage of social intercourse.

Apropos of this latter custom, it is related of him that, shortly after reaching Hartford, a friend visiting at their house witnessed the following characteristic scene. The door-bell rang about tea-time, and some half-dozen college students arrived. Doctor Goodwin and his wife welcomed them without any sign of surprise. After some delay a hospitable meal appeared and was discussed, followed by a pleasant evening; both host and hostess exerting themselves to entertain their uninvited visitors. After their departure each looked at the other, but neither was able to explain the visit. The next day the mystery was solved by a call from a delegation of students, who found they had been hoaxed by some of their fellows, and who desired to apologize for the intrusion. Needless to say, the young men were ever after strong friends of the president and his wife. The next invitation given to a set of students, however, was not accepted, they fearing the repetition of the joke upon themselves.

In personal appearance, Dr. Goodwin was tall and dignified, with finely-cut features and piercing eyes. The musical tones of his voice linger in one's memory. In late years, when time had crowned him with silver locks, and the deliberate step of age characterized his movements, his figure was one to command, as it received, the highest reverence. But he never lost a certain vivacity, which awakened at the meeting with his friends.

It has been said that Christian faith was the dominating keynote of his nature. None who knew him could fail to recognize the truth of this statement. He was a man of strong piety, in the noblest meaning of that word. Always grave and matured beyond his years, his religious life awakened during the later years of his college days, and steadily expanded during all the remaining years of his life, coloring and subduing all of his faculties, consecrating all his attainments to the service of his divine Master. His light shone more brightly as the darkness of waning years gathered around his earthly path. And his memory must remain, like a beacon, to those who knew him, an evidence of the profound truth and power of Christianity.

An examination of the list of his writings, to which allusion has been made, will show the versatility of his attainments, as well as the active interest he always took in those questions of the day, which, in his view, would affect injuriously the cause of Christian truth. This list covers only those speeches which were reprinted separately. To appreciate his activity in this respect, one must look through the journals of the Ecclesiastical Conventions of which he was a member, the pages of which are crowded with evidences of his incessant participation in debate. Other articles and works are upon questions of ethics, religion, history, ethnology, philology, politics, science, statesmanship, etc., besides numerous addresses before Church congresses, college alumni, and discussions of questions relating to the polity and services of the Church, and, in addition to all these, a great body of sermons.

Dr. Goodwin suffered greatly at times, during the latter part of his life, from insomnia. From this, however, he measurably recovered, and his death, after a brief attack of partial paralysis, came most unexpectedly. On the fifteenth day of March, 1890, he passed away, leaving a gap which, in society and in the Church, cannot soon be filled, and an enduring and grateful memory in the community, for his eminent services in the cause of religion, and good learning. His epitaph may fitly be written in words of his own choice :

"A servant of Jesus Christ, and for Him a teacher of men."

He was laid to rest in Woodlands Cemetery by the side of his beloved wife, whose death a few years earlier had closed upon earth a companionship which had endured for forty-six years ; and was followed to the grave by the Bishop of the Diocese and a large body of his fellow-clergy, as well as by a multitude of friends and others distinguished in every walk in life. The resolutions of affectionate regard which were adopted by the former, are appended, together with those of the Standing Committee of Pennsylvania.

Besides his membership in the American Philosophical Society, to which he was elected early in 1861, he was a member of the Historical Societies of Maine and Pennsylvania, the American Academy of Arts and Sciences, and the American Oriental Society ; and the first President of the Society of Biblical Literature and Exegesis.

Appendix A.

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95. Four articles on the "Change of Name" of our Church in *The Standard and The Church,* Jan. 19, Feb. 2, 9, 16, 1889.

Ditto, in a Pamphlet entitled "Shall the Protestant Episcopal Church in the United States of America cease to exist?" published by the Evangelical Ed. Society, 5000 copies, May, 1889; pp. 36.

96. Speech in the General Convention, Oct., 1889, on "Proportional Representation in the House of Deputies," with a note appended, in *The Standard of the Cross and the Church,* Nov. 16, 1889; 4 cols., — 12 pp.

Appendix B.

MEMORIAL ADOPTED BY THE CLERGY.

The Clergy of the Protestant Episcopal Church in the Diocese of Pennsylvania, called together by the recent death of the Reverend Doctor Daniel R. Goodwin, desire to place on record the following minute concerning their departed brother:

Dr. Goodwin's long and faithful service here made him, perhaps, the most conspicuous figure among us. His great ability, his ripe scholarship, the wide extent, indeed, and the minute accuracy of his knowledge, his quick perception, his readiness in debate, the power of his reasoning, and his unflinching courage in the maintenance of his own conscientious convictions were readily recognized by all who knew him. There were, however, other traits of his character which, possibly, more than his vigorous intellect, his rare learning, and his logical power, endeared him to his friends. For, in union with these qualities, there was in him a wonderful degree of gentleness and tenderness. No one had a keener sympathy with those in sorrow; no one a more wonderful power of adapting himself to their spiritual needs. His words to the sick and suffering, always happily chosen, were full of grace and consolation. They who were recipients of his ministry of mercy can never forget it. His rare judgment was never better tested than when he came into the seclusion of the sick-room to bring the comforts of religion. His fine mental powers, cultivated by long years of faithful and earnest study, shone at their brightest where the world is too apt least to esteem them.

They whose privilege it is to have known him in his home-life—to have witnessed his affection for his friends, his gentle kindliness to little children, his fine courtesy, his deep love for those bound to him by tenderest ties, and his genuine humility—well know how large an element in his true greatness was found there. As his days drew towards their close (and, thank God, with unabated intellectual power on his part), it may without exaggeration be said of him that his spiritual nature seemed to be ripening more and more for the peaceful rest of the blessed.

True to his friends, true to his country—grandly so in her years of peril—valiant for the truth as it presented itself to his mind and his heart, long must his memory be cherished by all who have learned from him to prize what is best and noblest in the pursuits of life.

Appendix C.

MEMORIAL ADOPTED BY THE STANDING COMMITTEE OF PENNSYLVANIA.

At a meeting of the Standing Committee, held April 1, 1890, the following minute was adopted:

In the death of the Rev. Dr. Goodwin the Church has lost one of her brightest ornaments, Theological Learning one of its most efficient upholders, and Religion one of its ablest defenders. Were this the opportunity, we might expatiate on each of these relations in which our departed friend and brother held so conspicuous a place. It will fall to the lot of others to do him justice in these particulars. It is ours rather to speak of him in connection with his membership for so many years in this body, and for most of the time its presiding officer. To say that he presided with uniform courtesy and intelligence would be saying but little. He was our authority in all matters pertaining to ecclesiastical law, and his was the acute mind which was ever ready to untie knotty questions. The adequacy of his learning was but rarely, if ever, at fault, and the lucidness and cogency of his reasonings in almost all instances, if not in all, admitted as conclusive. We shall greatly miss him here, as elsewhere in the Church. He was always, in her deliberative assemblies, a master of sentences, a mine of learning, a logical force that elicited the admiration of all. Long will he be remembered for all these high qualities by those who, in such assemblies, listened to his voice, the voice that, alas, for us, is now hushed in death.

We, too, will remember him for all that; and not less, for his devoutness in worship, his genialness in social converse, his consistency of Christian living, his honor for his high calling, and his untiring industry and inexhaustible patience in the discharge of every duty devolving on him in the various departments of effort in which he was called to exercise his eminent abilities. We thank God for all that He made him to be, and for all that, being what he was, he did for the cause of religion in the Church, and of good learning and right thinking and acting in the world. He will take his place assuredly for long continuance in the memory of the Church, and especially the Church in this Diocese, of which he was so able and devoted a minister.

Note on the Puquina Language of Peru.

By Daniel G. Brinton, M.D.

(*Read before the American Philosophical Society, November 21, 1890.*)

When the monarchy of ancient Peru, extending nearly two thousand miles along the Pacific coast, succumbed to the Spanish soldiery, it was found to be peopled by diverse tribes, speaking many dialects. These, however, belonged to but a few linguistic stocks, and both the missionaries and civil functionaries soon came to recognize three or four tongues, as "general languages," *lenguas generales*, throughout this wide area. In an official report dated in 1582, these were spoken of as three in number, the Kechua, the Aymara, and the *Puquina*.* The learned missionary, Father Geronimo de Ore, writing a few years later, makes the number four, adding the Yunca to the three already given.

We have a very fair knowledge, by means of grammars and vocabularies, of the Kechua, the Aymara, and the Yunca; but up to the present time have had practically no information about the Puquina. The only specimen of it in modern treatises is the Lord's Prayer, printed by Hervas, in his *Saggio Pratico*, and copied by Adelung in the *Mithridates*.† On this specimen Hervas based the opinion that the Puquina was radically different from any other known American tongue. Mr. Clement L. Markham, on the other hand, denied this, and pronounced the Puquina "a very rude dialect of the Lupaca," and a member of the same linguistic stock as the Kechua.‡ The editors of the *Mithridates* seemed to incline to this view, as they laid stress on some similarities to the Aymara dialects (of which the Lupaca is one). Von Tschudi also adopts it in his learned work on the Kechua.§

None of these authorities had any other material to go upon than the *Pater Noster* referred to. They speak of it as the only known specimen of the tongue. Hervas credits it to a work of Geronimo de Ore, the missionary already mentioned, which it is evident that neither he nor any other of the writers named had ever seen. This work is the *Rituale seu Manuale Peruanum*, published at Naples in

* *Relaciones Geograficas de Indias, Peru.* Tome I, p. 82 (Madrid, 1881).

† *Mithridates*, Theil III, Abth. II, s. 548–550.

‡ Markham, in *Journal of the Royal Geographical Society*, 1871, p. 305.

§ J. J. von Tschudi, *Organismus der Ketschua Sprache*, s. 76 (Leipzig, 1884).

1607. It is indeed rare, but there is a copy in the *Bibliothêque Nationale* at Paris, which I recently consulted. It contains not only the *Pater Noster*, but thirty odd pages in the Puquina tongue, and presents a veritable mine of texts for any one to work out a satisfactory presentation of the idiom. That is not my intention, but merely to call attention to this valuable source of knowledge in the hope that some of the many able French students of linguistics will give us such an analysis of these texts as, for instance, M. Raoul de la Grasserie has accomplished for the Timucua.

The source of De Ore's information appears to be the remarkable work of Father Alonso de Barcena, *Lexica et precepta grammatica in quinque Indorum linguis quarum usus per Americam australem*, said to have been printed at Lima in 1590, but of which not a single copy is known as extant. Ore expressly states that the Puquina version of the *Doctrina Christiana* which he publishes is according to the translation of "P. Alonso de Barzana, jesuita." In addition to the *Doctrina*, he inserts a Puquina translation of the Sacraments of Baptism, the Eucharist, the Creed, various exhortations, etc. These are accompanied by renderings in Spanish or Latin, and also into the Kechua and Aymara, so that the similarities and differences of the three tongues are clearly shown.

At the time of Barcena's mission, the Puquina was spoken on various islands in Lake Titicaca, in the neighborhood of Pucarani and in several villages of the diocese of Lima. Bastian quotes Oliva as averring that it was also current on the Pacific coast, in the extreme north-west of Peru, near Lambayeque; but I should hesitate to credit this without better evidence. The Titicacan tribe who made use of it was called *Uros* or *Ochozomas*. According to the authorities they were extremely low in culture, shy and dull. Acosta says of them that they were so brutish that they did not even claim to be men, but only animals.* Garcilasso de la Vega calls them rude and stupid.† Alcedo, writing in the latter half of the last century, calls them *Hunos*, and adds that formerly they lived in great misery and degradation on the islands in the lake, but had against their will been removed to the mainland, where they dwelt

* "Son estos Uros tan brutales que ellos mismos no se tienen por hombres. Cuentase dellos que preguntadolos que gente eran, respondieron que ellos no eran hombres sino *Uros*, como si fuera otro genero de animales" (Acosta, *Hist. de las Indias*, p. 62).

† "Los Indios Puquinas * * * que son rudos y torpes" (*Comentarios Reales de los Incas*, Lib. vii, cap. iv).

in dark caves and holes in the ground, covered with reeds, and gaining a subsistence by fishing.*

They are described as very jealous about their language and unwilling that any foreigner should learn it. As they all spoke more or less Kechua, their religious exercises and necessary communications with the authorities were carried on in that tongue—which will explain the presence of a number of words appropriate to such relations in their own idiom.

The entire dissimilarity of the Puquina to both Kechua and Aymara is forcibly shown by a comparison of the numerals.

	Kechua.	*Aymara.*	*Puquina.*
1.	huc	mayni	pesc
2.	iscay	pani	so
3.	quimsa	quimsa	capa
4.	tahua	pusi	sper
5.	pichka	pisca	tacpa
6.	soccta	chocta	chichun
7.	canchis	pa-callco	stu
8.	pusacc	quimsa-callco	quina
9.	iscon	llalla-tunca	checa
10.	chunca	tunca	scata

In these lists, three of the Aymara numerals, 1, 2, and 4, are independent; four of them, 3, 5, 6, and 10, are taken from the Kechua; and the remaining three are compounds, *pa-callco* being $2+5$; *quimsa callco*, $3+5$, and *llalla tunca* meaning "next to ten" or "less than ten." *Callco* is derived from the word for "foot," the counting being with the toes. On the other hand, there is not a single numeral of the Puquina which can be taken from either Kechua or Aymara, and, what is more singular, there is apparently not one which is compounded.

To illustrate the general appearance of the language, I shall give some extracts from De Ore's work, presenting the versions in the other *lenguas generales* for the sake of comparison.

The Sacrament of Baptism.

P. Quid fertes ad ecclesiam, virum aut mulierem?

R. Virum.

P. Quid petit ab Ecclesia Dei?

* Alcedo, *Diccionario Geografico-Historico de las Indias*, s. v. *Chucuito.*

℞. Fidem.
P. Fides quid ei praestabit?
℞. Vitam aeternam.

Aymara:

P. Cuna huahuapi yglesiaro apanita; yocallati, ymillachı?
℞. Yocallahua.
P. Diosna yglesiapata cunapi maysi?
℞. Fè Diossaro yassañassa.
P. Fè Diossaro yassañassa cunapi churani?
℞. Viñaya hacañahua.

Puquina:

P. Quiñ toopi, raago ayay, ynque atagoy ayay?
℞. Raago.
P. Quiñ hătai Diosn Yglesia huananac?
℞. Fè Dioshua cu hanchano.
P. Fè Dioshua cuhans anosc, quiñ hi yegue?
℞. Viñaya çumano (p. 63).

[*Vita eterna* is given in Quichua as *Viñay cauçaytam*, so the *Viñaya* of the Aymara and Puquina is probably Kechua.]

In Puquina:

Quid petit?—quiñ hatai?
Quid petunt?—quiñ hatanuy?

From the Sacrament of the Eucharist.

In Puquina:

Span. Jesu Cristo, hijo de Dios.
Puq. Jesu Cristo, Dios chuscu.
Sp. Quien es Jesu Christo?
Puq. Nuy Iesu Christox?
Sp. Es verdadero Dios y verdadero hombre. (?)
Puq. Iesu Christo, checa Dios, checa miñ.
(*Kech.* Iesu Christo, checan Dios, checan runam.)

Puq. uses the expression *Capac* Iesu Cristó = Kechua, *Capac*, señor.

P. Porque no reciben este Sacramento todos los Indios?
℞. Porque muchos dellos, auque estan ya Baptizados, adoran las huacas, y Idolos, como en tiempo de su gentilidad; y

no queriendo saber la ley de Dios, viven como gentiles, y beviendo con destemplanza, se emleriagan muchas vezes, y tienen enemistad los unos con los otros, y no estan en paz, usurpan la hazienda agena, sin quererla restituir, y por otros muchos vicios que tienen, les prohiben que no comulguen, y assi no reciben la Communion.

Kechua :

℟. Huaquin cunaca, naupahinatac (ña baptizasca caspapas) huaccancunacta, inti, quillacta, coyllorcunacta, orcocunactapas muchascanmanta: Diospa simintapas, mana chay cama yachayta munaspa, pampa cauçascan mantahuan, huachuc cascanmanta, runa macintin checninacuc, mana allipi purictac; hucpa yma haycanta harcapuc, hiticapuc, mana copuyta munaspa; yma haycca huchactapas huc hallicuscanmanta, ama comulgancachu, ñiscam, mana chazquincuchu.

Aymara :

℟. Yacapanacaca, baptizata cancassinsa, huaccanaca, inti, pacsi, huara huara, collonacasa, nayra hama hampathiri cancatapata; Diosna aropasa hani uca cama yatiña munasina, pampa hacata pampi, huatuca cancatapata, haque macipampi checnissiri, yancana çariri. maynina cunacauquisa harquiri, huaccaychasiri, hani ucaniro cutiyana munasina; cuna cauqui huchampisa huchallissitapata, hani comulganiti, satapi, hani catupisquiti.

Puquina :

℟. Huaquin a miñs ehe peogunha baptizaso samp, chu uña co acoa, inti, uque, chinacuna, chatallata hamp upallisoch, Dios hors hamp, apa cogama siscano hatarahua, pampaca quichcasochin, chu uñ atago roguesach; chu uñ mih matipura checniscanunch, entot quichgueno; miñ quiñ harqueno vatiqueno; apaeheguina, eno hatarava; quiñ hinanti huchallicuscaso hamp, ama comulgascaquinch, a sos apa ytinunch.

Spanish :

Creeis en Dios Padre, todo poderoso, creador del cielo, y de la tierra, de las cosas visibles y invisibles?

℟. Yo creo.

Kechua:

P. Y, ñin quichu Dios yaya, llapa atipacman, hanac pachap, cay pachap, ricuricpa, mana ricuricpa, ruraquenman?

℞. Y ñinim.

Aymara:

P. Ya, stati, mayni çapaqui Dios Auqui, taque atipiriro, harac pachana, aca pachana, uñatanacana, hani uñatanacansa luriripara?

℞. Ya satapi.

Puquina:

P. Cuhañapi Dios yqui vin atipeno guttac, hanigo pacas, hopacas, co hanquench, appa cohanquench, callaquenoguta?

℞. Cuhañequench.

Spanish:

As adorado huacas, villcas, cerros, rios, el Sol, y otra cora?

Kechua:

Huacacta, villcacta, orcocunacta, mayucta, ymaymana cunacta huampas muchacchu canqui?

Aymara:

Huaccanaca, villcanaca, collonaca, hauirinaca, inti, pacsi, yaccapa cuna cauquisa hampa thiritati?

Puquina:

Vpallinoui chatallata, coa, chacar, cachia, paragara, pachamama, inti, vin quiñeno hamp?

I add the *Pater Noster*, as the copies in Hervas and the *Mithridates* are defective in accurracy of proof-reading.

Pater Noster in Puquina.

Señ yqui, hanigo pacas cunana ascheno, po mana vpallisuhanta; po capaca aschano señ guta huachunta, po hatano callacaso hanta, quiguri hanigopa casna ehe cahu cohuacasna hamp; Kaa gamenque ehehesuma. Señ guta camen señ tanta, señ hochaghe, pampaehe sumao, quiguri señ, señ guta huchachasqueno gata pampachanganch cagu. Ama èhe acrosuma huchaguta señ hotonsuà enahata entonana quespina sumau. Amen.

It is obvious on a superficial examination that there are a number of verbal analogies, probably loan-words, to both Aymara and Kechua. Such are *inti*, sun; *mocna*, pl., *moccon*, hand, allied to Kechua *maqui*, etc.

The negative is *ama*, as:

Thou shalt not kill; *ama hallanaqueuanch*. Thou shalt not commit adultery; *ama suaguepanch*.

This is also a negative adverb in Kechua.

The plural is formed by various changes of the termination, as: Man (*homo*), *miñ*, pl., *miñs;* as "many men," *hoaquina miñs;* "all men," *hinantin miñs*; "your mother," *pomi;* "your mothers," *pomig*.

There seems a greater tendency to monosyllabism in the Puquina than in either of the other two tongues. Such words as *raago*, man (*vir.*); *atago*, woman; seem to be built up from the roots *ra* and *at*.

But as the object of this note is merely to call attention to the material for the study of this language, I shall not pursue these reflections.

NOTE.—About the beginning of June, the Society temporarily removed, and stored its collections, library, etc., etc., and vacated its building to enable alterations to be made that would render the same more commodious and fire-proof. The interior was remodeled, the two (southern) meeting rooms thrown into one, as also were the two northern rooms, and a new third story, to contain the books and MSS. of the Society, was added. No meeting was held until

November 7, 1890.

The Society came together in the new meeting room.

Present, 31 members.

President, Mr. FRALEY, in the Chair.

Mr. Robert Patterson Field, a newly elected member, was presented to the Chair, and took his seat.

Correspondence was submitted as follows:

Letters accepting membership in the Society from Messrs. George S. Fullerton, Robert P. Field, Heman L. Wayland, Philadelphia; Charles G. Leland, London, Eng.

A circular from Mr. A. Strauch, announcing his successorship to Mr. C. Vessilosski, as Secretary of the Académie Impériale des Sciences, St. Petersburg.

Circulars from the K. Zoologisch Genootschap Natura Artis Magistra, Amsterdam, announcing the death of Dr. G. F. Westerman, and the election of Dr. C. Kerbert as his successor.

A circular from the K. Gesellschaft der Wissenschaften, Göttingen, requesting Transactions, xiii, 3.

A circular from the Société Botanique Bavaroise, Munich, requesting exchanges.

A circular from M. Miguel Perez, announcing his successorship to Prof. Mariano Barcena, as Directeur of the Observatorio Meteorológico Magnético Central, Mexico.

Letters from societies responding to the request of the American Philosophical Society for exchanges, were as follows:

The Royal Asiatic Society (Straits Branch), Singapore; K. Danske Geografiske Selskab, Copenhagen; Observatorium der K. K. Nautischen Akademie, Triest; K. K. Militär-Geographische Institut, Wien; Geodätische Institut, Hydrographische Amt des Reichs-Marine-Amt, Berlin; Verein für Erdkunde, Cassel; K. Sächs. Meteorologische Institut, Chemnitz; Siebenbergische Verein für Naturwissenschaften, Hermannstadt; Naturwissenschaftliche Verein, Osnabrück; Würtembergische Verein für Handelsgeographie, Stuttgart; Etat Indépendant du Congo, Bruxelles; Société Neuchateloise de Géographie, Neuchâtel; Union Géographique du Nord de la France, Douai; Société de Geographie, Lille; Ministero di Agr. e Commercio Direzione Generale della Statistica, Rome; Manchester Geographical Society; Belfast Natural History and Philosophical Society; Instituto Meteorologico Nacional de Costa Rica; Dirección General de Estadistica, La Plata.

Letters of envoy were received from the Secretary of Mines, Melbourne, Australia; Royal Asiatic Society (Straits Branch), Singapore; Société de Géographie de Finlande, Helsingfors; Université Royale, Lund; Fondation de P. Teyler van der Hulst, Harlem; Osservatorio Marittimo dell' i. k. Accademia di Nautica, Trieste; K. Geologische Landesanstalt und Bergakademie, Prof. F. Reuleaux, Berlin; Würtembergische Vierteljahrshefte für Landesgeschichte, Stuttgart; Société de Géographie de Lille; Royal Statistical Society, Meteorological Office, London; Mr. W. Sinclair, Glasgow; Boston Society of Natural History; Department of State, United States Geological Survey, Smithsonian Institution, Washington, D. C.; Public Ledger Family, Philadelphia; Observatorio Nacional, Oficina Meteorológica Argentina, Cordoba, S. A.

Letters of acknowledgment (Transactions, xvi, 3) were received from the Société Royale de Zoologie, Amsterdam; Fondation de P. Teyler van der Hulst, Harlem; Bataafsch Genootschap der Proefondervendelijke Wijsbegeerte, Rotterdam; R. Accademia dei Lincei, Rome; K. Bibliothek, Berlin; Philosophical Society, Cambridge; Royal Society, Royal Institution, Royal Astronomical Society, Society of Antiquaries, London; Radcliffe Observatory, Oxford; Royal Society of Edinburgh; Boston Society of Natural History.

Letters of acknowledgment were received from Dr. Julius Platzmann, Leipzig (127); R. Academia de la Historia, Madrid (128, 129, 130); University Library, Cambridge. Eng. (133); Radcliffe Observatory, Oxford, Eng. (127–133); University of Toronto, Canada (99–133, Catalogue, Pts. i–iv, etc.); Dr. John M. Maisch, Mrs. Helen Abbott Michael, Philadelphia (128, 129, etc.); University of Iowa, Iowa City (125, 128, 129); Messrs. Lyman B. Hall (133), John A. Ryder, Benjamin Sharp, Philadelphia (128, 129, 132, 133).

Acknowledgments (129) were received from Mr. Samuel Davenport, Adelaide, S. Australia; Imperial Academy of Science, St. Petersburg; Prof. Paul Hunfalvy, Buda-Pesth, Hungary; Université Royale, Lund; South African Philosophical Society, Cape Town; Centralblatt für Physiologie, Berlin; Dr. Otto Böhttingk, Leipzig; Academie Royale des Sciences, Lisbon, Portugal.

Acknowledgments (130) were received from the Geological Survey of India, Calcutta; Tokyo Library, Tokyo, Japan; Royal Society of New South Wales, Sydney; Imperial Academy of Science, St. Petersburg; Université Royale, Lund; Fondation de P. Teyler van der Hulst, Harlem, Netherlands; Société Entomologique de Belgique, Bruxelles; Profs. Matthæus Much, Josef Szombathy, Vienna, Austria; Deutsche Geologische Gesellschaft, K. Preuss. Akademie der Wissenschaften, Gesellschaft für Erdkunde, Physiologische Gesellschaft, Berlin; Naturwissenschaftlicher Verein, Bremen; Verein für Thüringische Geschichte und Altertumskunde, Jena; Dr. Otto Böhtlingk, Leipzig; K. Sternwarte, München; Verein für Naturkunde, Offenbach a. Main; Dr. C. A. Dohrn, Stettin; Marquis Antonio De Gregorio, Palermo, Sicily; R. Accademia di Scienze, Lettere ed Arti, Padova; R. Accademia dei Lincei, R. Comitato Geologico d'Italia, Prof. Giuseppe Sergi, Rome, R. Osservatorio, Turin; Prof. Claudio Jannet, Prof. Lucien Adam, Rennes, France; Royal Society, Royal Observatory, Mr. James Geikie, Edinburgh, Scotland; Prof. J. P. Postgate, Cambridge, Eng.; Society of Arts, Juhlin Dannfelt, London; Natural History Society, Newcastle-upon-Tyne; Boston Society of Natural History; Messrs. H. D. Gregory, Inman Horner, Philadelphia; Mr. Everard F. im Thurn, British Guiana; South African Philosophical Society, Cape Town.

Letters of acknowledgment (131, 132, 133) were received from the Musée Royale d'Histoire Naturelle de Belgique, Bruxelles; K. K. Central-Anstalt für Meteorologie und Erdmagnetismus, Drs. Aristides Brezina, Friedrich S. Krauss, Wien; Naturforschende Gesellschaft des Osterlandes, Altenburg; Gesellschaft für Erdkunde, K. Geol. Landesanst. u. Bergakademie, Berlin; Verein für Erdkunde, Dresden; K. Sächs. Gesellschaft der Wissenschaften, Dr. Julius Platzmann, Leipzig; Verein für Geographie und Statistik, Frankfurt a. M.; Verein für Naturkunde, Offenbach a. M.; Société d'Anthropologie, Musée Guimet, Messrs. A. Del Cloizeaux, Abel Hovelacque, Claudio Jannet, E. Levasseur, Paris; Prof. Lucien Adam, Rennes, France; Philosophical Society, Prof. J. P. Postgate, Cambridge, Eng.; Mr. Samuel Timmins, Coventry, Eng.; Yorkshire Geological and Palæontological Society, Halifax, Eng.; Society of Antiquaries, Royal Society, Royal Astronomical, Statistical, Linnean, Geographical Societies, Royal Institution, Local Government Board, Dr. J. D. Hooker, London; Natural History Society of Northumberland, etc., Newcastle-upon-Tyne; Royal Society, Royal Observatory, Prof. J. Geikie, Edinburgh; Royal Dublin Society; Nova Scotia Institute of Natural Science, Halifax, N. S.; Natural History Society, Montreal, Canada; Mr. Horatio Hale, Clinton, Ontario; Geological and Natural History Survey, Ottawa, Canada; Hon. J. M. Le Moine, Quebec; Canadian Institute, University of Toronto, Sir Daniel Wilson, Toronto, Canada; Maine Historical Society, Portland Society of Natural History, Portland, Me.; New Hampshire Historical Society, Concord; Prof. C. H. Hitchcock, Hanover, N. H.; Amherst College Library, Amherst, Mass.; American Statistical Association, Boston Athenæum, Massachusetts Historical Society, Public Library, Boston Society of Natural History, State Library of Massachusetts, Massachusetts Institute of Technology, Dr. Oliver Wendell Holmes, Hon. Robert C. Winthrop, Boston; Museum of Comparative Zoölogy, Harvard College Library, Messrs. Robert N. Toppan, Joseph Lovering, J. D. Whitney, Cambridge; Mr. James B. Francis, Lowell, Mass.; Dr. Pliny Earle, Northampton, Mass.; Rev. Edward E. Hale, Roxbury, Mass.; Essex Institute, Salem; American Antiquarian Society, Worcester, Mass.; Rhode Island Historical Society, Providence; Franklin Society, Providence, R. I.; Connecticut Historical Society, Hartford; New Haven Colony Historical Society; New York State Library, Mr. James Hall, Albany; Prof. Walter Le Conte Stevens, Brooklyn; Buffalo Library; Prof. C. H. F. Peters, Clinton, N. Y.; Profs. J. M. Hart, T. F. Crane, B. G. Wilder, Ithaca, N. Y.; Astor Library, Columbia College, University of the City of New York, New York Hospital, New York Historical Society, Editors of "The Critic," Messrs. H. L. Abbot, Joel A. Allen, Daniel Draper, James Douglas, J. S. Newberry, J. J. Stevenson, New York; Oneida Historical Society, Utica; Vassar Brothers Institute, Poughkeepsie; United States Military Academy, West Point; Prof. Henry M. Baird, Yonkers, N. Y.; Messrs. J. F. Garrison, I. C. Martindale, Camden, N. J.; New Jersey Historical Society, Newark; Profs. C. F. Brackett, C. A. Young, Princeton, N. J.; Dr. Charles B. Dudley, Altoona, Pa.; Mr. M. H. Boyé, Coopersburg; Mr. Eckley B. Coxe, Drifton; Drs. Traill Green, J. M. Moore, Thomas C. Porter, Easton; State Library of Pennsylvania, Mr. Andrew S. McCreath, Harrisburg; Prof. Lyman B. Hall, Haverford; Mr. John Fulton, Johnstown; Linnean Society, Lancaster; Mr. P. F. Rothermel, Linfield; Franklin Institute, College of Physicians, Pennsylvania Hospital, Wagner Free Institute of Science, Messrs. John Ashhurst, Jr., W. S. Baker, Cadwalader Biddle, Andrew A. Blair, D. G. Brinton, J. H. Brinton, C. H. Clark, Thomas M. Cleemann, J. Solis Cohen, E. D. Cope, C. S. Dolley, Patterson Du Bois, Robert Patterson Field, Frederick Fraley, J. C. Fraley, Persifor Frazer, George Friebis, Philip C. Garrett, F. A. Genth, F. A. Genth, Jr., J. S. Harris, Lewis M. Haupt, H. V. Hilprecht, William A. Ingham, Francis Jordan, Jr., G. de B. Keim, J. P. Lesley, A. S. Letchworth, John M. Maisch, John Marshall, James T. Mitchell, George R. Morehouse, Isaac Norris, Jr., Charles A. Oliver, C. Stuart Patterson, Robert Patterson, John S. Packard, C. N. Peirce, William Pepper, Henry Phillips, Jr., Franklin Platt, F. Prime, Theo. D. Rand, T. B. Reed, Robert W. Rogers, W. S. W. Ruschenberger, John A. Ryder, L. A. Scott, Aubrey H. Smith, Albert H. Smyth, George Stuart, W. P. Tatham, H. Clay Trumbull, D. K. Tuttle, William H. Wahl, H. L. Wayland, Talcott Williams, Theo. G. Wormley, Ellis Yarnall, Mrs. Helen Abbott Michael, Philadelphia; Mr. John F. Carll, Pleasantville; Messrs. P. W. Sheafer, Heber S. Thompson, Pottsville; Rev. F. A. Mühlenberg, Reading; Mr. M. Fisher Longstreth, Sharon Hill; Philosophical Society, Messrs. Philip Sharples, Washington Townsend, West Chester, Pa.; United States Naval Institute, Annapolis, Md.; Maryland Historical Society, Peabody Institute, Maryland Institute for the Promotion of the Mechanic Arts, Prof.

William Osler, Baltimore, Md.; Smithsonian Institution, Surgeon-General's Office, United States Geological Survey, United States Naval Observatory, Anthropological Society, Messrs. Alexander Graham Bell, A. S. Gatschet, W. J. Hoffman, Thomas Jefferson Lee, Garrick Mallery, M.C. Meigs, C. V. Riley, Charles A. Schott, William B. Taylor, Lester F. Ward, Washington, D. C.; West Virginia University, Morgantown, W. Va.; Virginia Historical Society, Richmond; Prof. John W. Mallet, University of Virginia; Dr. Robert Peter, Lexington, Ky.; Georgia Historical Society, Savannah; Prof. Alexander Winchell, Ann Arbor, Mich.; Prof. E. W. Claypole, Akron, O.; Society of Natural History, Cincinnati Observatory, Cincinnati, O.; Rev. H. Stafford Osborn, Oxford, O.; Prof. John L. Campbell, Crawfordsville, Ind.; Chicago Historical Society, Chicago, Ill.; State Historical Society of Wisconsin, Madison, Wis.; University of Iowa, Iowa City; Academy of Natural Sciences, Davenport, Iowa; Kansas Academy of Science, Washburn College, Kansas Historical Society, Topeka; Colorado Scientific Society, Denver; University of California, Profs. John Le Conte, Joseph Le Conte, Berkeley; Mr. George R. Babcock, Oakland, Cal.; Prof. Daniel Kirkwood, Riverside, Cal.; Free Public Library, Mr. George Dadidson, San Francisco, Cal.; Sociedad Cientifica "Antonio Alzate," Mexico; Observatorio Astronomico Nacional Mexicano, Tacubaya; Museo Michoacamo, Morelia, Mexico; Bishop Crescencio Carrillo, Merida, Yucatan; Mr. E. F. im Thurn, British Guiana.

Accessions to the Library were received from the Straits Branch of the Royal Asiatic Society, Singapore; Royal Society of South Australia, Adelaide; Royal Geographical Society of Australasia, Secretary of Mines, Melbourne; New Zealand Institute, Wellington; Royal Society of New South Wales; Technical Museum, Sydney; Royal Society of Tasmania; Institut Egyptien, Cairo; Société Impériale de Geographie, St. Petersburg; Académi des Sciences, Cracow, Austria; K. Nautische Akademie, Triest, Austria; K. K. Geographische Gesellschaft, Vienna; Geographische-Commercielle Gesellschaft, Aarau, Switzerland; Geographische Gesellschaft, Naturforschende Gesellschaft, Bern; K. Universitetet, Lund; Physiologische Gesellschaft, Prof. F. Reuleaux, Berlin; K. Sächs. Alterthums-Verein, Dresden; Mr. Emile Schwœrer, Colmar, Alsace; Geographische Gesellschaft, Hamburg; Geographische Gesellschaft, Hanover; Deutsche Gesellschaft für Anthropologie, etc., Mr. J. E. Weiss, Munich; Mr. W. Grosseteste, Mülhausen, Alsace; Naturwissenschaftlicher Verein, Osnabruck; Würtembergische Vierteljahrsheft für Landesgeschichte, Stuttgart; Société de Geographie, Neuchâtel; Società Africana d'Italia, Naples; Ministero di Agricoltura, Industria e Commercio, Rome; Mr. L. M. Billia, Turin; Union Géographique du Nord de la France, Douay, France; Société de Géographie, Lille; Société Languedocienne de Géographie, Montpellier; Société d'Emulation des Côtes-du-Nord, St. Brieuc; Instituto y Observatorio de Marina de San Fernando; Royal Geological Society of Cornwall, Eng.; Meteorological Council and Office, Royal Society, Editors of "Nature," London; University College, Nottingham, Eng.; Penzance Natural History and Antiquarian Society, Boston Society of Natural History, Massachusetts Historical Society, Boston; Rhode Island Historical Society, Providence; Wesleyan University, Middletown, Conn.; American Chemical Society, New York; New Jersey Historical Society, Newark; Alumni Association of the College of Pharmacy, Publishers of "The Medical News," Franklin Institute, Library Company of Philadelphia, Dr. Charles W. Dulles, Philadelphia; War Department, United States Naval Observatory, Department of Agriculture, Washington, D. C.; Denison University, Granville, O.; Washington University, St. Louis; Kansas State Librarian, Kansas State Historical Society, Topeka; Colorado College Scientific Society, Colorado Springs; Historical Society of Southern California, Los Angelos; California Academy of Sciences, San Francisco; Bishop Crescencio Carrillo, Merida, Yucatan.

An obituary notice of Rev. Daniel R. Goodwin, D.D., was read by J. Vaughan Merrick.

The death of Dr. Richard J. Levis, November 11, 1890, æt. 63, was announced.

The following papers were presented: "Notes and Descriptions of Palæozoic Fishes," by Dr. E. D. Cope; "On Extinct Genera of Testudinata," by Dr. George Baur; "On the Mammalian Genus Palæosyops," by Charles Earle.

Prof. Harrison Allen made an oral communication on the subject of the affinity of the teeth of rats with those of Eocene mammals.

Dr. J. Cheston Morris referred to a late publication by Dr. McLaughlin, of Texas, regarding immunity from disease by carrying out the law of interference, and dilated upon the great prospective and revolutionary value of the so-claimed discovery, if the same should be verified.

New nominations, Nos. 1213, 1214, and 1215, were read.

Mr. J. Sergeant Price presented the following report from the Committee on the Michaux Legacy, with accompanying resolution, which was unanimously adopted:

To the American Philosophical Society:

The Michaux Committee respectfully reports that at a meeting of the Committee, held on October 28, a note was received from Prof. Heilprin, towards whose expedition to Mexico and Yucatan the Society last January appropriated from the Michaux Fund the sum of $200, stating that the officers of the expedition had not been as yet able to complete their report, but it was in progress, and as soon as they had fully determined the names of the trees and plants from the regions visited by them, and never before reported upon by botanist, a complete report would be made to the Society. A letter was also received from Prof. Rothrock, stating that, owing to the fact that he was about to take a party of scientists to the West Indies in his yacht and spend the winter there, and in the lands to the westward, in making scientific collections, it would be impossible for him to deliver his usual course of lectures under the auspices of the Society, but suggested that it should appropriate to him out of the Michaux Fund the sum of $300 (the amount given to him each season for said lectures) for the purpose of obtaining fresh forestry data and new knowledge of forest products and lantern illustrations for future lectures. The Committee fully approved of the suggestion of Prof. Rothrock, and its Chairman, Mr. Meehan, in written endorsement of the application, stated that it is only by the accumulation of facts of a general character bearing on special subjects, that the special subjects themselves can be well understood. That at present we are very much in the dark on the arboreal features and peculiarities of the portions of the Western Continent, outside of the United States, and that he was sure that Prof. Rothrock's labors would greatly enlighten us on the subject, and he was confirmed in his opinion by a letter just received by him from Prof. Krug, of Berlin, calling attention to the desirability of more knowledge of West India forestry and vegetation. Announcement was also made to us that Prof. Rothrock had been awarded a medal by the Paris Exhibition for his exhibits of photographs of American forestry, he having been enabled to make a portion of said exhibit by the appropriation of our Society, and in sending them copies of our photographic lantern slides.

The Committee submits the following resolution, which it desires shall be passed by the Society :

Resolved, That the sum of $300 be appropriated to Prof. Rothrock out of the Michaux fund for the purpose of obtaining fresh forestry data and new photographic lantern slides in his expedition to the West Indies for the use in future lectures under the auspices of the Society.

By order of the Committee,

J. SERGEANT PRICE, *Secretary*.

Mr. Price, having read to the Society a letter* from Prof.

* PARIS, 11 RUE LAS CASES, 16th October, 1890.

TO THE PRESIDENT OF THE AMERICAN PHILOSOPHICAL SOCIETY OF PHILADELPHIA :

Mr. President:—I sent to your address about two months ago, through the Smithsonian Institution, a copy of the last work of our regretted colleague, the late Mr. Auguste Carlier, entitled "The American Republic," in four volumes in octavo, to be offered to the American Philosophical Society.

I shall be very much obliged to you if, when this work reaches you, you will acknowledge its receipt.

I send you, enclosed in this letter, a photograph of Mr. Carlier, in case you do not possess it in your collection.

I take advantage of this occasion to send you mine also. I have had the negligence not to send it at the time when the Secretary requested this of the members; but it is time enough to repair that error and also to testify to you the high value I attach to the honor done me by the American Philosophical Society in admitting me in its midst on the presentation of the excellent Mr. Moncure Robinson.

You have already been notified by Mr. P. Massion, notary, in Paris, 58 Boulevard Haussmann, and testamentary executor of the late Mr. Carlier, that our regretted friend had left a legacy of twenty thousand francs to the American Philosophical Society. The legacy was entrusted to me, for he named me as his universal legatee, and it should be paid one year after his death by the terms of his will, that is, on the 16th of March, 1891, without interest until then.

All the rights of succession payable to the French Treasury are to my expense. The American Philosophical Society, then, will not have to pay any expenses but those of the power of attorney, that it should give to the person whom it will charge to receive this sum in Paris. This power of attorney, made before a notary public in Philadelphia, should be legalized by the French Consul in Philadelphia, and the signature of the said Consul will be in turn certified by the Ministry of Foreign Affairs in Paris.

So far as concerns me, I see no other legal steps to ask of the Society. (Of course, it is understood that the first document to produce is a resolution of the Society, at a regular meeting held in conformity with its rules, by which it shall expressly accept the legacy of Mr. Carlier, and give a power of attorney to some one to accept the same in its name in Paris, and at the same time to receive for it this sum.) But as Mr. P. Massion, the testamentary executor, who does not know, as I do, American legislation, might

Claudio Jannet to the President of the American Philosophical Society, stating that our late fellow-member, Auguste Carlier, of Paris, had, by his last will and testament, of which he was the universal legatee, bequeathed to the Society the sum of twenty thousand francs, submitted the following resolutions, which were unanimously adopted:

Resolved, That the American Philosophical Society hereby accepts the legacy of twenty thousand francs given to it by the last will and testament of Mr. Auguste Carlier, late of Paris, France.

Resolved, That a power of attorney be executed by the President, under the corporate seal of the Society, attested by the Secretary, appointing —— ——, of Paris, as its attorney in fact, and authorizing and empowering him, in its name, in Paris, to accept for it the legacy of twenty thousand francs given to it by the last will and testament of Auguste Carlier, of Paris, and to give to P. Massion, notary in Paris, 58 Boulevard Haussmann, his testamentary executor, or to any one else authorized to pay said legacy, a full and complete receipt and discharge therefor as fully as if given by the Society itself.

The President called to the attention of the Society the provisions of the will of the late Col. F. M. Etting, under which the Society has certain interests, and stated that during its recess he had requested Mr. Price, a member of the Philadelphia bar, to represent the Society in the matter.

Mr. Price explained the legal status of the case, and stated no bond was necessary to indemnify the executors; that an issue was now pending to determine the validity of the will, and that the Society had no real concern with the same.

Mr. Tatham moved that the action of the Treasurer, in declining to give any security to indemnify the executors, be approved.

Dr. Morris offered as an amendment that "the action of the President in employing Mr. Price as counsel for the Society be

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have some difficulty, I advise you to put in relation with him the person you will charge with receiving this sum about a couple of months before the 15th of March, 1891, so that, if it became necessary, Mr. Massion would be able to correspond with you, and you could furnish him with such document as he would judge useful. So that the execution of the legacy that Mr. Carlier has made you, will not be retarded.

In waiting for another occasion to correspond with you, believe me, Mr. President,

Your very devoted,

CLAUDIO JANNET,

Professor of Political Economy at the Catholic University of Paris.

approved, and that he be requested to continue to represent the Society."

The amendment was carried, and the question being put on the motion as amended, was carried.

And the Society was adjourned by the President.

Stated Meeting, November 21, 1890.

Present, 18 members.

President, Mr. FRALEY, in the Chair.

Hon. James T. Mitchell, a lately elected member, was presented to the Chair, and took his seat.

The resignations of Rev. George Dana Boardman and Mr. George B. Roberts were accepted.

Dr. Daniel G. Brinton presented "Notes on the Puquina Language of Peru."

The minutes of the Board of Officers and Council were submitted.

Pending nominations, Nos. 1213, 1214, and 1215, and new nomination, No. 1216, were read.

The Committee on Increased Accommodations reported progress.

And the Society was adjourned by the President.

Stated Meeting, December 5, 1890.

Present, 14 members.

President, Mr. FRALEY, in the Chair.

Correspondence was submitted as follows:

Letters of acknowledgment (131, 132, 133) were received from the Imperial Academy of Science, Imperial Russian Geographical Society, Comité Geologique de la Russie, Prof. Serge Nikitin, St. Petersburg; K. Zoologisch Genootschap, Natura Artis Magistra, Amsterdam; K. Zoologisch-Botanisch Genootschap, The Hague, Holland; Fondation de P. Teyler van der Hulst, Harlem; Prof. C. Leemans, Leiden, Holland; Dr. Friederich Krauss, Vienna; Naturforschende Gesellschaft, Freiburg, i. B. (131, 133); Verein für Thüringische Geschichte und Alterthumskunde, Jena; "Le Cosmos," Marquis de Nadaillac, Paris; Mr. Hamilton A. Hill, Boston, Mass.; Mr. G. F. Dunning, Farmington, Conn.; Dr. H. C. Chapman, Philadelphia; Museo Nacional, Buenos Aires (130).

Société Royale de Géographie d'Anvers, Antwerp, Belgium, was placed on the Society's exchange list to receive Proceedings.

A circular was received from the American Chemical Society, New York, announcing the holding of their Second General Meeting, December 30 and 31, 1890.

A communication was received from George Reiter, Cincinnati, O., announcing a supposed new discovery that water can be raised by suction or atmospheric pressure higher than thirty-four feet, which the Secretaries were instructed to answer.

A letter from Mr. Robert Patterson, in reference to the Peale collection of stone implements, was referred to the Curators.

Accessions to the Library were reported from the Department of Mines, etc., Wellington, New Zealand; Geographical Society, Tokio; Deutsche Seewarte, Hamburg; Verein für Kunst und Alterthum in Oberschwaben, Ulm; Geographische Gesellschaft, München; Société Royale de Géographie d'Anvers; Académie Royale de Belgique, Bruxelles; Prof. L. Rütimeyer, Basel, Switzerland; Ostschweizerische Geogr.-Commerc. Gesellschaft, St. Gall; Direzione Generale della Statistica, Rome; Société de Geographie de Lisboa; University of the State of New York, Albany; Bureau of Statistics of New Jersey; Prof. Robert W. Rogers, Carlisle, Pa.; Franklin Institute, Dr. Persifor Frazer, Mr. Henry Phillips, Jr., Philadelphia; Department of State, Washington, D. C.; Academy of Science of St. Louis, Mo.; Colorado Scientific Society, Denver; Sociedad Cientifica "Antonio Alzate," Observatorio Astronomico Nacional de Tacubaya, Mexico.

The report of the Treasurer was presented.

Pending nominations, Nos. 1213, 1214, 1215, and 1216, were read.

Prof. Cope offered the following resolution:

Resolved, That the resolution of the Society which requires that papers presented for publication by the Society shall be completed for publication, shall not be construed to require completed drawings for the illustration of such papers.

A vote being taken, the resolution was not agreed to.

And the Society was adjourned by the President.

Stated Meeting, December 19, 1890.

Present, 19 members.

President, Mr. Fraley, in the Chair.

A letter was received from the Rochester Academy of Science requesting exchanges, which was granted.

A letter of resignation was received from Mr. Herbert Welsh, Philadelphia, dated December 17, 1890, and the resignation accepted.

A plaster bust-portrait of Jefferson, for the Society's Cabinet, was received from Miss Emily Phillips, Philadelphia.

Photographs of the old Bartram Place (mansion, garden, etc.) were received from Dr. J. F. Holt, Philadelphia.

Letters of envoy were received from the Deutsche Seewarte, Hamburg; Bureau of Statistics of Labor and Industries, Trenton, N. J.; Rochester Academy of Science, Rochester, N. Y.

Letters of acknowledgment were received from the Royal

Society of Victoria, Melbourne (128, 130); Institut Egyptien, Cairo (131, 132, 133); Societas pro Fauna et Flora, Fennica, Helsingfors (131, 132, 133); Prof. Peter R. v. Tunner, Leoben, Styria (131, 132, 133); Profs. Friedrich Müller, Dionys Stur, Edward Suess, Vienna (130, 131, 132, 133); Deutsche Geologische Gesellschaft, Berlin (131, 132, 133); Geographische Gesellschaft, Hannover, Prussia (131, 132, 133); Prof. Dr. Dümischen, Strassburg, Alsace (130, 131, 132, 133); Prof. Dr. C. L. Rütimeyer, Basle, Switzerland (131, 132, 133); Schweiz. Naturforsch. Gesellschaft, Bern, Switzerland (131, 132, 133); Prof. Carl Vogt, Geneva, Switzerland (131, 132, 133); University of Tennessee, Knoxville (131, 132, 133).

Accessions to the Library were received from M. Theodor Gottleib, Leipzig; R. Università, Turin; Royal Society, Edinburgh; Geological Society, Manchester; Prof. George M. Dawson, Montreal; Astronomical Observatory of Harvard College, Cambridge; Academy of Science, Rochester, N. Y.; Henry Phillips, Jr., Philadelphia; Bureau of Education, Dr. Walter J. Hoffman, Washington, D. C.; University of California.

A letter was read from the Rittenhouse Memorial Association, requesting the Society to join in a petition to the Legislature, requesting the erection of a suitable monument to commemorate the services of David Rittenhouse to the State and the county.

After discussion and debate, the Society, on motion of Mr. Prime,

Resolved, That while the members of the American Philosophical Society individually sympathize with the proposed memorial requesting the Legislature to erect a monument to David Rittenhouse; yet, as a society, they consider it inexpedient to join in a petition so to do.

Pending nominations Nos. 1213, 1214, 1215, and 1216 were read, spoken to and balloted for.

The Committee on Finance presented its recommendations for appropriation for the ensuing year.

Mr. Prime moved to reduce the salary of the Librarian by $250.

Dr. Greene moved to raise the same to $1000.

The motion and amendment were subsequently withdrawn, and the appropriations passed, as reported.

Dr. Cope offered the following resolution:

Resolved, That a Committee, consisting of five members, be appointed by the President of the Society to consider and propose to a future meeting such measures as they may deem necessary for the well being and improvement of the Proceedings.

The resolution was adopted. The President subsequently appointed as such Committee, Dr. Cope, George F. Barker, Admiral Macauley, Dr. Jayne and Dr. Brinton.

Mr. Arthur Biddle moved that a Committee of five be appointed by the President at his leisure to consult with the Historical Society regarding the desirability of accepting the Etting bequest, and to report at the next meeting.

Dr. Morris moved to lay on the table, and a tie vote resulting on the motion, it was withdrawn, and the original motion being voted upon was carried.

The President subsequently appointed as such Committee, Mr. Arthur Biddle, Dr. Ruschenberger, Messrs. Wood, Price and Joseph C. Fraley.

Dr. Horn, from the Committee to obtain for the Society the Portrait of S. F. Baird, by Ulke, reported that it had been purchased and was now on the walls of the meeting room, and read a list of the donors for its purchase.

On motion, the thanks of the Society were tendered to the Committee for its services, and the Committee was discharged.

The ballots being counted, the following were reported duly elected members of the Society :

2183. Theodore Turrettini, Geneva.
2184. E. Mascart, Paris.
2185. William C. Unwin, London.
2186. Louis Vossion, Philadelphia.

And the Society was adjourned by the President.

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No. 2178. Henry Willis . . . . . Philadelphia.
2177. Robert W. Rogers . . . . . Haverford, Pa.
2176. Samuel Timmins . . . . . Arley, near Coventry, England.
2175. James T. Mitchell . . . . . Philadelphia.

May 16, 1890.

No. 2182. Charles Godfrey Leland . . . . . London.
2181. Heman L. Wayland . . . . . Philadelphia.
2180. Robert Patterson Field . . . . . Philadelphia.
2179. George S. Fullerton . . . . . Philadelphia.

December 19, 1890.

No. 2186. Louis Vossion . . . . . Philadelphia.
2185. William C. Unwin . . . . . London.
2184. E. Mascart . . . . . Paris.
2183. Theodore Turrettini . . . . . Geneva.

Decease of Members.

Resignations of Members.

Obituary Notices.

Letters Accepting Membership.

Miscellaneous.

PROCEEDINGS

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FOR

PROMOTING USEFUL KNOWLEDGE.

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Vol. XXIX. January to June, 1891. No. 135.

Vocabularies from the Musquito Coast.

By Daniel G. Brinton, M.D.

(*Read before the American Philosophical Society, March 6, 1891.*)

Through the kindness of the Rev. W. Siebärger, a missionary of the United Brethren, now resident on the Musquito coast, I have obtained several new vocabularies from that region, which offer points of interest to the ethnologist.

The most important of these is a list of words from the language of the Ramas tribe, the first and only specimen of their tongue that I have encountered. These people live on a small island in Blewfield lagoon. They number at present about two hundred and fifty souls, all of whom have been converted to Christianity, and all of them are able to speak and read English except a few very old persons. Their native tongue is rapidly disappearing, and in a few years, probably, no one will be left able to use it fluently and correctly.

In physique they are described as large and strongly built; in temperament, submissive and teachable.

Their language has always been reported as wholly different from that of the Musquito Indians, who occupy the adjacent mainland, and this is shown to be correct by the specimen sent me. It bears, in fact, no relation to any other tongue along the Musquito coast. It does not, however, stand alone, constituting an independent stock, but is clearly a branch, not very remote, of a family of languages once spoken near Chiriqui lagoon, and thence across to the Pacific, or nearly that far.

To this stock I have, in my classification of American languages assigned the name "Changuina," from its principal member, the Changuinas, who resided on the river of that name flowing into Chiriqui lagoon. It is said that some few villages of the stock may still be found about the headwaters of this stream.

My chief source of information about this family is derived from the small work of A. L. Pinart, published in Paris last year, entitled *Vocabulario Castellano-Dorasque, Dialectos Chumulu, Gualaca y Changuina.* M. Pinart knew of no members of the stock north of the Chiriqui lagoon, though Blewfields is more than two hundred miles to the north of it.

The following is the list of the words sent me. The orthography is German.

	RAMA.		RAMA.
Man,	*nikikna.*	Tongue,	*kup.*
Woman,	*kuma.*	Tooth,	*siik.*
Sun,	*nunik.*	Hand,	*kuik.*
Moon,	*tukan.*	Foot,	*kaat.*
Fire,	*abung.*	House,	*knu.*
Water,	*sii.*	1,	*saiming.*
Head,	*kiing.*	2,	*puk sak.*
Eye,	*up.*	3,	*pang sak.*
Ear,	*kuka.*	4,	*kun kun beiso.*
Mouth,	*kaka.*	5,	*kwik astar.*
Nose,	*taik.*		

Of these the subjoined present more or less distinct Changuina analogies:

	RAMA.	CHANGUINA.
Sun,	*nunik,*	*kelik-u.*
Fire,	*abung,*	*kebug-al* (fire-brand).
Water,	*sii,*	*si.*
Head,	*kiing,*	*kin-unuma.*
Ear,	*kuka,*	*kuga.*
Mouth,	*kaka,*	*kaga.*
Nose,	*taik,*	*θakai.*
Tongue,	*kup,*	*kuba.*
Tooth,	*siik,*	*su.*
Hand,	*kuik,*	*kula, kuluk.*
House,	*knu,*	*ku.*
One,	*saiming,*	*umai.*

The words for man and woman, *nik-ikna* and *ku-ma,* may have been borrowed from the Musquito, *wa-ikna* and *ma-iren.*

The numerals in the Changuina stock appear not to have been well defined, as they differ in all three dialects. The Changuina proper helps itself out with the Spanish: *umai*, one; *umai-dos*, two; *umai-tres*, three. The Gualaca dialect has *ku-e*, one; *ku-mat*, two; *ku-mas*, three. In both, "five" is "*kul-male*," a hand, which corresponds to the Rama *kwik-astar*.

The Rama words for "two" and "three," *puk-sak*, *pang sak*, belong to a series of numerals which had an extensive adoption by several diverse families in Guatemala and Costa Rica, and probably are of South American origin. They are distinctly traceable to the Cuna or Darien language, in which we have, 2, *pok'-ua*, 3, *pak'-ua*, and these reappear in the Guatuso of Nicaragua. This is evidence that the Ramas reached their island after they had adopted these Cuna words. This was probably after the Conquest. We know that in 1674–81, the Governor of Costa Rica, Don Juan Francisco Saenz Vasquez, marched against the Changuinas on account of their turbulent character, and severely punished them. Perhaps at this time the Ramas entered their canoes and sought refuge along the coast, far to the north of their ancient seats.

My informant adds a few words of the Cuna or San Blas language, picked up by him on the coast, as follows:

	San Blas.		San Blas.
Man,	*tula, siradi.*	**Foot,**	*naga.*
Woman,	*hoam.*	**1,**	*kuenohikua.*
Sun,	*tata.*	**2,**	*pogua.*
Moon,	*nu.*	**3,**	*pagua.*
Eye,	*ibia.*	**4,**	*pakawa.*
Ear,	*auar.*	**5,**	*atali.*
Hand,	*aregena.*		

Comparing this with the *Vocabulario Castellano-Cuna*, of A. L. Pinart (Paris, 1890), it appears to be a tolerably pure dialect of the tongue.

Mr. Siebärger also furnishes a vocabulary from the Twaka Indians. These natives live in a number of scattered hamlets about the headwaters of the Tungla or Princeapula rivers. The latter name is a compound of "Prinzo," the name of a tribe, and the Musquito *auala*, river.

From an inspection of the list, it is clear that they belong to the extensive Ulva stock, as I have assigned them from previous evidence in my classification of "The American Race." *

* *The American Race: A Linguistic Classification and Ethnographic Description of the Native Tribes of North and South America* (New York, 1891).

	Twaka.		Twaka.
Man,	*all.*	Tongue,	*taki.*
Men,	*mui.*	Hand,	*tingki,* or *tingma.*
Woman,	*yall, wana.*	Foot,	*kallni.*
Sun,	*ma.*	House,	*honi.*
Moon,	*waiku.*	Hill,	*assam.*
Star,	*yallu.*	1,	*as.*
Earth,	*sau.*	2,	*bo.*
Sea,	*kuma.*	3,	*bass.*
Fire,	*ku.*	4,	*araunka.*
Water,	*wass.*	5,	*singka.*
Head,	*tunuk.*	6,	*tiesko-as.*
Eye,	*makpa.*	7,	*tiesko-bo.*
Ear,	*tappan.*	8,	*tiesko-bass.*
Nose,	*nangtak.*	9,	*tiesko-araunka.*
Tooth,	*annak.*	10,	*sallap.*
Mouth,	*matikpas.*		

The word *tiesko* in the numerals 6, 7, 8, 9, is explained as a form of *tingki*, "hand." The numeral for "five," *singka*, sounds suspiciously like the Spanish *cinco;* but I find it also in other Ulva dialects. For "twenty" the Twaka expression is *mui aslui*, "the man one time," *i.e.*, all the fingers and toes counted at once.

Their expression of welcome, "How are you?" is *parrasta*, which explains the name of the Parrastahs, a tribe on the Rio Mico, belonging to the Ulva stock.

The plural suffix is *balna*.

Their term for God, or the Supreme Deity, is *Ma papangki*, "Sun-father," which indicates that they are, or were, sun-worshipers.

The Twakas locate the seat of man's life and emotions, not in the heart, as most nations, but in the liver; and they have in common use such expressions as:

issing sawram,	liver split = angry.
issing pini,	liver white = kind.
issing sani,	liver black = unkind.

In this they differ from their neighbors, the Musquitos, who employ in such expressions the word *kupia*, heart.

On a New Species of Atalapha.

By Harrison Allen, M.D.

(Read before the American Philosophical Society, January 16, 1891.)

ATALAPHA TELIOTIS, sp. nov.

Ears rounded much smaller than head. The internal basal lobe longer than broad, and without posterior projection. The external basal lobe longer than high, without notch at the base anteriorly. The hem occupying notch is half the height of the auricle and is ample. The tragus is coarsely crenulate on the outer border, slightly narrowed at the tip, which is not turned forward. The external surface is without a trace of ridge, and the notch at the base above the small basal lobe without a tubercle. Snout and lower lip quite as in other species of the genus, except that the chin-plate is somewhat wider.

Skull with groove on centre of face-vertex continuous with the anterior nasal aperture. Sagittal temporal ridge sinuate. The first upper premolar exceedingly minute, scarcely half the size of the corresponding tooth in other species; it can with difficulty be seen even with the aid of a lens. The lower premolars are nearer of a size than is the case in other species, the first being fully half the size of the second. The third lower incisor is rounded, minute, and without cuspules.

The membranes are much as in *A. noveboracensis,* but the terminal phalanx of the fifth finger is longer, and ends with a free end on the margin of the endopatagium. The membranes are attached to the foot at a point midway between ankle and the base of the toes.

The prevalent color of the hair is dark chestnut above, but lighter below. The base on the body is everywhere black, and the shafts buff. No ashy tips are anywhere seen. The ventral half of the side of neck is white. The hair is scanty along the ventral surface of the forearm and the proximal ends of the last three metacarpals. The dorsum of the interfemoral membrane is furred only at the basal third. The remaining characters as in *A. noveboracensis*.

This species is readily distinguished by the shape and small size of the ear and tragus, by the attachment of the wing-membrane to the foot, and by the peculiarities of the premolars in both jaws, as well as those of the third lower incisors. It agrees with a southern variety of *A. noveboracensis* (*A. frankii*) in the partially free dorsal surface of the interfemoral membrane.

The specimen was forwarded to me by Mr. J. G. Cooper, of the California Academy of Natural Science, in a bottle containing an example of *A. noveboracensis,* and it resembles this form so closely in coloration that at first I mistook it for an immature example of the species last named.

The specimen is in poor condition. After decomposition had set in, it had been preserved for a long time in strong alcohol.

Habitat unknown, but it is probably Southern California.

Measurements.

Head and body (from crown of head to base of tail)		38	mm.
Length of arm		22	"
" forearm		37	"
1st digit	Length of first metacarpal bone	2	"
	" first phalanx	4	"
2d digit	Length of second metacarpal bone	40	"
	" first phalanx	6	"
3d digit	Length of third metacarpal bone	40	"
	" first phalanx	14	"
	" second phalanx	15	"
	" third phalanx	2½	"
4th digit	Length of fourth metacarpal bone	38	"
	" first phalanx	10	"
	" second phalanx	8	"
5th digit	Length of fifth metacarpal bone	32	"
	" first phalanx	7	"
	" second phalanx	7	"
Length of head		12	"
Height of ear from head		4	"
" " base of external lobe to tip		6	"
" tragus		3	"
Length of thigh		14	"
" leg		16	"
" foot		6	"
" tail		39	"
Width 2d interdigital interspace		2	"
" 3d " "		10	"
" 4th " "		28	"
Difference between 3d and 4th interspace		18	"
Length of forearm		37	"

Thus the manal formula is 2–10–28–37, the difference between the third and fourth interdigital interspace 18, and is much the same as in *A. noveboracensis.*

The measurements of the body and of the metacarpals are within the range of these which can be made on specimens of *A. noveboracensis.* The second phalanx of the third finger is longer than the second; the second phalanx of the fourth finger is much shorter than the first; the second phalanx of the fifth finger is of the same length as the first. In these respects the measurements are in contrast with those of *A. novebora-*

censis. The thigh is shorter than the leg, while both are smaller than is the species named. The foot is shorter, while the tail is slightly longer.

Atalapha is the most aberrant of any of the genera of the Vespertilionidæ, as this family is at present defined. It presents features in common with the Emballonuridæ, the Molossi and the Phyllostomidæ. These remarks are appropriate at this place, since in *A. teliotis* the general plan of the ear is as in Emballonuridæ; the shape of the wing, especially as to the strength of the first metacarpal bone, the shortness of the fifth metacarpal bone as compared to others of its series, the rigidity of the phalanges of the fifth digit, the arrangement of the lines in the fourth interdigital space, the flexibility of the lips, the great height of the internal tuberosity and of the length of the epicondyle of the humerus, the reverted distal ulnar rudiment, the posterior deviation of the coracoid process, the presence of a distinct lateral lobe to the cerebellum, the number of the upper incisors (being restricted to two), and the general shape of the wing are as in Molossi; while the complete tympanic bone (forming a ring at the upper margin), the pisiform bone being palmad and articulating with the fifth metacarpal bone, the palmad distinctness of the metacarpal bones, the shapes and relative proportions of the ectoturbinals, the presence of numerous vertical raised muscle-bands on the endopatagium, the angle of the lower jaw not being deflected, but remaining in axial line with that of the horizontal ramus, the genus resemble the true Phyllostomidæ.

Notes on Hebrew Phonetics. By J. Cheston Morris, A.M., M.D.

(Read before the American Philosophical Society, March 6, 1891.)

It might seem extremely rash for one whose acquaintance with Hebrew scarcely extends to a knowledge of its letters to offer any observations upon them in the presence of those who have made an exhaustive study of the subject; yet I do so, as thinking that one who occupies "the room of the unlearned," and is looking at the matter from a distance rather than from the dust-obscured atmosphere of the conflict of opinions, may offer some hints which may prove of value, even though they may not be wholly new.

In commencing the study of Hebrew characters, one is struck with two facts: 1. That there is said to be no character representing a pure vowel sound. This, I believe, is not the case with any other known alphabet. 2. That a change was made during the Babylonian captivity of the Jews, substituting the present square characters for the more ancient form. Let us inquire, first, why this was probably done. At this time the sacred records were subjected to inspection of their conquerors, containing, as they certainly did, many things which would be more or less offensive to them, and calculated to cast ridicule if not bring persecution upon the exiles. What more natural than for those who had charge of these records to endeavor to conceal their contents by such a veil as opportunity afforded, viz., that the ancient phonetic value of the letters had been lost and the meaning of the words so obscured that only those initiated by long study of the Jewish sacred mysteries and traditions could read them? In this way we have accounted for the rise of the school of the Talmudists, the study of the Mishna and Gemara, and the origin of the Kabbala. No word was to be pronounced as written; it had an inscrutable meaning only to be learned by the initiated and transmitted by the use of points added to the letters. Add to this the inherent difficulty of representing the sounds of any people in the vocabulary of another race; as instances of this, take the substitution of "l" for "r" by the Chinese in learning English, or the difficulty a Frenchman or German has in acquiring our "th," or the Greek θ; or, as more to the point, the substitution by the uneducated German Jew of "sh" for pure "s." There is something in the physical structure of the vocal organs of each race which is reflected in the vocables used by it. In the Hebrew race as met with to-day this ringing nasal character strikes us all forcibly.

After these introductory thoughts, we are struck with the fact that one of their Hebrew letters, the ע, *ngain*, is so variously pronounced as to make one seriously question its true phonetic value. Its place in the order of the alphabet, as compared with the Phœnician and Greek, is that of the Greek *omicron;* its form in Phœnician and in the old Samaritan is o. In many Hebrew dictionaries this value is given it. Take, again, the ו, *vau*, its place that of the Greek F, *digamma*, its phonetic value that of the Latin v, or English ou. May not our double u, *w*, represent this, as well as the German v, *fow?* The sound of ק, *quof*, is lost to Western languages, except so far as represented by *q*, to which we add a *u* to make it vocable to us. The letters ס, *samech*, and ש, *shin*, are represented by the Greek σ, *sigma*, and ξ, *xi*, but are found in an inverted order in the alphabet. [The confusion between these letters goes back to a far earlier period when we find two of the Hebrew tribes disputing over Shibboleth or Sibboleth.]

But the very first letter is a vocable which in all other alphabets is considered a pure vowel sound, a; the fifth, *he*, is another, ĕ; the sixth, *chayt*, is ē, or ch; the tenth, *yod*, is i, *iota;* and, as above, *vau* = ou, or u (or sometimes f or v), and *ngain* = o. We have thus all our usual vowel sounds except y, which we know in French as *ygrec*, and substitute usually for the Greek *upsilon*. In Hebrew we have two sibilants, *zain* and *tsaddi*, the latter of which occupies the alphabetical position in Greek of *upsilon*. If we now try to substitute in Hebrew, as ordinarily written, the above values for the letters, we shall find we have a perfectly vocable language. The names of men and places are given not very differently from our modern pronunciation of them as elucidated by the pointed Hebrew, when allowance is made for the difference due, as above stated, to racial intonation.

In some instances, two or three consonants are found together, but these may be regarded as familiar abbreviations for well-known words, just as D. L. W. means for us Delaware, Lackawanna and Western R. R., etc. In this way we may find that the Hebrew is really no exception as regards the presence of characters indicating pure vowel sounds ; and, indeed, we have the authority of Josephus for the statement that it does. Chief among the words whose pronunciation was to be hidden was the name of the Deity—it was forbidden—and many, long, and bitter have been the controversies as to the true pronunciation of יהוה, *yod, hay, vau, hay.* Josephus says it was composed of four vowels.* He was a priest, and also well versed in Greek and Roman literature, and we may well accept his statement as reflecting the best learning of his times on Jewish matters. It seems to me that this ought to settle the question.

As to the consequences which would follow from such a view, I must leave them to those more competent to follow them out. It seems, however, to me that we would thus have better opportunities of comparing the Hebrew sacred records with those of all other ancient nations, and of clearing up much obscurity in ancient history and geography.

I would therefore suggest the following phonetic values :

א	$= \alpha =$ a	ל	$= \lambda =$ l
ב	$= \beta =$ b	מ. ם final	$= \mu =$ m
ג	$= \gamma =$ g	נ ן final	$= \nu =$ n
ד	$= \delta =$ d	ס	$= \sigma =$ s
ה	$= \varepsilon =$ ĕ	ע	$= o =$ o
ו	$= F =$ f or vow or ou or u	פ. ף final	$= \pi =$ p
ז	$= \zeta =$ z	צ. ץ final	$= \upsilon =$ y
ח	$= \eta =$ ē or $\chi =$ ch?	ק	$=$ $=$ q
ט	$= \vartheta =$ th	ר	$= \rho =$ r
י	$= \iota =$ i	ש	$= \xi =$ x
כ. ך final	$= \kappa =$ k	ת	$= \tau =$ t

And illustrate by

AN ATTEMPTED TRANSLITERATION OF GENESIS X.

ch ch ch
1. v ale tuldt bni-nē xm em v ipt v iuldu lem bnim aēr embul
Noah Shem Ham Japheth

v
2. bni ipt gmr v mgug v mdi v iun v tbl v mxk v tirs
Japheth Gomer Magog Madai Javan Tubal Meschech Tiras

* See Josephus, "Wars of the Jews," Book v, Ch. v, 7.

3. v bni gmer axknz v ript v tgrme
Gomer Ashkenaz Riphath Togarmah

v
4. v bni iun alixe v trxix ktim v ddnim
Javan Elisha Tarshish Kittim Dodanim

ch
5. male nprdu aii eguim barytm aix llxnu lmxpētm bguiem

ch z ?
6. v bni ēm kux v myrim v puth v knon
Ham Cush Mizraim Phut Canaan

ch
7. v bni kux sba v ēvile v sbte v rome v sbtka v bni rome xba v ddn
Cush Sheba Havilah Sabtah Raamah Sabtechah Raamah Sheba Dedan

ch
8. v kux ild at-nmrd eva eēl leiut gbr bary
Cush Nimrod

9. eva-eie gbr-yid lpni ieve ol-kn iamr knmrd gbur yid lpni ieve
Jehovah Nimrod Jehovah

10. v tei raxit mmlktu bbl v ark v akd v klne bary xnor
Babel Erech Accad Calneh Shinar

ch ch
11. mn-eary eeva iya axur v ibn at-ninve v at-rēbt oir v at-klē
Asshur Nineveh Rehoboth Calah

ch
12. v at-rsn bin ninve v bin klē eva eoir egdle
Resen Nineveh Calah

ch
13. v myrim ild at-ludim v at-onmim v at-lebim v at-nptēim
Mizraim Ludim Anamim Lehabim Naphtuhim

ch
14. v at-ptrsim v at-kslēim axr iyav mxm plxtim v at-kptrim
Pathrusim Casluhim Philistim Caphtorim

z? ch
15. v knon ild at-yidn bkru v at-ēt
Canaan Sidon Heth

16. v at-eibusi v at-eamri v at-egrgxi
Jebusite Amorite Girgashite

ch
17. v at-eēvi v at-eorqi v at-ėsini
Hivite Arkite Sinite

ch ch ch
18. v at-earudi v at-eymri v at-eēmti v aēr npyu mxpēut eknoni
Arvadite Zemarite Hamathite Canaanites

z
19. v iei gbul eknoni myidn bake grre od-oze bake sdme v omre v adme
Canaanite Sidon Gerar Gaza Sodom Gomorrah Admah
v ybim od-lxo
Zeboim Lasha

ch ch
20. ale bni-ēm lmxpētm llxntm barytm bgviem
Ham

21. v lxm ild gm-eva abi kl-bni obr aēi ipt egdul
Shem Eber Japheth

22. bni xm oilm v axur v arpkxd v lud v arm
Shem Elam Asshur Arphaxad Lud Aram

ch
23. v bni arm ouy v ēul v gtr v mx
Aram Uz Hul Gether Mash

ch ch
24. v arpkxd ild at-xlē v xlē ild at-obr
Arphaxad Salah Salah Eber

ch
25. vl obr ild xni bnim xm eaēd plg ki bimiv nplge cary v xm aēiv iqthn
Eber Peleg Peleg Joktan

ch
26. v iqthn ild at-almudd v at-xlp v at-evrmut v at-irē
Joktan Almodad Sheleph Hazarmaveth Jerah

27. v at-edurm v at-auzl v at-dqle
Hadoram Uzal Diklah

28. v at-oubl v at-abimal v at-xba
Obal Abimael Sheba

ch
29. v at-aupr v at-ēvile v at-iubb kl-ale bni iqtbn
Ophir Havilah Jobab Joktan

30. v iei muxbm m-mxa bake spre er eqdm
Mesha Sephar

31. ale bni-xm lmxpētm llxgtm barytm lguiem
Shem

ch ch
32. ale mxpēt bni-nē ltuldtm bguiem umale nprdu eguim bary aēr embul
Noah

ALSO OF JUDGES XII, 6.

ch
v iamru lu amr-na *xblt* v iamr *sblt* v la ikin l dbr bn v iaēzu autu v ix-
Shibboleth Sibboleth

ethuēu al mobrut eirden v ipl bot eeia maprim arboim v xnim alp.

On the Grapeville Gas-wells. By J. P. Lesley.

(Read before the American Philosophical Society, March 6, 1891.)

Mr. John Fulton, General Manager of the Cambria Iron Works, at Johnstown, Cambria county, Pa., has kindly furnished me with the following particulars of one of the most important and significant episodes in the strange story of Petroleum in Pennsylvania :

1. A report to him made October 12, 1888, by Edgar G. Tuttle, then Mining Engineer of the Company. This gives :—(*a*) the number of wells (27 or more) around Grapeville, in Westmoreland county, up to that date sunk and piped by different companies ;—(*b*) the length and sizes of the pipe line to Johnstown ;—(*c*) the pressures of gas at the well, at the 4th, 8th, 12th, 16th, 20th, 24th, 28th, 32d, 36th and 39th mile, and at the Cambria Works terminus.

2. A second report made to him two years later, February 25, 1891, by M. G. Moore, now Mining Engineer of the Company. This gives :—(*a*) the titles of eleven companies owning 85 gas-wells in the Grapeville district ;—(*b*) an account of the drilling especially of the Agnew well ;—(*c*) a table showing the decline of pressure at the Westmoreland and Cambria Companies' wells, from 386 lbs. on April 29, 1889, to 65 lbs. on February 2, 1891 ;—(*d*) a full table of the Co.'s thirteen wells, depths, dates of striking gas, the initial pressure of each, subsequently observed pressure at April 29, 1889, December 15, May 26, November 3, December 1, 1890,

January 5 and February 2, 1891, the first six wells starting with 460 lbs. and ending with 70 and 65 lbs. ;—(*e*) a diagram of the mode of piping the Agnew well ;—(*f*) a map of the country between Pittsburgh and Johnstown, showing location of groups of wells.

Mr. Fulton was prompted to sending me the data described above by his remembrance of my address, some years ago, at Pittsburgh, before the American Institute of Mining Engineers, in which I reiterated my belief on geological grounds in the comparatively speedy extinction of the rock gas industry of the country. He adds : "You will notice that recently one of the wells [at Grapeville] has been deepened to reach the 'Gordon sand,' and that a small supply of gas was found in this second and lower horizon of natural gas, but not enough to warrant any hopefulness of its maintaining the supply. A part of our works are being supplied yet with the natural gas from Grapeville, but it is weakening so fast that we have got to supplement it with artificial gases" (February 26, 1891).

My warrant for publishing in the Proceedings of this Society these most important geological and historical data is found in Mr. Fulton's words : "I do not think that there is anything in this report that is so private or confidential that it should not be made known; and you can therefore use the matter in these reports as you think wise. At the Cambria works we are using the Archer oil gas to take the place of the natural gas, and we are finding this to be a very good substitute. As you know, the Archer process consists in vaporizing fuel oil, and mixing at a very high heat steam with the oil. We have also opened our mines again here and are using coal in a great many sections of the works" (March 13, 1891).

October 12, 1888, the Westmoreland and Cambria Natural Oil Company owned seven (7) wells, located principally along Brush Creek, northeast of Grapeville, Westmoreland county, Pa. Three wells were connected with the pipe line ; the others were held in reserve, two of them being drilled to a thin crust of hard rock (silica) just overlying the gas sand, which served as a hermetical cover to prevent the escape of the gas, even at its high pressure in the gravel-sand rock beneath it.

This fact is important as explanatory of the retention of the gas in the rock for past ages.

The wells are 1100 to 1400 feet deep, according to their locality in the valley or on the hill, the gas rock lying nearly horizontal.

The pipe in the well is of 5 inch diameter.

The two wells, A, A^1, on the map, were turned on full for the pipe to Johnstown, the well R being turned on more or less as a regulator of the supply at the Cambria works.

The pressure at top of well was 335 lbs., as the 10-inch main to Johnstown would not stand a much higher pressure.

There seemed no difference in strength or volume of gas per minute blown off (free) by one of these wells, in Mr. Tuttle's presence, compared with that which he saw two years before at a free blow from a well just north of Grapeville Station.

The gauges were noted often, so as not to permit the pressure to rise much above 335 lbs.; and when this seemed likely to occur well R was shut sufficiently to reduce it again to 335. Formerly a weighted safety-valve, allowing a free blow, was used. Saturday evenings wells A, A^1 were closed, and only R used. "The gas in this field is not being wasted as formerly, or as greatly as it has been in the Murraysville field; and the prospects are that the Grapeville field will last the longer of the two."

"I understand that the flowing pressure in the Murraysville field is now [October 12, 1888] 250 lbs. The Grapeville wells have great volume. When one is blowing off in the air and then is shut quickly, the gauge runs up in fifteen or twenty seconds to 525 lbs. In some districts the wells require a minute, and even longer, to reach their normal of 500 lbs. The weaker or low-pressure wells require days to reach their normal pressure."

As it is impossible to store or tank gas, wells are now drilled to within a few feet of the gas horizon and "held" there. When the supply from other wells weakens, these wells are sunk into the gas rock, one after the other, to keep up the supply.

Wells that have broke through to the gas are restrained by a "packer," a thick, heavy rubber cylinder, 20 inches long, outside diameter ½ inch less than bore of well, fastened at the ends to the pipe going into the well (see cuts). The end of this pipe fits into the end of another pipe, making a "slip joint;" rubber flush with the outer diameter of the pipe; lower joint generally perforated to admit the gas; pipe A lowered into the well (and, if necessary, pressed down) to slip into pipe B, bulging the rubber packer against the sides of the well, and effectually stopping the rise of the gas *outside* the pipes. It can then be controlled by a valve at the top of pipe A, at the well mouth. Before this invention the gas could be held only below a certain pressure, above which it would force its way between the pipe and the sides of the well and blow the whole casing into the air. The economy to a district of the new "packer" is evident.

"At present (October 12, 1888) there appears to be no weakening of the supply, except when unusual and sudden demands are made on the gas. If the supply weakens, or a greater supply is needed, more wells may be added to the line. This may require the laying of more pipe, or the replacing of the present 10-inch main by a larger one. The W. & C. Company own about 20,000 acres, controlling a large part of the gas field."

The companies and wells around Grapeville in 1888 were as follows:

Westmoreland and Cambria, 7 wells, drilled between 1885 and 1888, three of them piped to Johnstown.

Carnegie, 6 wells.

Southwest, 2 or more, piped to Connellsville, etc. (drilling also on Brush Creek).

Greensburg Fuel, 2 wells, piped to Greensburg.

Jeanette Glass Works, 2, piped one mile west to the works.

Philadelphia Co., drilling near New Salem.

Owners unknown, 8 or more wells.

The W. & C. Co. have also seven wells (about 1400′ deep), three miles northwest of Latrobe, on a northeast and southwest line $2\frac{1}{2}$ miles long. The northern three have a 6 inch pipe to Latrobe. The other four have a 10 inch pipe running east by Derry Station, P. R. R., to Laurel Hill, where it feeds into the Grapeville-Johnstown main about ten miles from Johnstown. The flowing pressure of the wells supplying Johnstown is 200 to 275 lbs. per square inch. That of those suppiying Latrobe, 90 lbs.

Trial wells east of this field have been unsuccessful, very little gas being found.

Salt water flowed from some of the Latrobe group of wells.

The first and most northern well, the Fowler, was drilled in 1885, the last and southernmost, Miller, No. 3, in 1887. Their volume of gas does not equal that of the Grapeville wells, and requires a much longer time to gauge up to the same normal of 500 lbs.

The proposition at first made to land owners, to pay $40 or $50 for a 50 lb. well, and $1.00 extra for each additional pound, was *not* generally accepted.

Pressures along the main at every four miles (taken in 1886 and 1887) show the *loss of pressure by friction* in a pipe of 10″, increasing to 12″, 16″ and 20″, thus:

For first 20 miles 3250′, *ten* inch pipe of $\frac{3}{8}$ in. wrought iron.
For next 12 miles, *twelve* inch pipe of $\frac{1}{4}$ inch " "
For next $7\frac{3}{4}$ miles, *sixteen* inch pipe of $\frac{5}{16}$ in. cast "
For last $1\frac{3}{4}$ miles, *twenty* inch pipe of (?) " "

In the first column of the following table H. S. means High side. At the 39th mile, the gauge is at "Reducer low side." C. W. means the Cambria Works at Johnstown.

Table of Pressures to Show Loss by Friction.

Distance from well.	Size. of pipe.	1886. ——	1886. Nov. 13.	1887. March.	1887. March 15.
0	10 in.	155 lbs.	200 lbs.	320 lbs.	333 lbs.
4	"	149	182	313	320
8	"	132	170	285	295
12	"	120	148	255	261
16	"	112	129	208	212
20	"	84	100	166	168
24	12 in.	75	85	132	130
28	"	68	70	95	95
32	16 in.	55	58	75	76
36	"	53	51	54	37
H.S.	"	52	50	53	36
39	"	20	—	25	25
C.W.	20 in.	20	—	25	25

Table of Wells and Ownerships, February 25, 1891.

Greensburg Fuel Gas Company	5	wells.
Southwest Natural Gas Company	9	"
Versailles Natural Gas Company	3	"
Youghiogheny Gas Company	3	"
Jeanette Glass Works	4	"
Manor and Irwin Gas Company	2	"
Westmoreland Specialty Company	1	"
Westmoreland and Cambria Natural Gas Company	13	"
Carnegie Brothers & Company	11	"
Philadelphia Natural Gas Company	23	"
National Tube Works	6	"
Total number reported by M. G. Moore	85	

The W. & C. Company's 13 wells are all piped to Johnstown. Their depths and pressures at various dates may be found on a following table. The deeper are on the hilltops. They all get their gas in the Gants sand rock of Washington county. Well No. 12 was deepened with the design to reach a lower gas sand horizon; but the rope was cut by the sharp sand driven up by the gas issuing from the Gants sand. Before the tools could get through it they were lost, and fishing tools also afterwards; so the well was abandoned, and No. 13 (Agnew well) was drilled a short distance south of No. 12.

This new Agnew well reached the Gants sand January 15, 1891, went through it, and was cased with 8-inch pipe; packed just above the top of the sand; supplied with another inner 6-inch pipe; packed again at the bottom of the sand; and the Gants sand gas between the pipes laid into the Johnstown main.

Drilling was resumed through the 6-inch pipe, and stopped, February 21, 1891, at 2700 feet. The "Gordon sand" was found at 175 feet beneath the Gants sand, was 35 feet thick, and gave gas at only 30 lbs. pressure, which, however, in twenty minutes rose to 175 lbs., "when it was necessary to discontinue the test;" why is not explained. "While the *pressure* in the Gordon is now (February 25) very much greater than in the Gants, the *volume* is much *less*, as is clearly shown by comparing the *minute pressures;* that of the Gants being 65, and of the Gordon only 30 lbs." [A diagram of the pipe and packing arrangement for passing through the Gants sand, and drawing off its gas to Johnstown, is appended to Mr. Moore's report.]

Below the Gordon sand, for 1070 feet to the bottom of the well, not a sign of gas or gas rock was observable. [This only bears out all Mr. J. F. Carll's observations, published in his reports on the oil regions, especially his Seventh Report, I 5, just published by the Geological Survey of Pennsylvania.] The failure of the Agnew well to get a good supply from the Gordon sand does not necessarily condemn it over the whole Grapeville field, as it may be found in better condition in the central and northern parts of the field. Carnegie Bros. have begun drilling two or three wells to test the Gordon sand a little north of the centre of the Gants field, a mile from No. 10 (Sylvis well).

None of the Latrobe wells are piped to Johnstown.

Grapeville.—Table of Minute Pressures at Various Dates.

No.	Name.	Depth.	Struck Gas.	At First.	Apr. 29, 1889.	Dec. 15, 1889.	May 26, 1890.	Nov. 3, 1890.	Dec. 1, 1890.	Jan. 5, 1891.	Feb. 2, 1891.
1	Klingensmith	1100′	Feb. 13, '86	460	390	250	180	100	95	75	65
2	Henry.......	1133′	June, 1886	"	380	260	170	105	100	"	70
3	Moore.......	1149′	" "	"	390	"	175	100	95	"	65
4	Welker......	1144′	Oct., "	"	380	"	170	105	100		
5	Brown	1224′	May, 1887	"	390	"	180	100	95	75	65
6	Ferree.......	1312′	Aug., "	"	380	240	170	"	100	"	70
7	Minsinger ...	1466′	Nov. 21, "	410	390	"	"	95	85	55	40
8	Shutts	1468′	Feb. 13, '89	380	"	250	165	100	"	70	60
9	Kipple	1360′	Nov. 30, '89	260		260	"	"	95	75	65
10	Sylvis	1357′	Jan. 13, '90	235			170	105	100	"	75
11	Truxel	1267′	Feb. 20, '90	225			180	100	95	"	"
12	Byers	1350′	Oct., 1890	125							60
13	Agnew	1420′	Jan., 1891	75						65	65

The steady decline in minute pressure from 386 lbs. on April 20, 1889, to 65 lbs. on February 2, 1891, predicts a speedy extinction of the use of natural gas at the Cambria Works.

Calculating the average *rate per day of the observed decrease* we find it to be as follows:

From April 29, 1889,	646 days,	321 lbs.	2 lbs.	per day.
From Dec. 16, 1889,	413 "	188 "	2.200	"
From May 26, 1890,	252 "	107 "	2.355	"
From Nov. 3, 1890,	91 "	36 "	2.525	"
From Dec. 1, 1890,	63 "	30 "	2.100	"
From Jan. 5, 1891.	28 "	7 "	4 lbs.	"

I take this opportunity to suggest that we have in the decline of gas pressure in all wells of all gas regions the most cogent of arguments against the theory that *gas pressure* is produced by the *hydrostatic pressure* of the locality. For, it is self-evident that the hydrostatic pressure must remain always the same, and therefore cannot be the *vis a tergo* of a variable oil or gas pressure; otherwise this last should also remain constant to the last drop of oil and the last cubic foot of gas coming from the well. The gradual decline of gas pressure in every well and all wells is proof positive that it represents the gradual exhaustion of an *inherent force of self-expansion* not dependent upon any *hydraulic vis a tergo*.

Notes on Hebrew Etymologies from the Egyptian ANX. Enoch; Anoki; Enos. By J. P. Lesley.

(Read before the American Philosophical Society, March 6, 1891.)

Forty years ago, in my Lowell lectures on the "Origin of Man," I gave my views of the Arkite symbolism embodied in the crux ansata, or ANX symbol of life. They were not accepted; but I still regard that line of investigation as one entirely germane to modern scientific research, and capable of bearing good fruit, although my application of it to the crux ansata is much less probable than I then thought it; for the latest archæological results are rather in favor of regarding that symbol as a rude drawing of the human figure.

My present purpose is to direct attention to the influence which the universal use of this symbol in all ages of ancient Egyptian history must have exercised over the philology of surrounding races. Its name, ANX, the living, the alive, life, etc., was certainly the most sacred word in the Egyptian language; in general and constant use in their religious literature; on the lips of all their thinkers, and, in fact, of all classes of the population of the valley of the Nile, in all generations; and was embodied as an element in the personal names of pharaohs, nobles, priests, and common people; the evidence of which pervades the monuments and papyri. Every royal cartouche had the *anχ* scrupulously written after it, usually with the *tat*, to mean *the ever-living, the immortal. Pa anχ* is an instance of the designation of a pharaoh (Pierret). The use of the *anχ inside* the cartouche was later; for example, in the Ethiopian kingdom, and by Psammeticus II and III. The granddaughter of Pianchi II was named *Anχ-shap-n-ap;* the daughter of Takelot II, *Anχ-karama-t;* a princess of the family of Psammeticus II, *Anχ-ra-nefer-het.* Two places or cities in Egypt are known called *Xafra-anχ* and *Aseska-anχ*, evidently dedicated to the memory of the Kas, or spirits, of those monarchs, one of whom built the second great pyramid of Gizeh. A quarter of the oldest capital of Egypt, Memphis, was known as *Anχ-taui*, the life (or heart) of the two lands, Upper and Lower Egypt.

The word was popularly used, like our word "viands," for food of any kind that supports life. *Anχ-am* was the name of a tree, used as we use the word "live-oak;" and Lepsius quotes a curious sentence of great interest to Hebrew scholars: "Ra, the sun, who makes the tree of life (*am n-anχ*) green, producing things which issue from it," suggesting the "tree of life" (עץ החיים, more properly *the tree of living things*) of the garden of Eden.

The Egyptians seem to have used *anχu*, also, as the general plural name for all flowers, the plainly living parts of plants.

The Egyptians called a mirror *anχ*, because it represented the living object presented to it. They called the two eyes *anχ-ti*, because the life of an animal is best seen in his eyes. But they gave, curiously enough, the same name to the two ears, and only distinguished the terms apart in writing, by drawing the ideograph of eyes in the one case and of ears in the other. The pharaohs had two high officials, one called "his eyes in the south," and the other called "his ears in the north."

But *anχ* not only meant to live, to be alive, but had another derivative meaning, with a very remarkable application to the story of Enoch, viz., *to lift oneself, to rise up* and stand, *resurrection* and *ascension*. This meaning it retains in modern Coptic, as ONK, *extulit, assurexit*. An inscription at Edfu uses it for "the sun rising in the east." At Denderah is a picture of a sacred boat, in which stands a lotus flower, from which a snake is rising into the air, with the legend: "The snake ascends (*anχ*) from the lotus of the ship." On the sarcophagus of Besmut, at Luxor, is read, *anχ-f*, etc.: "He ascends like the ten stars." Another inscription reads: "The stars ascend (*anχu*) in heaven." And at Esne: "The stars ascend (*anχu*) to do their duty in the night." At Abydos, an inscription to King Seti I, of the nineteenth dynasty (before the date of the Exodus), addresses him thus: "Thou goest up (*χa-k*) above the earth like the bark of Orion in its season; thou arisest (*anχ-ta*) like the Star Sothis" (see Brugsch's Dict., pp. 198, 199).

The Hebrew tradition that the Hebrews came out of Egypt agrees with the fact that Moses, Aaron, Hur (named together, Exod. xvii, 10), Miriam, Achsaph (Caleb's daughter), Manassah (Joseph's son), and other early legendary personal names, are purely Egyptian. The intercourse of the two peoples was always intimate. The kings Asa, Amon and Manasseh had Egyptian names. Before the exile, the Hebrew colonies in the Delta were important. The Book of Genesis was not necessarily compiled at Jerusalem. The story of Joseph and Potipher's wife was based on the D'Orbigny papyrus. Adam and Seth seem to be the names of the two chief Delta deities Atum and Set. Noah and his wife seem to represent the Egyptian divine duad Nun and Nunt. There is nothing startling, therefore, in finding the *anχ* in the name Enoch, whose legend forms an episode in the antediluvian list.

The occupation of Southern Syria by the Egyptians dates back to the most remote times. The cartouche of Snefru, first king of the fourth dynasty, builder of one of the great pyramids, is cut on the rocks of the Sinaitic peninsula, at the turquoise and copper mines. The Hebrew legend of the *Anakim* of the Hebron country gives Anak three sons with Egyptian names, Ahiman, Sesai, Tolmai, fathers of the three tribes of the Anakim. Whether there was any philological connection or not, the compilers of Exodus seem to have seen the *anχ* in the name *Anak*, and described therefore the people as a giant race, analogous to the ghostly or demoniac Rephidim.

Remembering the large Greek element in the Delta far back in the centuries before Christ, and the Greek tradition that as Cadmus came from Phœnicia and settled Bœotia, so Cecrops came from Sais in Egypt and settled Attica, bringing with him the goddess Neith (Pallas Athéné), we might confidently expect many Egyptian words and names in Greece. Of these I will only allude to *Inachos* (*anch*), son of Oceanus and Tethys, who founded the Kingdom of Argos; and the sacred rivers *Inachos*, one in Argolis, the other flowing from Mount Pindus.

But to return to proper names in Hebrew; perhaps the most interesting of them all, in an etymological way, is that of *Enos*, the legendary grandson of Adam, in the second account of the creation in the fifth chapter of Genesis, the chapter which contains the name of Enoch. The word Enos is written, whether rightly or wrongly, אנוש, and pointed so as to be pronounced ănosh. The same word, written and pointed in the same way, occurs in the 55th Psalm and Job v, 17, with the meaning *a man*, but usually appears in the Hebrew books with a collective meaning as *mankind*. It occurs in *Son of Man*, Ps. cxliv, 3. Isaiah viii, 1 is directed to write with a *man's stylus*, that is, in the vulgar or common or demotic scrip, so that everybody could comprehend. Like Adam (man) it had no plural. But in later days, as when the Book of Daniel was written, the third letter had been dropped and the word became *ansh*, or emphatically *anshá*, meaning *man, mankind, man as man;* and this gave the common plural *anshim, men*. It repeatedly occurs in this book in the phrase "Son of man." A still further contraction of it gave the popular form AIS*h*, איש, *man*, with its feminine *aishê*, *woman* (as the Greek ἕνς, *one*, was contracted into εἱς, with a closer connection between the two languages than Gesenius here suspected).

In the pronunciation of words we must keep in mind that until the age of printing spelling has always been optional, and pronunciation local. Words passed from ear to ear, not from eye to eye. The same word was pronounced gutturally or dentally or lingually by different races and individuals, and written accordingly. Words were clipped, and written accordingly. Every Egyptian, Hebrew or Greek scholar knows this. Whether the *Anch* was spelled with an aleph, heth or áyen, it remained the same word. In one part of Egypt it was pronounced *an*χ, in another part *ansh;* just as the East Germans say *ich*, the North Germans *ik*, and the West Germans *ish*, for the English *I*, which the Greeks and Romans pronounced *eg-o*, the Hebrews *anoki*, the old Egyptians *nuk*, and the Copts *anuk*. By reference to Admiral McCauley's Dictionary, published in our Transactions in 1882, you will see at the top of the first column, on page 22, "*An*χ, life;" followed by "*Ansh*, to exist, to subsist." Other proofs it is unnecessary to adduce to show the practical identity of the Egyptian *An*χ, *life*, and the Hebrew *Anosh, Ish, man, Enos*.

As to the genetic connection of *An*χ and the Hebrew *Anoki, I*, the first personal pronoun, I would approach the subject with all possible caution. It is a fact that the pronoun was written *Ani*, without the *k*, especially in what Gesenius calls the "silver age of the Hebrew," Eccles. ii, 1. 11, 12, 15. 18, 20; iii, 17; iv, 1, 2, 4, 7; vii, 25. In Gen. xv, 7, and xxiv, 24, it stands alone (including the substantive verb) for *I am*. Schwartze, in his "Coptic Grammar," pp. 340, etc., seems to quite settle the fact that the final guttural was not a characteristic element of the first personal pronoun. And yet Gesenius seems to feel no hesitation in saying that the Hebrew *Anoki* (ANKI) "is the *primary* and fuller form of *Ani*," being more frequent in the Pentateuch (but in general more rare) than the shorter form *Ani;* and in some of the later books, as the Chronicles and Ecclesiastes, wholly disappearing, just as the guttural of the Saxon has been lost in modern English, and that of the Franks in modern French. He notices that the form *Anoki* occurs on the Phœnician monuments and in the Chinese NGO. The Sanskrit used only the guttural *aha,* like the Greek, Latin, German, etc., while the Aramaic, Arabic, Abyssinian have lost it, and use the shorter nasal form of the pronoun. It seems hardly possible, therefore, to avoid the conclusion that ANK was the primitive form of the first personal pronoun, and that it stood in genetic relationship to the Egyptian symbol of life, the *anχ*. Whether the symbol was constructed from the ideograph for *I* (a man with his arm bent pointing to his mouth) or not, I leave to the judgment of others.

But Gesenius remarks somewhere that *Anoki* is used in some Hebrew passages as an emphatic *I myself.* This would point to the constitution of the pronoun as a dissyllable, with a final KA, the well-known hieroglyph for the dead man's *spirit.*

I should like to draw attention to the identity of *ani,* the pronoun, and *ani,* the Hebrew (and generally Shemitic) word for *vessel,* not only a vase, urn, bucket, etc., for holding water especially, but also a *ship.* The human frame was called a *vessel* (of wrath or righteousness, of mercy, etc., etc.), and may easily have been originally regarded as the *vessel of life* par excellence. Were this idea feasible, it might return us to my former arkite (ship-mountain-water) interpretation of the *crux ansata.*

On an Important Boring Through 2000 Feet of Trias, in Eastern Pennsylvania. By J. P. Lesley.

(Read before the American Philosophical Society, April 3, 1891.)

The Eastern Oil Company's trial bore-hole on the Stern farm at Revere (Rufe's Corner), Bucks county, Pa., is 18 miles south of Easton, 16 miles north of Doylestown, 7 miles west of Riegelsville, 5 miles from Kintnersville, 8 miles from Munroe, 10 miles from Durham furnace, 1½ miles from Bucksville, 2½ miles from Ottsville, 4 miles from Ervina, and about 2 miles east of Haycock trap hill.

The following record was written from dictation of Mr. E. C. Rosenzi, 3414 Smedley street, Tioga, Philadelphia, February 25, 1891, Superintendent of the Company.

This is the first deep boring in the Mesozoic belt of Pennsylvania, known to me. Had my advice been asked I should have dissuaded from a costly attempt to find oil or gas in this formation. The record of the boring, however, is valuable to the geological student as the hole descends through 2076 feet of nearly horizontal strata of gray and brown mostly soft sandstone and shale, with some dark ("black") slate, one stratum of which (called "anthracite coal") produced an excitement in the district, and was extensively published by the newspapers.

It is almost needless to say that a bed of *anthracite* coal in undisturbed strata of Mesozoic age, and at a distance from trap, would be an incredible occurrence. The trap of the Richmond, Va., field only turns the bituminous coal bed to coke.

It is also hardly necessary to explain that a "*nine foot bed* of anthracite coal" anywhere in the brownstone belt of Bucks and Montgomery counties could hardly conceal itself underground. All the strata crop out to the surface; and such a stratum could not well escape exposure. Even smaller lenticular bituminous coal seams like those on Deep and Dan rivers in North Carolina, ranging in thickness from four feet down to one foot, show somewhere at their outcrops. Even if the well record at this point of it were clearer than it is, the fact of the existence of any considerable coal bed (especially an anthracite bed) would have to be carefully verified, either by several additional trial holes, or by a shaft, before being believed by any geologist versed in the characteristic features of this formation.

Riegelsville is 166′ above tide, and the Revere well mouth is supposed to be about 200 A. T. Its record is as follows:

8′	Alluvion..................From the surface down to	8′
102	Sandstone, brown..........................Down to	118
15	Shale, red..	133
5	Shale, bluish, soft	138
10	Shale, blue, hard	148
56	Sandstone, dark brown; *with coaly specks*............	204
7	Sandstone, brown, very fine grained	211
2	"*Black slate*," soft..................................	213
4	Shale, blue, hard	217
223	Sandstone, red, very hard	440
	Slate, purplish, very gritty, here.	
4	Sandstone, brown, fine grained......................	444
31	Sandstone, gray, very micaceous	475
10	Sandstone, gray, hard rock..........................	485
100	Sandstone, reddish brown	585
5	Sandstone and shale, gray	590
5	"*Black slate*," soft..................................	595
32	Shale, reddish blue, very hard	627
44	Sandstone, reddish brown	671
21	Sandstone, brown, and blue shale, coarse and fine....	692

53	Sandstone, brown, coarse and fine	745
55	Shale, brown	800
77	Sandstone, bluish red, hard ; with white clay veins ..	877
63	Sandstone, brown, fine grained.......................	940
40	Shale, brown, soft. "*Show of petroleum*"	980
30	Sandstone, brown, hard. "*Show of petroleum*"......	1010
15	Shale, *grayish black*	1025
	Shale, blue, here.	
55	Sandstone, red-brown, hard	1080
70	Sandstone, red-brown, hard	1150
	Here cased off the fresh surface water.	
5	*No record of this interval*............................	1155
31	Shale, pink	1186
64	Shale, pink	1250
10	"*Black slate, hard*".....................................	1260
90	Sandstone, red, "like the mass at 1150"	1350
40	"*Black slate, hard*".....................................	1390
	Here, gray sandstone.	
16	Sandstone, gray, hard ; with very minute white pebbles as large as pins' heads........................	1406
3	"*Sand perfectly black and gritty ;* boring easy"	1409
31	Shale, light gray, gritty	1440
7	Shale, reddish.................................... ...	
6	Shale, dark blue...	
42	Shale, light gray	
12	Shale, reddish, hard and gritty............	1506
39	Shale, reddish...	1545
15	Sandstone, bluish gray, fine grained rock............	1560
9	"COAL, ANTHRACITE"..........	1569

Here, in answer to my verbal objections to the notes in his well book, Mr. Rosenzi explained that the thickness might be incorrect, owing to the churning of the tools, but that it was in his opinion "certainly 5½ feet;" and that the "coal" came up in fine specks (no larger than the head of a pin) like all the other crushed and ground-up sand pumpings from the well, from top to bottom. No larger pieces were obtained ; and no analyses were made. The well was worked in brackish water, which afterwards became salt water. *See below at 1616*, where salt was first noticed on the board walls of the derrick.

10′	"*Black slate rock, very hard*"	1579′
25	Sandstone, gray, fine, softer	1604
6	Sandstone, brown, hard rock.........................	1610
6	Sandstone, gray, fine, softer	1616
	Here cased off the "salt water."	
8	Sandstone, first dark, then light gray	1624
	"Here salt water again and plenty of it."	

I could get no clear idea of this from Mr. Rosenzi's description. He first noticed the salt as a deposit from water splashed on the derrick. The salt taste was decided. He could say nothing about the flow, as the well was always full of water, but I could not learn that any stream issued from the mouth of the well.

16′	"*Black slate*, coarse, mixed with minute specks of COAL, and minute light gray pebbles	1640′
9	Sandstone, coffee-colored	1649
5	Sandstone, brown, very fine	1654
9	Sandstone, brown, very fine	1663
21	Sandstone, brown, very fine	1684
5	Sandstone, brown, dark	1689
10	Sandstone, gray, dark, hard	1699
5	Sandstone, gray, light, sharp	1704
17	Sandstone, brownish red, of usual character	1721
15	"*Black slate*"	1736

"*Cased well against salt water in black slate, at 1736.*"

"The driller remarks that here came in genuine soft black slate, which he recognized as the overlayer of the Oil Sand in Allegheny county, in the Wild Wood district where he worked." Nothing could more forcibly illustrate the ignorance of the well drillers as a class than this astounding statement; which is only exceeded by the ignorance of oil and gas speculators as a class, and the stockholders of the companies which they form, in giving ready credence to such statements from men whose only interest is that of obtaining their daily pay for boring wells.

2′	Sandstone, gray, fine, like 1604	1738′
14	Sandstone, brown, fine, hard	1752
28	Sandstone, brown, coarser	1780
	Cased off salt water successfully at 1782.	
5	Sandstone, brown, fine	1785
5	Shale, gray, hard	1790
30	Shale, grayish black	1820
9	Shale, light gray, bluish, hard	1829
3	"Blue Monday," (a term used by the drillers in Western Pennsylvania)	1832
26	Sandstone, bluish gray	1858
2	Shale, gray, hard	1860
10	Shale, brown, soft	1870
8	Sandstone, gray, sharp	1878
82	Sandstone, brown (or red), hard	1960
35	Shale, pink (or red), soft	1995
89	Sandstone, brown, coarse (February 21, 1891)	2084

I suppose that the boring is to be carried on to greater depth.

Mr. Benjamin Smith Lyman, Assistant on the Geological Survey of the State, whose Report on the Trias Brown Sandstone Belt of Bucks, Montgomery and Chester counties, Pa., is not yet quite ready for publication, informs me that the place assigned to *coal* in the above well record would come about 11,000′ below the top, or 10,000′ above the bottom of his general section of the formation ; the coal-bearing shales of Phœnixville being say 3500′ or 4000′ above the conglomerate base.

His long and exhaustive survey of the district has resulted in giving a combined thickness of more than 21,000 feet to these Mesozoic strata ; in a demonstration of the duplication of its measures along the Delaware river ; and in the discovery of both longitudinal and transverse anticlinal and synclinal flexures of considerable size. The latter system of folds is a very remarkable phenomenon, seeing that the folds lie with their northern ends abutting against (or riding over) the Durham hills, that range of Azoic highlands which extends from Reading into Northern New Jersey.

Mr. B. S. Lyman said:

Although the precise position of the Revere, or Rufe's Corner, well-boring has not been indicated within several hundred feet, it appears that the so-called coal bed is part of a 600 or 800 feet thick series of generally hard green and dark-red shales at something like 11,000 feet below the top of the Mesozoic rocks, mainly red shales, of Bucks and Montgomery counties, and 10,000 feet above the bottom of them, and 6000 feet above the hard blackish shales of the Phœnixville tunnel.

With a sketch he showed the course of the outcrop, a mile or so in width, of the green and dark-red shales, including the so-called coal bed and one or two other blackish shale layers, with generally a gentle northwesterly dip, from the Delaware river near Milford, N. J., along the east, south and west sides of a basin to Rufe's Corner ; thence northwestward, westward and southeastward, round Stony Point and Bucksville, in saddle form, east of the Haycock mountain, nearly to Ottsville ; then in almost a straight line southwestward for a dozen miles, past Perkasie and Sellersville ; and five or six miles further southwest, though bending slightly northward at Tylersport upon the southeastern disappearing end of a rock saddle ; but near Sumneytown bending sharply round a more important saddle so as to reach Harleysville, half a dozen miles to the southeast ; and there with a like decided bend in the opposite direction, but with a wider sweep, turning southwest and then nearly west, passing a little more than a mile south of Shwenksville, and so in a straight course to the Schuylkill, between Linfield and Sanatoga and some three miles below Pottstown.

The course of these comparatively hard beds is marked nearly everywhere by a decided ridge, particularly well defined between Ottsville and Sumneytown, and tunneled through at Perkasie. As the beds are partly green, their course is also indicated by the yellowish or greenish gray color of the surface of the ground contrasted with the red on either side from the several thousand feet of red shales above and below, except where trap replaces them above for a long distance from the Haycock southwestward. The geological structure is also well shown by very numerous observed dips and strikes.

Here and there among the harder beds, exposures have been observed of a couple of blackish shale layers some three feet thick, perhaps identical with those of the boring. One was seen by the roadside near Rufe's Corner; two in a ravine a mile and a half north of Ottsville, where some digging was done half a dozen years ago in a vain search for coal of any economical value, though small traces of it appear to have been found; another exposure of blackish shales was seen half a mile west of Perkasie; and still another about a mile east of Harleysville.

It is, of course, extremely improbable that the beds with a known outcrop of about sixty miles in length, cut across by numerous streams and roads and by several railroads and even in great part by a tunnel, and familiar throughout every foot of its surface to the highly observant inhabitants of the country, could have a coal bed of any value that should never, until this well, have been discovered through any complete natural exposure or through an occasional very noticeable outcropping or blossom. Indeed, facts observable on the surface, such as measured rock exposures, combined with proper regard to their dips, strikes and relative position and elevation, could no doubt give a very complete section of all the beds pierced by the well; and perhaps that will prove to be possible even with the somewhat rough collection of materials already made. From such observations on the surface, the character and thickness of each bed is to be known far more precisely and thoroughly than could be possible from any boring however careful, and beyond all comparison with the results of an ordinary one. The difficulty of accurate information from such wells is shown by the doubt in the present case whether the so-called coal bed was nine feet in thickness or five and a half.

The well record, in spite of all the imperfections that must be expected, has value as giving for a great thickness of rock beds a connected view that may serve in some degree as a check upon the not very essential errors that might arise in combining surface observations, especially those rough ones hitherto obtained. But the chief importance of the record is perhaps as an illustration of how ready men are to lay out thousands of dollars for such explorations where the same number of hundreds would by a surface survey give fuller and more accurate information.

Possible Sterilization of City Water.

By R. Meade Bache.

(*Read before the American Philosophical Society, April 17, 1891.*)

It is an open question whether the characteristic acidity of the digestive fluids is or is not efficacious in destroying pathogenic germs entering the stomach. But it ought to be evident on both sides that neither extreme can represent the truth, even if the digestive fluids possess that general property. It is certainly, on one side, too much to assume that, not even in a perfectly healthy stomach, are those fluids sometimes capable of eliminating such germs from the system, and, on the other, that they are always, in sickness or in health, capable of performing that task. So little vitalized are micro-organisms in their resting-stages, that it is easily conceivable that, when masked by food and water, and when the human system is in a weak condition, many escape the possibly destructive action of the healthiest digestive secretions.

It would, additionally, be an unwarrantable assumption, even if the healthy stomach were proved to be able always to neutralize the morbific action of pathogenic germs, that they find their inevitable path and exit, with or without vitality impaired or destroyed, dead or alive, through the alimentary canal; for in point of fact we know that one kind, at least partially, takes its disastrous course directly into the lungs. When the infinitesimal size of micro-organisms is considered, and when also is considered how varied is the character of the parts with which they must come into contact upon passing the œsophagus, it will readily be perceived that, even if they escape the sometimes assumed destructiveness of the digestive fluids, they must often be absorbed into the blood by other tissues as well as by those of the lungs.

If so believing, we should perceive at the same time that it is hopeless to contend, except by palliative sanitary measures, against the invasion of pathogenic germs through inhalation; but that, on the other hand, especially as our food cannot be sterilized wholesale, we should deeply consider the possibility of contending with them by means of the wholesale sterilization of water, which enters alone, or as the largest constituent, into our drink. That this has heretofore not been attempted is all the more remarkable, because it is believed by many persons that some of the worst forms of pathogenic germs reach us through the medium of drinking water. Inasmuch, therefore, as success in sterilizing the drinking water of a large city might be of untold benefit to it, it would be well that certain experiments were tried to that intent, upon the assumption that, be the pathogenic germs in a particular water many or few, they become, when received into the alimentary canal, whether or not large numbers of them are successfully dealt with by the stomach, injurious to the human economy.

Inherent in the Anderson iron process for the purification of water is a danger which, therefore, cannot be eliminated. In all processes there is a danger line which human foresight seeks to avoid by a safety-margin, which, in the long run, and in the nature of things, is a substantial guarantee against harm. But there are processes such, from their character, combined with the chapter of exigencies and the chapter of accidents, that they have but a small margin of safety. I place the Anderson process in this category, as an experience at Berlin, showing the danger that may result from the overworking and freezing, or both, of open filter beds, even if so acted upon and cleansed as they are intended to be by the Anderson process, fully warrants me in doing. Moreover, it should be incidentally mentioned that the process is not applicable to the constitution of all waters, or adapted to climates that have always, or are liable to, severe winter cold. It is said, however, upon excellent authority, based upon the indisputable evidence of microscopic examination, that by the process micro-organisms have, under the limiting conditions hereby implied, been neutralized in the proportion of 50,000 to about 20, virtually in the proportion of 50,000 to 0. But, coincidently with this result, which must obtain under favoring circumstances, there also always exists danger in the process through carelessness and neglect in filter cleansing, and necessity without law of overworking the capacity of a filter. As a finality in the process the ferric hydrate generated, blended with organic matter, is precipitated in a flaky, coagulated condition to the bottom of the water, the sand filter-bed of the settling reservoir, where, resting chiefly on the surface, the filter is therefore more readily than usual cleansed. The process therefore makes no pretense to destroy the micro-organisms, but merely to neutralize as much as possible their injurious action in the human economy, simply by entrapping them. What I contend, however, is that the best process of sterilization is that which does not seek to entrap micro-organisms, with the inseparable danger of their partial or almost entire escape alive, but that which, with abstention from their purposive arrest, kills, and allows them as free passage as possible to the stomachs of city dwellers. It will probably be thought at this point, with a very usual misconception, as that which we have in the Anderson process has proved quite efficacious, whereas that of which I speak is but an ideal, perhaps impossible of attainment, that I am proposing to accept a shadow for the substance of a thing. I would grant the cogency of the thought, had I ever intended to make denial of the excellence of the Anderson process, and proposed to offer a possibility in exchange for a reality. But, having taken neither of these positions, I do but state the case in the abstract, and the truth of it in that form being admitted (and I do not see how it can be denied), I have but to add before proceeding that, excellent as is the Anderson process, within its acknowledged lines, it would still be well to consider if the ideal one is not capable of accomplishment by the means which I am about to suggest.

About two years ago it occurred to me that before experimenting with bacteria, with reference to killing bacilli established in the human body, and with reference to the sterilization of city drinking water by electricity, I would pass a current through some water containing protozoa, and observe how much is required to kill them. With this purpose in view I took a glass tube of four inches in length and five thirty-seconds of an inch in calibre, and partially filled it with water teeming with protozoa from hay-infusion, which had previously been examined by me under the high power of a one-tenth microscopical objective, commanding a large field with an immersion lens, and depending upon which of two eyepieces was used, magnifying from five hundred and fifty to six hundred and fifty diameters. When both ends of the tube had been plugged up with brass eye-screws wrapped with paper, leaving their ends exposed in the tube, the volume of infusion intervening between the ends of the poles thus formed was only two-thirds of a cubic centimeter, and the distance between the poles only three inches. The electro-motive force at my disposal in my galvanic battery—only about thirty volts—was too small, and the resistance too high under these conditions for me long to hope to affect the protozoa in the tube by means of the current. The smallness of the volume of fluid in which the electricity could find play, and the liberation of hydrogen which could not escape or recombine, were together the cause of this ; the resistance from the latter cause proceeding by great leaps when a higher current was eventually employed. With the infusion the resistance was far less than with pure water, but still far too great to allow of much current, owing in sum to the small volume of liquid and to the increased liberation of gas in it as compared with that liberated in water. The current was so slight that at this point of time I was satisfied that if I were not able thus to destroy the vitality of the protozoa—and that was proved by microscopical examination—*a fortiori* it was not to be imagined that the vitality of schizomycetes in water could be arrested, because I had assumed that they would be more difficult than the other organisms to destroy, a conclusion which I do not now think warranted by my final investigation upon the basis of experiment. I therefore desisted from experimenting, and did not resume it until the work of Dr. Griffiths on micro-organisms came under my eye, from which I learned that he had killed bacteria with a very small current in media of a fluid character. I then resumed my experiments upon the basis of my previously enlarged experience, that a considerable volume of water is needed for the play of electricity, and that even a slowly increasing bubble of hydrogen in a closed tube, although far from effecting embolism, nevertheless produces rapidly cumulative resistance. Every one who deals with batteries or who is well-read in electricity knows in a general way of these phenomena ; I am merely referring to the exaggerated degree in which they manifest themselves under the specified conditions. I was well aware that for a given ampèrage, a given electro-motive force, a given character of liquid, a given temperature, and a given distance between poles, the resistance to a line of force of electricity is an absolutely fixed quantity. But as my final object, as will eventually be seen, was to charge a large volume of water so that upon being charged the electricity would concentrate with intense energy towards the opposite pole, it became necessary, even in laboratory experiments, to avoid action where the phenomena appear in an exaggerated adverse form. I therefore next proceeded to deal with small but unconfined volumes of liquid.

With the Wheatstone Bridge, with an electro-motive force of one hundred and ten volts, and one ampère of current, I found the resistance at two inches between the poles, placed vertically in a hay-infusion, in a round glass dish about five inches in diameter, to be 1560 ohms. Making the liquid a little shallower, the other conditions remaining the same, the resistance rose to 2120 ohms. In a very narrow, rectangular receptacle, the other conditions remaining virtually the same, the resistance rose to 3000 ohms. The poles being then placed in water, not in the infusion, in the round glass dish, the other conditions being the same as those in the first experiment, the resistance became 18,400. Slightly increasing the depth of water in the dish, the resistance sank to 13,000 ohms. These rude experiments were followed by a series conducted with two beautifully finished wooden, shellaced boxes, of exactly the same length and depth in the clear, but one of them of only half the width in the clear of the other. Thus was obtained with precision in the larger of the two (but, of course, the same consequence would have ensued with the smaller), by alternately making it exactly one-half full, and then full to the brim, the result that the volume thereby vertically obtained reduces by one-half the resistance of the lesser volume. Thus, also, by filling both boxes to the brim was obtained with precision the result that double the volume of liquid horizontally obtained reduces by one-half the resistance of the lesser volume. Therefore it was demonstrated that resistance in water, as well as in metal, is inversely proportional to volume as determining cross-sectional area, whether increased by vertical or horizontal extension; that is, is inversely proportional to cross-section, as dependent upon volume; and that in whichever of these two directions volume is gained, it introduces, proportionally, freedom of propagation of the electric force in and about the imaginary right-line joining the poles.

The result of a series of experiments, with the poles placed apart at 2, 4, 6, 8, up to 12 inches, showed that the resistance, whatever it may be, varies *directly* as the distance between the poles, a result identical with that in electrically charged wire, illustrating a law which should have been expected to hold good whatever figure and volume the lines of force between the poles might assume and occupy. The experiments clearly proved, too, that the resistance of water is very much greater than that of an infusion not seemingly dense.

There seems to be with some persons a belief that water is a good conductor, because current electricity so readily discharges itself by means of moistened surfaces. But current electricity so discharges itself through a film of water covering non-conducting surfaces in default of any other conductor whatever; and static electricity, for the same reason, readily vanishes through aqueous vapor, because of the fact that the vapor impairs the resistance of dry air as a dielectric. Yet electricity, in these two manifestations, acts thus, of course, not from choice but from necessity, taking, however imperfect, a path of conduction when there is no other, and the better of two paths when they differ, in proportion to their relative conductivity. Other persons imagine that water is a worse conductor than it really is. Any one who uses a hydro-rheostat well knows the highly resistant property of water to the electric current; but as free and in large volume it is not practically so resistant as it is sometimes thought to be, as any one may prove for himself by the rude experiment of plunging in an ample basin of water the sponge of one reophore of a medical galvanic battery, yielding from thirty to forty volts, while the sponge of the other reophore is placed on the back of the hand submerged in the water at the distance of four or five inches. The hand, the most callous part of the body except the heel, feels the current distinctly in every part, and if it has but the smallest abrasions of the skin in places remote from each other, the electric current makes them sting, finally condensing strongly at the pole on the hand.

After trying the experiments described, I flashed one hundred and ten volts through a glass tube, with half of a cubic centimeter of hay-infusion containing protozoa, with the poles half an inch apart; and also flashed one hundred and ten volts through a looped wire going from top to bottom of a small bottle containing four centimeters of the infusion. In neither case could subsequent microscopical examination detect that the organisms had been affected in the least. The whole of the current, of course, passed through the organisms in the tube. In the case of those treated with the looped wire it was only the residual force, which the wire did not carry, that they encountered. That under these conditions the wire does not carry all the electricity is shown in the forthcoming description of experiments, in which the work of killing bacteria was successfully accomplished with looped wire passing through fluid media, and carrying only a very small force, but for a considerable time. With so much electro-motive force as I used—one hundred and ten volts—I could not allow the discharge through the micro-organisms to be more than momentary, else they would have been destroyed for certain by the concentrated products of electrolysis.

Two main conclusions seemed to me from the beginning of my experiments to be justifiable. The first of these was that, inasmuch as protozoa have no nervous system, and do not seem to be injuriously affectible by the electric current (barring its action under conditions such as generate heat almost exclusively), we are accustomed to think erroneously of the current as capable of affecting and endangering all sensation and life, solely because of our own possession, and knowledge of the possession among other animals, of a nervous organization upon which stress may be put by the current. It seemed to me that the last experiment proves what is currently believed, that an animal protoplasmic organism has, *ipso facto* of its being protoplasmic, no nervous system. The second conclusion at which I arrived was that, if protozoa of the kind with which I had dealt are not easily killed by the electric current, it would be hopeless to think of destroying schizomycetes, except by a force which, for the practical purposes that I had in view, it is impossible to apply to them, especially as, in the pleomorphic forms assumed by some of them, it is notorious that they possess latent vitality difficult to extirpate.

I am still inclined to hold to the first conclusion, as justifiable from my experiments as far as they have even now gone, that animal micro-organisms, submerged in water or any other liquid, are not susceptible to injury from electric current approaching in force the highest that I used (which may be regarded as prodigious when the minuteness of the organisms attacked by it is taken into consideration), and that perhaps they are not susceptible to injury under those conditions from any current, however high. But, as to my first conclusion, I have since found myself, upon reading the work of Dr. Griffiths, egregiously in error through the false inference that I had drawn that, because the electric current did not destroy protozoa of the kind with which I was dealing, therefore bacteria would not be destroyed by it, at least within the bounds compatible with human life or well-being. It seems, however, that vegetable protoplasm, at least of the fungus kind, acts differently from animal protoplasm under the influence of the electric current. After reading the results of Dr. Griffiths, I gladly reverted to the intention with which I had set out in my experiments, of being able to suggest means by which bacilli forming a nidus in the human body could be destroyed and water supplied to cities could be sterilized for drinking purposes.

The author to whom I have referred is Dr. A. B. Griffiths, Fellow of the Royal Society of Edinburgh. He remarks that the full details of his experiments with electricity on bacteria are to be found in Volume xv of the Proceedings of the Society. In making the experiments he seems to have had no ulterior object in view but the gaining of information as to what amount of current would destroy certain micro-organisms. The wood-cut which he gives at page 177 of his work, *Micro-organisms*, represents a faradaic, not a galvanic battery, as the generator of the electromotive force used in his experiments. At the beginning of mine I used both the galvanic and the faradaic battery. The receptacles in which Dr. Griffiths placed pure cultures of different bacteria were simple, broad-based, short bottles, in which were fitted from top to bottom of each bottle a single loop of wire in free electric liquid communication with the micro-organisms. He does not in any case give the resistance in ohms of the media employed in the cultures.

The bacillus tuberculosis was killed by 2.16 volts, the bacterium lactis by 2.26 volts, and the bacterium aceti by 3.24 volts. The electric current was allowed to pass for ten minutes, and the temperature of the laboratory during the experiments was 16 C. (60.8 Fah.). In another series of experiments, bacillus tuberculosis was killed by 2.16 volts, bacillus subtilis by 2.72 volts, and bacterium allii by 3.3 volts. The current, as before, was allowed to pass for ten minutes, and the temperature of the laboratory was 17 C. (62.6 Fah.). In the first series of experiments no growths appeared from inoculation in fresh nutritive media, after an incubation of twenty-five days, with the thermometer at

38 C. (100.4 Fah.); and in the second series, similarly treated, no growths appeared after an incubation of twenty days, with the thermometer at 35 C. (95 Fah.). As before incidentally mentioned, all of these experiments were made with wire looped in glass bottles. Consequently all the electricity that attacked the microbes away from the wires was the residuum which the wires did not conduct, necessarily by far the lesser portion; and as the minimum of force was not sought or obtained, what is needed may be a mere fraction of the time and force actually employed. With so small a current as that used, and with the considerable volume of the respective liquids employed—which latter point the wood-cut shows—detriment to the organisms from products of electrolysis may be deemed inappreciable.

It has therefore been demonstrated that certain schizomycetes can be killed in a short time by a low current. Presumably all others can be killed in an equally short time by an equally low current; which was the assumption with which I had set out at the beginning of my own experiments, looking primarily to destroying pathogenic germs in the human body, and secondarily, to rendering them innocuous through the sterilization of water for drinking purposes. I therefore ask myself why, if a very low current, passing for a few minutes, can destroy bacteria in a bottle, should not a much higher one, administered repeatedly for the same time, be sure to destroy them in the human body? Daily, in the course of electro-therapeutic treatment, ten, twenty, twenty-five, and many more volts are administered to patients, avoiding only strong or continuous application of the current to the pneumogastric nerve, on account of the inhibitory action of the heart thereby provoked. But I will not pause just at this moment to speak more fully to this point, but will here confine myself to the main subject of this paper, clearly set forth by its title and the tenor of the preceding remarks. Reverting to the question of the sterilization of water for the use of cities, and with the new light upon the subject, which, as it appears, I might have gained for myself, but for having been diverted from my course by a false inference, I am constrained to ask my hearers, as I have asked myself in this case also, why the attempt should not be made to destroy bacteria wholesale in the drinking water of large cities by the method previously foreshadowed.

The means at our command seem to me ample. It is true that we cannot electrolize successfully a large reservoir of water, for in that the electricity would be too diffused to be effective. It is true that, in pipes from which water is flowing into or out of the reservoir, its germs would not be subjected to attack for more than a second. It is true that the resistance that we should have to overcome in water would be large. But, on the other hand, it is also true that the electric current that we have at our command is capable of indefinite increase. The electro-motive force of a few thousand volts (there are dynamos that generate ten thousand) thrown athwart a pipe of proper dimensions, would probably paralyze every bacterium in its path, more than compensating by force for slight duration in time as compared with the ten minutes adopted in the experiments of Dr. Griffiths, as to which it is imperative to remember that they did not determine either the amount of current, or of time required, for the destruction of the bacteria experimented upon; and, consequently, it will be observed, both force and time needed are probably very much less than his experiments on their face apparently demonstrate.

If lines of water-delivery as well as those of water-supply were subjected to the attack of the electric current, the severity of it would be more than doubled for the organisms. It would be immeasurably increased in severity; for experiments at the very beginning of bacteriological investigation clearly showed that the best mode of destroying bacteria involves the principle of repeating relatively moderate attacks upon them at intervals such as find them partially recuperated, and assail them in this the period of their least resistant vitality. The method to which I allude is that of repeated boiling of slight duration at moderate intervals of time. That they can bear this apparently severe process at all shows the protective influence for them of any fluid immersion within the chemical character that does not wholly ignore the difference of habits among their different species, and water seems to be a medium inclusive of them all. The principle involved in the mode of attack mentioned is the same as that involved in the mode of destroying bacteria here suggested. Taking it in connection with the facts that a reservoir represents a large volume of water, only a part or a few parts of which are being momently drawn upon for supply, and that many germs are constantly passing through natural phases of relatively less vitality, infinitely below that in which they, if pathogenic, being received into a favoring host, so vigorously form ptomaïnes, to their self-destruction as well as that of the host, it would seem that, if upon issuing from as well as upon entering a reservoir, the water were attacked in pipes from poles all but encircling them, with an electro-motive force of a few thousand volts, all germs must reach the denizens of cities supplied from such a source, wholly innocuous, because they would be dead.

It need hardly be said that, if the poles were placed opposite to each other on a heavy metal pipe conveying water, the electricity, seeking lines of least resistance, would not pass through the water at all, but around it, through the great mass of the pipe. But it should be obvious that it is easy to adapt to the place of electrical attack of a pipe a simple contrivance consisting of a section of the same diameter as that of the pipe, insulating the poles from each other, and both from the general line of the pipe. A plan that might at the first blush appear to some persons better, as not entailing thus radically breaking the continuity of the main pipe, would be to have two series of metallic insulated screws, representing by position two opposing arcs, the individual screws of which should enter and pass through corresponding holes in the pipe, the ends of the screws being uninsulated. But this plan would not do at all. The experiments described have proved the resistance of water to be so great that a large volume of it is required for electricity to pass easily through it. Consequently, in overcoming the resistance of water in a metal pipe with poles attached, in the form of insulated perforating screws, part of the electricity would, in making large excursions, be received and conducted to the poles by the metal of the pipe, instead of reaching them entirely through the water. But, if the pipe were interrupted by a non-conducting section, of length to be determined by the diameter of the pipe and the electro-motive force to be used, then those excursive lines of force would eventually fall into the determinate direction of the poles entirely through the water. We see this action clearly illustrated in the previous experiment, where, in open vessels, resistance to the current rapidly diminishes as we increase the volume of the liquid. We see the same thing also clearly illustrated in the case of the hand submerged in the ample basin of water, where the remotest abrasions of the skin sting from the current, finally emerging with condensed force at the pole resting on the submerged hand. In a pipe with a properly calculated non-conducting section, the lines of force would play freely inside of the pipe, occupying and limiting there a rounding imaginary space, varying in figure with every change of force, but always, of course, having its apices at the poles, approaching which, and especially at which, would be concentrated their intensest energy.

If the full significance and legitimate outcome in conclusion from the experiments that have been detailed have been perceived, it will have been realized that, although water acts like wire with reference to conductivity, through length, cross-sectional area, and temperature—exemplifying the law of conduction by and resistance to the electric current, with reference to volume, however disposed—the difference between wire and water, notwithstanding that metal has great conductivity and water very little, is enormous with reference to difference of capacity. We have but to determine, first of all, what electromotive force is needed for the purpose of destroying germs in water, assuming that they are thus destructible, and then, upon that basis, determine what the length and cross-section of non-conducting pipe should be to accumulate and discharge the force required. One could charge a constant stream of water in an insulated pipe as never wire nor any congeries of wires nor any metallic deposit on earth could be charged with electricity; for whereas all these would soon reach their utmost capacity for localized energy, an insulated flowing pipe has back of it all earth ready to receive and effectively return the force transmitted. We, however, need for our purpose at most only a small area of that vast space. But yet it is true, and a striking exemplification of the stated fact that, given a dynamo of far less than infinite power, with poles astride an estuary's living stream, so wide, so deep, that the earth there would not fuse before a fiery blast engendered by resistance, and connected as those waters are with every drop in every brook, the encircling oceans, and the interlying land, it would send its impulse thence over the whole uninsulated globe, and backward, in myriad lines of force, with all but synchronous and omnipresent thrill.

I stated at the beginning of my discourse that it is an open question whether or not the stomach is capable of destroying pathogenic germs. In that, of course, is involved the other open question, whether or not ordinary drinking-water is the source of disease. I have properly spoken of the questions as open ones, because so many persons are enlisted on opposite sides that I cannot venture without arrogance to decide them authoritatively. The tenor of the preceding remarks, however, must indicate that, personally, I believe drinking-water supply to be ordinarily one of the largest factors in the causation of some zymotic diseases; but lest I may have left it in doubt that I hold that view, I here state it explicitly. I have, I confidently believe, pointed out one way in which the evil may be abated, and perhaps neutralized; and this without disparagement of the efficiency of subsidence basins in their adverse influence upon bacterial dissemination. As to this (with the exception of treatment with iron) the last remaining factor in the production of pure drinking-water, I shall be glad to take a more opportune time than the present occasion, when I have so long engaged the attention of the Society, to prove directly, from my still later experiments and observations, what seems directly proved by the statistics of prevalence of typhoid fever in Philadelphia and elsewhere with reference to areas of different water-supply, that subsidence basins are also an important factor in the health of a city, not only relieving water of impurities in it, represented by alluvial and effete matter in suspension, but also relieving it in a measure of the impurity due to simultaneous deposition of the bacterial bearers of poison to our homes.

As to our ability to destroy the bacillus tuberculosis in the human body, by means of percutaneous administration of the electric current, I hope that I may be allowed to say a final word. I cannot see, as I have already remarked, why, if it can be killed in a bottle with a mere fraction of two volts (as I have shown by the experiments of Dr. Griffiths that it must have been killed), it cannot be killed in the patient suffering from tuberculosis, by the enormously greater electro-motive force that the body is capable of receiving without detriment in a concentrated form. This statement, however, is not intended to imply that the current would be capable of curing a case of tuberculosis which had involved caseous degeneration of the parts. If it did, it would also imply that to my mind electricity is creative. Electricity, however, although not creative, includes among its manifold and marvelous properties not only dynamic power, but attributes regenerative of vitality, and with these two it is capable, if the experiments of Dr. Griffiths are to be relied upon, of killing the bacillus tuberculosis in the living human body, in case the lesions of the disease have not seriously impaired electric conductivity in the parts morbidly invaded; and capable also of contributing to restore healthy function to them, and thence normal structure. It remains for physicians to make the essay here indicated at no expense or risk whatever. If the treatment prove to have any virtue in it, it would apply to other bacterial diseases besides tuberculosis.

In regard to the essay with reference to the sterilization of drinking-water, experiments could be made at no great labor and expense compared with the vast interests at stake in a large city. Through microscopic tests would soon be set at rest the question as to whether to any, and if to any, to what extent germs could, by the means described, be destroyed in city water, and scrutiny of the health of the city, within the lines especially of certain diseases, through comparison of present with past records, would in successive years have its own independent and conclusive tale to tell. I pledge Philadelphia prospectively in a bumper of pure water more worthy of celebration than the best Falernian wine.

Obituary Notice of P. W. Sheafer. By J. P. Lesley.

(***Read before the American Philosophical Society, April 3, 1891.***)

Peter Wenrich Sheafer was born at Wiconisco, in Dauphin county, Pa., March 31, 1819. His father, Henry Sheafer, was afterwards President of the Lykens Valley Railroad Company, and Superintendent of the Lykens Valley Coal Company, mining the finest quality of anthracite coal, at the west end of the Southern Anthracite Coal field. The discovery of the Lykens valley coal bed in the body of the Pottsville Conglomerate was one of the astonishing incidents of Pennsylvania geology, and enabled the Sheafers, father and son, to establish a great trade in anthracite coal upon the line of the Susquehanna river as far as Baltimore.

Peter Sheafer was engaged at various times in his long professional life in following the outcrop of this interconglomerate coal around the edges of the Southern and Middle fields, but without finding it in an equally good condition in any other parts of the region. He often expressed to me his hopes and his disappointments regarding it. It was but an episode in his career, for his large fortune was chiefly accumulated by the purchase and exploitation of the Mammoth and other large beds overlying the Conglomerate.

After leaving school, Peter took a full course at Oxford Academy, New York, with the object of a better geological acquaintance with coal and coal mining. But at that early date, the science of geology could hardly be said to exist. In 1835, the New Jersey and Virginia State surveys, and in 1836 the Pennsylvania survey, were begun. Prof. H. D. Rogers' first assistants were Mr. Booth, afterwards the chemist of the United States Mint, and Mr. Frazer, afterwards Professor of Chemistry in the University of Pennsylvania. The following year, Mr. Trego, Mr. McKinney, Dr. Whelpley, and others were appointed assistants on the survey. In 1838, Peter W. Sheafer received his commission, while Dr. Whelpley had charge of the Southern and Middle field, and Mr. McKinley of the Northern field. Henderson and I were the next year Whelpley's aids, and I saw little or nothing at that time of Peter Sheafer, who was busy with his own part of the field work, and was laying the foundation of that accurate knowledge of the order and quality of each coal bed which enabled him afterwards to make himself easily the principal practical mining engineer of the anthracite region. His mind and the training of it was just suited to this work of his life. He had good judgment, inexhaustible liking and ability for work, a retentive memory, a quick eye for money values, a peaceable disposition, great caution in undertaking, and pertinacity in accomplishing the exploitation of properties. He made himself personally acquainted with everybody and everything that happened or was likely to happen in the anthracite world, and kept himself in constant intercourse with owners, investors, speculators, mining prospectors, engineers, and railroad companies; and, what was the key to his fortune, never rode hobbies, or allowed himself to be turned aside into other pursuits; although at various times in his life he traveled far to examine and report upon distant coal fields for those who employed him as a professional adviser. I have known, also, of his reports on iron-ore properties and oil and gas lands. He was also a great collector of statistics, and was the first to conceive the idea of a statistical coal pagoda, with lines drawn across it at regular intervals to represent successive years, the old legendary 365 tons of anthracite sent to market the first year forming the apex of the pagoda, and its successive stories, bulging or being overhung according as the anthracite market received a greater or less addition to its ever-swelling volume of trade. He was for many years the recognized authority for the statistics of the region.

In 1848, he married Miss Harriet Whitcomb, of New England, and set up his home and office in Pottsville, the capital of the anthracite country. For forty-three years this has been his happy, hospitable, and elegant residence, and here his children, Louise, Arthur, William, and Harry were born and educated, his sons becoming partners in his enterprises, sharing the toils, the responsibilities, and the wealth of their father, and fitted well to maintain the honor of his name.

In 1850 Peter Sheafer took an active and influential part in the effort inaugurated by William Parker Foulke of Philadelphia and other gentlemen to obtain an appropriation from the Legislature for publishing Prof. H. D. Rogers' Final Report on the Geology of the State. Half of the appropriation was to be spent in field work, to bring the Report up to date, especially that part of it which related to the anthracite coal fields. Mr. Rogers formed a corps, consisting of Peter Sheafer and his cousin, John Sheafer, for underground surveys; myself for surface topography; Edward Desor, of Neuchatel, for the study of the surface deposits, and Leo Lesquereux, of Columbus, O., for the study of the coal plants. This work only lasted one year, and this corps was disbanded, but a good deal of special work was done in the following year or two in other parts of the State; and the Report did not appear until 1858.

At the organization of the Second Survey of the State, in 1874, Peter Sheafer's business interests were too exacting and important to permit of his taking an active personal hand in it, but he did all that he could to further the interests of the survey at Harrisburg and elsewhere through the following fifteen years of the continuance of the survey; and I am happy to say that the intimate friendship which he and I formed in 1851 was confirmed and continued with unabated cordiality to the present time. His son Arthur was commissioned as Mr. Ashburner's assistant in the long and difficult survey of McKean, Elk, Cameron, and Forest counties, where he exhibited great abilities for field and office work inherited from his father; and the greatest part of the "Report on Elk County," with its illustrations, is from Arthur Sheafer's own pen.

Peter Sheafer was a genial and lovable man, a religious man, and, what always struck me as very interesting, a man of poetical temperament, and a reader of the poets. But he was never properly trained to express his thoughts in a style of elegant composition. His business writings were unexceptionable. His statements of business facts and contracts were satisfactory, but he was unused to a logical, consecutive, well-systematized and picturesque presentation of a subject. This is, of course, to be ascribed to his lack of youthful classical training. I have often thought of him as that one of my friends whose life career best illustrated the advantages and disadvantages of college discipline. For by not going to college he gained more than he lost, and enjoyed great worldly and social prosperity at the very small cost of missing literary facility. I even doubt that the lack of technical school training in his profession as civil and mining engineer was at any time an obstacle in his path of life. He learned enough to join his experienced father in earlier enterprises; and in after ones his intercourse with business men and technical books and professional experts supplemented his own experiments and kept his intellectual ability abreast of the public needs of each succeeding year.

My friend Sheafer was a silent man, I should say reticent, always smiling and cheery in conversation, but seldom or never allowing even to his enthusiasm more than a momentary flash of expression. He had the confirmed habits of a good listener; and what he himself had to say was said in the fewest words the theme permitted or the occasion demanded. He was intently sympathetic, and loved to hear others talk; his own contributions being chiefly made in the shape of facts. No man better appreciated those whom he loved or respected, and this he owed to his poetic temperament.

One of the best instances of his ingenuity is his successful device for gobbing up a mine by boring down to its heading from the surface and causing a stream of water to carry down the bore-hole the fine slack or braize coal from a neighboring dust-hill. The coal-mud thus introduced into the abandoned workings is banked back behind loose brattices which let the water flow through but retain the mud, which in some months becomes solid and firm enough to hold up the roof; and then the workings are reopened and the mine is robbed of its pillars. The coal usually lost by the crushing of the pillars is thus saved without danger to the miners; and the country is also saved from caving and settling; which entails a further profit, inasmuch as the coal beds above the one worked out are preserved intact for future mining. Schuylkill county ought to erect a statue to Peter W. Sheafer for this invention alone.

He became a member of the American Philosophical Society, July 17, 1863. He was a member of the Academy of Natural Sciences of Philadelphia, of the Historical Society of Pennsylvania, of the American Institute of Mining Engineers, and of the American Association for the Advancement of Science. His philanthropic feelings induced him to become a member of the American Colonization Society.

His death took place at Brown's Mills, Burlington, N. J., to which he had been taken from Atlantic City in the hope of saving his life, and he was buried at Pottsville, March 31, 1891.

He was six months my senior in age; and now I remain the last one of that old set of the first geological survey of our State. They are all gone—H. D. Rogers, Booth, Frazer, McKinney, Trego, Holl, Boyé, R. E. Rogers, Haldeman, Whelpley, Hodge, Jackson, Henderson, McKinley, Sheafer—not one lives to tell the adventures of those early days of our science, when the very foundation principles of it had to be laid, and the physical constitution of Pennsylvania had to be discovered, without experience and without instruction. The bare outlines of the story have been told; but the individual life of that story will never be told; is, in fact, untellable.

Artesian Well in Lowest Trias at Norristown.

Notes by Prof. O. C. S. Carter.

(Read before the American Philosophical Society, May 1, 1891.)

Drilled in the Trias of Norristown, near Stony creek, for water for steam boilers.

15′	Made ground..to	15′
23	Sandstone, light colored, coarse grained, containing fragments of orthoclase feldspar..................	38
33	Sandstone, dull red, fine grained, with specks of muscovite. Color due to iron oxide..................	71
31	Sandstone, light pink (produced by pink orthoclase), fine grained; quartz grains transparent; fine specks of muscovite mica........................	102

Water was struck every ten feet down to 70; none thence to 90; abundance of water between 70 and 102 (located by the driller at 95, 100 and 102); cased at 18 with 6 inch pipe (5⅝ inside). Steam pump furnished 1003 gallons per hour. After pumping 4000 gallons, the level of water in well fell 12 feet; after 7500 gallons, it fell 16 feet and stood.

Analysis of well water gave 11.8 degrees of hardness, as compared with 6 degrees for Schuylkill river water; 14 degrees for English surface New Red water (Wanklyn); and 17 degrees for English deep well, New Red water.

The lime exists mostly as carbonate, with some sulphate, and probably comes from the cement between the sandstone grains.

Another artesian well, situated within a hundred feet of this one, gave water which precipitated in the boilers a fine white powder of carbonate of lime, which did not cake and was easily blown out. This well water is therefore as useful in steam boilers as is Schuylkill river water; and is better, because it holds no mud or sand in suspension. A little soda neutralizes the sulphate of lime. The water also becomes perceptibly softer after continued pumping.

Artesian Well in Lowest Trias, at Norristown.

Well drilled about half a mile from the Trenton limestone, which outcrops at Mogee's Station, on the Schuylkill river, to obtain water for the manufacture of artificial ice.

	Cased at 28 feet with 6 inch pipe.	
30′	Sandstone, very white and fine grained, containing a little pink orthoclase.........................to	30′

5′	Sandstone, white, containing coarse fragments of orthoclase.	35′
6	Shale, dark red	41
14	Sandstone, white, containing muscovite mica	55
10	Sandstone, lighter color, more feldspathic	65
3	Sandstone, very white, fine grained	68
6	Sandstone, dark red, coarse, containing much iron oxide and a little mica	74
4	Shale red	78
18	Sandstone, red, fine, micaceous.	96
4	Shale red	100

Water was first struck between 35 and 40. More than ten "crevices" [probably water cracks] passed between 35 and 100. The water now rises to within 16 feet of surface. Steam pump delivers 1500 gallons per hour. After ten hours' pumping the water falls only 10 feet in well, the whole fall occurring, however, in the first 45 minutes. With an improved pump 3000 gallons per hour were obtained.

Water Well in Lowest Trias, at Washington Square, Montgomery County.

22′	Sandstone, red, micaceous to	22′
12	Clay, stiff, red	34
1	Shale, red (*Trias*)	35

Water first struck at 16 feet ; a crevice every 3 or 4 feet ; stands at 11 feet from the surface, and never falls lower, no matter how much is pumped, at the rate of 1500 gallons per hour.

Artesian Well in Trias, in Worcester Township, Montgomery County, Pa.

Drilled on the Duffield farm, on the north bank of Stony creek, at the crossing of the Stony Creek Railroad, between Custer and Belfry, through New Red (Trias) red shale and clay slates, some of them blackened with coaly matter.

20′	Clay slate, gray, hard ; little mica to	20′
5	Clay slate, *blackened* with coaly matter	25
5	Shale, red	30
5	Clay slate, dark, fine grained	35
5	Clay slate, very *black*, hard, compact	40
3	Shale, red	43
2	"*Quartzite*"	45
3	Clay slate, gray	48
17	Clay slate, compact, hard.	65

The *quartzite* was said by the driller to be so hard that he could only drill six inches of it in ten hours.

Water was first struck at 38; again at 65; nowhere else. Water stands at 15 feet of the surface; yields 60 gallons per hour; drops 25 feet after pumping 6 hours.

Evidently the Stony creek water soaks slowly through the bed planes between the clay slates.

Artesian Well in Lower Silurian Limestone, in Montgomery County, Pa.

Drilled on Charles Kunkle's farm, south side of the Valley Green road, east of the Bethlehem pike, north-northeast of Flourtown.

40′	Limestone, not micaceous.	to	40′
20	Limestone, micaceous		60

Water first struck at 40′; depth of well 60′; several small "crevices;" water stood at 35 feet beneath the surface, and was not lowered by steam pumping 500 gallons per hour.

Artesian Well in Lower Silurian Limestone, at Parkesburg, Pa.

By Prof. J. P. Lesley.

Mr. P. H. Gibbons, Vice-President of the Parkesburg Iron Co., at Parkesburg, Chester county, Pa., was good enough to furnish me by letters dated January 1, February 9 and February 11, 1886, with fragmentary notes of the boring, and forty-five samples for examination, which I have in bottles, the depth in feet recorded on the corks, and finely powdered specimens on glass slides for microscopic use.

Soil, first passed through		18′
Limestone struck	at	20
Quicksand encountered	at	23
Cased quicksand out.	at	24
Limestone ("bastard"), more dense and solid.	to	42
Quicksand again	at	42
Limestone	to	53
Quicksand, with flow of water	at	53
Limestone, purer	to	92
Sandstone, yellow, fine grained, 7′ thick	to	99
Limestone, of varying qualities, sometimes sandy, "then mica, then lime or marble;" no water.	to	174
Limestone, of varying nature	to	522

Specimens examined under the lens, at the following depths:

27′ Resembles a sandstone, light gray, with white fracture, some quartz crystals and a show of mica.

32 Same as above, with a trace of iron oxide.

34′ Same as above, with an increase of mica.
37 Same as above.
48 Same material, but blackish gray.
60 More carbonate of lime, and some mica ; reddish crystals, peroxide of iron.
69 Large percentage of carbonate of lime.
79 Limestone.
90 Limestone.
95 Quicksand, yellowish white.
99 Same as last.
102 Limestone ; mica and quartz in quantity.
117 Limestone, reddish.
122 Limestone, bluish light gray, mica.
150 Limestone, with yellowish red crystals.
171 Limestone, white, fine grained.
179 Same as last.
194 Same as last.
208 Limestone, grayish white.
227 Same as last.
239 Same as last.
255 Same as last.
268 Same as last.
282 Same as last.
288 Limestone, hard, and fine grained, light gray, white.
302 Same, increasing in hardness.
308 Same as last.
324 Same, gray and white ; show of mica.
332 Same, darker gray ; more mica.
347 Same as last.
360 Same, bluish gray ; coarse granules.
372 Same as last.
387 Same as last.
404 Same, granules finer ; show of mica.
415 Same, grayish white, still finer ; less mica.
422 Same as last.
433 Same, dark gray, mica, iron.
448 Same, more crystalline (rhombohedral); more mica.
455 Same, crystalline, dark gray.
464 Same, crystalline, gray and white.
472 Same, fine crystals, light gray.
486 Same, finer granules, very hard ; with mica.
502 Same, perfectly crystalline ; more mica and feldspar.

One slide prepared to show crystalline forms.

The occasional dissemination of minute flakes of mica and fine grains of feldspar through the limestone is better evidence of the deep-sea deposition of these Ordovician or Lower Silurian limestone beds than is the silica in quartz form which they contain.

The beds are highly tilted to the south; therefore the vertical hole exaggerates the thickness. The formation is probably "Calciferous" *No. IIa*, but no fossils have been found just here. No record of water obtained.

Artesian Well in Potsdam Sandstone, in Montgomery County, Pa.

Notes by O. C. S. Carter.

Drilled on William Janeas' property, near Williams Station, at the crossroads, south of Lancasterville, and east of Spring Mill, the Plymouth Railroad sweeping around it on the southwest.

64′	Sandstone (*Potsdam No. I*), coarse .... to	64′
6	Sandstone, fawn colored, micaceous	70
10	Sandstone, light brown, fine	80
10	Sandstone, coarse, micaceous, transparent quartz.	90
22	Sandstone, fine, micaceous	112
6	Sandstone, very coarse, larger fragments of quartz, with red iron stains.	118
4	Sandstone, coarse	122
4	Sandstone, fine, grayish brown	126
4	Sandstone, coarse, fawn colored.	130
2	Sandstone, fine, resembling ground ginger.	132

No conglomerate like that of the Willow Grove Potsdam outcrop passed through; beds tightly laid so that water crevices were few and insignificant. No water struck until the drill reached 80. Water rose and stood at 70. Steam pump delivered only 300 gallons per hour; water falling 10 feet after pumping 10 hours.

Artesian Well of Chalybeate Water, in Chester Valley Clays, near King of Prussia, Montgomery County, Pa

Notes (condensed) of Prof. Oscar C. S. Carter.

Drilled on William Thomas' land; 90 feet deep; water, deep brown (cider) color, even after 30,000 gallons had been drawn by a steam pump in three days; bubbles of carbonic acid gas constantly escaping; water not clear after standing several days; precipitate, analyzed, was carbonate of iron; precipitation not complete after a week.

35′	Yellow clay .... to	35′
10	Layer of rounded pebbles of white quartz, resembling those on the sea shore	45

10′	Fine white sand and pebbles	55′
10	Blue clay, holding iron balls	65
10	Fine yellow clay, holding iron balls	75
	Thin bed of solid sandstone which seemed to be *Triassic*, perhaps not *in situ*.	
5	feet of Chester Valley limestone (no more limestone)	80
	Struck top of *Potsdam S.S.*	at 90

Water first struck at about 40′ down ; at first, muddy ; soon cleared on standing ; supply soon exhausted by the pump ; merely surface water.

No more water until depth of 81′.

Chalybeate water at 81′ ; immediately rose in the dry well to within 32′ of surface. Pumped this water, 60,000 gallons, during 5 days (steam pump). Then iron water exhausted, and clear water took its place. Iron water evidently came from clay beds holding iron balls ; some of which were brought up by the drill. Well cased (6″ iron pipe) to 83′.

Water stratum evidently lies between the clays and the rock floor.

Artesian Well in the Mica Schist of Philadelphia.

Notes by O. C. S. Carter.

Drilled by H. W. Kelsey, of the Oriental Bath Co., 1104 Walnut street, Philadelphia, for the supply of the baths.

Drillings at every 10 feet examined under a lens ; elements arranged below in order of their abundance in the specimen pumping. No rock seen except mica schist and gneiss. Only *traces* of feldspar noticed above 170. Colorless muscovite mica makes all the strata nearly white from 160 to 210. The biotite mica darkens the strata from 210 to 266. *No hornblende seen in any of the pumpings.*

20′	Clay, the Philadelphia brick clay	to 20′
46	Gravel (thin layer of clay at bottom)	66
34	Mica schist; milky quartz, biotite mica, occasional speck of muscovite mica, no feldspar	100
20	Mica schist ; muscovite mica and trans. quartz	120
10	Mica schist ; biotite, quartz and muscovite	130
10	Mica schist ; quartz, muscovite, some little biotite	140
10	Mica schist ; biotite, quartz, some little muscovite	150
10	Mica schist ; coarse fragments of quartz and muscovite.	160
10	Gneiss ; coarse fragments of pink orthoclase, muscovite and quartz ; *first appearance of feldspar*	170
10	Gneiss ; quartz, orthoclase feldspar and muscovite	180
10	Gneiss ; muscovite, quartz, biotite, little feldspar	190
10	Gneiss ; muscovite, orthoclase and quartz	200
10	Gneiss ; muscovite, orthoclase and transparent quartz	210

10′	Mica schist; quartz, biotite, muscovite	220′
10	Mica schist; biotite, quartz, muscovite	230
20	Mica schist; biotite and quartz	250
15	Mica schist; biotite, muscovite, quartz	265

Few crevices; strata tightly packed; first rock water struck at 120; rose to 28′ beneath surface; pumped 5 quarts a stroke, 80 strokes a minute, 6000 gallons an hour; level falls 20′ after one hour's pumping.

Water a little hardened by sulphates and some iron.

Artesian Well in Mica Schist, near Radnor, Delaware County, Pa.

Notes by O. C. S. Carter.

Drilled on M. Wheadley's farm, in Chester county, Pa., in the *hydromica schist* of the South Valley Hill belt.

30′	Sharp white quartz fragments	to 30′
58	Schist, very micaceous, silver gray, soapy	88

Water crevices struck at 70 and 85; water rose only 10 feet in the well, and stood at 70 feet below the surface; yield, only 120 gallons per hour; drops 5 feet after pumping five hours.

Feldspar Bed in Laurentian (?) Gneiss.

By Prof. Oscar C. S. Carter.

(Read before the American Philosophical Society, May 1, 1891.)

The feldspar quarry is opened on the east bank of the Schuylkill river, between Lafayette Station and Spring Mill, where the Reading Railroad (Norristown branch) and the Pennsylvania Railroad (Schuylkill Valley division) run side by side under the bluff outcrops of syenite and gneiss supposed to be of Laurentian or Archaic age, bordered on the south by C. E. Hall's Chestnut Hill Mica Schist belt of undetermined age.

A small stream cutting down into the Schuylkill just south of the quarry marks the contact of the mica schist and syenite and gneiss belts. About 100 yards north of the quarry is the granite vein described in Prof. H. D. Roger's *Geology of Pennsylvania,* 1858.

The county road runs between the railroad tracks and the bluff, and the feldspar bed is quarried for 35 feet alongside of the road. The feldspar is also exposed between the road and the railroad for 10 feet more, making the bed at least 45 feet broad; the highest point of rock exposed is 15 feet above the level of the county road.

The dip of the feldspar bed is northward (40°) beneath the gneiss.

The direction of the feldspar bed does not conform to the strike of the belts of gneiss, but, on the contrary, is transverse, *i. e.*, nearly north and south.

The feldspar is orthoclase, of light pink color, with an occasional streak of white granular quartz running through it. Some of the large masses quarried out contain considerable quartz. Large masses of biotite mica are occasionally met with in quarrying; but the occurrence of biotite is not general through the rock.

The quarry was opened in the summer of 1886, and about 30 tons taken out and sold to the potteries at Trenton, etc. It is the only feldspar quarry in Montgomery county. The quarry in Delaware county is described in the Annual Report of the Geological Survey of Pennsylvania for 1886. A few others, in the States of Delaware, New York, Connecticut, Massachusetts and Maine furnish all the feldspar manufactured into pottery in the United States, the total production from all the quarries, from 1882 to 1887, having been 14,000; 14,100; 10,900; 13,600; 14,900; 10,200 tons, valued respectively at $70,000; $71,112; $55,112; $68,000; $74,500; $56,100. The crude feldspar is valued at the Trenton potteries at about $5 the long ton; and the pulverized feldspar at $11; the quartz being carefully separated out.

A Fragment of Objectionable University-Extension Teaching.

By R. Meade Bache.

(*Read before the American Philosophical Society, May 15, 1891.*)

It need hardly be said, and yet, to obviate the possibility of misinterpretation in outside quarters of that which I am about to remark, it becomes necessary formally to declare that I have no intention to depreciate the cause represented by the well-concerted effort of University-Extension teaching to disseminate knowledge heretofore confined to the comparatively few. I could heartily wish that my theme admitted of no mention save of generalities, but thus treated it would not subserve the interest which I would gladly promote, by being brought home to the minds of my hearers, upon whose individual influence partially rests the benefit which University-Extension teaching is capable of effecting. The attempt to correct incidental error is strictly correlated to endeavor to promulgate the truth, and if it be wise to seek to sow intellectual seed broadcast, then it must also be wise to select it carefully, and to eradicate the tares if any should appear, especially if the soil be virgin, possessing little previous vigorous growth to maintain itself against invasion of injurious crops that haply may be introduced and appear as fruitage of the untried field.

I was present on the evening of the 16th of February last, at Association Hall, in this city, at the lecture of Prof. Richard G. Moulton, of Cambridge, England, on Dumas' *Monte Cristo* as a companion study to *Prospero*, and there heard his attempt at the demonstration of psychical analogies, similar to those which his Syllabus for other occasions included, between the respectively preternatural and supernatural elements in *Monte Cristo* and *The Tempest*. Yet, although I am a monist, believing that all existences, whether religious, philosophical, or scientific, form one intimately connected and coherent whole in nature, the sole barrier to the just and complete comprehension of which condition lies in the feebleness of the human intellect, I also believe that, perforce of that infirmity, we are constrained to view things in the strictest categories, and that we judge of them only more or less clearly by rigid comparison of their immanent likeness and unlikeness; and hence, although, as was said of Dean Swift by one of his lady-loves, he could write well if he chose to about a broom-stick, it is not, in my view, philosophically permissible to any one to take a broom-stick for a rational flight, and from its suggestion superpose a witch, and with her scale the empyrean, opening up to vision all earthly things below in a maze with relation to themselves and the outspreading heavens.

If by accident, and it was of the purest, for I was invited, and did not go of my own motion to hear Mr. Moulton, some of his teachings have become my text, so much the worse for him, or mayhap for me, if I should meet dissent from my propositions. But I make light of the possible consequences to myself, in view of what I deem the justice of my cause. In the interest of that truth which is said to be mighty and always to prevail, of which, however, I have my serious doubts, I speak frankly in what I deem the interest of Philadelphia, which I love; of literature, which I also love, and of art generally, which has been my never-ceasing pleasure throughout life. Mr. Moulton's merits are enthusiasm and elocutionary ability, his faults extravagance and defective logical perception. The result is seen in unbridled imagination soaring over the fields of literature, where, however entertaining, he is not a safe guide to dwellers on the average plane of life in mind, thought, training, and all that goes to form the individual as he stands. I proceed, after this necessary preamble, to the discussion of a few statements made by him on the occasion to which I have referred, not relating at all to the point that I have mentioned, but involving what many others as well as myself deem the greatest heresy against tenets fundamental in literature, safely leaving to the sober second-thought and calm review of the literarily educated among his audience the justification of the opinion that I have expressed as to the general tenor and defect of his instruction.

Mr. Moulton opened his lecture with the strange remark that, whereas his own regard is especially reserved for literature in itself, doubtless that of the great majority of his hearers was concentrated upon the author. This was wholly irreconcilable with the fact of the presence of the large audience that greeted him upon that occasion for the ostensible purpose for which it had assembled. Interest in authors, among any portion of the reading public, is always subordinate to interest in literature. That public stands in exactly the same category, if not in exactly the same relation, to literature and authors, as does Mr. Moulton himself. He himself could not, if he would, divest himself of interest in individual authors compatibly with being interested in their works, the one interest with everybody being exactly proportional to the other. He protested too much in his intended exaltation of literature, more than it is human to feel, for there is, upon the assumption of individual love for literature, no other category than one inclusive of the highest teacher and the lowliest scholar, in all that regards the relativeness of literature and the author. If Mr. Moulton's statement were correct, as representing a possible condition of mind, it would be futile to address any mixed audience assembled for literary entertainment and instruction, except by first endeavoring to convert its component individuals from the error of their way of thinking, that the author is more interesting than his book. But that was evidently not the intention of the lecturer, as set forth in his printed Syllabus of the lecture course, but to make critical study of specimens of the higher literature, upon the assumption of general knowledge of, love for, or at least capacity to learn to appreciate, the productions of master minds in the various provinces of literary art.

A statement in Mr. Moulton's lecture, much more worthy of notice, however, because it involved a dangerous thing to say before a mixed audience, without due qualification to forestall any possible misunderstanding as to the limited reach of the declaration, was contained in his repudiation of all authority for the laws of grammar, clinching the assertion by the remark that in England they do not "set so much store as we in America by Lindley Murray." He declared unreservedly, and proceeded to argue, that so-called laws of grammar are not binding, so repeatedly enforcing the point by using the expression of one of his correspondents, whom he cited as charging that Browning's Caliban "speaks bad grammar," as to impress the listener with the belief that he himself regards that expression as good English. That the sentiment was quite agreeable to some scattered groups among the audience was very evident from the gentle murmur of assent and the incipient stir of applause that arose among them. He went on to say that the popular impression that grammatical law is binding arises from confounding two different senses in which the word is used as defining two diverse things. Now, the idea of law, as everywhere apprehended, however imperfectly formulated as a statement of fact or obligation, however even provisional, has, as a term, but one signification. Relating to physical phenomena, it contains the affirmation of correspondence between cause and effect, authoritative with man. Relating to man, whether as supernally or humanly ruled, it contains the assertion of authority as defining conditions and imposing upon him obedience. Whether, then, the idea is expressed with reference to nature beyond or within man's control, the term corresponds with it, and always relates to that which he regards as authoritative.

Most unfortunate for Mr. Moulton's plea was the distinction which he attempted to draw between legislative laws and the law of custom in language. The essential difference between them, he affirmed, lies in the fact that legislative laws are imposed by authority under penalty, whereas the so-called laws of grammar, being derived from language, and not it from them, are not of any binding authority whatever. But, just as a general consensus of opinion in a community is by legislative action reflected in the concrete form of legal enactment, so a similar consensus of opinion in a community as to language is reflected concretely in the forms in accepted general usage in speech. Back of all laws of language, as well as of all legislative laws, are mandate and penalty, none the less in the first because they are not there formally expressed. Human laws, whether legislative or otherwise, are, in a word, the expression of the will of the community. The laws of speech, as existing in a particular community, are therefore in their sphere as mandatory as are those of a legislature; nor is their infraction possible without incurring and suffering penalty. Attached to their infraction is the penalty resulting from less comprehensibility in written and oral speech, less ability to secure the widest audience, less possibility of communion with one's fellow-men, and at the lower depths, the absolute impossibility of maintaining the best social status. Because all peoples themselves make language, they cannot be bound by that which they create, is an untenable proposition, seeing that in the evolution of human affairs practice comes first, and then custom, and then the formulation of custom in the unwritten law of precedent, if not in the shape of written law. It is the individual that is bound by the law of grammar as well as other law, not the community creative of correspondent language, and failure to discriminate between the essentially different agencies as, on the one hand, representing authority, and on the other obedience, leads from specious view to specious statement. It may be frankly admitted that Caliban has a right to a grammar of his own, without at the same time admitting that there is no law of grammar, when it is considered that we find all men, up to their individual capacity, using speech with recognition of law incorporate in every individual tongue.

Another unfortunate statement made by Mr. Moulton in the lecture referred to, was when he answered certain criticisms upon Browning, that no matter how he varies his theme, he is generally obscure and ever identifiable through his mask. Mr. Moulton asserted as to these strictures, that every great author necessarily has his medium through which he must address his world, and it is for his world, if it incline to love him, to study to become familiar with the medium in which the message of the seer is at first enshrouded. But even undeniable greatness in literature, and such is Browning's, does not depend upon obscurity, but must needs be lessened, not increased by obscurity. Neither does personality, inseparable from utterance, enhance, but, on the contrary, it limits literary greatness. Unless we are to renounce existing standards, obscurity cannot be admitted as a merit, but must be recognized as a defect. Mr. Moulton mentioned *The Ring and the Book* as perhaps the greatest of all poems, and therefore, inferentially, Browning as perhaps the greatest of all poets. The work is marvelously fine, despite fitful, but by no means continuous obscurity, despite portions in which its style is too Hudibrastic to suit the graveness of the theme, and most notably of all (because it might so easily have been otherwise by a halt in time), despite the lameness of its ending. Browning himself says, in the very first line of the superfluous last part of the poem, "Here were the end, had anything an end;" yet relentlessly goes on to reflections of the late actors on the scene, now tame and uninteresting, with even mention that Guido died penitent (with short shrift it must have been, an hour or so at most, including the procession to the place of execution); for which the reader cares not a jot, such terrorized reconciliation of life with death being the common end of darkest criminality in face of unexpected retribution. Fearful is the anticlimax, with its additional Byronic looking towards and mention of the "British Public," when, merely by omission, the grandest possible climax lay just before the author, where the doomed miscreant, Guido, renouncing on the instant his mock heroics and blatant atheism, as he hears his executioners at his cell's door, every shred of pretense falling from his naked hideousness, cries, "Abate,—Cardinal,—Christ,—Maria,—God, ... Pompilia, will you let them murder me?" The tale is told. There is a natural ending, beyond which extension is but injury: even the epilogue is out of date. But such things apart, can it possibly be thought as worthy of existence as the first part of Faust, which, if men remain as men now are, must endure until earth, grown cold and lifeless, still rolls on through space. To address his world, a limited world, a less than the greatest type of author may be obscure and must be personal through his writings, but to address the whole world, to be greatest in literary art, one must so dominate it in clearness and impersonality as though behind the Olympian clouds, where almost alone stands Shakespeare. The grand epic traits of Homer, all but his equal among the immortals, admit of no direct comparison between them, but speaking broadly, there is nothing to choose between them on the score of clearness and impersonality.

It is recognized that what is superlatively great in art is known as such by all orders of men: the fact is thus determined. Before such works no veil of obscurity hangs, but supreme greatness in them is revealed, if not equally, at least as a presence to all men. This law of perception, however, does not exist for science and the highest scientific men. Herbert Spencer has toiled through a long life generally unknown, and wholly unremunerated with this world's goods, although, with well-poised brain and feet firmly set on logical procedure, he has made a march of progress, barring his agnosticism, joined by thousands who have taken fire from his torch to millions beyond unaware of whence came the light. But art is for all the world, by the simple avenues of sense, with much or little intellect, while science, the possession of the few, must ever remain beyond the ken of the multitude save in diluted forms of knowledge. Yet, in entire forgetfulness of the present civilized standpoint in science, Mr. Moulton declared that the savage's knowledge of nature far exceeds that of the civilized man. The ground taken for the assertion was the savage's recognized capacity in woodcraft, following trails, and other skillfulness of the most primitive sort, forced upon him by his daily needs, and not to be spoken of in the same breath with the larger acquaintance with nature possessed by civilized man for centuries, especially that represented by the late wondrous civilized advance through study of the highest physical laws.

The *omne admirari* is as pernicious a phase of the human intelligence as is that of the *nil admirari* attitude of mind. To be catholic in taste is not to embrace all creeds and proselytize to every faith. To enjoy truly, with exalted sense, is to discriminate. To have the highest æsthetic enjoyment throughout life depends upon holding one's self in the attitude of receptivity for all that may appeal to one within the present accepted canons of good taste, and beyond, even if it be unfamiliar, for genius is ever enlarging the bounds of taste. The canons of good taste at a given moment of time represent but the evolutionary point of general human advance, beyond which one cannot proceed sanely by leaps, but led by genius, may enter untrodden space beyond. Except the fundamental, there are no absolutely fixed canons of good taste in art but the academical, and they are constantly invaded, for the grand jury of the world is always in session to decide upon works of art, and its decision is final. The life of the individual artist may pass away unrecognized and unrequited, but the span that the longest life compasses is short in comparison with that which may be for all time. To attempt to defend the greatest author at every point, to find no blemish even in obscurity, to make human imperfection flawless, is mistaken zeal. One of the most conspicuous marks of genius is the inequality of its productions. Look for confirmation anywhere, amid many cases that might be cited, to Goethe, to Victor Hugo. In a single work, *Wilhelm Meister*, are to be met palaces and huts, jostling each other. What a great gulf divides *L'Homme qui Rit* from *Nôtre Dame de Paris.* Compare George Eliot's *Romola*, gem of the purest water, with *Daniel Deronda*, and thence descend in our survey to the depths of ineffable dullness in *The Impressions of Theophrastus Such.* Truly, there is difference in kind between these, making intimate comparison between them impossible; but it is purely between degree as limited by kind as kind that I am instituting the comparison. Is each production of these authors as good of its kind as is another by the same author of a different kind, within its kind; and is not one wholly unworthy of another? that is a fair consideration. Within the very same kind, however (let us put the question to a crucial test), shall we, out of love for Shakespeare, say that even he is always equal to himself? Instance any men and women of genius, and it can easily be shown, if they produced much, that side by side with great performance lies what was beneath their greatness to produce, if it go no further (but it does go much further) than such lapse where even Homer nods. Vainly, because we love an author, would we claim for him equality in all his creation. If so attempting, we really seek to strip him of one of the characteristics that shed, not lustre, but a side-light, on the title to his fame.

Mankind is subject to epidemic crazes of anticipation, admiration and repudiation. The Mississippi Scheme and the South-Sea Bubble, blown to hugest dimensions by the breath of millions, sailed upward until burst by continued puffs of praise. Within a very short period Brown-Séquard, who did not even claim that which the public attributed to him, was raised heavenward, then dropped to earth. Koch was most wisely moderate in statement; all to no purpose when the imagination of the public set sense aflame. Even tulips, two centuries ago, and orchids, but yesterday, have each had with the proverbial dog their little exalted day; that of the dog, as no longer individual, but collective in popular admiration, reigning at present throughout the whole Anglo-Saxon world. In what an unæsthetic general atmosphere of judgment of excellence we live we must perceive upon reflection that, through jaqueminots, la France, and other types, it took fashion at last to find out, and that but lately, the beauty of the rose. But this especially modern development of factitious rapture is not in the real interest of anything good, least of all in that of cultivating popular taste for art. The best interests of that cultivation lie in appreciative recognition of greatness, though careful discrimination and frankest acknowledgment of imperfections as well as merits in a work of art, while at bottom thankfulness is felt for the gift that has been added to the sum of blessings. It is not ennobling to kiss with equal fervor the clay feet and the golden brow of our idol. Gladly let us welcome him among our household gods; remembering, however, that after all, he is human, but all the more lovable for being so. Let us avoid lauding his imperfections, as did Mr. Moulton, when he claimed merit even for the obscurity of Browning, because, as he said, it arises "from excessive sight." The defense is inadmissible; for art depends upon perspective, upon rigid selection, involving therefore exclusion, converging upon finest limitation, resulting in ideal form evolved from void. He who in literature strives at any time to include, or does inadvertently include, in the treatment of a theme, more in quantity or in quality than its development can symmetrically combine, has not then successfully raised the sleeping angel from the block of marble. Virgil, with excessive requirement of his own exquisite skill, well understood the demands of the highest art, when he willed that at his death the work which he had not yet published should perish; for he as well as others of the ancients knew well, as the French of modern times know and strive to practice, that it is in perfection of form that literary as well as all other art chiefly and almost wholly resides; and in literature, unlike other art, which is limited, form includes color, and even the "concord of sweet sounds," and all else that, from delicacy to robustness, through human strength and weakness, appeals to the wide range of affections in the responsive heart of man.

Whoso likes, in poetry or prose, unformed, elusive idea, that sparkles evanescently with promise but half-redeemed in uncoördinated thought, either enjoys the contemplation of his own profundity, not the author's work, or else is himself so much poet or reasoner that, from fitful gleams of light, as one may think out a whole heaven, inspired by the droning from a stupid pulpit, he shapes to suit his fantasy what, not the bard nor other writer, but his unconscious self lends to the satisfaction of his soul. In either case is self-analysis wanting, which would prove to such misguided beings that works which so inspire are not of art, but of art's inchoate suggestion; a pleasant sketch perchance, but not the finished picture, in which they themselves complete the task; for although in literature the delicately, not the mathematically expressed idea, combines the finest finish with its form, it is also true that in it all should ever tend from airy nothing, not thither to revert, or never issue. Admirably Browning says:

> "Fancy with fact is just one fact the more;
> To wit, that fancy has informed, transpierced,
> Thridded and so thrown fast the facts else free,
> As right through ring and ring runs the djerid
> And binds the loose, one bar without a break."

But, just as in all literary art the djerid, *fancy*, is needed truly to bind fact together in all-inclusive bond, so also in all literary art is needed the first of facts, the djerid, *form*, to "bind the loose," in parts and whole, as one "without a break."

A Sketch of the Life of Dr. Gouverneur Emerson.

By W. S. W. Ruschenberger, M.D.

(*Read before the American Philosophical Society, May 15, 1891.*)

Descriptions of the peculiar attainments of members of the American Philosophical Society, and of their labors to increase and diffuse knowledge of truth of any kind, are interesting features in the Society's annals. For such reason it has long been a practice to have prepared a suitable notice or memoir of every resident member soon after his death.

At the close of his life Dr. Emerson had been a member of the Society more than forty-one years. He was warmly interested in its welfare, and took a more or less active part in its proceedings. Notwithstanding his worthiness of it, a tribute to his memory in the Society has not been recorded.

Just after his death, in 1874, it was suggested that I should prepare a notice of him. Inquiry at the time led to the belief that materials for a suitable memoir could not be easily obtained. Even among his intimate friends, Dr. Emerson was notably reticent about himself, never indulged in reminiscences of his past experience: in fact, his associates knew nothing of his life or career.

Recently, however, his near kinsmen have kindly opened sources of information, and now, after long delay, a sketch of his life and work, in sufficient detail for estimation of his character and measurement of his usefulness while living, is respectfully submitted.

Emerson is an ancient English surname and probably not hereditary.

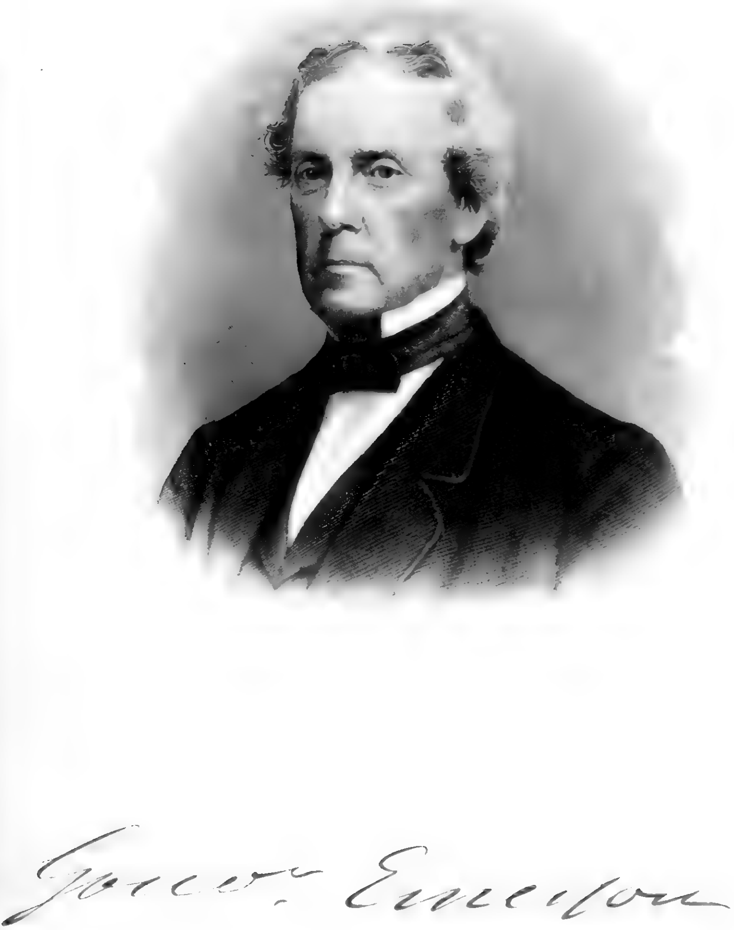
The Emersons of Delaware sprang from a respectable English parentage, and were among the early colonists of Penn's province. They were all farmers, and proprietors of their farms.

The grandfather of the subject of the following sketch, Gouverneur—familiarly called Govey—Emerson, his wife Sarah, born Manlove, and their six children, were received into membership of the Duck Creek Meeting of the Society of Friends in 1757.* His youngest son, Jonathan, born July 17, 1764, married Ann Bell in 1794.† They had seven children,

* Records of Duck Creek Meeting, Kent county, Del.

† *Genealogical Note.*—Gouverneur Emerson married Sarah Manlove, 1746.
Issue—Jacob, b. 1751; m. Sarah Stout.
Manlove, b. 1759; m. Susan Blundell.
Jonathan, b. 1764; m. Ann Bell.

Robert Bell m. Mary O'Brien of Ireland.
Issue—Henry, Robert, Thomas, John, Mary, Agnes, Lucy.
Henry, m. Elizabeth Lewis.
John, m. Mary Lewis; Issue—Ann, Margaret, Mary, Lucy, Eliza L., Stephen.
Ann (Bell) m. Jonathan Emerson. Issue—Gouverneur, Sarah (died), Mary, Susan B., Manlove (died) and Ann Eliza.



two sons and five daughters, the youngest of whom is the sole survivor. The eldest of them, Gouverneur Emerson, was born August 4, 1795, near Dover, Kent county, Del. In after-life he remembered with pleasure that when little more than seven years old he was permitted to roam in the woods with a gun.

At an early age he was sent to the Westtown School, a famous boarding school under the direction of the Society of Friends, which was opened May, 1799, in Westtown township, Chester county, Pa. He returned to Dover in 1810, and was for a short time at a boarding school in Smyrna. Thence he was transferred to a classical school at Dover, the principal of which was the Rev. Stephen Sykes.

With the preliminary education acquired at those schools, and prompted by his mother, he began to study medicine at the age of sixteen, 1811, under the preceptorship of Dr. James Sykes, a prominent surgeon and eminent citizen, who was a first cousin of his mother. Dr. Sykes was once Governor of the State of Delaware, and during many years presided in its Senate.*

His father, Jonathan Emerson, died in 1812, leaving his family an ample real estate, consisting of farms and improvements thereon.

Gouverneur continued his study and went to Philadelphia, probably in the autumn of 1813, to attend medical lectures.

His mother, in 1814, married Manlove Hayes, who had children by two previous wives. He was born in 1769 and died in 1849, aged eighty years. The children of his third marriage were Harriet Sykes, Manlove and Charles P., all of whom are living. Their mother, a lady endowed with excellent womanly qualities and a strong character, so managed her family that her children and those of her husband were never aware of any difference or preference of kinship, and were affectionate friends during their lives.

Having attended three complete courses of lectures and submitted an inaugural thesis on *Hereditary Diseases*, the University of Pennsylvania granted Gouverneur Emerson, March, 1816, the degree of Doctor of Medicine. He was a member of the Philadelphia Medical Society from 1813, and was elected its Secretary in 1816.

Prior to his graduation he was a private pupil of Dr. Thomas Chalkley James, an eminent practitioner, who was professor of midwifery, the first

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Ann m. (second time) Manlove Hayes, Esq., of York seat, near Dover, Del. His great-grandfather, Richard Hayes, the first *American* ancestor of the family, settled in Delaware in 1698, at the age of 20, and m. Dolly Manlove.

Issue—Harriet Sykes, Manlove, Charles P.

Mary m. 1st Jones, 2d Francis, 3d Edgar.

Agnes m. James Sykes (a delegate to the First American Congress).

Issue—James, Nancy (who m. Commodore Jacob Jones, U. S. Navy), Matilda, John, Harriet.

Lucy m. Rev. William Magaw, D.D., Rector of St. Paul's P. E. Church, Philadelphia. Buried under the church.

* Biographical Memoir of Dr. James Sykes. By Gouverneur Emerson, M.D. Journal of the Medical and Physical Sciences, February, 1823.

ever appointed, in the University. During this association a warm and enduring regard sprang up between them.

Dr. Robert Hutchinson Rose had purchased, in 1809, a hundred thousand acres of wild land,* which included the township of Silver Lake, near Montrose, the capital of Susquehanna county, Pa., and was endeavoring to attract settlers upon it. He and Prof. James were cordial friends. Possibly influenced by the Professor's good opinion of his young friend, Dr. Rose invited Dr. Emerson to be his family physician, to become a member of his household, and practise medicine in the neighborhood. Prof. James advised him to accept the offer, suggesting in support of his advice, that a settled occupation in the country would fortify his health, which at that time was slightly impaired.

Dr. Emerson arrived at Silver Lake about the end of September or beginning of October, 1816. He was a tall, slender man just past the twenty-first anniversary of his birth, and was, no doubt, hopefully forecasting the future of his career. Before he received Dr. Rose's invitation he had designed an excursion to the Northern States. After a survey of the position he was to occupy, he determined to delay beginning his work until after he had made his projected journey.

In a letter of seven closely-written foolscap pages, dated Silver Lake, Dec. 5, 1816, and addressed to his friend at home, Alexander L. Hayes,† he gives a full summary of his observations during his excursion.

He started alone on horseback from Silver Lake, October 15, 1816, and at the close of the next day reached Unadilla, a New York village, not very many miles beyond the northern boundary of Pennsylvania. There he was not a little surprised to learn that a Philadelphia banknote for $100, with which he had supplied himself to pay his traveling expenses, would be received only at a discount. He was obliged to give that note for ninety dollars in notes of New York banks. Travelers of the present time are not taxed in such manner, because our paper money has the same value everywhere in the United States.

He visited Schoharie, Schenectady, the Balstown Spa, Saratoga, and, passing over the Hudson river at Fish Neck, entered Vermont. From Rutland he crossed the Green Mountains to Montpellier and Danville; passed several days in Southern Canada, traversed New Hampshire and the province of Maine, and returned by the way of Waterford, Troy and Albany, to Silver Lake, after a ride of about 2000 miles.

Having been born and bred in the country, he naturally devotes a large part of his letter to descriptions of the soil and the agricultural value of lands which he saw on his way.

* Precisely, 99,200 acres. History of Susquehanna County, Pa. By Emily C. Blackman. Claxton, Remsen & Haffelfinger, Philadelphia, 1873.

† Alexander L. Hayes, son of Manlove Hayes by his first wife, was born in Sussex county, Del., March 7, 1793, and was President Judge of the Court of Common Pleas in Lancaster, Pa., from 1833 to 1849, when he resigned, and was again elected 1864 and died in office, 1873.

See, Biographical Encyclopedia of Pennsylvania. Philada., 1874.

In reference to the people he says: "The Yankees have a great deal of frankness about them. If they are very desirous of knowing your circumstances, and of course, inquisitive, they are willing to tell you their own. Knowledge, religion, civility and money are more equally diffused in New England than in the Middle and Southern States; but there are not as many men of brilliant talents or true piety—more common civility but less polish, and few opulent men, and girls of course. * * * They have a fondness for title and distinction. The most respectable men by far are the tavern-keepers. * * * You will hear that Judge ——— keeps there, and that General ——— five miles this side, and that they are *nice* men; a *nice* man and a fine Yankee are equivalent terms. * * * They call all kinds of vegetables sauce."

Dr. Emerson, who was probably the first physician settled there, practised his profession at Silver Lake nearly two years.

At the instance of a friend, Mr. Andrew Hodge, he was appointed, November, 1818, surgeon of a merchant ship, called the *Superior*, Captain John Hamilton, bound to China.

He joined the vessel, which had already dropped down the river, December 7, 1818. The weather was stormy and the wind adverse. The *Superior* did not get to sea till the 12th.

The cabin mess, composed of the officers of the ship and three passengers, counted eleven persons, a number quite sufficient to shield them from a sense of weariness or solitude.

Dr. Emerson kept a journal. A brief notice of the nature of sea-sickness is recorded the first day at sea.

On the 13th, out of sight of land, a brig from Prince's Island, coast of Africa, bound to Rhode Island, was spoken. She had been seventy days at sea and was short of water. As the quarantine laws were then very rigidly observed at Marseilles, the port to which the *Superior* was bound, to avoid risk of vitiating her clean bill of health which might be consequent upon direct personal communication with any vessel or place before reaching Marseilles, casks of water were thrown overboard and picked up by the brig.

On the 14th, being then in the Gulf stream, the Doctor notes in his journal the use of the thermometer in navigation.

January 26, 1819, the *Superior* arrived at Marseilles, thirty-five days from the Capes of the Delaware.

As soon as the ship entered the mole, the captain went to the Health Office, but was required to remain in his boat outside of the grate, and to throw his papers into a tub of vinegar presented to him, the object being to destroy any contagious matter they might contain. Letters brought for persons on shore, after being cut through in several places to give easy access to the vinegar, were treated in the same manner. Every vessel arriving was required to undergo quarantine. No person was permitted to land, and none to visit her from the shore. A guard was stationed on board to enforce observance of the rules. At the time the plague prevailed in the Barbary States.

A celebrated Dutch physician, Boerhaave, recommended distilled vinegar as an efficient remedy against putrid diseases. Vinegar was supposed to be antiseptic and therefore protective against all contagions. The hands of those who had to do with contagion were moistened with it, and their clothing and other objects were exposed to its vapors. During the plague of 1720, at Marseilles, it is said t at four convicted thieves, who were employed in caring for the sick, protected themselves from the contagion by the use of vinegar, and were granted their lives on condition that they would reveal the means they used to shield themselves in their perilous work. And hence, perhaps, came the preparation called "Thieves' vinegar."

But since modern studies of the processes of fermentation and putrefaction have led to the belief that they, as well as all contagions, are due to the presence of microscopic organisms, vegetal or animal, called mycroderms, bacilli, microbes, etc., vinegar has lost its antiseptic reputation.

Early on the morning of February 4, the Harbormaster came alongside of the *Superior*. Learning from the guard that no one on the ship was sick, he came on board; and, after disinfecting the officers and passengers in the cabin and the sailors in the forecastle, by exposing them to the pungent fumes of oxymuriatic acid gas (chlorine), he granted *pratique*, *i.e.*, liberty of the port. Then the ship was moved to the vicinity of the Custom House, and the gentlemen found quarters at the Hotel des Ambassadeurs.

After a sojourn of two months at Marseilles the *Superior* sailed April 5, and on the 15th anchored in Gibraltar bay ; and was detained some time in quarantine, and afterwards many days waiting for a favorable wind. Before daybreak, May 6, 1819, the anchor was weighed and on the 7th the ship was fairly at sea.

August 1, the ship was anchored at Angier, Java, and on the 3d proceeded on her way. The anchor was let go again, Aug. 20, off Macao, where merchant ships bound to Canton were detained twenty-four hours. In the afternoon of the 21st a passport to proceed up the river was granted and a pilot sent on board. The ship started about half-past three o'clock P.M., and anchored in the Bocca Tigris sometime after midnight. The pilot landed the next morning to exhibit at the fort there the "chop" or permit to go up the river, and brought back two pilots and two Mandarins to remain on board till the ship reached Whampoa, the common anchorage of foreign ships trading at Canton. It is sixteen miles below the city. The *Superior* anchored in the evening of the 23d, and on the 26th, Dr. Emerson and fellow-voyagers were lodged in Swedes Factory at Canton.

In a letter to his mother, dated November 5, 1819, Dr. Emerson says : "After the first impressions of the abundant novelties wore off, the dull uniformity which followed became tedious, and time now appears to fly slowly."

He relates that in consequence of drinking Samshoo, a liquor prepared from rice, which in excess produces a fierce, maniacal intoxication, the crew of the *Superior* mutinied, and, in the absence of the captain, endeavored to kill the officers and take possession of the ship. Officers of other vessels lying near, immediately joined in the conflict. Some of the crew were knocked down and others stabbed. Eight of the ringleaders were put in irons, and fed on bread and water for ten days ; and under such treatment became as subordinate as they always had been.

He gives account of an accident to himself which might have been serious, as follows :

"I went on board a ship where they kept a Spanish bloodhound. He was tied before I went on deck ; but while sitting in conversation with some of my friends, he broke loose and sneaking alongside leaped into my face. The damage I sustained was a wound through the left lower eyelid, a deep cut on the temple, and one under my shoulder, together with a very black and inflamed eye, from all of which, I am happy to inform you, I have recovered. The dog is the most savage of his species. I escaped *very well considering*. He has injured others more seriously."

Referring to mosquitoes, he says : "I sleep under a net which lets the air circulate, but keeps out every kind of insect. You will be pleased to see it. I think the plan so ingenious and good that it will be adopted by many of our friends."

A plain implication from the Doctor's remark is that the mosquito net was a novelty to him in 1819, and not known in the neighborhood of his native place. Are we indebted to the Chinese for this invention?

The party finally left Canton for Whampoa, Nov. 22. The ship had been moved below the common anchorage when they reached her about noon. She arrived at Lintin on the 23d, and there found the U. S. frigate *Congress*, Capt. John D. Henley, said to have been the first American man-of-war to visit China. She anchored here Nov. 3, with many of the crew suffering from dysentery, ascribed to the water taken on board at Angier. Her presence aroused the suspicion of the Chinese authorities that it meant no good, and therefore they would not allow provisions to be furnished to her from Canton. The *Superior* brought several barrels of bread for her use, and other American merchantmen conveyed to her barrels of beef and pork.

On the 26th Nov. the *Superior* sailed from Lintin homeward bound.

On Saturday, Jan. 16, 1820, then in the Indian ocean, she was boarded from a Patriot privateer, said to be two months out from Buenos Ayres. She was armed with sixteen guns and had a crew of two hundred men.

Dr. Emerson, in his journal, says : "We first discovered her on Friday morning, about three miles off our starboard quarter, standing on the same course. The wind was light and unfavorable ; a high head-swell further impeded our progress. Towards night the strange sail had gained upon us. We thought she showed a desire to speak. Every precaution seemed to have been taken to disguise her real character, by carrying little sail, but we still suspected her of foul intentions. The night was dark, but she kept close to us and always in sight. In the morning, being off our weather quarter, within gunshot, she ran up a Spanish flag and fired a gun to bring us to. When close to us she backed her topsails, hauled down the Spanish and ran up the Patriot colors, at the same time opened all her weather ports, ran out her guns and brought her whole broadside of eight guns to bear upon us. The star-spangled banner floated over our quarterdeck.

"We now thought ourselves in a rather unpleasant situation. Although no declared enemy, still the many outrages and piracies under what was called the Patriot flag made us fear we might not fare better than others under similar circumstances.

"Her boat, rowed by a set of cutthroat-looking fellows, came alongside. The officer, apparently of inferior rank, wore a belt full of pistols and daggers. He was without a coat and barefooted. A renegade American attended him as interpreter. Having noted the ship's name, the latitude and longitude, etc., this accomplished officer directed his attention to our breakfast table, at which we had just intended to sit down. After refreshing himself and companions, the work of plunder began. They robbed us of many barrels of beef, pork, bread, butter, tea, silk, canvas, iron kettles, live stock, etc. The villains seemed to think themselves as fairly entitled to what they took as if they were purchasers. Whenever they came across anything they fancied, they said with all effrontery imaginable, 'Half for us and half for you,' adding from time to time, by way of consolation, 'We don't want to do you any harm.'

"They stated that they had a great deal of sickness on their ship and were throwing men overboard every day. They tried to induce me to join them, offering any rate of wages I might ask. They had a surgeon, but he was so indifferent that if in my way they would throw him overboard, and so get rid of him. His pay was a hundred dollars a month, but they would allow me any price I asked. Having consulted among themselves aside, they said that they had agreed not to force me to go with them against my will, although they were so much in want of medical assistance. According to their account the prevailing diseases on board were scurvy, dysentery, fever and ague, which had reduced what remained of the crew to a deplorable condition. Receiving a decidedly negative answer from me to their invitation, they next demanded a supply of medicines. I gave them some of a common kind, such as I thought might be useful to the wretches. The suspicious rascally officer took some of each one on the point of a dagger and thrust it into my mouth, watching me intently all the while, not satisfied till he had seen it on my tongue. This experience reminded me of a ludicrous scene in the "Honeymoon," where the doctor is forced to take his own medicine or be thrown out of the window.

"Though they robbed us in this unwarrantable manner, we were not treated as badly as we had expected. A strong breeze sprang up which prevented their small boats from passing between the two vessels. They permitted us to make sail, but followed in our wake. The breeze stiffened to a gale. Night came, dark and stormy. We changed our course. On the following morning, to our great joy, nothing was seen of our piratical friend."

March 20, the *Superior* was boarded by a Delaware pilot, and in the evening of the 23d reached Chester, 117 days from Lintin. The ship had been absent from Philadelphia sixteen months.

His journal during the voyage contains testimony of industrious study and intelligent observation of all things at sea or on shore that impressed their images on his mind. Marine animals and aquatic birds, wherever they appeared were described. Drawings of some were made. These and original sketches of places seen, and maps of ports visited, with now and then an apt quotation from some poet, illustrate his pages.

He gives detailed accounts of what he saw at Marseilles and on his way to it. Whatever was new to the young traveler seemed to be charming. Appearances of people and things, famous localities with their historical associations combine to quicken curiosity and impart a glow of interest to his record of pageants viewed, of visits to hospitals, public buildings, theatres, museums, etc. Days were passed at Aix, St. Remy, Nimes, Avignon and Vaucluse. Many pages are given to descriptions of the remains of ancient Roman buildings, and of whatever interested him in those places.

He gives interesting accounts of Gibraltar, and describes a visit with a companion on horseback to Algeçiras, a port of Andalusia, six miles west of the famous fortress.

At Angier, in the Straits of Sunda, he tells of the many canoes and boats which came to the ship with fowls, fruits in great variety, vegetables, Java doves and Java sparrows in little bamboo cages, monkeys, paroquets, sea shells, and animals of the deer kind not taller than our domestic cat, and all being at moderate prices found ready sale among strangers. The natural, corporal characteristics of the Malays, seen here, their costume, language, as well as the appearance of their dwellings on shore, the mountain scenery, tropic vegetation, and political condition are sketched and commented upon.

Macao, Whampao, Canton, Lintin; pagodas, scenery and Chinese boat population along the river are in like manner noticed in detail.

The instruction derived from his observation and study, and the formative influence of his experiences during those months of separation from home, may not be definitely measured, but possibly to his alert mind they were as effective as the training of a college course.

With such preparation for work, on the 4th of August, 1820, the twenty-fifth anniversary of his birth, Dr. Emerson settled himself at No. 37 Chestnut street, Philadelphia, ready to give professional attention to any who might ask it. Possibly the time might have been opportune to introduce a young physician to business. Thirteen deaths from yellow fever in the city had been reported during the season of 1819. The circumstance had created a vague apprehension of its recurrence, and may have induced people to appreciate practitioners of medicine more highly than when there was no prospect of needing them ; and consequently, new candidates for practice might be more promptly noticed. The apprehension was realized to some extent ; during the autumn of 1820, seventy-three persons died of the disease in the city.

Dr. Emerson was appointed an attending physician of the Philadelphia Dispensary, September 19, 1820, and resigned the office, May 21, 1822.

The City's Councils elected him a member of the Board of Health, March 12, 1823 ; and the Board appointed him its Secretary the same day. It is conjectured that he resigned three years later.

Prevention of the introduction and spread of smallpox in the city at that period attracted attention. Between January, 1818, and December, 1822, five years, only nine deaths from smallpox in the city had been reported. Fear that the disease might again enter the city was no longer manifest. For this reason it was supposed that vaccination had been generally neglected in the community.

The Board of Health was without authority to enforce measures to prevent the spread of the disease, then present, and for this reason its members were not willing to act ; but at the instigation of Dr. Emerson the Board announced in the daily newspapers, three times, that smallpox was in the city and recommended all unprotected persons to be vaccinated without delay. The same year, November 15, 1823, the Board again warned the public of its danger, saying, "And as it is believed that there does exist among some an unjust prejudice against the practice of vaccination, the Board conceives it a duty to declare that the evidence afforded by our city in its long exemption from smallpox, together with the happy results which have followed the introduction of vaccination in all parts of the world, ought to be sufficient to convince the most incredulous of the salutary influence of this inestimable preventive."

Dr. Emerson submitted to the Board for approval and transmission to the Legislature a draft of a law and memorial on the subject. The proposed law in substance provided that vessels having smallpox on board should be quarantined on arrival in the same manner as those affected with other contagious diseases ; that inoculation of smallpox should not be practised in any case without the sanction of the Board ; and that authority already conferred on the Board of Health to deal with contagious diseases specified should be extended to smallpox.

After debating the subject at several meetings, the Board approved the memorial and draft of the proposed law, January 28, 1824, and transmitted them to the Legislature then in session. Although 160 deaths from smallpox had occurred in the city during 1823, a member of the House of Representatives retarded its action on the bill after it had passed the Senate by securing a seemingly innocent amendment to it, but which in fact provided that appointment to offices connected with the Board of Health might be so made as to reward political and partisan services without regard to fitness of the candidate.

Mr. William Binder and Dr. Emerson were sent to Harrisburg to point out the effect of the amendment, and at the end of four days' work they secured its rejection and the enactment of the original bill. A copy of the act was duly delivered to the Board of Health, April 7, 1824.

His work as a member of the Board of Health, and his communications to the newspapers pointing out the risk of permitting those affected with smallpox to freely mingle with citizens, bear witness to Dr. Emerson's disinterested benevolence.

During 1824, deaths from smallpox in the city numbered 325. They were reduced to six in 1825, and to three in 1826. But these facts are not conclusive that the measures taken by the Board of Health during this period contributed to abate the prevalence of the disease, because, both prior and subsequent to this time, the rate of mortality from smallpox in the city, between 1807 and 1840, fluctuated in the same striking manner, as Dr. Emerson shows in his papers on *Medical and Vital Statistics*, published in "The American Journal of the Medical Sciences," November, 1827, November, 1831, and July, 1848.*

Dr. Emerson published in "The Journal of the Medical and Physical Sciences," February, 1823, a brief and interesting memoir of Dr. James Sykes, who was his first preceptor in medicine; and a charming biographical memoir of Dr. Samuel Powel Griffitts, in the "North American Medical and Surgical Journal," in 1827.

July 6, 1832, Dr. Emerson, accompanied by Dr. Isaac Hays, visited the first case of "spasmodic cholera" that occurred in the city, his original description of which is in his commonplace book.

The disease became epidemic. Deaths from it numbered 1021. Dr. Emerson had charge of the Hospital for Orphans. As a token of appreciation of his service during the epidemic, a silver pitcher was presented to him, upon which is inscribed:

To
GOUVERNEUR EMERSON, M.D.,
The City of Philadelphia,
Grateful for his disinterested and intrepid exertions,
In a period of public calamity.
——:o:——
Transeat in exemplum.

He lectured in the Franklin Institute of Pennsylvania in 1833, on meteorology, and in 1834, he delivered another course on heat, electricity and galvanism, in connection with the subject.

* Mr. Pliny E. Chase reported at a meeting of the American Philosophical Society, February 5, 1869, and subsequently published, his *Comparative Statement of Mortality in the Society of Friends and that of the General Population of the City of Philadelphia from* 1800 *to* 1869, which, he states, was compiled largely from Dr. Emerson's papers.

Dr. Emerson was chosen to be a member of the American Philosophical Society, April 19, 1833. At stated meetings he made many brief communications on many subjects, which are recorded in Vol. i to Vol. xvi of the published Proceedings.*

He was one of the Councilors of the Society during ten years, from 1837 till the end of 1846.

He delivered a lecture *On the Advantages Derived from Cultivating the Arts and Sciences,* before the Philadelphia Mercantile Library Association, in the hall of the Musical Fund Society, December 8, 1839.

Among other points of interest, he states that the first successful attempt to cross the Atlantic in a vessel propelled by steam was made in a steamship called the *Savannah*, commanded by Moses Rogers, a native of Connecticut, but long a resident of Philadelphia. He sailed from New York, March 28, 1819, and arrived at Savannah, Ga., April 6, whence, after some delay, he crossed the ocean and arrived at Liverpool, June 20, having used steam or sails, as the wind permitted. From Liverpool the *Savannah* went to Elsineur, Stockholm, Cronstadt, St. Petersburg and Copenhagen. She then returned to Savannah, Ga., and thence went to Washington, D. C. Thus the practicability of crossing the Atlantic in a vessel propelled by steam was first demonstrated by an American.

In this connection he relates how Thomas Godfrey, an obscure citizen of Philadelphia, from a casual observation of the reflection of light, perceived the principle upon which he constructed, in 1730, the mariner's quadrant, and how he was robbed of the credit of his invention, and claims that Godfrey is entitled to "the lasting gratitude of all concerned, either directly or indirectly, in nautical pursuits, by inventing the only instrument that can securely guide the ship when far from land," and they should not permit only "a fragment of the most perishable stone" "to mark but for a few years longer the grave of Godfrey."

This appeal induced members of the Mercantile Association and others to construct a suitable monument to Godfrey's memory.

* The subjects upon which he made oral or written communications are as follows:

The production of electricity from the animal body; the production of electricity from steam; observations on Mower's paper on meteorology; excessive mortality of male children; effects of hot weather on infants; causes operative in changing the proportions of the sexes at birth; importance of phosphoric acid in agriculture; phosphorescent light produced in the diamond by friction; the compound action of the mental and optical faculties concerned in vision; cultivation of cotton in the Northern States; cleaning flax-fibre for market; extent of propagation of atmospheric vibrations produced by explosions of powder; manufacture of the sugar and syrup of sorghum; imphæ, or African sugar cane and cultivation of sorghum; improvements in Whitney's cotton gin; Robbini's process for preserving wood from decay by injecting into it vapor of coal tar; remarks on the part taken by the American Philosophical Society in connection with the Franklin Institute, to establish stations for meteorological observations; earthquake of October 20, 1870, reported November 4, 1870, as to expanse over which shocks were noted; lunar influence on wet and dry weather; ascription of the gradual translation of the peach-tree belt southward on the Atlantic coast to the progressive removal of the forests, causing exposure of the fruit trees to severe climatic fluctuations.

The closing paragraph of this interesting lecture is here cited as a fair sample of its style and tone.

"I hope I have said enough to prove that for prosperity and security, nations are mainly dependent upon the intellectual capacities and acquirements of their citizens. We have never known or heard of one that has not experienced its days of trial, and it cannot be supposed that our own country, whose hills and valleys now rejoice in the possession of peace and abundance, can always be exempt from calamity. If ever driven by adverse fortune to fearful extremity, happy will it be for her, if, in that day, like France at the crisis referred to, or like England—sustained during her long and dreadful conflicts by the resources furnished through her Watt—be rescued by her philosophers! Let us, therefore, like France, and the mighty people from whom we chiefly spring, use all our efforts to foster and diffuse the arts and sciences, and to banish the word *impossibility* from our vocabulary."

Dr. Emerson delivered an address, June 1, 1843, at Laurel Hill Cemetery on the completion of an unostentatious monument erected to the memory of Thomas Godfrey.

The reason for this tribute is stated in the address, substantially as follows:

One day while an ingenious young man, Thomas Godfrey, a glazier, was replacing a pane in a window on the north side of Arch street, opposite to a pump, a girl after filling her pail placed it on the sidewalk. Turning towards it he saw that the image of the sun was reflected from the window into the bucket of water, and from it back to his eye.* This simple observation led him to study the law of the reflection of light, and to invent a quadrant with speculums to take the distances of stars which he supposed might be of service at sea. The same year, 1730, he had made his reflecting instrument.† One was taken to the West Indies and used during the voyage to ascertain the latitude. It was brought back to Philadelphia before the end of February, 1731. The practical value of the instrument was thus demonstrated.

Although James Logan, in May, 1732, described the mariner's quadrant constructed by Godfrey in a letter to the celebrated mathematician, Dr. Edmund Halley, then President of the Royal Society of London, he did not obtain credit for his invention. It is believed that Dr. Halley

* John F. Watson, in his "Annals of Philadelphia," states this incident somewhat differently. According to his account, which seems to be accurate, Godfrey was glazing at Stenton, the residence of James Logan, and noticed the reflection of the sun's image from the window to a piece of fallen glass and from it to his eye. He immediately went into Mr. Logan's library and took from the shelf a volume of Newton's works to consult. Mr. Logan entered almost at the same time, and asked him the object of his search, and was much pleased with Godfrey's ingenuity, and from that time became his zealous friend.

In those days glazing was done by soldering the panes into the frame work. Glaziers were also plumbers, and did not paint.

† He lent one to Joshua Fisher for trial in his surveys of the Delaware. See Watson's "Annals of Philadelphia."

suppressed Mr. Logan's letter, and communicated the description of Godfrey's quadrant to Hadley, a mathematical instrument maker in London, who, after making slight mechanical changes in the instrument, obtained a patent for it. In this way Godfrey's invention came to be unjustly called Hadley's quadrant.

Dr. Emerson establishes Godfrey's right to priority of invention on the testimony of James Logan, Benjamin Franklin, Peter Collinson and others.

Thomas Godfrey was born in Bristol township, near Germantown, on his father's farm of 150 acres, in 1704, and died in 1749, and was buried there.* He was fairly educated, and was a member of Franklin's famous Junto. He taught himself to read Latin.

Mr. John F. Watson, the annalist, convinced of the wrong done to Godfrey, sought his grave, ascertained the inscription which had become illegible on the gravestone, and in 1838, at his own expense, had the remains with those of his wife, father and mother transferred to Laurel Hill Cemetery.

The Mercantile Library Association and certain inhabitants of Germantown jointly contributed means to erect a monument to Godfrey, the completion of which was the occasion of Dr. Emerson's address.

Possession of several hundred patrimonial acres in Kent county, Del., accounts for his attention to agricultural affairs. He made numerous and extensive experiments to ascertain the comparative value of different fertilizers. He erected a building on Frankford creek, Philadelphia, in which was manufactured, under the direct management of a Frenchman named Jourdan, a fertilizer called Jourdan's phosphate. This product was extensively used during several years. In 1844 or '45, two tons of Peruvian guano were brought to Philadelphia as a sample. At his suggestion he and his friend, Mr. D. B. Cummins, purchased each a ton and introduced it to the farmers of Delaware. On one of his farms he constructed a mill for crushing bones by horse power. The work was imperfectly done; but by treating the crushed bones with sulphuric acid and mingling the product with ashes and fine earth a fertilizer was produced which proved to be a good substitute for Peruvian guano, and cost much less. By observation and experiment he ascertained, in 1849, that the delightful and peculiar flavor of our so-called grass butter is due to the sweet-scented vernal grass—*Anthoxanthum odoratum*—which flourishes in pasture fields till about the end of May, and upon which the cows feed. He obtained from this sweet vernal grass an essential oil, and ascertained that it contains *benzoic acid*, upon which its flavor depends; and that a small quantity of benzoic acid administered to a cow imparted to the butter made from her milk the same flavor it has while sweet vernal grass forms part of her feed.† He delivered appropriate addresses before horticultural and agri-

* Watson's "Annals of Philadelphia."

† See, Letter, Oct. 31, 1849, from Dr. Emerson to the Commissioner of Patents. Report of the Commissioner of Patents for the year 1849, Part II—Agriculture—pp. 372–75.

cultural societies at several places in Delaware and Pennsylvania, and published a pamphlet on the cultivation of cotton in the Middle States. He edited *The Farmer's Encyclopedia and Dictionary of Rural Affairs*, an octavo volume of 1173 pages, illustrated by seventeen plates, which was published by Carey & Hart, in 1844. In adapting it to American use, Dr. Emerson added to the original English text about thirty per cent. of the volume.

Although attentive to whatever related to agricultural improvements, he was seriously interested in medical affairs.

In 1845 the New York State Medical Society invited the medical institutions of the country to appoint delegates to meet in the city of New York on the first Tuesday of May, 1846, and form a National Medical Convention to devise measures to promote the common interests of the medical profession and improve medical education. Many prominent physicians, representing medical bodies in different parts of the United States, were present. Dr. Emerson, one of the delegates from the Philadelphia Medical Society, was with them.

On organizing the meeting it was found that 133 delegates from medical societies in sixteen of the twenty-nine States were duly accredited, and that seventy-five of them were from New York. This partial and unequal representation led a delegate to propose that the Convention should at once adjourn *sine die*. His proposition was not accepted. After due deliberation officers were elected, and committees were appointed to prepare a plan of organization, etc., and among them a committee to prepare a code of medical ethics to govern the medical profession of the United States. Dr. Emerson was appointed a member of it.

The several committees were instructed to report at a meeting of the Convention to be held on the first Wednesday of May, 1847, in Philadelphia.

The National Medical Convention met at the appointed time, May 5. Of 239 delegates elected to it from twenty-two States, including the District of Columbia, 175 were present.

The committees appointed in New York presented their reports, which were duly considered.

The Convention, by a resolution adopted May 7, became the American Medical Association. The new organization elected officers, appointed standing committees and adjourned to meet in Baltimore on the first Tuesday of May, 1848.

Dr. Emerson participated in the creation of the American Medical Association. In a note written by him on the cover of a copy of it, he claims that the Code of Medical Ethics was compiled exclusively by Dr. Isaac Hays and himself. The Association still holds its annual meetings, always to the advantage of the medical profession, and is recognized as authority on questions of medical policy in the United States.

Dr. Emerson was a member of its first Committee on Publication, 1847, and served on till 1853; of the Committee on Medical Sciences, and contributed to its report of 1850, Vol. iii, pp. 91–94, "Observations on Vital Statistics;" of the Committee on Hygiene, 1851; and of the Committee of Arrangements, 1855.

Dr. Emerson was elected a fellow of the College of Physicians of Philadelphia, February, 1847. He never contributed to its Transactions. He was elected a delegate from the College to the American Medical Association in 1849, and in 1858; and to the National Quarantine and Sanitary Convention in 1857, and 1858.

He was a member of the Academy of Natural Sciences of Philadelphia from August, 1853; of the Philadelphia County Medical Society from 1857, of which he was President; and of the Medical Society of the State of Pennsylvania.

Dr. Emerson's medical practice from about 1828 to 1840 was lucrative and extensive. His interest in agricultural affairs, always notable, gradually increased with the lapse of time, and his interest in medical affairs gradually abated till he relinquished the practice about the year 1857.

Dr. Emerson, by invitation, began to live with Mr. Henry Seybert, at No. 926 Walnut street, in May, 1856. Apartments in the house were assigned to each proportionately. Dr. Emerson was the caterer, though they did not mess at the same table, and kept a detailed account of the household expenses which were periodically and equally shared. They lived together in perfect harmony eighteen years—till Dr. Emerson died.

Mr. Henry Seybert and Dr. Emerson were warm friends. Their close association is notable because their pursuits and aims in life were wide apart. Their mental characteristics were quite different. They were alike in condition. Both were unmarried, and both in easy circumstances. In some respects their tastes and ways were the same, simple, economical.

Dr. Emerson had a working knowledge of botany, mineralogy, geology and physics. Mr. Seybert had been educated in Paris, and trained in the School of Mines to be a chemist and mineralogist, and after his return home did some good work. In these scientific paths they were congenial. But Mr. Seybert was deeply imbued with religious sentiment.

While he was in Paris mesmerism attracted public attention, and he became interested in spiritualism.

He had read that "it is easier for a camel to pass through the eye of a needle than for a rich man to enter the kingdom of heaven." His construction of this sentence made him unhappy. He was so much tormented by the thought that all his attempts to lead a good life were useless as regards *future* existence because *he was rich*, that he consulted pious men on the subject, and among them the Archbishop of Rouen. By them he was assured that the sentence was addressed to the *sinful* rich *only*, and not to those who gave of their goods liberally to the poor.* Whether his many charities were prompted more by disinterested consideration for others than by this assurance is conjectural. Be this as it may,

* Obituary Notice of Henry Seybert, by Moncure Robinson. Read before the American Philosophical Society, Oct. 5, 1883.

Mr. Seybert was known for his charity and public spirit,* but most distinguished by his deep interest in a supposition or doctrine that after death and disintegration of his body by natural decay or cremation, a man's soul, wearing the carnal appearance of himself, may, at any time, be made manifest to the living through the medium of specially endowed persons, and in this manner communication with the world of spirits may be held. In this modern spiritualism he was a staunch believer. Shortly before his death he gave to the University of Pennsylvania $60,000 to found a chair of philosophy, on condition that the University should appoint a commission to investigate "all systems of morals, religion or philosophy which assume to represent the truth, and particularly of modern spiritualism." †

While Mr. Seybert was engaged in the study of spiritualism, Dr. Emerson, who had no respect for his friend's belief, was occupied in endeavoring to improve agricultural methods and in cultivating his several farms in Delaware.

His mother, Mrs. Ann Hayes, died in 1862, aged 86 years. Her long life was exemplary in every sense, unselfish and continuously kind and charitable. The positions occupied by her children are significant of the mother's attention and care for their welfare. To her Dr. Emerson late in life ascribed his first love for the British classical writers.

Society in Philadelphia was discordant at the outbreak of the great Rebellion, because the interests and affiliations of many of its residents were in the South and with the rebels. Those persons were openly defiant, threatening and at times belligerent. To determine if possible who were and who were not to be trusted, a few loyal men held midnight conclaves

* Among acts which may be ascribed to his public spirit was Mr. Seybert's unsolicited gift to the city. He substituted a new for a good old clock and bell which had long well served to ring out the hours, joyful news as well as alarms, from the State House steeple to very far-off dwellers in the city. Unexpectedly the sound of the Seybert bell is comparatively very feeble, scarcely audible more than 500 feet in any direction during the busy hours of the day, or at any time when there is a moderate breeze.

In the following humerous stanza, its author makes use of this circumstance to contrast the "clash and jingle" of St. Mark's chime of bells which greatly disturbed the neighbors at the time:

"There's a bell whose swinging gives out no ringing,
And I hear no dinging in the State House yard;
And where its rolling looks like tolling
I stand and tremble lest my hearing's hard;
For, with steeple rocking and hammer knocking,
And people mocking,
I hear no more
The low dull mutter
Those dumb lips utter
Than the stone Washington before the door."

† Preliminary Report of the Commission appointed by the University of Pennsylvania to Investigate Modern Spiritualism, in accordance with the bequest of the late Henry Seybert (page 5). J. B. Lippincott Company, Phila., 1887.

Henry Seybert died March 3, 1883, aged 82 years.

which ultimately resulted in the organization of the Union League of Philadelphia, December 27, 1862, the members of which were pledged to "unqualified loyalty to the government of the United States and unwavering support of its efforts for the suppression of Rebellion." *

Dr. Emerson, who was elected a member February 16, 1863, daily visited the Union League and participated in its proceedings till the end of his life.

Dr. Emerson did not devote his time and thought exclusively to the practice of medicine and agriculture. He was interested in questions of political economy, social science. He translated the second edition of Le Play's "Organization of Labor," a learned and valuable contribution to the literature of the subject. This work, the last from his pen, was published in 1872.

He died very suddenly in his office, July 2, 1874, near the end of the 79th year of age. His grave is next to that of Thomas Godfrey, Laurel Hill Cemetery.

He bequeathed his ample estate, including several farms, which together contain more than a thousand acres of arable land in Delaware, to his kinsmen.

His long life was virtuously spent, and so far he was above the bulk of mankind. Seemingly always under the influence of his early Quaker training by his mother, never manifesting the least pretension to piety, or solicitude about his future existence, his daily conduct was shaped in obedience to the precepts of the Decalogue and of Christianity. Naturally modest and considerate of the rights of others, he was never aggressive. A dignified and courteous demeanor, varied attainments and the easy flow of his conversation made him a welcome and frequent guest in the society of good and cultivated people.

A genius for persistent labor never permitted his talents, which were far above the average, to be idle. His career was marked by habitual industry and useful work rather than by special achievement in any of his pursuits. Though not a discoverer, or a great leader in science, his exemplary conduct and benevolent labors entitle him to general approbation, and his memory to our kindly respect.

Appendix.

A list of Dr. Gouverneur Emerson's publications :

"A Biographical Memoir of Dr. James Sykes, February, 1823." "Chapman's Journal of the Medical and Physical Sciences."

"Biographical Memoir of Dr. Samuel Powel Griffitts, 1827." "The North American Medical and Surgical Journal."

"Medical Statistics, being a Series of Tables showing the Mortality in

* Twenty-fifth Anniversary of the Organization of the Union League of Philadelphia, December 27, 1887. Press of J. B. Lippincott Company, Philadelphia, 1888.

Philadelphia and its Causes." "The American Journal of the Medical Sciences," November, 1827.

"Medical Statistics, consisting of Estimates relating to the Population of Philadelphia, with its Changes as Influenced by the Deaths and Births during Ten Years, viz., from 1821 to 1830 inclusive." "The American Journal of the Medical Sciences," November, 1831.

"Vital Statistics of Philadelphia for the Decennial Period from 1830 to 1840." "The American Journal of the Medical Sciences," July, 1848.

"Lecture on the Advantages Derived from Cultivating the Arts and Sciences." By G. Emerson, M.D. Delivered before the Philadelphia Mercantile Library Association, in the hall of the Musical Fund Society, December 8, 1839. Printed by A. Waldie, Philadelphia, 1840.

"An Address delivered at Laurel Hill Cemetery on the Completion of a Monument Erected to the Memory of Thomas Godfrey, June 1, 1843." By G. Emerson, M.D.

"The Farmer's Encyclopedia and Dictionary of Rural Affairs; embracing all the most recent discoveries in agricultural chemistry, adapted to the comprehension of unscientific readers, illustrated by numerous engravings of animals, implements and other subjects interesting to the agriculturist." By Cuthbert W. Johnson, Esq., F.R.S., Barrister-at Law; Editor of the "Farmer's Almanac;" corresponding member of the Agricultural Society of Edinburgh; the Horticultural Society of Maryland, etc. Adapted to the United States, by Gouverneur Emerson. 8vo, pp. 1173. Carey & Hart, Philadelphia, 1844.

"Address delivered before the Society for Promoting Agriculture of the County of Philadelphia, at their Annual Exhibition, at the Rising Sun Tavern, October 6, 1848." By Gouverneur Emerson, M.D. Henry C. Clark, Printer, Philadelphia, 1849.

"An Address delivered before the Delaware Horticultural Society at Wilmington, on the 24th of September, 1851." By Gouverneur Emerson, M.D.

"Report on the Agency of the Refrigeration Produced by Upward Radiation of Heat as an Exciting Cause of Disease." "Transactions of the American Medical Association," Vol. vi, 1853, pp. 139-152.

"An Address delivered before the Agricultural Society of Chester County, Pa., September 17, 1853." By Gouverneur Emerson, M.D.

"An Address delivered before the Agricultural Society of New Castle County, Del., at the Annual Exhibition held in Wilmington, September 12, 1855." By G. Emerson, M.D.

"An Address delivered before the Agricultural Society of Kent County, Del., October 15, 1857." By G. Emerson, M.D., of Philadelphia.

"Results of Extensive Experiments in the Use of Superphosphate of Lime, etc., communicated to the Agricultural Society of Kent County, Del." By Dr. G. Emerson, February 2, 1859.

"Jourdan's Ammoniated Superphosphate of Lime; its Nature and Uses;

with directions to farmers for applying it to their crops, and observations which cannot fail to impart much useful practical information."

[There is conclusive evidence that this pamphlet was written by Dr. Emerson.]

"Cotton in the Middle States; with Directions for its Easy Culture." By G. Emerson, M.D. Author of the "Farmer's and Planter's Encyclopedia," Philadelphia, 1862.

"Land Drainage." An address delivered before the Farmer's Club of Kent County, Del., at Dover, January, 1872. By G. Emerson, M.D., of Philadelphia. [Illustrated by a topographical sketch map of Kent county, Del.]

"The Organization of Labor, in accordance with Custom and the Law of the Decalogue; with a summary of comparative observations upon good and evil in the regime of labor, the causes of evil existing in the present time, and the means required to effect reform; with objections and answers, difficulties and solutions." By F. Le Play, Senator (of France), Inspector-General of Mines, Commissioner-General to the Universal Exposition (in Paris), of 1855, 1862 and 1867. Author of *Des Ouvriers Européens* and *La Reforme Sociale.*

"Les politiques veulent en un état bien rêglé, plus des maitres des arts mechaniques, que de maitres des arts liberéaux." Richelieu (*Testament Polito*).

Translated by Gouverneur Emerson, M.D., member of the American Philosophical Society. From the French of the second revised and corrected edition published at Tours, in 1870. Claxton, Remsen & Haffelfinger, Philadelphia, 1872. 12mo, pp. 417.

Stated Meeting, Januarg 2, 1891.

Present, 17 members.

Mr. DUDLEY in the Chair.

Correspondence was submitted and accessions to the Library were announced.

A letter was received from Mr. L. Vossion, dated Philadelphia, December 20, 1890, accepting membership.

A circular was received in regard to the celebration of the seventieth birthday of Prof. Rudolph Virchow, from the Committee on the same in Berlin.

The report of the judges and clerks of the annual election was submitted, and the following members were declared the Officers and Council of the Society for the year 1891:

President.

Frederick Fraley.

Vice-Presidents.

E. Otis Kendall, Dr. Ruschenberger, J. P. Lesley.

Secretaries.

George F. Barker, Daniel G. Brinton, Henry Phillips, Jr., George H. Horn.

Curators.

Patterson Du Bois, J. Cheston Morris, Richard Meade Bache.

Treasurer.

J. Sergeant Price.

Councilors (for three years).

Aubrey H. Smith, George R. Morehouse, Samuel Wagner, William C. Cattell.

Councilor for two years, in place of Dr. Daniel R. Goodwin, deceased.

Dr. Charles S. Wurts.

Nominations for Librarian being in order, Mr. William P. Tatham nominated Mr. Henry Phillips, Jr.; Prof. E. D. Cope nominated Mr. Benjamin Smith Lyman.

The Secretaries presented a paper by Dr. J. Lindhal on a skull of a Megalonyx leidii, n. sp., for the Transactions. On motion, the communication was referred to a Committee of three members, to be appointed by the President, to examine and report upon.

(The President subsequently appointed Profs. Leidy, Lesley, and Heilprin as such Committee.)

Dr. J. Cheston Morris called the attention of the Society again to the subject of Vital Molecular Vibrations:

Force is not motion, as Dr. McLaughlin puts it, but that which causes motion or change in matter. While its true nature is unknown, the phenomena of the various physical forces correspond so completely with undulations or vibrations that they are recognized as such, the results of impulses brought to bear upon matter capable of atomic vibration; and the tendency of modern thought is more and more towards considering light, heat, electricity, chemical affinity and mechanic force as all of them essentially only modifications of one and the same force. But when we come to consider the phenomena of life, while we find that living bodies are all composed of material atoms similar to those of the inorganic world, another force or impulse seems to be at work suspending or reversing the ordinary action of the physical forces. It is characterized by acting, as they do, only under special conditions, viz., the presence of plasma or organizable matter, heat, oxygen, light, and a germ, itself the product of previous life. Withdraw any of these—the ordinary phenomena of inorganic matter present themselves. But whenever they are present, an organized form results which tends to follow the type of its parent forms. Fresh particles of matter are taken up and others are discharged; in other words, we have the phenomena of growth, development, secretion, excretion and of reproduction; all the physical laws and properties of matter are retained and followed, but they are subordinated to or coördinated with those of another force, which we call vital, organic or germ force, with its own laws as distinctly defined as those of chemistry or heat. It is just as unreasonable to deny the existence of the former as of the latter.

Hitherto the vibratory theory has only been applied to explaining physical phenomena. It remained for Dr. McLaughlin to extend its application to vital phenomena, by showing how completely it explains the phenomena of immunity from, and prevention of, infectious and contagious diseases by the law of *interference*. I wish to call your attention to a similar explanation of the phenomena of germ force and heredity by the law of *transference*. If two weights are suspended at proper distances from a cord fastened transversely between two pillars, and a third weight is similarly suspended between them, and motions imparted perpendicularly to each other to the two outer weights, these motions will be so transferred to the third weight as to cause it to describe a series of curves resulting from the impulses transmitted; or if a powder be dusted over a square tin plate, and the edge of the latter be touched at certain nodal points, the powder will arrange itself in certain lines and geometric figures. Is not this precisely what happens when the germ-cell and sperm-cell, the molecules of each vibrating in accordance with the impulses impressed upon it, unite in the production of the new germ, which in turn vibrates in accordance with these impulses, and proceeds accordingly to arrange and develop fresh molecules, forms and figures similar to its antecedents? In this way we have the explanation of the germ resulting only as the harmonic product of suitable vibrations—of the hereditary transmission of qualities—and of the variations from type which occasionally occur. We have also the explanation of the cessation when life vibrations shall have been exhausted or transmuted into other forms of life itself, or so-called death. We have also the explanation of the periodicity of many, if not all, of the functions of living bodies, both in health and disease. Likewise, we have an explanation of the effects of drugs on certain organs and functions. To say "that opium produces sleep on account of its somniferous tendency" is to veil our ignorance very thinly. But, if we suppose that nerve tissue has a certain vibration, so differing in period from that of the morphia molecule which we introduce into the blood, that until the latter is eliminated or changed the nerve vibrations are modified or suspended, we can form a much more rational conception of the effect of opium. So also with the selection of appropriate food from a common plasma by different organisms, and also from the blood by the various organs and structures of the body. In fact, a new field is opened to biologists, naturalists, physiologists and physicians whose limits are at present far beyond our ken.

New nomination No. 1217 was read.

The Committees appointed at last meeting, of which Dr. Cope and Mr. Biddle were respectively Chairmen, were continued.

And the Society was adjourned by the presiding member.

Stated Meeting, January 16, 1891.

Present, 73 members.

President, Mr. Fraley, in the Chair.

Correspondence was submitted and accessions to the Library were reported.

Mr. L. Vossion and Prof. G. S. Fullerton took their seats.

A circular was received from the Museo de la Plata, Argentine Republic, requesting exchanges, also sending one of its publications.

Letters of acknowledgment were received from the Geological Survey of India, Calcutta (131, 132, 133); Taschkent

Observatory, Taschkent, Russia (131, 132, 133); K. K. Geologische Reichsanstalt, Drs. Friederich Müller, Dionys Stur, Vienna (131, 132, 133); Naturwissenschaftliche Verein des Reg.-Bez., Frankfurt a. O. (131, 132, 133); Mr. Joseph Prestwich, Shoreham, Kent, England (127, 128, 129, 130); Chicago Academy of Science, Chicago (130, 131, 132, 133).

Accessions to the Library were received from the Académie R. de Belgique, Bruxelles; Naturwissenschaftliche Verein des Reg.-Bez., Frankfurt a. O.; Verein für Erdkunde, Halle a. S.; Physikalische-Medicinische Societät, München; Prof. Ferdinando Bosari, Naples; R. Accademia dei Lincei, Rome; Osservatorio Astronomico, Turin; Société de Géographie, Lille; Commission des Annales des Mines, Rédaction "Cosmos," Paris; R. Astronomical Society, Editors of the "Geological Magazine," "Nature," London; Prof. George M. Dawson, Ottawa, Canada; Museum of Comparative Zoölogy, Harvard University, Cambridge, Mass.; American Statistical Association, Boston; Editors of "American Journal of Science," Yale College, New Haven; University of State of New York, Albany; New York Historical Society, New York; Franklin Institute, Engineers' Club, College of Pharmacy, Editors of the "Homœopathic Physician," "Medical and Surgical Reporter," "Medical News," American Bar Association, Mercantile Library, Messrs. J. E. Ives, Henry Phillips, Jr., Philadelphia; U. S. Naval Institute, Annapolis; Johns Hopkins University, Editors of "American Journal of Philology," "American Chemical Journal," Baltimore; Department of State, U. S. Naval Observatory, Smithsonian Institution, Anthropological Society, Hydrographic Office of U. S. Navy, Prof. Albert S. Gatschet, Washington, D. C.; Public Library of Cincinnati; Musée de la Plata.

The stated business of the meeting was then taken up, and, on motion, the Society resolved to proceed to the election of Librarian for the ensuing year. It was resolved to conduct the same by ballot, and that the polls should remain open thirty minutes, during which the Society took a recess to enable the members present to deposit their votes.

J. Sergeant Price, Esq., and Dr. Persifor Frazer were appointed by the Chair as tellers to conduct the said election; who, after the polls had been closed, reported to the President that Mr. Henry Phillips, Jr., had received 39 votes, and Mr. Benjamin Smith Lyman, 31 votes; whereupon the President declared Mr. Henry Phillips, Jr., to have been duly elected Librarian of the Society for the ensuing year.

[Secretary Phillips being present and not voting.]

On motion, the President was authorized to appoint at his leisure the Standing Committees of the Society, which he subsequently selected, as follows:

Finance.

William B. Rogers, Philip C. Garrett, Charles S. Wurts.

Hall.

J. Sergeant Price, William A. Ingham, Charles A. Oliver.

Publication.

Daniel G. Brinton, George H. Horn, Samuel Wagner,
Patterson DuBois, Horace Jayne.

Library.

Edwin J. Houston, William V. McKean, William John Potts,
Jesse Y. Burk, William H. Greene.

The Committee on the Paper of Dr. J. Lindahl reported the same to be worthy of publication, which was so ordered, and the Committee was discharged.

Prof. Cope's Committee and Mr. Arthur Biddle's Committee reported progress and were continued.

Pending nomination, No. 1217, and new nominations, Nos. 1218 and 1219, were read.

And the Society was adjourned by the President.

Stated Meeting, February 6, 1891.

Present, 17 members.

President, Mr. FRALEY, in the Chair.

Correspondence was submitted and accessions to the Library were announced.

The President announced the death of Hon. George Bancroft (January 17, 1891), æt. 91, and, on motion, was authorized to appoint a suitable person to prepare the usual obituary notice. Prof. J. Bach McMaster was subsequently appointed.

Pending nominations 1217, 1218 and 1219 were read.

Mr. Arthur Biddle presented a report from the Committee on the Etting Bequest, recommending that the Society decline to take any part in the litigation arising out of the caveat filed to the last two codicils of the will of F. M. Etting, deceased, now pending, and that the Society decline to act as Trustee under said will.

On motion of Mr. Horner, the report was accepted.

On motion of Dr. Morris, the Society declined to litigate under the caveat to the last two codicils now pending.

On motion of Mr. Horner, the Society declined to accept the trust.

On motion of Mr. Biddle, the Secretaries were requested to notify the executors of the action of the Society.

And the Society was adjourned by the President.

Stated Meeting, February 20, 1891.

Present, 12 members.

Mr. WILLIAM A. INGHAM in the Chair.

The death of Prof. Alexander Winchell, Ann Arbor, Mich., February 18, 1891, æt. 72, was reported.

Correspondence was submitted and accessions to the Library were reported.

The Free Public Library, Jersey City, was placed on exchange list to receive Proceedings.

The Library Committee reported suggestions to facilitate the replacing of the books on the shelves in the Society's Library; that the Library room should be finished; that bookcases to contain works of reference should be placed in the meeting room, and that the Society should appropriate $500 for the purchase of new books.

After this latter recommendation had been presented, a letter was read from the Treasurer requesting that no appropriation should be made for that purpose for the present, giving his reasons for the same.

The Committee's recommendation was postponed for the present.

The minutes of the Board of Officers and Council were submitted.

Pending nominations Nos. 1217, 1218 and 1219 were read, spoken to, and balloted for, and No. 2187, Commander F. M. Green, U. S. School Ship *Saratoga*, was declared elected a member of the Society.

And the Society was adjourned by the presiding member.

Stated Meeting, March 6, 1891.

Present, 19 members.

President, Mr. Fraley, in the Chair.

Correspondence was presented and donations to the Library reported:

A letter from Theodore Turrettini (Geneva, February 8, 1891) accepting membership.

A circular in relation to the formation of State library associations.

A circular in relation to the Fifth International Geographical Congress to be held in Washington, August 26, 1891.

A circular from the Society of Borda, Dax, announcing the death of M. Henry du Boucher, a former President.

A circular from l'Académie des Sciences, etc., de Belgique, announcing the death of Lieut.-General J. B. I. Liagre, its Permanent Secretary.

A letter from R. Brabbée (Vienna VIII, Kochgasse 27) enclosing a specimen of his new method of reckoning.

A letter from Dr. Antonio Del Bon (Padua) in relation to Prof. P. E. Chase's paper on "English and Sanskrit Root-analogues."

Letters from August Tischner (Leipzig) on "The Celestial Phenomena," "The Movements of the Sun in Space," "The Movements of the Planets," "The Solar System" and "The Elements of the Elliptic Orbits."

A paper by Dr. D. G. Brinton entitled "Some Vocabularies from the Musquito Coast" was presented.

Dr. J. Cheston Morris presented a pamphlet entitled "Tepeu" (by Dr. Thomas E. Pickett), on the hypothetical migrations of the *Morbus Americanus*, upon which he made some remarks, referring to the account given by Josephus of the evils caused the Jewish youth by the entrance of the Midianitish women into the Hebrew camp.

Dr. J. Cheston Morris made some remarks on "Hebrew Phonetics," and was followed by Prof. J. P. Lesley upon the same subject.

Prof. Lesley made some remarks on a report by Mr. John Fulton (Johnstown, Pa.) on the diminution of the supply of natural gas and its ratio.

Dr. Morris called attention to the case of the miners recently entombed at Jeanesville, Pa., for nineteen days almost without food. "They were found in a breast near where they had been working. The water from an abandoned mine at a much higher level, estimated at 145 feet, had entered the mine and imprisoned them. This is the longest period in the history of mining in Pennsylvania of preservation of life under such circumstances. And in this connection it may be also well consider that in no case on record has an attempt at cannibalism been made by the sufferers. This fact should be placed to the credit of a class of men too often unjustly despised and maligned. When these men were borne alive from the mine, the whole crowd of bystanders accompanied them to the temporary hospital singing the doxology.

"The level of the water in abandoned mine dropped slowly, day by day, in consequence of pumping incessantly, at rates varying from two to fourteen feet."

New nominations Nos. 1220, 1221 and 1222 were read.

The Committee on Improved Accommodations reported progress.

Prof. Cope, from the Committee appointed December 19, 1890, to consider the improvement of the Proceedings of the Society, presented a report.

Considerable discussion took place upon the same, and the following resolution was adopted, *nem. con.*:

Resolved, That the Report and Resolutions accompanying be recommitted to the same Committee, and the Committee be continued in order to obtain fuller data as to the matters therein referred to; and the Committee be instructed to present its Report at the first meeting of the Society in May, 1891 (May 1).

On motion, the Society

Resolved, That the Treasurer, J. Sergeant Price, Esq., be authorized and directed to give notice to the City of Philadelphia to quit the rooms in the building of the Society now occupied by it for the use of the courts and its officers, at the end of the present tenancy, viz., on the 1st of July, 1891.

And the Society was adjourned by the President.

Stated Meeting, March 20, 1891.

Present, 3 members.

Dr. J. Cheston Morris in the Chair.

Correspondence was submitted as follows:

Letters of envoy were received from the Ministère des Travaux Publics, Paris; Meteorological Office, London.

Letters of acknowledgment were received from Royal Society of Victoria, Melbourne, Australia (131, 132, 133); Mr. Samuel Davenport, Adelaide, Australia (130); Royal Society of N. S. Wales, Sydney, Australia (131, 132, 133); Tokyo Anthropological Society (131, 132, 133); Société R. des Sciences, Upsal, Sweden (130, 131, 132, 133, and Trans. xvi, 3); Friesch Genootschap, Leuwarden (133); R. Accademia degli Agiati, Rovereto, Austria (129, 130, 132, 133); Prof. Hermann Rollett, Vienna (129, 130, 132, 133); Prof. Hauer, Vienna, Austria (132, 133); Naturwissenschaftliche Wochenschrift, Berlin (131, 132, 133); K. Bibliothek, Berlin (131, 132, 133); Naturforschende Gesellschaft, Emden (131, 132, 133); Prof. E. Hœckel, Jena (131, 132, 133); Dr. Julius Platzmann, Leipzig (131); Verein für Vaterländische Naturkunde, Stuttgart (131, 132, 133); Am. Geog. Society, New York (131); Mr. L. Vossion, Philadelphia (131, 132, 133, 134); Denison Scientific Association, Granville, O. (131, 132, 133); Michigan State Library, Lansing (131, 132, 133, 134); Museo National de Buenos Aires (125, 126, 127, 128, 129, 131, 132, 133).

Letters of acknowledgment (134) were received from Mr. J. M. Le Moine, Quebec; Toronto University Library, Canadian Institute, Sir Daniel Wilson, Toronto; Geological Survey, Ottawa; Maine Historical Society, Society of Natural History, Portland, Me.; New Hampshire Historical Society, Concord; Dr. C. N. Hitchcock, Hanover, N. H.; Amherst College, Boston Society of Natural History, Mass. Historical Society, Athenæum, Messrs. T. M. Drown, Robert C. Winthrop, S. P.

Sharples, Boston; Museum of Comparative Zoölogy, Profs. A. Agassiz, Robert N. Toppan, Cambridge; The Essex Institute, Salem; American Antiquarian Society, Worcester; Free Public Library, New Bedford; Mr. James B. Francis, Lowell; Prof. Pliny Earle, Northampton, Mass.; New Haven Colony Historical Society; Connecticut Historical Society, Hartford; Mr. George F. Dunning, Farmington, Conn.; New York State Library, Albany; Hamilton College, Clinton; Profs. T. F. Crane, J. M. Hart, B. G. Wilder, Ithaca; Vassar Brothers' Institute, Poughkeepsie; Rochester Academy of Science; Library of U. S. Military Academy, West Point; The Oneida Historical Society, Utica, N. Y.; New York Hospital, University of the City of New York, Dr. John J. Stevenson, Columbia College, Gen. Henry L. Abbot, Meteorological Observatory, American Museum of Natural History, New York; New Jersey Historical Society, Newark; Free Public Library, Jersey City; Prof. C. A. Young, Princeton; Mr. Isaac C. Martindale, Camden, N. J.; Dr. Robert H. Alison, Ardmore; Mr. Burnet Landreth, Bristol; Dr. Martin H. Boyè, Coopersburg; Mr. Eckley B. Coxe, Drifton; Drs. Traill Green, J. W. Moore, Thomas C. Porter, Easton; Mr. Andrew S. McCreath, Harrisburg; Haverford College; Drs. Allen C. Thomas, Isaac Sharpless, Lyman B. Hall, Haverford College; Mr. J. N. Fulton, Johnstown; Linnean Society, Lancaster; Mr. P. F. Rothermel, Linfield; Messrs. Heber S. Thompson, P. W. Sheafer, Pottsville; Mr. M. Fisher Longstreth, Sharon Hill; Lackawanna Institute of History and Science, Scranton; Philosophical Society, Messrs. Washington Townsend, Philip P. Sharples, West Chester, Pa.; Library of the Pennsylvania Hospital, Engineers' Club of Philadelphia, Philadelphia Library, Wagner Free Institute of Science, Zoölogical Garden, Franklin Institute, Academy Natural Science, Messrs. John Ashhurst, Jr., Andrew A. Blair, Charles Bullock, Edwin J. Houston, S. Castner, Jr., Thomas M. Cleemann, C. S. Dolley, Samuel Dixon, Patterson Du Bois, Frederick Fraley, Persifor Frazer, George Friebis, George S. Fullerton, Horace Howard Furness, H. D. Gregory, F. A. Genth, Fred. A. Genth, Jr., Edward Hopper, W. A. Ingham, William W. Jefferis, W. W. Keen, J. P. Lesley, John Marshall, Geo. R. Morehouse, James T. Mitchell, E. Y. McCauley, Charles A. Oliver, J. Sergeant Price, Robert Patterson, William Pepper, Henry Phillips, Jr., Franklin Platt, C. N. Peirce, W. S. W. Ruschenberger, Henry Reed, Theo. D. Rand, James W. Robins, L. A. Scott, Benjamin Sharp, Albert H. Smyth, Aubrey H. Smith, H. Clay Trumbull, Samuel Wagner, William H. Wahl, Henry Willis, Mrs. Helen Abbott Michael, Philadelphia; Rev. F. A. Mühlenberg, Reading, Pa.; U. S. Naval Institute, Annapolis; Peabody Institute, Maryland Institute, Maryland Historical Society, Baltimore, Md.; Bureau of Ethnology, U. S. Geological Survey, Smithsonian Institution, U. S. Signal Office, U. S. Naval Observatory, Surgeon-General's Office, Anthropological Society, Patent Office, Rt. Rev. John J. Keane, Messrs. Charles A. Schott, H. Haupt, Albert S. Gatschet, Garrick Mallery, W. Strong, Washington, D.C.; Prof. J. C. White, West Virginia University, Morgantown, W. Va.; University of Virginia, University of Virginia P. O.; Mr. Jed. Hotchkiss, Staunton, Va.; Elliott Society of Science and Art, Charleston, S. C.; Georgia Historical Society, Mr. William Harden, Savannah, Ga.; University of Alabama; Denison Scientific Association, Granville; Cincinnati Society Natural History, Cincinnati Observatory; Rev. Henry S. Osborn, Oxford; Dr. E. W. Claypole, Akron, O.; Dr. Robert Peter, Lexington, Ky.; Athenæum, Columbia, Tenn.; University of Tennessee, Knoxville, Tenn.; University of Illinois, Champaign, Ill.; The Newberry Library, Chicago, Ill.; Dr. John L. Campbell, Crawfordsville, Ind.; State Historical Society of Wisconsin, Madison; Prof. J. C. Branner, Little Rock, Ark.; Col. William Ludlow, Gen. W. F. Raynolds, Detroit; Prof. Alexander Winchell, Ann Arbor, Mich.; Colorado Scientific Society, Denver; Kansas State Historical Society, The Kansas Academy of Science, Topeka; Observatorio Astronómico National Mexicano, Tacubaya, Mexico.

Accessions to the Library were reported.

Pending nominations 1220, 1221, 1222, and new nominations 1223, 1224, 1225 and 1226 were read.

And the Society was adjourned by the presiding member.

Stated Meeting, April 3, 1891.

Present, 13 members.

President, Mr. FRALEY, in the Chair.

Correspondence was submitted.

Accessions to the Library were reported.

Prof. Lesley read an obituary notice of the late Peter W. Sheafer (b. March 31, 1819; died at Pottsville, March 26, 1891).

The death of Dr. Thomas B. Reed was announced (Philadelphia, April 1, 1891, æt. 59).

Prof. Lesley read a paper "On An Important Boring Through 2000 Feet of Trias in Eastern Pennsylvania," which was followed by some remarks on the subject by Mr. B. S. Lyman.

Pending nominations, Nos. 1220, 1221, 1222, 1223, 1224, 1225 and 1226 were read.

The report of the Trustees of the Building Fund was presented.

And the Society was adjourned by the President.

Stated Meeting, April 17, 1891.

Present, 13 members.

President, Mr. FRALEY, in the Chair.

Correspondence was submitted as follows:

A letter was received from the American Consul General, Melbourne, Australia, asking the Society to participate in a scientific expedition to the Solomon Islands and other places, with a view of collecting ethnological and anthropological specimens.

A circular was received from the Royal Society of New South Wales, offering its medal and money prize, for the best communication containing the results of original research or observation upon scientific subjects.

An invitation was received from the Hungarian Committee to attend the Second International Ornithological Congress, which will be held in Budapest at Whitsuntide, 1891.

Letters were received from the Société Hongroise de Géographie, and from the "Journal of Comparative Neurology," Cincinnati, Ohio, asking for exchanges, which were so ordered.

Letters of envoy were received from the Royal Society of New South Wales, Sydney; Musée Teyler, Haarlem; Nederlandsche Letterkunde, Leiden; Ministère de l'Instruction Publique, Paris; Bath and West and Southern Counties Societies, Bath, England; Royal Statistical Society, London; Mr. Frank Vincent, New York; Department of the Interior, Smithsonian Institution, Washington, D. C.

Letters of acknowledgment were received from the Tokyo Library (131, 132, 133); Université Royale, Lund, Sweden (130, 131, 132, 133); Physikalisch-Medizinische Societät, Erlangen (131, 132, 133); K. Sächs. Alterthumsverein, Dresden (131, 132, 133); Oberhess. Gesellschaft für Natur- und Heilkunde, Giessen (131, 132, 133); Prof. Otto Bottlingk, Leipzig (131, 132, 133); K. K. Sternwarte in Prag (130); Museum d'Histoire Naturelle, Strasburg (131, 132, 133); Naturforschende Gesellschaft, Schweiz. Naturforsch. Gesellschaft, Bern (131, 132, 133); Biblioteca Nazionale Centrale, Firenze (131, 132, 133); R. Comitaté Geologico D'Italia, Rome (131, 132, 133).

Mr. R. Meade Bache read a paper on "Possible Sterilization of City Water," which was followed by a discussion.

Pending nominations 1220, 1221, 1222, 1223, 1224, 1225 and 1226, and new nominations Nos. 1227, 1228 and 1229 were read.

And the Society was adjourned by the President.

Stated Meeting, May 1, 1891.

Present, 13 members.

President, Mr. FRALEY, in the Chair.

Letters of envoy were received from the K. Akademie der Wissenschaften, Vienna, Austria; Société des Sciences Naturelles et Archéologiques de la Creuse, Guéret, France.

Letters of acknowledgment were received from the Naturhistorische Gesellschaft, Hanover, Prussia (131, 132, 133); R. Accademia dei Lincei, Prof. G. Sergi, Rome (131, 132, 133); Marquis Antoine de Gregorio, Palermo, Sicily (131, 132, 133); Société Nationale des Sciences Naturelles et Mathematiques, Cherbourg, France (131, 132, 133); Société des Sciences Naturelles et Archéologiques de la Creuse, Guéret, France (131, 132, 133); Prof. Léon de Rosny, Paris (131); Société Académique, Troyes (131, 132, 133); Société Polymathique de Morbihan, Vannes (131, 132, 133); Sir J. W. Dawson, Montreal (134); State Library of Massachusetts, Boston (134); Prof. Elihu Thomson, Swampscott, Mass. (134).

At request of the Kg. Norske Videnskabers Selskab, Throndhjem, Norway, it was placed on list to receive Proceedings from 131.

The following societies were placed on the exchange list to receive Proceedings from No. 131:

K. Sächs. Meteorologische Institut, Leipzig; K. Sächs. Sternwarte, Leipzig; Académie des Sciences, etc., Angers, France; Schlesische Gesellschaft für Vaterländische Kultur, Breslau, Germany; Società Italianá delle Scienze (5 Piazza S. Pietro in Vincoli), Rome, Italy; Naturwiss. Verein, Regensburg, Germany; Bureau für Wetter Prognose, Leipzig, Saxony; Naturhist. Landes-Museum, Klagenfürt, Austria; Société Géologique de Normandie, Havre, France.

An engraved portrait of the late Prof. Von Rath was presented by his widow.

The following deaths of members were announced:

Rev. S. S. Lewis (Cambridge, England), March 31, 1891.

Dr. John LeConte (Berkeley, Cal.), April 29, 1891, æt. 73 (b. Dec. 4, 1818).

Dr. Joseph Leidy (Philadelphia), April 30, 1891 (b. Sept. 9, 1823).

On motion, the President was authorized to appoint suitable persons to prepare the usual obituary notices of Dr. Leidy and Dr. LeConte.

Prof. Lesley read a paper on "Artesian Wells in Philadelphia, Norristown, Montgomery and Delaware Counties," with notes by Prof. Oscar C. S. Carter.

Prof. Lesley presented a paper by Prof. Oscar C. S. Carter on "The Feldspar Bed in the Laurentian Gneiss near Lafayette Station."

Mr. Holman made an oral communication in relation to a new microscope, lately invented by him, by which objects distant from its front lens over two and a half feet could be readily examined in their habitat. For example, at that distance a salamander of a few inches in size would appear some thirty inches in length, and its whole circulation of blood would be plainly visible. The instrument uses a photographic lens as an object glass, and is really a short-focus telescope.

Pending nominations Nos. 1220 to 1229 (inclusive) were read.

Mr. J. Sergeant Price, the Treasurer, having reported to the Society that he had received through its attorney, Mr. John H. Harjes, of Paris, the sum of three thousand eight hundred and fifty-five dollars and forty-two cents, the full amount of the legacy of twenty thousand francs (at the exchange of 5.18¾ francs per docia) given to it by the will of the late Mr. Auguste Carlier, of Paris, a member of our Society, submitted the following resolutions, which were unanimously adopted:

Resolved, That the thanks of the Society be returned to Mr. Louis Vossion, the French Consul at Philadelphia, for his aid in preparing the necessary papers and certificates therein for presenting our claim for said legacy to Mr. P. Massion, of Paris, the Executor of Mr. Auguste Carlier; he as a member of our Society declining to make any charge therefor for fees and expenses.

Resolved, That the thanks of the Society be returned to Mr. John H. Harjes, of the firm of Messrs. Drexel & Co., for his valuable services as our representative in Paris, in obtaining from Mr. P. Massion, the Executor of Mr. Auguste Carlier, the legacy of twenty thousand francs given to us by his will and remitting the same to us without any charge for the time and care given to our interests, which acts of kindness are highly appreciated by the Society.

The Committee on Extended Accommodations reported progress.

The deferred business being in order, the report of the Committee submitted March 6, 1891, was taken up.

Prof. Cope moved that the consideration of the same be postponed until the next regular meeting of the Society, and that notice thereof should be placed upon the meeting postal-cards.

Mr. Price moved, as a substitute and amendment, that the consideration of the report should be postponed until the first regular meeting in November, 1891.

The amendment, being put to a vote, was declared carried.

The resolution as amended was then unanimously adopted.

And the Society was adjourned by the President.

Stated Meeting, May 15, 1891.

Present, 19 members.

President, Mr. FRALEY, in the Chair.

Correspondence was submitted as follows: A circular was received from the Observatorio de San Fernando announcing the death of the Director of the Observatory, Sr. D. Cecilio Pujazon.

Letters of envoy were received from the K. Sächsische Gesellschaft der Wissenschaften, Leipzig; Royal Statistical Society, London.

Letters of acknowledgment were received from the Linnæan Society of New South Wales, Sydney (130); Rhode Island Historical Society, Providence (134); Prof. O. N. Rood, New York Academy of Sciences (134); Dr. Morris Longstreth, Messrs. John R. Baker, J. S. Harris, George de B. Keim, George Stuart, College of Pharmacy, Philadelphia (134); State Library of Pennsylvania, Harrisburg (134); Mr. John F. Carll, Pleasantville (134); Prof. J. T. Rothrock, West Chester (134); Wyoming Historical and Geological Society, Wilkesbarrè (134); Signal Office, Washington (131, 132, 133, and Transactions xvi, 1, 2, 3); Leander McCormick Observatory, University of Virginia (134); Denison Scientific Association, Granville, O. (134); Davenport Academy of Sciences, Davenport, Iowa (134); Observatorio Nacional de Tacubaya, Sociedad Cientifica "Antonio Alzate," Mexico (134); Museo Michoacano, Morelia; Bishop Crescencio Carrillo, Merida, Yucatan (134).

Dr. Ruschenberger read an obituary notice of the late Dr. Gouverneur Emerson.

The death of Julius E. Hilgard (Washington, D. C.), May 2, 1891, was announced.

The President reported that he had appointed Dr. Ruschenberger to prepare the obituary notice of the late Dr. Leidy, and Prof. Barker that of the late Dr. LeConte (Berkeley, Cal.).

Mr. R. Meade Bache read a paper entitled "A Fragment of Objectionable University-Extension Teaching."

The minutes of the Board of Officers and Council were submitted.

Pending nominations Nos. 1220, 1221, 1222, 1223, 1224, 1225, 1226, 1227, 1228 and 1229 were read, spoken to and balloted for.

At the call of Committees, Prof. E. J. Houston, Chairman, reported a minute of resolutions adopted at the last meeting of the Committee on Library, but the hour of 10 P.M. having arrived, after which, by the laws of the Society (Chapter ix, § 5), it is not permitted to take up new business, the consideration of the Report and the matters therein contained, was postponed, on motion, to an adjourned meeting of the Society to be held at its Hall on May 29, 1891, at 8 P.M.

Secretaries Barker and Brinton, the tellers appointed to conduct the balloting for members, reported the following to have been duly elected members:

2188. Dr. René Gregory, Leipzig.

2189. Prof. Henry W. Spangler, University of Pennsylvania, Philadelphia.

2190. Prof. A. de Quatrefages, Membre de l'Institut, Paris, France.

2191. Sir Robert S. Ball, Astronomer Royal for Ireland, Dublin.

2192. Prof. Charles E. Munroe, Newport, R. I.

2193. Right Rev. William Stubbs, LL.D., D.D., Bishop of Oxford, England.

2194. Dr. E. T. Hamy, Conservator du Musée du Louvre, Paris, France.

2195. Prof. Jules Oppert, Membre de l'Institut, Paris, France.

2196. Prof. Gaston Maspero, Paris, France.

And the Society was adjourned by the President.

An Adjourned Meeting was held May 29, 1891.

Present, 11 members.

President, Mr. FRALEY, in the Chair.

The President stated the object of the meeting.

Prof. Edwin J. Houston, Chairman, read the following extract from the minutes of the last meeting of the Committee on Library:

The Library Committee respectfully reports to the Society that it is unable to understand the plans of the Committee on Extended Accommodations as regards the general character of the new bookcases to be furnished, their location, number and size.

The Library Committee cannot intelligently carry on the work delegated to it by the Society, unless its duties and those of the Committee on Extended Accommodations be clearly defined by the Society.

A general discussion took place, and the Chairman of the Committee on Extended Accommodations explained the work and the plans of the Committee.

Prof. Houston stated the points at issue to be three, viz.:

1. Does the Society desire all its books to be placed in the new Library room? or,
2. Does it wish any in the North room? or,
3. Does it wish any in the Meeting room.

On motion of Dr. Morris it was, *nem. con.*:

Resolved, That the stock of publications issued by the Society shall be placed in a portion of the North room.

On motion of Dr. Hayes it was, *nem. con.*:

Resolved, That the Committee on Extended Accommodations be directed to locate and construct cases for books, and cabinets, in accordance with plans to be approved of by the *Library Committee.*

On motion of Prof. Smyth it was, *nem. con.*:

Resolved, That Daniel G. Brinton and Henry Phillips, Jr., and each of them, be appointed delegates to represent this Society at the meeting at Moscow, this year, of the Congres International d'Anthropologie et Archéologie Prehistoriques, provided that the said appointment shall entail no expense whatever upon the Society.

And the Society was adjourned by the President.

PROCEEDINGS

OF THE

AMERICAN PHILOSOPHICAL SOCIETY,

HELD AT PHILADELPHIA, FOR PROMOTING USEFUL KNOWLEDGE.

VOL. XXIX. JULY TO DECEMBER, 1891. No. 136.

Notes on Calospasta Lec.

By George H. Horn, M.D.

(Read before the American Philosophical Society, October 2, 1891.)

Some years ago, in a critical review of the genera of Meloidæ, it seemed evident, from the modifications of the form of the tarsal claws, that some genera remained to be discovered to fill the gaps existing. These forms were indicated at the time and one of them has already been found. Another of the missing links must come in the vicinity of the genus under discussion and is really foreshadowed in the slight claw modifications already observed. That the material may be at hand and ready for use in the event of further discoveries is my excuse for presenting this short paper for the consideration of those interested.

CALOSPASTA LEC.

In the *Trans. Am. Ent. Soc.*, 1878, p. 60, I gave a brief table of the species then known to me. Since then another species has been described (*loc. cit.*, 1883, p. 312).

Two more new species have recently been collected, both from California, which, with the one not included in my previous table, will require some modification of it.

1. Spurs of hind tibiæ slender and not very dissimilar 2
   Spurs of hind tibiæ dissimilar, the inner slender, the outer cylindrical and truncate... 6
2. Elytra strongly costate .... 1. **mirabilis.**
   Elytra not costate.. 3
3. Median line of front deeply impressed ; head red....... 2. **histrionica.**
   Median line of front not at all impressed ; head and thorax dark blue or green 4
4. Median line of thorax impressed; thorax not longer than wide; color green...................................... 3. **viridis.**
   Median line of thorax not impressed.......................... 5

5. Thorax narrow, longer than wide ; elytra ornate.
   Head and thorax obviously punctate................ 4. **elegans.**
   Head and thorax quite smooth.................... 5. **perpulchra.**
   Thorax short, nearly twice as wide as long ; black, subopaque. 6. **Fulleri.**
6. Body above and beneath entirely black................ 7. **moesta.**
   Thorax red.
   Head and thorax sparsely but distinctly punctate, each punctured with a short, black, neat hair .... 8. **Morrisoni.**
   Head and thorax absolutely smooth, without hair. 9. **nemognathoides.**

C. mirabilis Horn, *Trans. Am. Ent. Soc.*, 1870, p. 93.

In this species the antennæ are filiform, the joints closely articulated.

The anterior tarsi of the male are simple, the last ventral segment with a shallow semicircular emargination.

Occurs in Southwestern Utah, Mojave Desert and San Diego, Cal., Rock Spring and near Yuma, Ariz.

C. histrionica, n. sp.

Piceous black, moderately shining, head red, humeri triangularly orange yellow. Antennæ black, filiform, joints moderately closely articulated : head oval, smooth, with but few punctures ; median line deeply impressed, hind angles rounded, mouth parts piceous ; thorax longer than wide, much narrowed at anterior half ; disk feebly convex, transversely depressed in front, a feeble median impression posteriorly, surface almost entirely smooth ; elytra nearly twice as wide at base as the thorax, a faint slender costa on each side ; surface scabrous, the humeri nearly smooth ; body beneath piceous black, shining. Length .34–.54 inch ; 8.5–14 mm.

Male.—First three joints of the anterior tarsi thickened, gibbous on the upper side, with a deep groove producing a bilobed appearance. Last ventral with a small triangular notch.

Female.—Anterior tarsi simple. Last ventral entire.

The form of the anterior tarsi of the male is a repetition in a less marked manner of that observed in Eupompha, while the form of the head, especially in reference to the median groove of the front, is seen in both Eupompha and Tegrodera.

It seems probable that species will yet occur requiring the union of the three genera, as all of them are characterized by the claws being unequally cleft, the lower portion shorter than the upper and connate with it.

Collected near San Diego, Cal. For specimens I am indebted to the kindness of Dr. C. V. Riley.

C. viridis Horn, *Trans. Am. Ent. Soc.*, 1883, p. 312.

Antennæ rather stoutly filiform, the joints closely articulated, 4–10 not longer than wide.

The thorax is wider than long, the median line impressed.

The male has simple anterior tarsi. The last ventral is broadly triangularly emarginate and impressed along the middle.

This species is notable in having the claws cleft very near the tip, so that the under portion is but little shorter than the upper.

Occurs in Colorado and New Mexico. Collected by Prof. F. H. Snow.

C. elegans, *Lec. Ann. Lyc.*, v, p. 161; *Proc. Acad.*, 1853, p. 341; var. *humeralis* Horn, *Trans. Am. Ent. Soc.*, 1870, p. 93.

Antennæ filiform, moderately closely articulated, joints all longer than wide. On each side of the front, at the insertion of the antennæ, is a gibbosity causing a deep depression above the clypeus.

When fully colored, the dull blue elytra have a yellow vitta of irregular form starting from the humeri, continuing closer to the side than the suture and with an interruption near the apex. The vitta may be reduced in size until there remains merely a triangular humeral spot.

The males have the anterior tarsi dilated, not very notably except the first joint; there is, however, no depression above. The last ventral segment is feebly triangularly emarginate.

Occurs in various parts of Southern California, from San Diego northward.

C. perpulchra Horn, *Trans. Am. Ent. Soc.*, 1870, p. 92.

Very like *elegans* in all its structural characters. The bright blue elytra have three yellow bands, basal, median, and apical, interrupted by the suture. This species may vary by the gradual loss of the bands, from the apical to the basal, until the elytra are entirely blue. Those with the humeral spot only resemble the var. *humeralis*, of the preceding species; but apart from the ornamentation, the two species may be distinguished by the present having a brighter blue color, smoother surface, the head and thorax quite smooth, while in *elegans* they are very obviously punctate.

The sexual characters are as in *elegans*.

Occurs in Owen's Valley, Cal.

C. Fulleri Horn, *Trans. Am. Ent. Soc.*, 1878, p. 59.

Black, subopaque. Antennæ filiform, but rather stout; joints closely articulated and scarcely longer than wide. Head, from in front, triangular in form, the sides parallel behind the eyes, hind angles obtuse, occiput truncate. Thorax nearly twice as wide as long.

The anterior tarsi of the male are simple; the last ventral broadly triangularly emarginate, the fifth broadly and not deeply emarginate.

Occurs in Southern California. Found rather abundantly by Mr. Morrison.

C. moesta Horn, *Trans. Am. Ent. Soc.*, 1878, p. 59.

Entirely black. Thorax longer than wide, not closely punctate. Antennæ slightly thicker externally, the joints submoniliform and not closely articulated. Tarsal claws cleft very near the base, the lower portion not half the length of the upper. Spurs of hind tibiæ dissimilar, the outer cylindrical, the apex truncate and slightly expanded, inner spur slender.

The males have the anterior tarsi simple, the last ventral with a shallow triangular emargination.

From Southern California, precise locality not known.

C. Morrisoni, n. sp.

Elongate, black, thorax orange red. Antennæ black, slightly thickened externally, joints moniliform; head transversely quadrate, usually with a central rufous spot, parallel for a short distance behind the eyes, hind angles rounded, surface sparsely punctate; thorax scarcely longer than wide, widest one-third from apex, apical third more rapidly narrowed, posterior two-thirds slightly narrowed, disk feebly convex; a slight median depression posteriorly, surface sparsely but distinctly punctate and with shortened black hairs; elytra scabrous, with very short hairs; body beneath black, shining, sparsely pubescent; posterior tibial spurs dissimilar, the outer cylindrical, truncate, slightly broadened at tip, the inner slender and acute; claws deeply cleft, the lower portion more than half the length of the upper. Length .42–.64 inch; 10.5–16 mm.

Male.—The anterior tarsi are simple. Last ventral broadly triangularly emarginate and slightly longitudinally impressed.

In color this species resembles the following, but the head and thorax are very distinctly punctate and more or less pubescent. It is, moreover, much larger, and the surface scarcely shining.

Occurs in Southern California, and was found rather abundantly by Mr. Morrison. At the time when I had but a unique of the next species I supposed these to be merely fully-developed specimens of it.

C. nemognathoides Horn, *Trans. Am. Ent. Soc.*, 1870, p. 92.

Black, moderately shining, thorax red. Antennæ comparatively slender, the joints longer than wide, not moniliform; head quite smooth, with few very indistinct fine punctures; thorax as wide as long, sides arcuately rounded in apical half, disk convex, without impression, surface smooth and shining; elytra scabrous, sometimes feebly so, surface moderately shining; body beneath black, shining; spurs of hind tibiæ dissimilar, the inner slender, acute, the outer cylindrical, truncate, and slightly wider at tip; claws not deeply cleft, the lower portion two-thirds the length of the upper. Length .22–.32 inch; 5.5–8 mm.

In the male the anterior tarsi are slender. The last ventral segment is deeply incised.

This species might be supposed to be merely a feebly developed form of the preceding. The differences have there been given, to which might here be added the form of the antennæ. It also resembles several of our species of Nemognatha.

Occurs in Owen's Valley, Cal., and in Arizona near Fort Yuma.

The Electrolysis of Metallic Formates.

By Hill Sloane Warwick.

(Read before the American Philosophical Society, November 6, 1891.)

The facility with which many metallic formates could be reduced to the metallic state by heat, or in the case of silver and mercury, even by the action of light, having led to the hope that they might be employed with particular advantage in electrolysis, the following series of experiments were made upon solutions of copper, zinc and cadmium formates, in order to ascertain the effect of dilution, temperature and pole separation, as well as the conditions necessary in order to effect their quantitative estimation and separation. The current was generated by a battery of ten cells, of the "crowfoot" type, each cell being 3.1 dm. in height, by 1.9 dm. in diameter, and having a capacity of 2 liters ; the dimensions of the zincs were 1.5 cm. by 1.5 cm., and of the radiating copper plates constituting the positive pole 1.5 cm. by 1.5 cm. By means of this battery a comparatively uniform current of 2.8 c.c. electrolytic gas per minute was generated after the cells had been in use for some time.

The strength of the current was measured by means of an ordinary voltameter, and was ascertained before and after the completion of the experiment. For the deposition of small quantities of metal, thick platinum-foil electrodes were used, 3.8 cm. wide, and immersed to the depth of 3.8 cm. in the solution. For quantities above .05 gram, they were unsatisfactory, the metal showing a great tendency to separate in a spongy condition at the edge. In the earlier determinations a platinum dish was used, weighing about 67 grams, and having a capacity of 150 c.c. ; in the later ones a dish weighing 117 grams, and with a capacity of 275 c.c., was employed. The results obtained with the larger dish were necessarily somewhat less exact than with the one of smaller size. The positive pole consisted of a thick platinum wire, the lower portion of which was wound into a horizontal spiral. In some of the separations it was found expedient to substitute for the spiral a small platinum crucible 2.5 cm. in height and 2.8 cm. in diameter, closed by a cork, through which passed a copper wire in contact with the bottom of the crucible. In order to regulate the distance between the poles, a filter stand was used, having inserted on its movable arm an ordinary binding screw, to which the positive pole was attached.

The following formates were prepared :

Copper Formate.

This salt was made by precipitating cupric oxide from a hot solution of copper sulphate, by means of caustic potash ; the precipitate was washed by decantation until free from traces of potash ; it was then dissolved in formic acid having the sp. gr. 1.015, obtained in the usual way from oxalic acid and glycerine, through which a current of steam was allowed to pass in order to prevent too great a rise of temperature, with the consequent production of decomposition products; the salt was allowed to crystallize out by spontaneous evaporation in a current of warm air, and recrystallized. An abundant crop of large, blue, monoclinic crystals was obtained, having the composition $Cu\,(C\,HO_2)^2 + 4\,H_2O$, efflorescing in dry air, soluble in eight parts of water and changed by boiling to the sparingly soluble basic salt $Cu\,(C\,HO_2)^2.\ 2\,Cu\,(HO)^2$.

Zinc Formate.

A solution of ordinary crystallized zinc sulphate was treated with an excess of sodium carbonate, heated almost to boiling, freed by decantation from soluble impurity and dissolved in hot formic acid. The solution was evaporated down and allowed to stand, after filtering off a slight precipitate that formed on boiling, and which gave the iron reaction with potassium sulphocyanate.

Monoclinic prisms having the formula $Zn\,(C\,HO_2)^2 + 2\,H_2O$ separated out, isomorphous with the cadmium salt, permanent in the air and soluble in twenty-four parts of water at ordinary temperature.

Cadmium Formate.

This salt was prepared by dissolving cadmium obtained by distillation in vacuuo, in nitric acid, neutralizing with a hot solution of potassium carbonate, washing by decantation until free from soluble carbonate and dissolving in formic acid. Large monoclinic crystals separated out, having the composition $Cd\,(C\,HO_2)^2 + 2\,H_2O$, permanent in the air, readily soluble in water.

(Note.—The formulas of copper and cadmium formates are given as follows: $Cu\,(C\,HO_2)^2$ and $Cd\,(C\,HO_2)^2$ in the last edition of Watts' *Dictionary of Chemistry*, differing from all other authorities. Experiments made to settle the question resulted in the formulas assigned, which is in accordance with the ones usually given.)

Lead Formate.

Solutions of lead acetate and sodium formate were mixed and allowed to stand. Large white anhydrous rhombic crystals gradually separated out in radiating needles, sparingly soluble in cold water, more readily in hot, but with partial decomposition into free acid, and a basic salt of variable composition.

Cobaltous Formate.

A hot solution of cobaltous sulphate was neutralized with caustic soda solution, washed by decantation until free from all but traces of the precipitant, dissolved in formic acid, filtered, and allowed to evaporate in a current of warm air. The salt separated in crusts, consisting of indistinct crystals, having the composition $Co\,(C\,HO_2)^2 + 2\,H_2O$, dissolving with difficulty to a reddish-colored solution.

Manganous Formate.

This salt was prepared from manganous carbonate precipitated from a hot solution of manganous sulphate, by means of sodium carbonate added to alkaline reaction and decanted as rapidly as possible until free from all except very slight traces of soluble salts. It was then dissolved in formic acid and allowed to crystallize very slowly. The crystals thus obtained were allowed to recrystallize. The crystals are small, pale reddish monoclinic prisms, soluble in fifteen parts of water, and contain two molecules of water of crystallization.

Nickel Formate.

A solution of nickel chloride was treated with a slight excess of sodic hydrate, washed several times by decantation with hot water, dissolved in acid and evaporated down. A greenish crust formed, made up of very small, bright, green needles—$Ni\,(C\,HO_2)^2 + 2\,H_2O$.

Ferric Formate.

Ferric chloride was treated with excess of a solution of ammonia, washed with hot water, and allowed to digest in formic acid at a temperature which was not allowed to exceed 70°, until the hydrate of iron had completely dissolved, which required several hours. The deep-red solution was allowed to crystallize by spontaneous evaporation. Yellowish-red needles, crystallizing in radiating tufts, separated out, which formed a light, loose, coherent powder. When dried at a moderate temperature, it was readily soluble in cold water with an acid reaction. Aqueous solutions on warming became turbid from the partial decomposition of the salt into ferric hydrate and free acid. A similar decomposition takes place in solutions at ordinary temperatures after standing for some time. (The foregoing salt was made in preference to ferrous formate on account of its greater solubility.)

Mercuric Formate.

Mercuric oxide was dissolved in formic acid, but on warming the solution slightly it decomposed into the very sparingly soluble white mercurous formate, carbon dioxide and formic acid, according to the following equation :

$$2\,Hg\,(C\,HO_2)^2 = Hg_2\,(C\,HO_2)^2 + C\,HO_2H + CO_2 \text{ and}$$
$$Hg_2\,(C\,HO_2)^2 = 2\,Hg + C\,HO_2\,H + CO_2.$$

The precipitate was gray in color from the presence of free mercury. The tendency to decompose is such that in solution at ordinary temperatures these changes take place readily in the light and, with more slowness, even in the dark. The "ous" salt comes out in minute shining crystals, very insoluble in water, and on continuous warming becomes entirely converted into free mercury. The formates of silver, bismuth and tin were not prepared, as they were not considered available for various reasons.

In order to ascertain the comparative accuracy of the results obtained by means of the ordinary gravimetric methods, as compared with those obtained by means of the current, a series of experiments was made with the metals chosen for particular study. The gravimetric method adopted was the same for all three, namely, estimation as oxide, conducted in the ordinary way.

Copper (Determined as CuO).

Copper formate taken, in grams.	Copper by theory, in grams.	Copper in CuO formed.	Difference in percentage from theoretical.
(1) .8024	.2252	.2261	+.39 per cent.
(2) .7924	.2226	.2232	+.27 "
(3) .7063	.1984	.1982	—.10 "
(4) .7063	.1984	.1979	—.25 "

The first two determinations were high, due perhaps to the efflorescence of the salt. All subsequent weighings were done in a covered watch-glass, and the results obtained corresponded closely with the theoretical.

In the following electrolytic depositions of copper, solutions of copper formate of known strength were used.

Copper (Determined Electrolytically).

Copper present in solution.	Copper found.	Free formic acid.	c.c. H_2O.	Time in hours.	Differ'e in percentage from theoretical.
(1) .1434 grams.	.1438	10 c.c.	125	46	+.27%
(2) .1074 "	1075	15 c.c.	"	16	+.09
(3) .0987 "	.0988	5 c.c.	"	17	+.10
(4) .0987 "	.0987	10 c.c.	"	16	.00
(5) .1074 "	.1077	10 c.c.	"	16	+.27
(6) .1057 "	.1056	10 c.c.	"	17	—.09
(7) .1057 "	.1052	15 c.c.	"	17	—.47
(8) .1101 "	.1104	10 c.c.	"	42	+.27

In the above experiments a platinum dish was used at the negative pole, and the wire spiral as the anode. A current of 0.8—1.60 c.c. HO gas per minute was allowed to run over night. The poles were separated 2.5 cm. Before cutting off the current, the level of the liquid in the dish was raised by the addition of water, and the current allowed to act for an additional half hour. No further deposit of copper took place on the clean surface of the dish, indicating that the metal was completely precipitated. The current was then discontinued, the liquid quickly poured off, and the dish washed with hot water, being finally dried on a warm iron plate at a temperature not exceeding 100° C. The dish was then set aside for some time until it had acquired the temperature of the room and weighed. The solutions failed to give any indication, except the merest traces, of copper when tested with ferrocyanide of potassium. The time varied from sixteen to forty-six hours without materially affecting the result. No perceptible oxidation took place during drying, although the deposit was somewhat dark. It came out as a compact adherent coating, readily dissolving in nitric acid.

A comparison between the results obtained shows conclusively not only that the deposition of copper from its formate solution can be accomplished, but that it is fully as accurate as the ordinary gravimetric method.

Zinc (Determined as ZnO).

Zinc formate taken, in grams.	Zinc by theory, in grams.	Zinc in zinc oxide found.	Difference in percentage from theoretical.
(1) .5508	.1875	.1870	—.26 %
(2) "	"	.1876	+.05
(3) "	"	.1869	—.31
(4) "	"	.1872	—.16

The four determinations made by the usual gravimetric method were estimated finally as zinc oxide which, for purposes of comparison, have been converted into metal.

Zinc (Determined Electrolytically).

Zinc present in grams.	Zinc found.	Free acid.	c.c. H_2O.	Time in hours.	Current in HO gas per minute.	Difference in percentage from theory.
(1) .0625	.0614	none	100	16	1.8 c.c.	....
(2) .0625	....	10 c.c.	100	16	1.8 c.c.	....
(3) .1250	....	15 c.c.	100	16	2.0 c.c.	....
(4) .0818	.0476	5 c.c.	100	17	.8 c.c.	....
(5) .0818	.0816	15 c.c.	100	17	1.7 c c.	—.24 %
(6) .0818	.0819	15 c.c.	100	16	1.7 c.c.	+.12
(7) .0513	.0513	25 c.c.	100	16	1.7 c.c.	....
(8) .1026	.1021	10 c.c.	100	17	1.7 c.c.	—.48
(9) .1026	.1023	15 c.c.	100	43	1.8 c.c.	—.29
(10) .1006	.1007	10 c.c.	100	16	1.7 c.c.	+.09
(11) .1006	.1003	10 c.c.	100	16	1.7 c.c.	—.29

The foregoing determinations of zinc formate were performed under a variety of conditions. (1), (2), (3), (4) were made with the dish as cathode, and the wire spiral as the positive pole; the results both with and without free acid were unsatisfactory, the deposit being very spongy and failing to come out completely, as proved by testing the solution with potassium ferrocyanide. The dish was then made the anode and the zinc was allowed to separate on the platinum crucible which was made the negative pole. The amount of free acid varied from 10 to 25 c.c. The deposit was gray and adherent on the sides and bottom, but rather spongy at the periphery. Around the top of the crucible the metal was black in color. The final determinations were accurate but required the greatest care to avoid detaching loose particles of metal.

The deposit was not regular, the bottom of the crucible being more or less free from zinc on account of the accumulation of gas. The time of deposition averaged sixteen hours. Such currents as sufficed to separate copper were unsatisfactory, even when the electrodes were brought in close contact. In the determinations that were satisfactory, the current strength varied from 1.6—1.8 HO gas per minute, and the poles were close together.

Cadmium (Determined as CdO).

Cadmium formate taken.	Cadmium by theory.	Cadmium in CdO found.	Difference in percentage from theory.
(1) .4224	.1988	.1983	—.25%
(2) .4224	.1988	.1982	—.30

Both results are somewhat too low, possibly owing to reduction of the oxide to metal and consequent loss by volatilization.

Cadmium (Determined Electrolytically).

Cadmium present in grams.	Cadmium found in grams.	Free acid.	c.c. H_2O.	Time in hours.	Differ'ce in percent from theoretical.
(1) .0497	.0498	15 c.c.	100	16	+.20%
(2) .0994	.0996	10 c.c.	100	18	+.20
(3) .0994	.0991	10 c.c.	100	16	—.30
(4) .1231	.1228	10 c.c.	100	44	—.40
(5) .1231	.1229	10 c.c.	100	17	—.16
(6) .0984	.0984	10 c.c.	100	16	....
(7) .0984	.0985	10 c.c.	100	16	+.10
(8) .1004	.1005	10 c.c.	100	16	+.09
(9) .1004	.1002	10 c.c.	100	17	—.19

The dish was used as the negative electrode, the spiral as the positive, except (1), in which the cadmium was deposited on the crucible, the dish serving as the anode. The distance between the poles was 2.5 cm. The variations in the conditions of the experiments noted above caused no noticeable difference in the results. The deposit was not apparently oxidized by moderate warming. Current 1.25 to 1.5 c.c. HO gas per minute.

The solutions were tested for cadmium at the conclusion of each experiment, but none was found, proving that the metal was completely deposited. It formed a firm and adherent coating, white in color, with a bright metallic lustre.

I. Influence of Dilution upon the Precipitation of Copper.

Copper present in grams.	Copper found.	Free acid.	c.c. H_2O.	c.c. HO gas per minute.	Time in hours.
(1) .0717	.0199	3 drops	100	1.75	1
(2) .0358	.0111	$\frac{3}{2}$ "	"	"	"
(3) .0179	.0057	$\frac{3}{4}$ "	"	"	"
(4) .0089	.0028	$\frac{3}{8}$ "	"	"	"
(5) .0044	.0014	$\frac{3}{16}$ "	"	"	"
(6) .0022	.0006	$\frac{3}{32}$ "	"	"	"
(7) .0011	.0003	$\frac{3}{64}$ "	"	"	"

The distance between the poles was 2.5 cm. The area of the electrodes was (3.8 cm. × 3.17 cm.) × 2. The deposition was performed in beakers, having a capacity of 400 c.c., a height of 10 cm. and 7.6 cm. in diameter. The deposit was bright and adherent and, although the amount of free acid present was very small, the metal was not spongy. The results obtained were in close accord with those assigned by theory, according to the law that the amount of metal deposited in a given time is proportional to the strength of solution.

II. The Influence of Temperature upon the Precipitation of Copper.

Copper taken in grams.	Copper deposited.	Free acid.	c.c. H_2O.	Time in hours.	Temperature in degrees Cent.
(1) .0211	.0019	none	150 c.c.	1	20°
(2) "	.0046	"	"	"	40°
(3) "	.0080	"	"	"	60°
(4) "	.0119	"	"	"	80°

The area of the electrodes was (3.5 cm. × 3.8 cm.) × 2. Distance between poles 2.8 cm. The current gave 1.25 c.c. HO gas per minute. (1) was slightly spongy and had a slight deposit of basic green salt at the top. (3) was somewhat dark and slightly spongy at the top but adherent. The amount of metal deposited increased with rise of temperature, as follows: .0027 grams (20°–40°), .0034 grams (40°–60°), .0039 grams (60°–80°). The ratio of increase also rose with the temperature, being greatest between 60° and 80°. In the above series the determinations were made in neutral solutions; in the following, 15 c.c. of formic acid was added.

Copper taken.	Copper deposited.	Free acid.	H_2O.	Time.	Temperature in degrees Cent.
Grams.	Grams.	c.c.	c.c.	Hours.	
(1) .1037	.0104	15	150	$\frac{1}{2}$	20°
(2) "	.0164	"	"	"	40°
(3) "	.0237	"	"	"	60°
(4) "	.0319	"	"	"	80°

The distance between the poles was 2.9 cm., area of electrodes (3 5 cm. × 3 8 cm.) × 2, current strength 7.5 c.c. OH gas per minute. The ratio of increase was: (20°–40°) .0060 grams, (40°–60°) .0073 grams, (60°–80°) .0082 grams. A comparison between the two series of results would indicate that the presence of dilute free acid in moderate quantity exercises no material influence on the amount of metal deposited, even at elevated temperatures.

III. The Influence of Pole Separation upon the Precipitation of Copper.

	Copper taken.	Copper deposited.	H_2O.	Time.	Distance between electrodes.
	Grams.	Grams.	c.c.	Hours.	cm.
(1)	.1974	.0133	700	1	1.58
(2)	"	.0106	"	"	3.16
(3)	"	.0093	"	"	4.75
(4)	"	.0084	"	"	6.33
(5)	"	.0078	"	"	7.91
(6)	"	.0073	"	"	9.50
(7)	"	.0064	"	"	12.66

The area of the electrodes was (3.8 cm. × 3.48 cm.) × 2, free acid present 10 c.c. (1) was slightly spongy. (7) was very close to the edge of the dish. The diminution was (1–2) .0027 grams, (2–3) .0013 grams, (3–4) .0009 grams, (4–5) .0006 grams, (5–6) .0005 grams. The current gave 1 75 c.c. OH gas per minute.

The foregoing experiments were performed in a crystallizing dish 15.2 cm. by 7.6 cm., with a capacity of 900 c.c. In the following series the determinations took place in a beaker 10 cm. in height by 7.6 cm. in diameter.

	Copper taken.	Copper deposited.	H_2O.	Time.	Distance of electrodes.
	Grams.	Grams.	c.c.	Hours.	cm.
(1)	.1434	.0302	200	1	1.58
(2)	"	.0248	"	"	3.16
(3)	"	.0208	"	"	4.75
(4)	"	.0172	"	"	6.33

The current gave 1.75 c.c. oxyhydrogen gas per minute, area of electrodes (3.8 cm. × 3.16 cm.) × 2, free acid present 5 c.c. The diminution was (1–2) .0054 grams, (2–3) .0040 grams, (3–4) .0036 grams. In both series the rate of diminution rapidly lessened as the distance between the electrodes increased.

Experiments made under conditions similar to the above, except that no free acid was present, were failures, the deposits being exceedingly spongy.

I. Influence of Dilution upon the Precipitation of Cadmium.

	Cadmium taken.	Cadmium deposited.	H_2O.	Free acid.	Time.	OH gas per minute.
	Grams.	Grams.	c.c.	c.c.	Hours.	c.c.
(1)	.0994	....	100	none	$\frac{1}{4}$	1.75
(2)	.0497	....	"	"	$\frac{1}{2}$	"
(3)	.0994	....	"	.5	$\frac{1}{2}$	"
(4)	"	.0218	"	5	1	"
(5)	.0497	.0109	"	$\frac{5}{2}$	"	"
(6)	.0248	.0053	"	$\frac{5}{4}$	"	"
(7)	.0124	.0026	"	$\frac{5}{8}$	"	"
(8)	.0062	.0011	"	$\frac{5}{16}$	"	"

In (1) and (2) no free acid was added, and in (3) only .5 c.c. was present; all three were failures. The amount of acid was then increased to 5 c.c., and the experiment repeated, all the other conditions remaining the same. The deposit was adherent and compact. The poles were 3.16 cm. apart, and had an area of (2.85 cm. × 3.8 cm.) × 2.

II. Influence of Temperature upon the Precipitation of Cadmium.

	Cadmium taken.	Cadmium found.	H_2O.	Free acid.	H_2O gas per minute.	Temperature in degrees Cent.
	Grams.	Grams.	c.c.	c.c.	c.c.	
(1)	.1231	.0240	150	10	1.75	20°
(2)	"	....	"	"	"	40°
(3)	.0497	.0088	145	25	"	20°
(4)	"	.0110	"	"	"	40°
(5)	"	.0210	"	"	"	60°
(6)	"	.0257	"	"	"	80°

(2) was very spongy and was covered with a white gelatinous deposit resembling cadmium hydrate. The amount of cadmium was then diminished more than half, while the amount of formic acid present was increased to 25 c.c. (5) and (6) were somewhat spongy but adherent. The increase was (20°–40°) .0022 grams, (40°–60°) .0100 grams, (60°–80) .0047 grams. The amount of metal deposited increased with rise of temperature, being greatest at 80°, but the greatest ratio of increase was at 60°, being almost five times greater than at 40°, and more than twice as great as at 80°. These results were so different from those obtained with copper that a second series of determinations was made, in which the amount of cadmium in the solution was reduced still more in order to insure a compact deposit at the higher temperatures. The results which were in close accord with those above are as follows:

	Cadmium taken.	Cadmium deposited.	H_2O.	Free acid.	OH gas per minute.	Temperature in degrees Cent.
	Grams.	Grams.	c.c.	c.c.	c.c.	
(1)	.0198	.0022	135	15	1.25	20°
(2)	"	.0031	"	"	"	40°
(3)	"	.0078	"	"	"	60°
(4)	"	.0103	"	"	"	80°

III. Influence of Pole Separation upon the Precipitation of Cadmium.

	Cadmium present. Grams.	Cadmium deposited. Grams.	H_2O. c.c.	OH gas per minute. c.c.	Separation of electrodes. cm.
(1)	.0994	....	700	2.2	1.58
(2)	"	.0059	"	1.25	"
(3)	"	.0023	"	.8	"
(4)	"	.0009	"	"	3.16
(5)	"	.0002	"	"	6.33
(6)	"	....	"	"	12.66

Although 20 c.c. of free formic acid was present in (1) and (2) both were failures, the latter, though it was weighed, being merely approximate, some particles having been washed off. The current was then reduced to .8 c.c. HO gas per minute. Adherent deposits were obtained, but in such small quantity that (5) yielded only a trace. The ratio of diminution was (3–4) .0014 grams, (4–5) .0007 grams. Area of electrodes (3.8 cm. × 3.48 cm.) × 2, time 1 hour, free acid present 10 c.c.

I. Influence of Dilution upon the Precipitation of Zinc.

	Zinc present. Grams.	Zinc deposited. Grams.	H_2O. c.c.	Free acid. c.c.	OH gas per minute. c.c.
(1)	.1250	.0300	100	.5	1.75
(2)	.0625	.0155	"	.25	"
(3)	.1250	.0173	"	5.	"
(4)	.0625	.0083	"	$\frac{5}{2}$	"
(5)	.0313	.0043	"	$\frac{5}{4}$	"
(6)	.0156	.0028	"	$\frac{5}{8}$	"

(1), (2), (5) and (6) were spongy, especially the last. Distance between the poles 3.16 cm. Area (2.85 cm. × 3.8 cm.) × 2, time one hour.

II. Influence of Temperature upon the Precipitation of Zinc.

	Zinc taken. Grams.	Zinc deposited. Grams.	H_2O. c.c.	Free acid. c.c.	OH gas per minute. c.c.	Temperature in degrees Cent.
(1)	.1539	....	150	10	.3	20°
(2)	.1026	.0145	"	"	1.8	"
(3)	.1026	....	"	"	"	40°
(4)	.0205	....	"	none	.8	20°
(5)	"	....	"	"	.8	"
(6)	"	....	"	"	1.8	"
(7)	.0513	.0029	145	5	.9	"
(8)	"	.0019	"	"	"	40°
(9)	"	.0010	"	"	"	60°
(10)	"	....	"	"	"	80°
(11)	"	....	"	"	"	"
(12)	"	....	"	none	"	"

(1), (3), (5) and (6) were very spongy. In (4), (10) and (11) no deposition of metal took place, (12) was spongy and was covered with a white coating of zinc hydrate. At 80° no metal was deposited in the presence of free acid provided the current was not too strong. The ratio of decrease with rise of temperature was (20°–40°) 10 grams, (40°–60°) 9 grams, (60°–80°) no deposit. The distance between the poles was 2.85 cm. Area of electrodes (3.8 cm. × 3.16 cm.) × 2. Duration of experiment, one hour.

III. Influence of Pole Separation upon the Precipitation of Zinc.

	Zinc taken.	Zinc deposited.	Free acid.	H_2O.	OH gas per minute.	Time.	Distance between poles.
	Grams.	Grams.	c.c.	c.c.	c.c.	Hours.	cm.
(1)	.0102	.0046	10	700	1.9	3	1.58
(2)	"	.0023	"	"	"	"	3.16
(3)	"	.0015	"	"	"	"	6.33
(4)	"	.0003	"	"	"	"	12.66

Area of electrodes (3.8 cm. × 3.48 cm.) × 2. The deposit was firm and compact. Compared with the results obtained with copper and cadmium, the result in (4) is too low.

Lead (Determined Electrolytically).

On account of tendency of lead and manganese to separate in the form of peroxide at the positive pole, it was deemed advisable to make a series of experiments on the metals themselves before attempting to effect their separation. The results were as follows:

	Lead taken.	Lead found.	Free acid.	H_2O.	OH gas per minute.	Time.	Difference from theory.
	Grams.	Grams.	c.c.	c.c.	c.c.	Hours.	
(1)	.1153	....	5	100	1.	16	....
(2)	"	....	20	"	1.2	48	....
(3)	"	....	5	"	2.8	3	....
(4)	"	....	20	"	"	16	....

50 c.c. of a lead formate solution were used in each of the above experiments. In all of them, the lead was deposited in a spongy state at the kathode with more or less peroxide on the positive pole.

As the moist metal deposited on the kathode rapidly oxidizes, even when adherent and compact, the results obtained are invariably too high and in practice it is customary to estimate lead as peroxide on the anode securing its deposition in that form by the addition of nitric acid to the solution. The results obtained with free formic acid, as given above, were not such as to justify attempting its separation from either copper, cadmium or zinc.

Manganese (Determined Electrolytically).

	Manganese taken.	Manganese found.	Free acid.	H_2O.	OH gas per min.	Time.	Difference from theory.
	Grams.	Grams.	c.c.	c.c.	c.c.	Hours.	Percentage.
(1)	.0554	.0552	5	100	2.2	17	—.36
(2)	"	.0556	"	"	2.7	18	+.36
(3)	.1108	.1101	20	"	2.8	24	—.63
(4)	.0554	....	30	"	1.6	16	....

The platinum dish was made the anode, the wire spiral serving as the negative pole. With small quantities of free acid, (1) and (2), considerable peroxide of manganese, separated on both poles, with larger quantities, (3) (4), only very slight traces were found on the kathode. The deposition in (4) was not complete. The peroxide formed a black, lustrous coating on the dish, adherent while moist, but scaling off upon being heated.

The manganese which separated on the kathode was removed by means of a small piece of filter paper, which was ignited and the ash added to the contents of the dish, which was then raised to an intense heat in order to convert the peroxide of manganese into Mn_3O_4, in which form it was finally weighed. Traces of Mn were found in solution (3).

ELECTROLYTIC SEPARATIONS.

Cadmium from Manganese.

	Cadmium taken.	Manganese taken.	Cadmium found.	Free acid.	H_2O.	OH gas per min.	Time.	Difference from theory.
	Grams.	Grams.	Grams.	c.c.	c.c.	c.c.	Hours.	Percentage.
(1)	.0497	.0554	.0425	35	75	.8	16	....
(2)	"	"	.0440	"	"	1	"	....
(3)	"	"	.0498	25	"	2.7	17	+.20
(4)	.0511	"	.0509	20	"	2.4	19	—.39
(5)	"	"	.0697	5	150	2.7	18	....
(6)	.1022	.1108	.1098	20	75	2.5	17	....
(7)	"	"	....	40	150	2.8	45	...
(8)	.0511	.0554	.0514	30	75	2.7	18	+.58

In the preliminary experiments on manganese alone, it was found that the presence of 20 c.c. of free acid was sufficient to prevent the deposition of any peroxide on the kathode, except in the very slightest traces; but the presence of cadmium in the solution seemingly had a contrary effect, as the presence of even 40 c.c. of acid failed to prevent the separation of traces of manganese on the negative pole (7). In (5), to which 5 c.c. of free acid had been added, the deposit of peroxide of manganese upon the negative pole was almost five times greater than in a solution of manganese to which no cadmium had been added, all the other conditions being the same. In all the above experiments the platinum dish was used as the anode, the platinum crucible serving as the negative electrode. In (1) and (2) the cadmium was not completely deposited. Traces of cadmium were found in (6) and (7). More or less manganese was found in all the deposits, but only in traces in the presence of more than 20 c.c. of free acid; (4) and (7) were very spongy; the others were slightly so at the periphery of the crucible, but adherent. The best results were obtained by fulfilling the conditions described in (3), (4) and (8); but to obtain a compact deposit of cadmium free from all traces of manganese, it is evident that the amount of free acid must be increased and the poles separated. Under these conditions, a stronger current must be employed than that furnished by the battery of "crowfoot" cells, with which my experiments were carried on.

Zinc from Manganese.

	Zinc taken.	Manganese taken.	Zinc found.	Free acid.	H_2O.	OH gas per min.	Time.	Difference from theory.
	Grams.	Grams.		c.c.	c.c.	c.c.	Hours.	Percentage.
(1)	.0562	.0554	....	30	90	2.9	17	....
(2)	"	"	....	20	100	"	16	....

The dish served as anode, the crucible as kathode. Both were failures; the zinc being spongy and containing MnO_2 and not entirely precipitated.

Copper from Zinc.

	Copper taken.	Zinc taken.	Copper found.	Free acid.	H_2O.	OH gas per min.	Time.	Difference from theory.
	Grams.	Grams.	Grams.	c.c.	c.c.	c.c.	Hours.	Percentage.
(1)	.1074	.0818	....	5	100	1.8	46	....
(2)	"	"	....	"	"	1.2	17	....
(3)	"	.1124	....	"	"	.8	16	....
(4)	"	.0818	.1072	15	"	"	"	—.18
(5)	"	"	.1073	20	"	"	17	—.09
(6)	.0987	"	.0990	"	"	"	"	+.30
(7)	"	"	.0984	"	"	.6	16	—.30
(8)	.1057	.1006	.1052	15	"	.8	"	—.47
(9)	"	"	.1061	"	"	"	18	+.37
(10)	"	"	.1058	"	150	"	"	+.09
(11)	"	"	.1059	20	"	"	19	+.18
(12)	"	"	.1053	"	"	"	21	—.37
(13)	"	"	.1060	"	"	"	16	+.28

As will be seen from the above, it was possible to separate copper free from zinc, except the slightest traces, by using a weak current in solutions to which 15–20 c.c. of free formic acid had been added. By employing stronger currents, or diminishing the amount of free acid, the copper was deposited admixed with considerable quantities of zinc. If the necessary precautions are observed no zinc will be deposited, and the copper will be compact and adherent.

Cadmium from Zinc.

	Cadmium taken.	Zinc taken.	Cadmium found.	Free acid.	H_2O.	OH gas per min.	Time.	Difference from theory.
	Grams.	Grams.	Grams.	c.c.	c.c.	c.c.	Hours.	Percentage.
(1)	.1231	.0818	....	15	100	.2	17	....
(2)	"	"	.1229	30	"	.8	19	—.16
(3)	"	"	.1234	"	"	"	43	+.24
(4)	"	"	.1426	35	"	1.25	16	+15.83
(5)	"	"	.1233	30	"	.8	"	+.16
(6)	.0492	.0409	....	15	"	"	"	....
(7)	"	"	.0842	"	"	1.25	"	....
(8)	.0984	.1026	.0322	35	"	.8	19	....
(9)	.0492	.0409	.0494	15	"	"	41	+.40
(10)	.0984	.1026	.1735	35	75	1.25	17	....
(11)	"	"	.0722	"	"	.8	"	....
(12)	"	"	.0982	25	125	"	18	—.20
(13)	"	"	.0985	"	"	"	16	+.10
(14)	.1004	.1006	.1001	"	"	1.	48	—.29
(15)	"	"	.0993	"	"	"	17	—1.09
(16)	"	"	.1000	"	"	"	"	—.39
(17)	"	"	.1001	"	"	"	18	—.29
(18)	"	"	.1008	"	"	"	20	+.39
(19)	"	"	.0999	"	"	"	16	—.49

The first seven determinations were made in a platinum dish weighing about 67 grams; the remainder in a much larger dish weighing 117 grams. The results obtained with the latter were not as satisfactory as with the smaller dish (2) (3) (5), although a qualitative examination of the deposit and solution proved that the separation was complete (9) (12–19). The distance between the poles materially influences the results. In (6) the positive pole was in close contact with the dish; the cadmium contained zinc. In (9) the conditions were similar in all respects to the preceding, except that the distance between the poles was 2.5 cm.; the deposit was free from zinc. With .2 c.c. OH gas per minute, only a small quantity of the cadmium was separated (1), the greater portion remaining in solution. With 1.25 c.c., on the other hand, the zinc was deposited as a dark-gray coating upon the cadmium (7), even in the presence of 35 c.c. of free acid (10). In solutions containing .10 grams of each metal a current of .8–1 c.c. HO gas per minute sufficed to secure a satisfactory deposit in the presence of 25 c.c. formic acid (12–19). With smaller quantities of metal (9) 15 c.c. of free acid was sufficient. The deposits in the above experiments were adherent and compact. There was no tendency to sponginess even in deposits containing large quantities of zinc.

Copper from Cadmium.

Copper taken.	Cadmium taken.	Metal deposited.	Free acid.	H_2O.	OH gas per min.	Time.	Difference from theory.
Grams.	Grams.	Grams.	c.c.	c.c.	c.c.	Hours.	Percentage.
.1074	.0984	.2061	10	100	.8	17	....

This result was not unexpected, considering what we have already learned in regard to the behavior of these metals. The deposit was very dark and spongy. Both metals were completely precipitated. Two subsequent experiments were equally unsatisfactory ; in one the current was reduced to .3 c.c. OH gas per minute ; in the other, 25 c.c. of formic acid was added. No separation was effected.

Copper from Iron.

	Copper taken.	taken.	Copper found.	Free acid.	H_2O.	OH gas per min.	Time.	Difference from theory.
	Grams.	Grams.	Grams.	c.c.	c.c.	c.c.	Hours.	Percentage.
(1)	.1057	.1248	.1035	25	125	.8	20	....
(2)	"	"	....	"	150	"	42	....
(3)	"	"	.1019	"	"	"	19	....
(4)	"	"	.0999	"	"	"	17	....
(5)	"	"	.1014	"	"	"	18	....

Although free acid was present in considerable quantity (25 c.c.), the formate of iron in the solution was decomposed with the formation of ferric hydrate, which separated as a light yellow froth on the surface of the solution. It also formed crusts at the edge of the copper deposit, which adhered to the dish with such tenacity that all attempts at removal by mechanical means were failures. Mere washing was without avail, and more energetic measures resulted in a loss of copper, (1) and (4). Dilute hydrochloric acid was added to (2) ; but, while it dissolved traces of copper, it failed to remove the deposit of iron hydrate. Dilute sulphuric acid was also tried without success (3). In the final determination 20 c.c. of concentrated oxalic acid was added at the end of seventeen hours and the current allowed to act one hour longer. The froth floating on the surface was dissolved, but the deposit on the copper was not appreciably affected. Except at the periphery the copper had a bright metallic lustre and was firm and adherent.

Cadmium from Iron.

	Cadmium taken.	Iron taken.	Cadmium found.	Free acid.	H_2O.	OH gas per min.	Time.
	Grams.	Grams.	Grams.	c.c.	c.c.	c c.	Hours.
(1)	.0984	.1248	.0996	25	150	.8	23
(2)	"	"	.1021	"	"	"	45

The same trouble was experienced here. Similar attempts were made to remove the iron, but without success. In the first of the above determinations 10 c.c. of oxalic acid solution was added before the conclusion of the experiment ; in the latter, 20 c c. of the same solution.

The hydrate of iron in the solution disappeared, but adherent crusts still remained on the surface of the cadmium.

Zinc from Iron.

Several tentative experiments were made, but as the iron showed the same tendency to separate on the sides of the dish, as in the preceding determinations, they were not continued.

Copper from Cobalt.

	Copper taken.	Cobalt taken.	Copper found.	Free acid.	H_2O.	OH gas per min.	Time.	Difference from theory.
	Grams.	Grams.	Grams.	c.c.	c.c.	c.c.	Hours.	Percentage.
(1)	.1101	.1080	.1105	100	175	1	21	+.36
(2)	"	"	.1095	"	"	"	17	—.54
(3)	"	"	.1097	"	"	"	"	—.36
(4)	"	"	.1107	"	"	"	18	+.54
(5)	"	"	.1098	"	"	1.2	17	—.27
(6)	"	"	.1097	"	"	1	16	—.36

On attempting to prepare a solution of cobaltous formate for the above determinations, it was found that the salt made according to the method already described was not readily soluble in water. The solution was therefore prepared by double decomposition as follows: 500 c.c. of water containing 6.563 grams of sodium formate was mixed with an equal amount of water in which 8.728 grains of cobalt chloride had been dissolved.

Of this solution 50 c.c. was taken, containing .1080 grams of cobalt. The distance between the poles was 3.8 cm. except (1) and (4) in which it was 2.8 cm. Both of the latter were spongy; the others slightly so. As the conditions, otherwise, were similar, the difference in the character of the deposits was apparently due to the separation of the poles. Traces of cobalt were found in all the copper deposits. The copper was all out except in (3), (5) and (6), in which the solutions were colored yellowish brown on the addition of hydrogen sulphide.

The copper deposit was dark in color and adherent, although not very compact on the bottom of the dish.

Copper from Nickel.

	Copper taken.	Nickel taken.	Copper found.	Free acid.	H_2O.	OH gas per min.	Time.	Difference from theory.
	Grams.	Grams.	Grams.	c.c.	c.c.	c.c.	Hours.	Percentage.
(1)	.1101	.1028	.1095	75	175	1	20	—.54
(2)	"	"	.1097	100	"	"	17	—.36
(3)	"	"	"	"	"	"	18	—.36
(4)	"	"	.1098	"	"	1.2	17	—.27
(5)	"	"	.1096	"	"	1	"	—.46
(6)	"	"	.1098	"	"	"	"	—.27

The same trouble was experienced in preparing a satisfactory solution of pure nickel formate as with cobalt and it was found advisable to prepare the solution by double decomposition in the same way as the latter salt, 500 c.c. of this solution contained 8.3077 grams of nickel chloride and 6.2469 grams of sodium formate. In both cases a slight excess of sodium formate was used. The copper contained traces of nickel and slightly colored the solution when tested with hydrogen sulphide. The conditions were similar to those given under cobalt and the results were quite as satisfactory. The copper was bright and compact.

Cadmium from Cobalt.

	Cadmium. taken.	Cobalt. taken.	Cadmium found.	Free acid.	H_2O.	OH gas per min.	Time.	Difference from theory.
	Grams.	Grams.	Grams.	c.c.	c.c.	c.c.	Hours.	Percentage.
(1)	.0984	.1080	....	25	100	.5	22	....
(2)	"	"	....	"	150	.8	45	....
(3)	"	"	....	50	"	1.5	18	....

It was naturally expected that cadmium would be completely precipitated from cobalt and nickel by employing a weak current, but from an examination of the above results, it will be seen that a separation was not accomplished.

Even with a current of 1.5 c.c. OH gas per minute, the cadmium failed to deposit completely and was contaminated with cobalt (3). (1) was very spongy and the solution still contained cadmium at the expiration of 22 hours. The current was then increased and allowed to act for 45 hours (2). Cadmium was found in the solution, cobalt in the deposit. The distance between the electrodes was 2.8 cm.

Cadmium from Nickel.

	Cadmium taken.	Nickel taken.	Cadmium found.	Free acid.	H_2O.	OH gas per min.	Time.	Difference from theory.
	Grams.	Grams.	Grams.	c.c.	c.c.	c.c.	Hours.	Percentage.
(1)	.0984	.1028	.0758	35	150	.5	19	....
(2)	"	"	.1045	"	"	1.5	21	....
(3)	"	"	.1348	50	125	1.5	17	....

The results were quite as unsatisfactory as with cobalt. Cadmium was found in all three solutions, and more or less nickel was found in the deposits. In (3) the nickel came out as a gray deposit on the cadmium. The deposit was firm and adherent, although dark in color. The distance between the electrodes was 2.5 cm., except (3), in which the pole separation was 2.8 cm.

Zinc from Cobalt.

	Zinc present.	Cobalt present.	Zinc found.	Free acid.	H_2O.	OH gas per min.	Time.	Difference from theory.
	Grams.	Grams.	Grams.	c.c.	c.c.	c.c.	Hours.	Percentage.
(1)	.1006	.1080	....	50	175	3	17	....
(2)	"	"	....	100	"	5	18	....

Zinc from Nickel.

	Zinc present.	Nickel present.	Zinc found.	Free acid.	H_2O.	OH gas per min.	Time.	Difference from theory.
	Grams.	Grams.	Grams.	c.c.	c.c.	c.c.	Hours.	Percentage.
(3)	.1006	.1028	....	50	175	2.7	18	....
(4)	"	"	....	100	"	5	"	....

(2) and (4) were performed under similar conditions. The distance between the poles was 2.2 cm. The current was generated by a battery of Bunsen cells. Even with a current of 5 c.c. gas per minute zinc was found in the solution in traces, while considerable quantities of cobalt and nickel separated as a coating upon the cadmium. (1) and (3) were also failures. A separation was not obtained even approximately.

Summary.

As a result of the foregoing experiments, it was found that the amount of copper, cadmium or zinc deposited in a given time was proportional to the strength of the solution, and that the presence of free acid in moderate quantity did not materially affect the result.

Increasing the distance between the poles resulted in diminishing the amount of metal deposited, but the rate of decrease diminished as the distance between the electrodes increased.

Elevation of temperature caused an increase in the amount of metal deposited, the rate of increase being greatest at 80° in neutral and acid copper solutions, and at 60° in cadmium solutions containing free acid. On the other hand, the amount of zinc deposited in solutions, to which free acid had been added, diminished as the temperature rose, nothing being deposited at 80°.

Attempts to secure compact and adherent deposits of cadmium and zinc in neutral solutions were failures.

In acid solution copper and cadmium separated completely and satisfactorily. The zinc deposits were spongy, but the precipitation was complete.

Lead was mainly deposited on the negative pole, both in neutral and acid solutions. Manganese was precipitated on both poles, but the amount of peroxide separating on the kathode was reduced to mere traces by the presence of free acid.

The following separations were satisfactorily accomplished: copper from zinc, cobalt and nickel and cadmium from zinc and manganese.

Attempts to deposit copper in the presence of iron and cadmium, and zinc in the presence of iron, cobalt and nickel, were successful. Nor was it possible in the presence of the last three metals named to estimate cadmium.

In conclusion, I wish to express my obligations to Prof. Edgar F. Smith, at whose suggestion the work was undertaken. To his supervision and advice is largely due whatever value may attach to these results.

Stated Meeting, September 4, 1891.

Present, 3 members.

President, Mr. FRALEY, in the Chair.

Letters of acceptance of membership were received from Dr. Caspar René Gregory, Leipzig, Germany; Dr. E. T. Hamy, Prof. E. Mascart, Dr. Julius Oppert, Prof. A. De Quatrefages, Paris, France; Prof. W. Cawthorne Unwin, Kensington, England; Rt. Rev. William Stubbs, D.D., LL.D., Bishop of Oxford, England; Sir Robert S. Ball, Dublin, Ireland; Prof. Charles E. Monroe, Newport, R. I.; Prof. Henry W. Spangler, University of Pennsylvania.

Dr. Harrison Allen, of Philadelphia, resigned by letter from membership in the Society.

On motion, the resignation was accepted.

Letters of envoy were received from the Geological Survey of India, Calcutta; Académie Royale des Sciences, Amsterdam; Société Royale des Sciences, Upsal; Naturforschende Verein, Brünn, Austria; K. Geodätische Institut, Berlin; Schlesische Gesellschaft für Väterlandische Cultur, Breslau; Verein für Naturkunde, Cassel; K. Sächs. Meteorologische Institut, Chemnitz; Siebenbürgische Verein für Naturwissen, Hermanstadt; Leopoldinisch-Carolinische Akadémie, Halle; Societa Italiana Delle Scienze, Rome; Société des Antiquaires de Picardie, Amiens; Académie des Sciences, Arts et Belles-Lettres, Caen; Musée Guimet, Ecole Polytechnique, Bureau des Longitudes, Paris; Manchester Literary and Philosophical Society; Meteorological Office, London; Royal Irish Academy, Dublin; Smithsonian Institution, Washington.

Letters of acknowledgment were received from the Geological Survey of India, Calcutta (134); Tokyo Library, Anthropological Society, Asiatic Society of Japan, Tokyo (134); Comité Geologique de la Russie, St. Petersburg (134); Dr. Otto Donner, Helsingfors, Finland (134); Royal Danish Geographical Society (131–134), Prof. J. S. Steinstrup (134), Copenhagen; K. K. Central-Anstalt für Meteorologie, etc., Drs. A. Brezina, E. Suess, Friederich Müller, Vienna (134); Hungarian Academy of Sciences (128–131), Prof. Paul Hunfalvy, Budapest (130–133); Naturforschende Gesellschaft des Osterlandes, Altenberg (134); Gesellschaft für Erdkunde (134), K. Geodätische Institut, Berlin (131–134); Naturhistorische Verein, Bonn (129); Naturwissenschaftliche Verein, Bremen (134); K. Sächsische Meteorologische Institut, Chemnitz (131–134); Naturforschende Gesellschaft, Emden (134); Naturwissenschaftliche Verein des Reg.-Bez., Frankfurt (130); Dr. A. Weisbach, Freiberg (134); K. Leopoldinisch-Carolinische Akademie, Halle a. S. (109, 130–133, and Trans., xiv, 3); Geographische Gesellschaft (131), Deutsche Seewarte (131–134), Hamburg; Prof. Hermann Kopp, Heidelberg (131–134); Naturhistorische Gesellschaft, Hannover (134); K. Sächsische Gesellschaft der Wissenschaften, Dr. Julius Platzman, Prof. J. Victor Carus, Dr. Otto Böhtlingk, Leipzig (134); Naturwissenschaftliche Verein, Osnabrück (131–134); K. Sternwarte, München (134); Verein für Vaterländische Naturkunde, Würtemberg (129, 130).

Accessions to the Library were announced from the Institut Egyptien, Cairo; Geological Survey of India, Calcutta; Government Astronomer, Madras; Norwegische Meteorologische Institut, Christiania; Société Roumaine de Geographie, Bucharest; Nederlandsche Botanische Vereeniging, Nijmegen; Friessch Genootschap voor Geschied, etc., Leuwarden; Académie Royale des Sciences, Prof. Ad. De Ceuleneer, Bruxelles; Augustus R. Grote, Bremen; Tudományos Akademia, Budapest; Ostschweizerische Geogr.-Commerc. Gesellschaft, St. Gall; M. Ferdinando Borsari, Naples; M. A. Del Bon, Padua; Profs. Léon de Rosny, Emile Schwærer, Edward Pepper, Paris; Le Comte de Charencey, St. Maurice; Mr. Samuel Timmins, Coventry, England; Philosophical and Literary Society, Leeds; Mr. James L. Bowes, Liverpool; Meteorological Council, Society for Psychical Research, Profs. Joseph Prestwich, Thomas E. Pickett, London; Nova Scotian Institute of Natural Science, Halifax; Hemenway Expedition, Mr. Robert T.

Swan, Boston; Scientific Alliance, American Museum of Natural History, Prof. Edward V. D'Invilliers, New York; Empire State Association of Deaf-mutes, Rome, N. Y.; Mr. William E. Griffis, Schenectady; Mr. Charles Earle, Princeton; Mr. Samuel F. Bigelow, Newark; Geological Survey of New Jersey, Trenton; Academy of Natural Sciences, Hon. Charles O'Neill, Messrs. R. Meade Bache, Henry Phillips, Jr., Drs. J. C. Morris, Charles A. Oliver, Persifor Frazer, J. E. Ives, Edmund J. James, W. S. W. Ruschenberger, Miss Emily Phillips, Philadelphia; Wyoming Historical and Geological Society, Wilkesbarre; Historical Society of Delaware, Wilmington; Department of the Interior, Smithsonian Institution, Col. Garrick Mallery, Messrs. A. C. Peale, W. H. Seaman, Lester F. Ward, Washington, D. C.

A photograph of the Mansion and Graves of the Penn family, in England, was received from Mr. F. Gutekunst, Philadelphia.

Photographs for the Society's Album were received from Mr. Samuel Timmins, Coventry, England; Mr. Louis Vossion, Philadelphia, and Prof. Robert W. Rogers, Carlisle, Pa.

The death of James Russell Lowell (Boston, Mass., August 12, 1891, æt. 72) was announced.

Pending nominations 1230 and 1231 were read.

And the Society was adjourned by the President.

Stated Meeting, September 18, 1891.

Present, 2 members.

President, Mr. FRALEY, in the Chair.

Letters of envoy were received from the Colonial Museum of New Zealand, Wellington; Observatoire Physique Central, St. Petersburg; Université Royale de Norvége, Christiania; Musée Teyler, Harlem, Holland; K. Preussische Meteorologische Institut, Berlin; Musée Guimet, Paris; Royal Observatory, Greenwich; Zoölogical and Royal Statistical Societies, London; Bureau of Statistics of Labor, Boston; U. S. Coast and Geodetic Survey, Washington.

Letters of acknowledgment were received from the Naturforschende Gesellschaft, Bern (134); University, Basle (134); Société Royale de Zoologie Natura Artis Magistra (134), Academie Royale des Sciences (127–130, and Trans., xvi, 2, 3), Amsterdam; Royal Library, (134); K. Zoologische-Botanische Genootschap, 'S Gravenhage (134); Royal Netherland Museum of Antiquities, Leiden (134); K. Danske Videnskabernes Selskab, Copenhagen (130, 131, and Trans. xvi, 3); Société Royale des Sciences, Upsal (125–129); Bibliothèque Royale de Belgique, Bruxelles (131–133); Marquis Antonio de Gregorio, Palermo (134); R. Accademia di Scienze, etc., Modena (125–129 and Trans. xvi, 2); Università, Pisa (134); R. Comitato Geologico, Rome (134); R. Bibliotica N. C., Firenze (134); R. Osservatorio, Turin (134); Société Linnéene, Bordeaux (134); Prof. Lucien Adam, Rennes, France (134); Bureau Centrale Météorologique (131–134), Société D'Anthropologie, "Cosmos," Marquis de Nadaillac, M. A. Des Cloizeaux, Paris (134); Sir Henry Thompson, London (134); Mr. Samuel Timmins, Coventry, England (134); Philosophical Society, Prof. Dr. J. P. Postgate, Cambridge, England (134); Royal Institution, Victoria Institute, Royal Astronomical Society, Linnean Society, Royal Society, Society of Antiquaries, London (134); Geographical Society, Manchester (131–134); Natural History Society of Northumberland, Durham and Newcastle-upon-Tyne (134); Royal Dublin Society (134); Prof. James Geikie, Royal Observatory, Royal Society, Royal Scottish Geographical Society, Edinburgh (131–133); Free Public Library, Jersey City (131–134); Prof. Thomas Chase, Providence (131–133); Drs. E. D. Cope, W. G. A. Bonwill, J. M. Maisch (134), "National Baptist," Philadelphia; University of California, Prof. Joseph Le Conte, Berkeley, Cal. (134); Prof. Daniel Kirkwood, Riverside, Cal. (134); Free Public Library, Mr. George Davidson, San Francisco (134).

Letters of acknowledgment (135) were received from the Canadian Institute, Toronto; Geological Survey, Ottawa; Mr. Horatio Hale, Clinton; Nova Scotian Institute of Natural Science; Maine Historical Society, Society of Natural History, Portland; Vermont Historical Society, Montpelier; Prof. C. H. Hitchcock, Hanover, N. H.; Massachusetts Historical Society, State Library of Massachusetts, Hon. Robert Winthrop, Mr. Hamilton A. Hill, Boston; Museum of Comparative Zoölogy, Mr. Robert N. Toppan, Prof. J. D. Whitney, Cambridge, Mass.; Essex Institute, Salem; Free Public Library, New Bedford; Dr. Pliny Earle, Northampton; American Antiquarian Society, Worcester; Rhode Island Historical Society, Providence Franklin Society, Providence; Prof. Charles E. Monroe, Newport; New Haven Colony Historical Society; Connecticut Historical Society, Hartford; Buffalo Library; Prof. E. North, Clinton, N. Y.; Profs. T. F. Crane, J. M. Hart, B. G. Wilder, Ithaca; Vassar Brothers Institute, Poughkeepsie; Oneida Historical Society, Utica; U. S. Military Academy, West Point; Prof. Henry M. Baird, Columbia College, Astor Library, American Museum of Natural History, New York Hospital, Academy of Medicine, University of the City of New York, Historical Society, Meteorological Observatory, Prof. J. J. Stephenson, Capt. R. S. Hayes, New York; Rev. Joseph F. Garrison, Mr. Isaac C. Martindale, Camden; Free Public Library, Jersey City; New Jersey Historical Society, Newark; Nassau Hall Library, Prof. C. A. Young, Princeton; Dr. R. H. Alison, Ardmore; Prof. Martin H. Boyé, Coopersburg; Hon. Eckley B. Coxe, Drifton; Dr. Traill Green, Profs. J. N. Moore, Thomas C. Porter, Easton; Mr. Andrew S. McCreath, Harrisburg; Mr. Ario Pardee, Hazleton; Mr. John Fulton, Johnstown; Linnean Society, Lancaster; Mr. Peter F. Rothermel, Linfield; Prof. John F. Carll, Pleasantville; Mr. Heber S. Thompson, Pottsville; Rev. F. A. Mühlenberg, Reading; Mr. M. Fisher Longstreth, Sharon Hill; Philosophical Society, Messrs. William Butler, Philip P. Sharples, West Chester; Mr. Thomas Meehan, Germantown; Wagner Free Institute of Science, Academy of Natural Sciences, Zoölogical Society, Pennsylvania Hospital, Library Company of Philadelphia, Messrs. R. L. Ashhurst, John Ashhurst, Jr., R. Meade Bache, W. G. A. Bonwill, Charles Bullock, Cadwalader Biddle, S. Castner, E. D. Cope, J. Solis Cohen, Thomas M. Cleeman, Paterson Du Bois, Robert P. Field, Persifor Frazer, George Freebis, Frederick A. Genth, Frederick A. Genth, Jr., H. D. Gregory, Joseph S. Harris, Lewis M. Haupt, William A. Ingham, W. W. Jefferis, John Marshall, J. W. Maisch, James T. Mitchell, Charles A. Oliver, Franklin Platt, Robert Patterson, C. Stuart Patterson, C. N. Peirce, Henry Phillips, Jr., William Pepper, Frederick Prime, Theodore D. Rand, W. S. W. Ruschenberger, L. A. Scott, Coleman Sellers, Carl Seiler, Albert H. Smyth, H. W. Spangler, H. C. Trumbull, W. P. Tatham, D. K. Tuttle, Talcott Williams, Joseph Wharton, Louis Vossion, Philadelphia; Maryland Historical Society, Peabody Institute, Institute for the Promotion of the Mechanic Arts, Baltimore; U. S. Naval Institute, Annapolis; Smithsonian Institution, Weather Bureau, U. S. Coast and Geodetic Survey, U. S. Geological Survey, U. S. Naval Observatory, Anthropological Society, Mr. W. B. Taylor, Surgeon-General's Office, Dr. A. S. Gatschet, Major J. W. Powell, Prof. Herman Haupt, Capt. Thomas Jefferson Lee, Washington, D. C.; University of Virginia; Leander McCormick Observatory, Charlottesville; Virginia Historical Society, Richmond; Mr. Jed. Hotchkiss, Staunton; Georgia Historical Society, Savannah; Cincinnati Society of Natural History; Cincinnati Observatory; Prof. E. W. Claypole, Akron, O.; Dr. Robert Peter, Lexington, Ky.; Athenæum, Columbia, Tenn.; Geological Survey of Missouri, Jefferson City; Prof. J. C. Branner, Little Rock, Ark.; Col. William Ludlow, Detroit; Wisconsin State Historical Society, Madison; Davenport Academy of Sciences; Kansas State Historical Society, Topeka; Colorado Scientific Society, Denver; University of California, Prof. Joseph Le Conte, Berkeley; Lick Observatory, Mt. Hamilton, Cal.; Prof. Daniel Kirkwood, Riverside, Cal.; Mr. George Davidson, San Francisco; Observatorio Astronomico Nacional Mexicano, Tacubaya; Sociedad Cientifica, "Antonio Alzate," Mexico; Bishop Crescencio Carrillo, Merida, Yucatan.

Accessions to the Library were announced from the Comité de Conservation des Monuments de L'Art Arabe, Cairo, Egypt; Royal Society of Tasmania; Secretary of Mines, Melbourne, Victoria; New Zealand Institute, Wellington; Tokyo Library; K. Akademie der Wissenschaften, St. Petersburg; M. O. A. L. Pihl, Christiania; Naturforschende Gesellschaft, Bamberg; K. P. Geodätische Institut, Association Géodésique Internationale, Berlin; Naturforschende Gesellschaft, Emden; Verein für die Geschichte und Altertumskunde, Erfurt; Naturwissenschaftliche Verein des Reg.-Bez., Frankfurt a. O.; K. Leopoldinisch-Carolinische Deutsche Akademie der Naturforscher, Halle a. S.; Schweizerische Naturforschende Gesellschaft, Bern; Société de Physique et d'Histoire Naturelle, Geneva; Biblioteca N. C. di Firenze; Direzione Générale della Statistica, Rome; Ministère de l'Instruction Publique et des Beaux Arts, Société Americaine de France, Paris; Dr. John Evans, Hemel Hempstead; Natural History and Antiquarian Society, Penzance; Royal Society, Edinburgh; Bureau of Statistics of Labor, Boston; Dr. J. S. Newberry, New York; Departments of Labor, State, War, Smithsonian Institution, Mr. Sanford Fleming, Washington, D. C.; Col. Charles C. Jones, Augusta, Ga.; Mr. William Harden, Savannah; Dennison University, Granville, O.

Pending nominations Nos. 1230 and 1231 were read.

And the Society was adjourned by the President.

Stated Meeting, October 2, 1891.

Present, 9 members.

Vice-President, Dr. RUSCHENBERGER, in the Chair.

Letters of envoy were received from the Naturforschende Verein, Brünn; K. P. Akademie der Wissenschaften, Berlin;

K. Sächsische Gesellschaft der Wissenschaften, Leipzig; Gesellschaft zur Beförderung der gesammten Naturwissenschaften, Marburg; Verein für Vaterländische Naturkunde in Würtemberg, Stuttgart; Museo Nacional de Buenos Aires; Oficina Meteorológica Argentina, Cordoba.

Letters of acknowledgment were received from the Imperial Academy of Science, Prof. Serge Nikitin, St. Petersburg (134); Societatea Geografica Românа, Bucharest (131–134); K. Danske Videnskabernes Selskab, Copenhagen (134); Université R. de Norvège, Christiania (128–134); Société Entomologique de Belgique, Bruxelles (134); Fondation de P. Teyler van der Hulst, Harlem (134); Naturforschende Verein in Brünn (128–133); Académie des Sciences, Cracow, Austria (134); Osservatorio Marittimo, Trieste (131–134); Section für Naturkunde des Ö. T. C., Vienna (134); K. Geodätische Institut (135), K. P. Meteorologische Institut (134), Deutsche Geologische Gesellschaft (135), Berlin; K. Sächsische Altertums Verein, Dresden (134); Naturwissenschaftliche Verein des Reg.-Bez., Frankfurt a. O. (134); Gr. Hess. Univ. Bibliothek, Giessen (129); K. Leopoldinisch-Carolinische Akademie, Halle a. S. (134); Verein für Thüringische Geschichte und Altertumskunde, Jena (134); Verein für Erdkunde, Metz (131–134); Dr. C. A. Dohrn, Stettin (134); Verein für Vaterländische Naturkunde in Würtemberg, Stuttgart (131–134 and Trans. xvi, 3); Prof. Johannes Dümichen, Strasbourg (134); Prof. Guido Cora, Turin (134); R. Accademia di Scienze, etc., Modena (134); Societa Africana D'Italia, Naples (131–134); R. Accademia di Scienze, etc., Padua (131–134); M. A. Des Cloizeaux, Dr. E. T. Hamy, Paris (135); Cte. de Charencey, St. Maurice les Charencey (134); Institution of Civil Engineers (129, 130), Sir James Paget (134), London; Mr. Alfred R. Wallace, Parkstone, England (131–134); Prof. Robert W. Rogers, Carlisle (135); Col. Garrick Mallery (135), Prof. C. V. Riley (134), Smithsonian Institution, Washington, D. C.; Museo Nacional, Dr. H. Burmeister, Buenos Aires (134); Instituto Fisico-Geografico Nacional, San José de Costa Rica (131–134); South African Philosophical Society, Cape Town (131–133).

Accessions to the Library were reported from the Tokyo Library; R. Accademia Degli Agiati, Rovereto, Austria; Naturwissenschaftliche Gesellschaft "Isis," Dresden; Société des Sciences Physiques et Naturelles, Bordeaux; Bureau des Longitudes, Paris; Société de Geographie, Toulouse; M. Nicholas Ball, Block Island, R. I.; New York Forest Commission, Albany; American Museum of Natural History, Prof. J. S. Newberry, New York; M. J. A. Udden, Rock Island, Ill.; Academy of Sciences, St. Louis; University of California, Sacramento; Observatorio Meteorologico-Magnetico Central, Mexico; Commissão Geographica e Geologica, San Paulo, Brazil; Museo Nacional Oficina Meteorologica Argentina, Buenos Aires; Direccion Central de Estadistica, Guatemala, C. A.

The death of D. Humphrey Storer, M.D., Boston, September 10, 1891, aged 87, was announced.

Prof. Cope offered a paper for the Transactions on the "Ophidians of North America," which was referred to Drs. Horn, Ryder and Heilprin.

Dr. Horn made a communication on the genus Calospaste.

Dr. Franz Boaz, of Worcester, Mass., presented through the Secretaries a paper entitled, "Vocabularies of the Tlingit, Haida, etc., Languages."

Prof. Cope made some remarks on the results of a late expedition to the Gallapagos islands.

Pending nominations Nos. 1230 and 1231 were read.

And the Society was adjourned by the presiding member.

Stated Meeting, October 16, 1891.

Present, 17 members.

Vice-President, Dr. Ruschenberger in the Chair.

Correspondence was submitted as follows:

A circular was received from the Local Committee on Organization of Pan-Republic Congress and Human Freedom

League, inviting the Society to its reunion on October 12 and 13, 1891, at the State House and Academy of Music.

A circular from the Naturhistorische Gesellschaft zu Nürnberg, announcing the celebration of its ninetieth year.

A circular from the Académie Royale des Sciences de Lisbonne, announcing the death of its Secretary, José Maria Latino Coelho, on August 29, 1891.

Mr. Paul Leicester Ford requested by letter the permission to consult the draft of the Declaration of Independence, now stored away with other valuable papers of the Society.

Letters from the President and Mr. W. S. Baker were read in support of the request.

On motion, the Curators were authorized to restore to a place in the fireproof building of the Society its manuscript of the Declaration of Independence in the autograph of Thomas Jefferson.

Dr. Hays moved as an amendment "that it be kept in a fireproof safe."

The amendment, being put to a vote, was not agreed to, and the original motion was adopted by the Society.

On motion, it was resolved that Mr. Ford be permitted to have access to the document in question in the presence of one of the Curators of the Society.

Letters of envoy were received from the Académie Royale des Sciences, etc., de Belgique, Bruxelles; Société des Sciences Physiques et Naturelles, Bordeaux; Bureau des Longitudes, École Polytechnique, Musée Guimet, Ministère des Travaux Publiques, Paris.

Letters of acknowledgment were received from the Royal Society of N. S. Wales, Sydney, Australia (134); Accademia degli Agiati, Rovereto, Austria (134); K. K. Naturhistorisches Hofmuseum, Dr. Aristides Brezina, Vienna (135); Dr. Caspar René Gregory, Leipzig (135); Académie des Sciences, Belles Lettres et Arts, Bordeaux (134); Société de Geographie, Lille, France (135); Ecole d'Agriculture, Montpellier (135); Muséum d'Histoire Naturelle (128); M. Victor Duruy, Prof. A. de Quatrefages, Paris (135); Natural History and Philosophical Society, Belfast (134); College of Pharmacy, Philadelphia (135); Central Meteorological Observatory, Mexico (135); Mr. Everard F. im Thurn, British Guiana (135).

Accessions to the Library were reported from the Société Royale de Géographie d'Anvers; Académie Royale des Sciences, Bruxelles; Geographische Gesellschaft, Bern; Naturhistorische Gesellschaft, Nürnberg; Accademia delle Scienze, Torino; Ministère des Travaux Publiques, Paris; Yorkshire Geological and Polytechnic Society, Halifax, England; Geological and Natural History Survey of Canada, Montreal Geological Society of America, Rochester, N. Y.; Free Public Library of Jersey City; Messrs. J. E. Ives, Henry Phillips, Jr., Pennsylvania Prison Society, Philadelphia; U. S. Department of Agriculture, U. S. National Museum, Washington, D. C.; Mr. W. Curtis Taylor, Tacoma, Wash.

A photograph was received for the Album from Dr. Caspar René Gregory, Leipzig.

The Committee appointed to examine Prof. Cope's paper, offered at the last meeting for the Transactions, reported that he desired to withdraw the same and recommended that the request be granted. On motion, the Society permitted the paper to be withdrawn.

The stated business of the meeting was then taken up, and pending nominations Nos. 1230 and 1231 were read, spoken to and balloted for.

The following minute was read from the Library Committee:

STATED MEETING, OCTOBER 10, 1891.

The Chairman was authorized to report to the Society the suggestion that the fireproof for the valuable books and papers heretofore ordered by a vote of the Society, which order was not executed because of the absence of any sufficient foundation for the fireproof, be now carried into effect, as the walls of the building appear to be entirely sufficient for that purpose.

On motion, the Library Committee respectfully requested the Curators to indicate to the Committee what cases they will need for the purposes mentioned by Dr. Morris to the Committee for the display of antiquities, etc.

Dr. Morris, on behalf of the Curators, stated the reasons why at present the Curators could not designate exactly how much was wanted; that much of the collections of the Society was as yet unpacked and temporarily inaccessible; that until the Curators knew how much space would be needed they could not designate it.

Mr. McKean moved that the Committee on Hall be requested to carry into effect the order of the Society, made several years ago, to procure a fireproof safe for the safe custody of the valuable books and papers of the Society, or to inform the Society, if they find such to be the fact, that the walls of the Society's building are not yet deemed strong enough to support such a safe.

Mr. DuBois inquired as to whether any limit had been placed as to the size and price of such a safe.

The Secretaries replied that in the original motion there was no limitation.

Dr. Cope suggested that a new base might have to be built to support so great a weight.

Dr. Greene suggested that several small safes might better serve the purpose than one large one.

Prof. Barker suggested that a vault could be erected in the basement of the Society's building as a receptacle for its documents.

On motion of Mr. McKean, the motion was referred to the Hall Committee.

All other business of the meeting having been disposed of, the Tellers reported the result of the voting for candidates to the Presiding Member, who declared that

2197. Prof. George Forbes, F.R.S., London,

2198. Mr. Joseph G. Rosengarten, Philadelphia,

had been duly elected members of the Society.

And the Society was adjourned by the President.

Stated Meeting, November 6, 1891.

Present, 31 members.

President, Mr. FRALEY, in the Chair.

Mr. Joseph G. Rosengarten, a newly elected member, was presented to the Chair and took his seat.

Correspondence was submitted as follows:

A letter of acceptance of membership from Mr. Joseph G. Rosengarten, Philadelphia.

A letter from Mr. William Curtis Taylor, requesting exchanges on behalf of the Tacoma Academy of Science, Tacoma, Wash. On motion, the Academy was ordered to receive Proceedings from No. 96 and Catalog.

A letter from Mr. Joseph G. Rosengarten, in behalf of various persons, requesting the Society to accept their gift of a marble relief portrait of the late Mrs. Emma Seiler, and to fix a time for its formal presentation. On motion of Mr. Dudley, the gift was accepted and the 20th of November was selected.

Letters of envoy were received from the Société Imp. Russe de Géographie, St. Petersburg; Institut Méteorologique de Roumanie, Bucharest; Meteorological Office, Royal Statistical Society, London; Royal Dublin Society, Royal Irish Academy, Dublin; Geological Survey of Pennsylvania, Harrisburg; Theological Seminary, Hartford, Conn.

Letters of acknowledgment (135) were received from Prof. Serge Nikitin, St. Petersburg; Anthropologische Gesellschaft, Vienna; Prof. Peter Ritter von Tunner, Leoben, Austria; Prof. Abel Hovelacque, Paris; Mr. Samuel Timmins, Arley, England; Philosophical Society, University Library, Cambridge, England; Victoria Institute, Linnean Society, Royal Society, Royal Meteorological Society, Messrs. C. Juhlin Dannfeld, P. L. Sclater, London; Manchester Geographical Society, Philosophical Society, Glasgow; Prof. Andrew A. Blair, Mr.

Joseph G. Rosengarten, Philadelphia; Kansas Academy of Science, Topeka.

Accessions to the Library were reported from the Société Imp. Russe de Géographie, St. Petersburg; Institut Météorologique de Roumanie, Bucharest; Bataviaasch Genootschap van Kunsten en Wetenschappen, Batavia; K. Akademie van Wetenschappen, Amsterdam; Instituto y Observatorio de Marina, San Fernando; Philological Society, Cambridge, England; Meteorological Council, London; Mr. Samuel Timmins, Arley, near Coventry, England; Mr. James B. Francis, Lowell, Mass.; Massachusetts Historical Society, Boston; Hartford Theological Seminary, Mr. J. A. Spalding, Hartford; Geological Survey of Pennsylvania, Harrisburg; American Society for Extension of University Teaching, University Marine Biological Association, Prof. Edwin J. Houston, MacCalla & Company, Philadelphia; Commissioner of Pensions, Bureau of Education, U. S. Commission of Fish and Fisheries, Dr. Albert S. Gatschet, Washington, D. C.

The death of Hon. William Morris Davis at Philadelphia, was announced as having occurred in October, 1891.

On motion of Secretary Brinton, the paper of Dr. Boaz, on "Indian Languages," was ordered to be printed in the Proceedings.

A communication on "The Electrolysis of Metallic Formates," by Hill Sloane Warwick, was presented by Secretary Barker.

Curator Patterson Du Bois presented the following report on the examination, by Mr. Paul Leicester Ford, of the autograph copy of the Declaration of Independence owned by the Society.

Notes on the Various Copies of the Declaration of Independence in Jefferson's Handwriting.

According to order the Society's copy of the Declaration of Independence was examined by Mr. Paul Leicester Ford, in the meeting room of the Society, on Wednesday, October 21, 1891, in my presence as Curator. The following facts were obtained from Mr. Ford.

There were nine known MS. copies of the Declaration :

1. Jefferson's original first draft is now in the possession of the Department of State at Washington. It contains five emendations by Franklin and two by John Adams.

2. On the 28th of June, 1776, a fair copy was submitted to Congress. It was discussed on the 3d and 4th of July, and passed late in the day of the 4th of July. There is no evidence that this copy, or any other, was signed, except by the regular official attests, on the 4th of July. All traces of this copy have been lost for many years. The engrossed copy now in the Department of State at Washington, which is, of course, not in Jefferson's handwriting, was signed on the 2d of August following—some of the signers not having been in or members of the Congress on the 4th of July, while others who were there and voted for the Declaration were not among the signers.

Between July 4th and 8th, Jefferson wrote copies as follows :

3. One for John Page.

4. One for George Wythe.

5. One for Edmund Pendleton.

6. One for Richard Henry Lee, the copy now in the possession of the American Philosophical Society, to which it was presented by Lee's grandson.

7. In 1825, Jefferson wrote that he had given a copy to Mazzei, who had subsequently given it to a French countess. Of this we know nothing further.

8. A fair copy was written for Madison, perhaps fifteen years or so after the copies made in 1776 were written. This is now in the possession of the Department of State.

9. In 1821, Jefferson wrote a copy which he inserted in his autobiography.

This Society has in its possession the letter, dated July 8, 1776, in which Jefferson presents to Richard Henry Lee the copy above numbered 6. Jefferson writes : "I enclose you a copy of the Declaration of Independence as agreed to by the House, and also as originally framed ; you will judge whether it is the better or worse for the critics." On July 21, Lee acknowledged it, and said : "I wish sincerely, as well for the honor of Congress as for that of the States, that the manuscript had not been mangled as it is." On this Mr. Ford observes : "In 1825, when this manuscript came into the possession of your Society, John Vaughan, who, I believe, was then your Secretary, wrote to Jefferson, asking him 'if it was the original draft.' To this Jefferson replied, stating it was not, but added : 'Whenever in the course of the composition, a copy became overcharged and difficult to be read with amendments, I copied it fair, and when that also was crowded with other amendments, another fair copy was made, etc. These rough drafts I sent to distant friends who were anxious to know what was passing. . . . Whether the paper sent to R. H. Lee was one of these, or whether, after the passage of the instrument, I made a copy for him with the amendments of Congress, may, I think, be known from the face of the paper.' An examination of the paper proves conclusively that it is the latter, to which has been added an endorsement in the handwriting of Richard Henry Lee, and marginal notes in the handwriting of Arthur Lee, both of which are attested by Richard Henry Lee, the grandson of the former, on the document itself. As Arthur Lee was absent from this country in 1776, and did not return to it till 1779, his notes must have been made subsequent to the latter date."

The underscoring and bracketing in the copies 3, 4, 5, 6 signify, then, that Congress either struck out or altered the phraseology of those passages.

Mr. Ford desires me to return his hearty thanks to the Society for the privilege of examining the manuscript. It seems to me that the Society is likewise indebted to Mr. Ford for the foregoing valuable information.

PATTERSON DU BOIS, *Curator.*

The Treasurer, Mr. Price, presented a report from the Michaux Committee, as follows:

TO THE AMERICAN PHILOSOPHICAL SOCIETY:

The Michaux Committee respectfully reports that at a meeting of the Committee, held on November 5, 1891, a letter was received from Dr. J. T. Rothrock, enclosing the following list of the subjects proposed for the Thirteenth Course of Lectures given under the auspices of the American Philosophical Society:

1. Vegetation of the Bahamas and Jamaica (illustrated).
2. Vegetation ot the Bahamas and Jamaica (illustrated).
3. Physical Geography of the Bahamas and Jamaica (illustrated).
4. Some Problems for the Future, arising from Forest Growth, Surface Drainage and State Lines.
5. Forestry in Pennsylvania.
6. Relation of Forests to the Surface of the Earth.
7. Some Points in Practical Forestry.

It is expected that the Lectures will be delivered in the Hall of the Academy of Natural Sciences, which has been kindly tendered to him by the Academy for that purpose.

The Committee approved of the proposition and requests the Society to make an appropriation of $255 out of the income of the Michaux fund to meet the expenses of the Lectures.

In January, 1890, the Society made an appropriation of $200, out of the income of the Michaux fund, to Prof. Heilprin, towards the expenses of his expedition to Mexico and Yucatan, and your Committee has just received from him a paper entitled "Observations on the Flora of Northern Yucatan," in the nature of a report to it of his botanical work in that country, which is herewith submitted as part of its report to be printed in the Proceedings of the Society.

The Committee submits the following resolutions, which it desires shall be passed by the Society.

Resolved, That the sum of two hundred and fifty-five dollars be appropriated out of the income of the Michaux fund towards the expenses of the Thirteenth Course of the "Michaux Forestry Lectures," by Dr. J. T. Rothrock.

Resolved, That the paper of Prof. Heilprin, entitled "Observations on the Flora of Yucatan," as well as the paper presented by Dr. Rothrock entitled "Some Observations on the Bahamas and Jamaica," in the nature of report to the Michaux Committee of his visit to these Islands in 1891, be printed in full in the Proceedings of the Society as part of the report of the Michaux Committee.

By order of the Board,

J. SERGEANT PRICE, *Secretary.*

The resolutions, as reported, were adopted by the Society.

Observations on the Flora of Northern Yucatan.

By Prof. Angelo Heilprin.

It is not a little singular that while the Mexican region as a whole has from the beginning of the century to the present day attracted the attention of botanists of all nations, and contributed more largely to the initial understanding of geographical botany than perhaps any other region of the globe, the Province or State of Yucatan should not have drawn to it a single botanist of note. Indeed, it is only in the last few years that any systematic effort has been made towards the determination of its flora, even the relationship of which has not yet been precisely ascertained. Grisebach, in his *Vegetation der Erde* (1884, Vol. ii, p. 301), dismisses the region with the bare statement that unfavorable climatic and physical conditions prevent luxuriance of vegetable development, and Hemsley, in his report upon the botany of Mexico and Central America, prepared for Godman and Salvin's *Biologia Centrali-Americana* (*Botany,* iv, p. 151, 1888), merely asserts our ignorance in the following words: "Before concluding this part, we may add that little is known of the details of the botany of Yucatan, except that it is very poor and scanty, and largely composed of plants that still bear long droughts without injury. The poverty of the flora is ascribed to the fact that the copious rains rapidly filter away through the porous limestone substratum." Drude, in his *Handbuch der Pflanzengeographie* (1890), ignores the region entirely. In view of this very limited knowledge of the flora of a country so interesting as is Yucatan, I venture to submit a few general observations which were hastily picked up during a field reconnaissance made in the early part of 1890 (late February and March), principally in the interests of geological and zoölogical research. The collection of plants, which serves as a basis for some of the determinations referred to in this paper, was made by Mr. Witmer Stone, one of my associates in exploration, to whom I am indebted for notes and remarks on distribution, etc. I desire in this place also to acknowledge my indebtedness for various favors to D. Emilio MacKinney, of Merida, Yucatan, the author of the now progressing *Nuevo Judio*,* who has kindly assisted me in the determination of species not in flower, and of which specimens could not readily be obtained for our collections, and also furnished the local or Maya names.

Perhaps the traveler's first surprise on landing in Yucatan is that his eyes do not immediately fall upon a line of lofty primeval forest; secondly, he may be distressed by the utter barrenness which at times distinguishes much of the region that is covered by the bush or "jungle." This is the condition throughout much of the dry season when the trees and bushes, instead of being buried in dense and brilliant verdure, are as bare as though they had just passed through the tail end of one of our northern winters. The more striking does this condition appear when it is recollected that the region under consideration is well within the tropics, but little elevated above the level of the sea, and seemingly well fitted for the development of a rich and luxuriant flora. In the region first visited by us—the flat limestone tract included between the seaboard and the capital city—the vegetation is monotonous to a high degree. There is little of that variety of form which we are accustomed to associate with the vegetation of the south—little or nothing of the life which astonishes by its exuberance. By far the greater number of the arboreal elements of the scrub—for it is more nearly scrub than either jungle or forest—belong to the group of the Leguminosæ, among which the *yaxhabin*† (a species of Cassia) and the dog-acacia or *subinché* (*Acacia cornigera*), with their abatis of thorns, stand out as prominent members. Beyond the presence here and there of one or more species of cactus (*Cereus Peruvianus*, *C. flagelliformis*, *Cactus opuntia*) and the vision of distant cocoa-palms and oranges, there is little to remind the stranger from the north that he is not traveling in his own country. There are no large foresters swinging garlands of evergreens to the breeze, no canopy of flowers to waft perfume to the air. All about are tree-like bushes, fifteen to twenty-five feet in height, thin and so spare in their foliage as to permit of but indifferent shade, and most of them stocked with a wonderful armor of hooks and thorns. There are few flowers on the interground, and what appear on the branches above are almost wholly of a yellow color—the flowers of the Cassia and of the numer-

* *El Nuevo Judio: Apuntes que serviran para la formacion de La Flora Yucateca.* Merida, 1889.

† Pronounced with the German pronunciation of the vowels, *yashabin*. The x which appears in many of the Maya or Yucatecan words, as in Uxmal, has the sound of *sh*.

ous associated Acacias. These may be taken to represent the white blossoms of our cherry and dogwood. Here and there the eye catches a glimpse of a solitary screw-pine, the ɔipil* of the Mayas (*Pandanus candelabrum*), a plant which seems to have pretty firmly engrafted itself upon the Yucatan flora.

Withal that is lacking to indicate a tropical flora there is equally little that is really distinctive of the northern woods; there are no oaks, maples, beeches, poplars, junipers, cedars or pines. Excepting the Acacias we failed to detect a single genus of northern forest trees.† Yet the total impression produced by the vegetation was one immediately suggestive of the north, and not of a flora intermediate in character between that of the north and that of the south. The largely denuded condition of the trees undoubtedly conduced towards this impression.

This is the picture of the limestone flats between Progreso and Merida, and of much of the region lying to the east, south and west of the capital city; it is the picture as we found it in the dry season, in the month of March, before nature had yet begun to respond to those refreshing influences which are the offering of the rainy season.‡ It was the tropical winter. But even at this season of the year there were pieces of landscape that were fragrant in their verdure. Wherever the hand of man had transformed the native scrub into the fertile, but ever dreary and monotonous, hennequen country, with its countless aloes (*Agave rigida?* var. *A. Sisalana*) planted in avenues of geometrical precision, the eye is sure to rest upon a number of scattered garden spots. They are the groves of the haciendas, and it is difficult to conceive of anything more brilliant or refreshing than these oases in what might be termed a fertile desert. The dense masses of foliage of the orange, *ramon* (*Brossimum alicastrum*), and one or more species of Ficus (*F. longifolia*), with their deepest tints of green, and the overarching plumes of the cocoanut, offer a sharp contrast to the bleak expanse of hennequen, and a picture of loveliness not soon to be forgotten.

Along the roadways and in the gardens of Merida numerous examples of the true arboreal vegetation of the tropics are to be met with. Conspicuous among these are the silk-cotton tree (*Bombax ceiba*) and the *bonete* or *kumché* (*Jacaratia Mexicana*), both of which assume the stately proportions of forest trees. At the time of our visit they were already in full fruit, although they as yet showed scarcely a vestige of leaf. This peculiarity, so novel to the stranger, was also true of most of the larger trees, such as the sapote (*Sapota achras*), pochote (*Eriodendron anfractuosum*), the so-called native cedar or cedro (*Cedrela odorata*), etc. The

* The Maya Ɔ, or reversed C, is pronounced as a short lingual tz.

† So many of the bushes and trees being destitute of leaf, and therefore largely unrecognizable, it is possible that more of the temperate forms are actually represented than appeared to us to be the case.

‡ Returning to Progreso in the early part of June, I found that the vegetation, although considerably advanced, was still backward as compared with that of the eastern lowland plains of major Mexico, and in every way much less luxuriant.

plum or siruela (*Spondias*) was also bearing heavily, but it still bore traces of flowering. One of the most ornamental trees of the roadside is the "southern pine" or *Casuarina*, which also thrives extensively in the open and windy sand spots of Progreso.

The tree which at the time of our visit gave the tone of luxuriance to the vegetation was the ramon (*Brossimum alicastrum*), the dense masses of whose foliage are a refreshing object in the street scenery of almost every town in northern Yucatan. It is extensively cultivated for horse and mule fodder, and thus frequently appears for cause stripped of its leaves for a height of thirty to forty feet. It then shows to advantage the brilliant contrast between its pale gray, almost white, trunk and the dark green of its crown. Plants with showy flowers were not numerous, and the flowers where occurring were not specially remarkable either for beauty or for fragrance. There were, however, one or two notable exceptions, which went far to redeem the reputation of the tropics. One of these was the tree known in the Maya language as *xkuiché*, which comprises the two species familiar to botanists as *Pachira alba* and *P. fastuosa*. Both forms were completely naked, except for the large tufts of red and white blossoms which were scattered over the branches. The tree is a favorite with the natives, and we met with it at numerous places along the open roadside; but its true home is the village garden. Scarcely less attractive in its display of flowers is the siricote (*Cordia Sebestana*), with its large and brilliant cups of scarlet, the abiding place of several species of humming-bird.

The picture of Merida and its surroundings, so far as the vegetation is concerned, is also the picture of much of the outlying region where settlements have effected a lodgment. The approach to every village is heralded by a growth of sabal or cocoanut, the former of which attains the dimensions approximately of the Florida palmetto, rising in graceful shafts sixty to eighty feet in height. Its most picturesque garb is seen when the tree is enclosed by the trunk and cable masses of the *copó* (*Ficus rubiginosa*), whose close embrace makes it appear as though the same trunk and roots were nourishing and supporting the lives of two very distinct organisms. The fig, of later growth, had wrapped its massive descending roots about the shaft of the palm, and in such a manner as to leave little or nothing of its fellow visible except the tufts of leaves. Manifestly the pseudo-parasite had started life from above, possibly from seeds deposited by a bird, gathering sustenance from the atmosphere and its contained impurities. I could find neither here nor in Mexico proper, where I subsequently had frequent opportunity of observing this growth, evidence of strangulation of the host. Inasmuch as the trunk of the palmetto does not materially increase in bulk after it first rises from the ground, I doubt much if this closing around causes any real injury to the plant attacked, contrary to the general belief of the natives. The finest specimens of the cocoa-palm were met with by us at a locality on the north coast known as the Serrito, a few miles to the east of the Puerto de Ɔilam. The tree does not in this place grow to any great height, perhaps forty to fifty feet, but it appears in full vigor, and many of the trees of the large grove, which is here bathed by the ocean breezes, were laden with fruits. Compared with the cocoa-palms which I subsequently met with in the Mexican region west and northwest of Vera Cruz, these appeared to be of a much more healthy type, and altogether their general aspect was much fresher. In the same region is also found the dwarf cocoanut (*Cocos coyol*).

In the mountain region forty to sixty miles south of Merida, or beyond Ticul, certain new elements are introduced into the vegetation, which impart to it a somewhat distinctive character; but, broadly speaking, the flora is still that of the northern limestone flats, with its acacias as the dominating feature. At several points on the northern flank of the Sierra, as between the hacienda of San Juan and Uxmal, and again between Ticul and the hacienda of Tabi, there are extensive growths of the red gum, the *chakah* of the Mayas (*Bursera gummifera*), the tree which yields much of the chewing gum of commerce. Like most of the larger foresters it was destitute of leaves, and in its peculiarly dichotomizing branches and copper-colored trunk, it could not fail to attract the attention of the traveler. The tree grows to a height of some forty to sixty feet, and in such close association as to form woods of its own. I met with it in considerable abundance along the line connecting Vera Cruz and Jalapa, not far from the village of San Juan. Along the roadways and in the thinner jungle the lesser pineapple or piñuela (*Bromelia pinguin*) was very abundant, its long and rigid saw-like leaves, tipped with bright crimson, forming an effective foreground to the more delicate types of vegetation beyond. Especially beautiful is the effect produced by these plants at the approaches to the famous ruins of Uxmal; great tufted masses, five to seven feet in height, line the roadway on either side—a natural stockade alike impassable to man and beast.

Only along a comparatively short stretch of roadway between Izamal and Tunkas, on the Camino Real to Valladolid, did we meet with that phase of vegetable development which the mind popularly associates with a southern flora—a flora which is tropically luxuriant, and where luxuriance is dependent not upon the special growth of plants of a single order, but upon an assortment of largely heterogeneous elements. The beginnings of such a vegetation we found a few miles to the southeast of Sitilpech. The limestone has here undergone deep decay, liberating a rich deposit of red earth, which has attracted a profuse and varied flora. The trees are very much larger than we had heretofore seen in the bush and some of them almost noble in their proportions. Manifestly they are the remains of a forest which was at one time far more majestic than it is to-day, and which dates its primal destruction probably to the period of the early colonization of the country by the Spaniards. The overarching boughs, decked with a profusion of dog-jessamine (*Tabernæmontana amygdalifolia*), orchids and air plants, especially the latter, help to form a dainty bit of road scenery which it would be difficult to match. Of the orchids, the *Cattleya* was especially abundant, forming by its large bunches great unsightly scars in the axils of the forest trees. We collected also a number of *Oncidia*, etc. The epiphytes were mainly Tillandsias or Bromelias, which in places literally covered some of the large foresters, especially the *pich* (*Inga xilocarpa*). Among other components of the vegetation are the Spanish bayonet (*Yucca*) and Fourcroya, rising thirty to forty feet, and several species of cactus (*Cereus grandiflora, C. flagelliformis, Melocactus*). The first of these, the far-famed night-blooming Cereus, occurs in great sprawling masses, dependent from the lower branches of the bush. Here and there it is closely associated with the organ or giant cactus (*Cereus Peruviana*) and with other species to form dense and impenetrable thickets. Many of the plants were in flower at the time of our visit.

Three large cenotes, or, more properly, aguadas, those of Shkashek and Balantun, open up within a short distance of one another on this road, and their deep basins are largely encircled by a luxuriant growth of forest. Over the surface of two of these, great lily pads had encroached upon the water, recalling a picture from our own far north. In a second well a brake or cane, together with the *puh* (*Pandanus utilis*), had largely usurped the place of the lily. I observed here also a number of calabash bushes or trees (*Crescentia cujete*).

On the northern coast of the peninsula, adjoining the luxuriant *sapotales* of the Serrito, is a vast mangrove maze. Unlike the mangroves of the Southern United States, such as I had observed in profuse development on the western coast of Florida, or of Bermuda, the Yucatan mangrove is a noble forester, rising a hundred feet or more in height. The great air-shoots or roots descend from an elevation of fifty to seventy-five feet, and in their massiveness recall the giant cables of some of the *Ficaceæ*. In its general aspect the mangrove forest is most impressive—a wilderness of roots, stems and foliage, into which but little sunlight penetrates.

Attention has already been directed to the *scanty* character of the Yucatan sylva; this is, indeed, the nature of the "jungle," which is referred to by nearly all travelers since the days of Stephens and which encompasses the sites of many of the larger ruins of the interior. The true forest jungle, such as is to be met with in the State of Tabasco or in the low Mexican region west of the Gulf, is wanting over the greater part of the extensive limestone plain of the north, nor does it show itself in the mountain tracts either. This condition has led botanists to assume that the northern half of the peninsula was climatically and physically unsuited to the development of the profuse and healthy vegetation which elsewhere distinguishes tropical Spanish America. Indeed, Grisebach goes so far as to assume that the deficiency of forms is mainly due to an absence of rainfall, which is, however, as well marked in Yucatan as it is in most non-mountainous tropical countries. The fallacy of this view has already been pointed out by Woeikof.* The scraps of luxuriant growth that appear here and there, taken in conjunction with the giant dimensions of some of the scattered foresters, seem to me to point rather to

* *Reise durch Yukatan und die südöstlichen Provinzen von Mexiko*, 1874. Petermann's *Mittheilungen*, 1879, p. 202.

favorable than to unfavorable conditions and to an explanation of the existing sparseness of the vegetation which has no connection with climatic or physical influences. I think it all but certain that an extensive forest at one time covered the land, and that successive devastations in one form or another have brought the surface to the condition in which we now find it. That the Spaniards here, as in Mexico proper, caused wanton destruction of the native forests is positive; but how often the destruction has been continued since the period of the conquest has not yet been determined.

The following brief notes on some of the plants observed by us may serve in a measure to elucidate the vegetation of northern Yucatan; most of the determinations have been made by Mr. MacKinney, who has also supplied the Maya names (the second name which occasionally appears in parentheses is the one in common use).

Cassia sp.? (*Yaxhabin*).—Tree, 15–20 feet, very abundant in the open scrub between the seaboard and Merida. Flowers bright yellow.

Acacia cornigera (*Subinché*).—Very abundant in the bush.

Acacia odoratissima? (*Baalché*).

Inga xilocarpa (*Pich*).—One of the largest of the roadside trees, 70–100 feet or more in height. This tree appears to be specially selected for decoration by the Tillandsia.

Bombax ceiba (*Yaxché*).—The silk-cotton tree is one of the giants of the Yucatan flora, of which it constitutes one of the distinctive features; 70–100 feet; very abundant. Specially noble examples of this tree, one of them measuring not less than eight feet in diameter, are found in the region about Ticul. Destitute of leaf at the time of our visit, but bearing an ample supply of pods.

Eriodendron anfractuosum (*Pochote*).—An abundant tree, mostly of smaller size than the ceiba; flowering.

Pachira alba, Pachira fastuosa (*Xcuyché—Amapola*).—Cultivated as ornamental trees; 15–25 feet; flowering, but devoid of leaves.

Brossimum alicastrum (*Ox—Ramon*).—Very abundant in all the village gardens; cultivated for fodder. Tree, 60–80 feet.

Ficus grandifolia (*Akúm*).—Large and abundant tree.

Ficus rubiginosa (*Copó*).—Very abundant as a pseudo-parasite on Sabal.

Ficus laurifolia.—Shade tree in the park of Merida.

Jacaratia Mexicana (*Kumché—Bonete*).—Large and abundant tree—in fruit. The conspicuous triangular fruit is prepared in a variety of ways as an article of food.

Carica papaya (*Put—Papaya*).—The papaw; very abundant in gardens.

Bursera gummifera (*Chacah*).—Tree (destitute of leaf at the time of our visit) very abundant in the hill region south of Ticul; 50–60 feet.

Spondias lutea (*Abal—Xkinim-hobo—Siruela*).—One of the forms of Yucatan plum; extensively cultivated.

Spondias microcarpa (*Aac-abal*).

Spondias rubra (*Xkis-abal*).

Cordia Sebestana (*Kopté—Siricote*).—Abundant in gardens.

Cedrela odorata (*Kulché*).—Abundant in gardens in Merida and in nearly all villages.

Casuarina.—Abundant in gardens and in open places ; 30–60 feet.

Anona squamosa (*ɔalmui—Saramayo*).—The custard apple.

Anona muricata (*Guanávano*).

Anona glabra (*Op*).

Sapote achras.—Much cultivated for its delicious fruit ; tree 50–80 feet.

Lucuma mamosa (*Chacalhas*).—The mamey.

Mamea Americana.—The San Domingo mamey ; extensively cultivated.

Persea gratissima (*On—Aguacate*).—Alligator-pear.

Plumeria alba (*Nicté—Flor de Mayo*).—Cultivated for its beautiful and highly aromatic flowers.

Tabernæmontana amygdalifolia (*Uɔupek—Jazmin de perro*).—Dog-jessamine. Very abundant along some of the roadways, as on the Camino Real between Izamal and Tekantó ; flowering.

Crescentia cujete (*Luch—Jicara*).—Calabash tree ; observed at the aguada of Shkashek.

Tecoma equinoctialis (*Sac-ak—Bejuco de Chiquiuite*).

Cucurbita pepo (*Kúm—Calabassa*).—Calabash.

Rhizophora mangle (*Tapché*).—Forming extensive forests on the north shore, east of the Puerto de Dilam.

Cereus Peruvianus (*Nun—Organo*).—The organ cactus, forming dense and almost impenetrable thickets ; 20–30 feet. Very abundant near the hacienda of Tabi, southeast of Ticul. A smaller species is known as Nuntsutsui.

Cereus grandiflora (*Pitaya*).—Abundant in the thickets, where its great depending masses impede penetration.

Cereus flagelliformis (*Canchoh*).—Common on rocks.

Cereus lanatus (*Tsacám*).

Cactus opuntia (*Pakám*).—The common nopal.

Melocactus communis (*Polxnúk—Bisnaga*).—Abundant in places.

Bromelia pinguin (*Chom—Piñuela*).—Abundant, and forming dense thickets.

Musa sapientia (*Sac-haas*).—The common banana ; extensively cultivated.

Musa paradisiaca (*Box-haas*).—Plantain ; also common.

Cocos nucifera.—Abundantly cultivated, and forming along the northern shore beautiful groves ; 50–70 feet.

Cocos coyol.—Dwarf cocoanut.

Sabal Mexicana (*Bayal-xaan*).—I am not certain that this is the common species of palmetto of Yucatan ; the tree attains a height of some 70–80 feet.

Thrinax otomale (*Bon-xaan*).

Thrinax parvifolia (also *Bayal-xaan?*).

Pandanus candelabrum (*Cipil*).—Stray specimens appearing here and there in the bush, between Progreso and Merida.

Pandanus utilis (*Pah*).—In the waters of the cenote of Balantun.

Some Observations on the Bahamas and Jamaica.

By Dr. J. T. Rothrock.

(Read before the American Philosophical Society, November 6, 1891, as part of the Report of the Michaux Committee.)

The American Philosophical Society having last season set apart from the Michaux legacy the sum of three hundred dollars towards defraying the expenses of my West Indian exploring and collecting trip, I desire to offer the following:

The object of the appropriation was the collecting of photographs and information which could be utilized in the preparation and delivery of the annual lectures, popularly known as "The Michaux Forestry Course."

Towards accomplishing this, the islands of New Providence, Eleuthera, San Salvador, Watling and Inagua, all of the Bahama group, were visited, as well also as Jamaica and its lesser political dependency, the Grand Cayman, which is situated one hundred and ninety nautical miles, nearly W.N.W., from the western end of Jamaica.

As the time allowed for my entire trip was but three months, it is evident that no prolonged stay could be made in any one place. We devoted by far the greater portion of our time to the island of Jamaica, and found everywhere, but especially on its greatest altitudes of 7000 feet, ample returns for our search.

In all, about one hundred and fifty good negatives were obtained. As duplicates were usually made, it is fair to say there are about seventy-five satisfactory illustrations of trees, physical geography and topography of the islands visited.

How rich a field the island of Jamaica offers may readily be inferred from the following facts:

1. If reduced to a square, the island would be about sixty-five miles long by as many wide.

2. Its population is only about 600,000 souls.

3. Only twenty-five per cent. of its area is under cultivation.

4. The agricultural methods are very primitive and fertilizers are sparingly used.

5. Notwithstanding these facts, this small area, after retaining enough for home uses, sends into the markets of the world nearly $9,000,000 worth of products each year. These are mainly from the vegetable kingdom.

It is well, also, to call attention to the fact that, of these exports, probably about fifty per cent. are shipped to the United States as against thirty-seven per cent. to Great Britain. Of fruit alone, we received in 1889 not less than $1,580,000 worth, as rated by the exports there. Of course, its value here was vastly greater. There has been during the past five years a *decided increase* in the trade with the United States, and *some also* with Canada.

In spite of the relative proximity of the Bahamas and Jamaica, the contrast between these islands is exceedingly marked. The Bahamas are low and show no considerable elevations. Jamaica reaches a maximum altitude of 7360 feet above the sea level. The soil of the Bahamas is scanty, and consequently cultivation entails fertilization. That of Jamaica is of great depth, and its continued productiveness is evidence of a vast natural fertility. The flora of the Bahamas shows marked resemblance to that of Florida. The flora of Jamaica is essentially tropical, save at such altitudes as suit plants of cooler regions. In such places we found the common chickweed (*Stellaria media*), the white clover (*Trifolium repens*), associated with plants from the cooler parts of southern regions.

The mangrove (*Rhizophora mangle*), common to the tropical seas around the globe, attains in Jamaica (compared with that in Florida and in the Bahamas) a surprising height. Near Port Morant are large jungles, where the trees attain a height of at least sixty feet. This is the proper place to call attention to possible tannin production, which the mangrove suggests. No tree that we have here, at all approaches it in the

now so important to Jamaica, has been introduced there.

Of the original forest but little remains in Jamaica, though reproduction has again covered the steeper slopes with a luxuriant growth of timber.

Jamaica is not wanting in hard woods. Some of these are of great value. It is claimed that of these they need none from us. Though, on the other hand, it is equally sure that for white and yellow pine the island draws very largely upon our resources. The United States furnished Jamaica in 1889 nearly $200,000 worth of building material, of which the major part was probably lumber. It is not probable that the economic resources of the vegetable kingdom in Jamaica are properly recognized, or that we derive from them now anything like what we shall in the future.

Attention should also here be called to the fact that, years ago, attempts were made to introduce the Sisal hemp from Yucatan into the islands on the southern coast of Florida. It appears to have been abandoned (probably from want of proper machinery to extricate the fibre). The plants are now growing wild in these Florida islands, and have been introduced, under the intelligent and earnest direction of Gov. Sir Ambrose Shea, into the Bahamas, where they promise soon to furnish large quantities of fibre which will rival manila in the markets of the world.

From Publication No. 86, of the U. S. Hydrographic Office for the Year 1888, page 1, I quote the following: "The sea breeze generally sets in about 9 A.M., and, blowing either directly on shore, or, according to the trend of the coast line, at an angle to it, continues till about sunset, when a calm interval is succeeded by a light off-shore air, attaining its greatest strength about day dawn, and being succeeded by an oppressive calm, to be again followed by the sea breeze. On the coasts of Cuba, Santo Domingo, Puerto Rico and Jamaica, the regular sequence of land and sea breezes is seldom interrupted." So far as our observation could go in so brief a period, we can entirely confirm this general statement. These local breezes must not, however, be confounded with the trade winds which, from latitude 28° N., come normally from the N.E. or E.N.E. and sweep over the ocean areas in which these islands lie. Neither must we lose sight of the fact that, at Kingston, in Jamaica, the wind comes the year through almost constantly from the S.E.

Observation has shown that during the months of November, December and January frequent rains fall upon the northern side of the island of Jamaica. It would appear as if the direction of these trade winds and the position of the island of Cuba might explain some notable differences in the distribution of this winter rain upon the northern shore of Jamaica. From Cape Maysi, on the eastern end of Cuba, to Morant Point, the eastern end of Jamaica, the direction is N.E. ½ N. or about N. 39° E. The distance is about 180 nautical miles. Port Antonio bears by the compass from Cape Maysi about 8° more to the westward than Morant Point. Both of these places are, however, fairly in the line of the N.E. trade winds, which may reach them without sweeping over the mountainous, fog-enveloped eastern end of Cuba. It is important to bear in mind that these mountains on the eastern end of Cuba attain a height of 7000 feet and must have a temperature considerably below that of the sea level. A line drawn from Lucea, on the northwestern end of Jamaica, would cut the mountains of Cuba about 100 miles from the eastern end. In other words, the trade winds from the N.E., to strike Lucea, must first cross the mountains of Cuba, where, by the lower temperature, the moisture is precipitated. Whereas, the normal N.E. trade wind can reach Port Antonio without having to cross the Cuban mountains. The latter reach the Jamaica coast as wet winds, whose moistu re is precipitated on the northern side of Eastern Jamaica; but the winds which reach Lucea come as dry winds.

The facts, as observed by us, were, first, the large aqueous precipitation of Port Antonio and the small precipitation at Lucea. The whole fact is briefly expressed by the saying of the sailors, that to find Port Antonio you had but to enter the blackest, rainiest port on the northern side of Jamaica.

The practical bearing of this is not hard to see from a sanitary standpoint. The high ground on the western end of Jamaica is the climate most suitable for the invalid. The beautiful little town of Lucea, if it possessed a large, well-kept hotel, would be an ideal winter resort for our northern invalids.

Whether considered from the standpoint of climate, scenery or productiveness, Lucea could be made a more desirable winter resort than the Bahamas. Indeed, I am so strongly impressed by the possibilities of Northwestern Jamaica for the invalids of the future that I cannot refrain from making these statements as positive as I have.

There is one more factor to be considered in the climate of Lucea. It is that the trade winds from the N.E. tend, on striking the northern coast of Jamaica, to be deflected into E.N.E. winds. This would place Lucea somewhat under the protection of the parishes to the east of it; so far, at least, as the rainfall is concerned.

We lay in the harbor of Port Morant, on the southern side of Jamaica, whilst a furious north wind was blowing on the northern side of Jamaica and deluging the region near Port Antonio with the rainfall. Yet we received a very moderate share of the rain, which was drained from the clouds by the mountains north of us.

Dr. Morris read a note from Mr. Patterson, Trustee under the will of the late Franklin Peale, suggesting the removal of the stone-age collection of relics, and moved that the Curators be instructed and authorized to withdraw from the custody of the Academy of Natural Sciences the Peale stone-age collections.

A discussion ensued, in which Dr. Brinton, Dr. Morris, Dr. Cope, Mr. Dudley, Mr. Martindale and Mr. Du Bois took part.

The President stated the manner in which the Society had become the owner of the collection referred to.

On motion of Mr. Dudley, the further consideration of the whole matter was postponed until the next regular meeting of the Society, and the Curators were requested in the meantime to examine into the facts and report upon the same.

At the call of deferred business, the report from the Committee of which Prof. E. D. Cope was Chairman, postponed from May 1, 1891, was taken up and considered.

Prof. Cope requested that the same might be postponed until next meeting, which, on motion, was agreed to.

And the Society was adjourned by the President.

Stated Meeting, November 20, 1891.

Present, 26 members.

President, Mr. Fraley, in the Chair.

On motion of Mr. Dudley, it was

Resolved, nem. con., That the ordinary business of the Society should be suspended, and that such matters as were set for this evening should be postponed until the next regular meeting, and that the only business that should be attended to to-night, should be the reading of a paper by Mr. Henry C. Baird, on "Carey and Two of His Recent Critics—Bœhm-Bawerk and Marshall," and the presentation of the portrait of Mrs. Seiler.

Mr. Henry Carey Baird read a paper on "Carey and His Recent Critics."

Mr. Rosengarten read the following letter:

Frederick Fraley, Esq.,

President American Philosophical Society.

Dear Sir:—Some of the friends of the late Mrs. Emma Seiler, including many of her pupils, desire to present to the Philosophical Society, of which Mrs. Seiler was a member, a marble relief portrait of that lady, to be placed in your Hall, as a memorial of her scientific labors and of her success in elevating musical education, and of her contributions to a better knowledge of the voice in speaking and singing. You are respectfully asked to request the Philosophical Society at its next meeting to accept this gift, and to fix a time when it can be presented, and a memoir of Mrs. Seiler, be read, to be preserved and printed in the record of the Transactions of the Society.

We are very respectfully, etc.,

Mrs. Caspar Wister,
Mrs. Brinton Coxe,
Miss Rosengarten,
Miss Bradford,
Miss Maria Hopper,
Mrs. Messchert,
Miss Messchert,
Miss Bennett,
Miss Eliza B. Chase,
Mrs. Agnes G. E. Shipley,
Mr. William Ellis Scull,
Mr. M. H. Messchert,
Mr. Charles Platt,
Mrs. S. I. Lesley,
Mrs. Marriott C. Smythe,
Miss Maria Moss,
Mrs. John W. Field,
Miss Ella C. White,
Miss Mary A. Burnham,
Miss Kate S. Gillespie,
Miss B. M. Randolph,
Mrs. George McClellan,
Rev. Dr. T. K. Conrad,
Mr. William Platt Pepper,
Mr. Edward H. Coates,
Mr. J. G. Rosengarten.

Philadelphia, November 4, 1891.

Mr. Rosengarten, presenting the portrait of Mrs. Seiler, spoke as follows:

Mr. President:—At the last meeting, the American Philosophical Society agreed to accept a marble relief portrait of the late Madame Seiler, presented by a few of her friends and pupils. I now have the pleasure, on behalf of the subscribers, to present it to you and through you to the Society. Madame Seiler was a member of this Society, one of the six women who have thus far been enrolled on its list. The others were Princess Dashkoff, Mrs. Somerville, Mrs. Agassiz, Miss Maria Mitchell and Miss Helen Abbott. Her works on "The Voice in Singing" and "The Voice in Speaking" were not her only claims to this distinction. In Germany, her native country, Madame Seiler was a pupil of the famous teachers of the University of Berlin, and it is to her that is attributed the first use of the laryngoscope in studying the organs of the throat, while her discovery and description of some of the parts of the throat were of great value. She brought letters of introduction from well-known German savans to the late Dr. George B. Wood, for many years President of this Society, and through him was enabled to make the acquaintance of the Rev. Dr. Furness, among its oldest members. This venerable member of the Philosophical Society helped her in all of her literary work, and was her kind and steadfast friend through all her life; his last act of kindness was officiating at her funeral, when his tender sympathy and earnest words assuaged the grief of her family and her friends. But no patronage and no help would have availed without the talent, energy and ability which won for Madame Seiler hosts of friends here. Her success was shown in the establishment of a singing academy, where many pupils were trained in her methods, and her little leisure was spent in scientific and literary work. Much still remains in manuscript, but her printed books have been freely used and commended by the later writers on the subjects specially her own. As a mark of respect and affection, her friends and pupils have secured this admirable marble relief portrait. It is the work of Mr. Henry K. Bush Brown, a young American artist, and it is now presented to the Philosophical Society, with the request that it may find a suitable place on the walls of its hall, where there are portraits and busts of many of the distinguished men who have been members. What Madame Seiler did to entitle her to this honor will be set forth in detail in a biographical sketch to be read this evening, and that memoir will no doubt be preserved in the growing list of necrological notices in the printed papers of the Society. On behalf of the subscribers this marble relief portrait is presented to the Society as an expression of the affection and admiration felt for Madame Seiler in her lifetime and in the hope of thus perpetuating her name and memory as those of a woman who did much for a scientific knowledge of music and whose general culture, broad sympathies and earnest labors endeared her to all who knew her. Coming to this city almost an entire stranger—not even a master of the language spoken here—it was the kindness shown to her by members of the Philosophical Society that enabled her to find employment and to show her mastery of her art and to carry on her scientific work and to write her books. It is eminently fitting, therefore, that this memorial portrait should find its final resting place on the walls of your hall, and that her name and services should be perpetuated in your records. I now, in the name and on behalf of the subscribers, hand over to you and through you to the keeping of the Society, the portrait of Madame Seiler, a member of the Society, a woman of many virtues and talents and beloved by a large circle of friends, who have joined in thus testifying their sense of the honor conferred on her by this Society and of her eminent right to it.

The President accepted the portrait in a few appropriate remarks.

Mrs. J. P. Lesley then read the following sketch of Madame Seiler:

Mrs. Emma Seiler was born on the 23d of February, 1821, at Wurtzberg, in the kingdom of Bavaria. Her maiden name was Diruff, and her father was court physician to Ludwig, King of Bavaria, and also Surgeon-General to the kingdom. Emma Diruff had two brothers and two sisters. One of her sisters afterwards married Dr. Canstadt, a celebrated physician and professor at Jena, who also started a medical journal, which is still in existence. Her other sister married Dr. Demme, professor of surgery at Berne, and brother of a distinguished Lutheran clergyman of that name, formerly settled in Philadelphia.

The children of Dr. Diruff were on familiar terms with the young princes and princesses at the court of King Ludwig, and occasionally shared their lessons with the same tutors and professors, and Emma grew up in close intimacy and friendship with the princesses, and with the young Maximilian, and Otto, King of Greece. She lived in the atmosphere of court life, was early presented, and the king and queen valued highly their intercourse with the family of the court physician. To our American ideas these are trifles, but unless we understand all the early influences of a young life, we cannot realize what one must have to overcome in later years when living among people to whom all such distinctions are purely artificial.

Her early youth was a very happy one, devoted to her education, in the heart of a family circle of sufficient wealth to be free from serious anxieties and cares, and their home in the midst of beautiful scenery, for which she had all her life a deep appreciation.

In the year 1841 Emma Diruff was married to Dr. Seiler, a young physician whose family like her own was one of the oldest and most aristocratic in Bavaria. The estate of her husband, to which she at once removed with him, was situated in Langenthal in Switzerland, not far from

Berne. She was then twenty years old. For some years she lived in outward comfort, not called on for serious exertions beyond the cares for her children and the guidance of her family affairs. But in 1846 some speculations in which her husband had engaged failed; all his property except the estate on which they lived was lost, and from this time forth she lived a life of deep and constant anxiety, and under the necessity for unremitting exertion. They both thought that their home on the estate might be made remunerative by turning it into a private asylum for insane patients, and into this work Mrs. Seiler threw herself with the energy and ardor of her nature, making herself the sympathetic friend of those whose mental maladies were of the milder type, and having great influence over the violent. At one time, after watching successfully for some months a case of suicidal mania, the patient escaped her and was found to have hung herself. Mrs. Seiler, after an hour of heroic effort, succeeded in restoring the life that was apparently extinct. At another time, she was badly injured by lifting an insane woman, and carried that injury and the suffering it occasioned to her dying day. But she was never one to dwell upon personal sorrows and pains, or talk about them; nor could she help away her griefs by personal resentment, a poor way for any of us to be helped. But she went on courageously with the work appointed to her, only finding her eyes and her heart more open and sympathetic with her sufferers, and her hands more active.

In the year 1847 a famine came upon Switzerland, not due to failure of crops, but to political causes. The French invaded Switzerland in preparation for the Franco-Austrian War, blockaded all the outlets, and the price of provisions became so high that the very poor had no means to supply their wants. At Langenthal and in many other places, they fell dead in the streets from starvation. Mrs. Seiler's heart ached well-nigh to bursting with the miseries she saw around her—the dead and dying in the streets, the wretchedness of those who survived. Night and day she pondered on their distresses and thought over plans for their relief. But all her plans required money and she had none. One night in her agony she prayed, "Oh, my God, send me power to help my poor dying people! Oh, my God, show me the way!" "I prayed all night upon my knees," she said, "and by daylight my mind was clear."

She rose early, and having attended to her family and her patients, she went to the clergyman of the village, to ask for his sympathy and approval. When she had finished an ardent appeal to him, he said to her in a deep and solemn tone which she was fond of imitating, "Read the Bible to those dying people." And when she said, "But they are starving to death; they must have food," he only repeated mechanically, "Read the Bible to those dying people, every one." When she declined to do this, and rose impatiently to go, he said, in the same sepulchral tone, "When that great day comes when the Judge shall separate the sheep from the goats, where will *you* be?" "That does not concern me at all," said Mrs. Seiler, "whether I shall go with sheeps or goats. I was thinking of something very different. But you, sir, how shall it be with you in that day? Will you go to sheeps or goats?" There was no answer to this question, and she hurried away to carry out her vision of the night without the aid of the clergyman. "I walked to every comfortable house that I could reach on foot," she said, "and besought them to give me whatever they could spare in food or money." Her eloquence brought a generous response. Then she went through the wretched streets, and invited three hundred to come to her house the next day. She bought materials, and herself prepared large kettles of nourishing broth, and bought huge loaves of bread. Then she lodged and fed them through the day on her own premises. Many lives were saved by this timely aid, but this was but one part of Mrs. Seiler's midnight planning. As soon as the poor lives were enough restored for work she induced them to learn some little handicraft by which to help themselves. She herself understood all the beautiful methods of embroidery and exquisite darning and crocheting, and to these she added braiding of hats and baskets and mats, that she might teach them. The hands so awkward and unskillful at first, soon became expert under her instruction, and even very little children in the end did exquisite work. And now she had a real manufactory of salable articles. Then she sent to many rich persons at a greater distance to come and see. "I was a very handsome woman then" she said with naïve simplicity, "and I thought to myself, I will now make my beauty of some use. So I did send to all my courtiers [she meant admirers] to come and see me, and I made it very agreeable for them, and they did buy all my poor people's work, and that did give me much money, to take in and feed and teach more starving people, and then many young ladies of fine families came to me and said, 'Mrs. Seiler, we will learn all your arts, and then we will come and help you to teach the poor people;' and they did. And so the circle of blessing was extended."*

I cannot close this little history of one brief period of Mrs. Seiler's life without telling you that her methods in this time of her country's needs were so successful and far reaching that the Swiss government and afterwards the Swedish and Danish governments sent emissaries to see them; and so convinced were they of their goodness and practicability that they copied them in their own administration.

Her versatility and energy and physical strength were at this time very great, and her resources unfailing. During the whole period of the famine she had to plan carefully and keep the strictest account of expenses and also arrange new plans to replenish an ever-lessening treasury. So, while teaching the handicrafts, she set about discovering the fine natural voices which she knew must exist among the poor peasants who flocked daily to her estate. Having found fifty or more capable of it, she devoted

*Mrs. Seiler's daughter writes me: "When I was in Germany, I made it a point to ask my mother's brother and sister as well as old friends about her youth, and all agreed that she was not only the handsomest girl in Wurtzburg, and called 'The Rose of Wurtzburg,' but was also beloved by all who knew her."

herself with ardor to the training of a band of choristers, who in time sang the most beautiful music all over the neighborhood ; she gave lovely concerts, and the proceeds enabled her to carry on her pious charity a much longer time.

Much of all this I learned from her own lips, told so incidentally and naturally, one could see that she did not herself appreciate its admirable character. But it was strikingly confirmed to me by a lady from this city who with her husband traveled through that region only a few years ago. In the mountains she met a peasant whom she asked if he had ever known a Mrs. Emma Seiler who once lived there. His face brightened all over as he assured her that he remembered her well, and then he told with enthusiasm the story of her saving the lives of so many of his comrades and the good she had done in many ways to all the people.

Late in August of 1851, the home at Lagenthal was broken up, the private asylum came to an end, and Mrs. Seiler found it necessary to support herself and her children by her talent for music, and she left Switzerland never to return to it as a home.

She went first to Dresden, and there took lessons of Wiek, the father of Clara Schumann, with whom she became intimate. She supported herself and her children by giving piano lessons while she was cultivating her voice. But while in training there she lost her voice, a bitter disappointment to her, because she could earn much more by teaching vocal than instrumental music. She remained in Dresden three years, during which time her house was the rendezvous of the principal musical celebrities. She worked hard at her piano lessons, but she did not recover her voice. Then she went to her sister Mrs. Canstadt at Breslau and passed a year giving lessons, and then to Heidelberg. Here she found piano lessons poorly paid; every one wanted singing, and this inspired her to study with zeal the laws of vocal physiology, and the causes of the overstrain which had destroyed her own voice and that of so many others. Here at Heidelberg she became intimate with the two Bunsens, the chemist and the statesman, and also with Kirchoff, professor of physics. Bunsen the chemist and Kirchoff together discovered the spectroscope while she was there, which excited all her enthusiasm.

In December, 1856, she met Helmholtz, who was made professor extraordinary of music. He was then engaged in writing his great work on "Sensation in Sound," and went to Mrs. Seiler almost daily for several months for advice and for verification of his calculations by her experiments. After living in Heidelberg nearly six years she went in 1856 to Leipsic to study herself, and to give her children a musical education at the conservatory. Here she knew well Moschelles, Drysholk, and David the violinist, and also the professor of physiology Ernest Heinrich Weber, and with his aid she studied the anatomy and physiology of the voice and published her first book "Old and New in the Art of Singing," which created a profound sensation in musical circles. From Leipsic she went to Berlin. By the care and training she had given herself after she had discovered the cause of her trouble she recovered her voice, and was now once more able to give lessons in singing. She had the first laryngoscope, invented by Manuel Garcia, constructed after her own directions, and by it she discovered the verification of her theories with regard to the head notes of the female voice. In Berlin too she found herself in a delightful society, meeting often Du Bois Reymond, the egyptologist Lepsius and many other distinguished companions.

In 1866, finding her means of earning a livelihood almost at an end through the straightened means of the German people during the war, which did not permit many to indulge in the luxury of music, she left Germany and came to Philadelphia. Every movement of her life seems to have been made under the stress of stern necessity. She loved a permanent home, but she accepted these changes, the parting from old friends, the barriers of language, the unaccustomed ways of a new world, with the same sweet patience and simplicity that characterized her life.

I am not competent to speak of her musical career in this city and must leave it to abler minds to do it justice. She brought letters from wise and good men in Europe which at once placed her cause in the best hands. The extracts from the valuable sketches of Charlotte Mulligan and Harriet Hare McClellan, former pupils and friends, which follow my imperfect record, will supply the information I cannot give. From Dr. Furness she had the highest service that devoted friendship could give, since he gave time and personal labor and much care in translating her manuscripts into exquisite English. Her work on "The Voice in Singing" is entirely her own. In the "Voice in Speaking" she had much assistance from her son, Dr. Carl Seiler, in the physiological parts. In establishing her school of vocal music she had the personal assistance and generous backing of many devoted friends.

I may mention here that within two years of her residence in Philadelphia Mrs. Seiler was made a member of the American Philosophical Society, an honor accorded to but six women since its foundation: the Princess Catherine Romanowa d'Aschkow, Mrs. Somerville, Miss Maria Mitchell, Mrs. Emma Seiler, Mrs. Louis Agassiz and Miss Helen Abbot.

I have heard that she was not a good business woman, and I can well believe it. No one has all the gifts. Her monumental work consists in the voices she trained, and in the noble principles of art she inculcated. I am told that the principal strength of her teaching lay in cultivating purity of tone and truthfulness of expression.

Those who think that she overdid the value of technique, would do well to read her fine chapter on "The Esthetic View" in "The Voice in Singing." It was one of her strongest and deepest principles, differing greatly from some modern ideas, that art and genius cannot do the best if divorced from morality. So she despised Wagner's music, and would say indignantly, "He is a man of immoral life; we must not allow that the music of the future can be furnished from such a source." As one of her dear friends said of her to me, "No, Mrs. Seiler could never believe that a bitter spring could bring forth sweet waters. It was the same with her innocent pure mind in all art," said this same discerning friend. "She could walk about a room full of nude figures with real enjoyment of the exquisite outlines, but let her see a fully veiled figure whose attitude or expression denoted meanness or low tastes and a shudder went through her."

I had not a close intimacy with Mrs. Seiler; she was too much occupied for me to have been willing to take up much of her time; but those who knew her better can easily fill out and correct the only portrait of her that my warm personal friendship allows. She came at intervals an uninvited but most welcome guest to take tea and pass the evening with us; those evenings will never be forgotten.

Her conversation had a rare charm, and was by no means confined to those subjects she would have been supposed to be most interested in. She had an appreciative interest in what each friend had most at heart. The young artist in painting was surprised to encounter in her such sympathy with the humblest efforts, and was charmed with her accounts of the various schools of art in the Old World, and her stories of wonderful paintings and their effects. The scholar and the student found her a delighted and receptive listener to his researches in Archæology or Egyptology; and her personal stories of distinguished scholars whom she had known intimately in Europe lighted up the moments she gave them. Often most amusing in its dramatic characterization of persons and events her conversation was always kindly and could not wound. I must make one exception. There were occasions where she was carried out of herself by her indignation at what she knew or believed to be wickedness. But these occasions were rare. She had in the main a sweet and patient temper as surely as she had a warm and loving heart and a sunny spirit. One remembers far oftener the delicious humor, the innocent childlike mirthfulness with which she would tell of her own adventures and escapades. I recall how, after her first visit to Europe, after she had made a home among us, she came to spend an evening with us, and the glee with which she told us one little incident of her travels. She was in Italy, and I think on the train between Rome and Naples, when some ladies who were attracted by something she said about music to her companion joined in the conversation. In the course of it they mentioned that the Italian government had directed that the works of Mrs. Emma Seiler on the "Voice" (an American lady they called her) should be introduced into all the schools. Do you know her, they asked? She looked reflective. "Yes, I do know that woman quite well indeed," said Mrs. Seiler; "she is a good woman and she knows quite well about the voice; she has studied it long. Ladies, your gouvairnment [so she pronounced it] has done a very good thing indeed to direct that the books of Mrs. Seiler shall be taught in the schools. I will myself tell her just so soon as I return to America." And she bade them farewell without disclosing her identity.

There is no doubt that she was impulsive and impetuous; those qualities could not have existed apart from the divine energy that accomplished such results. The sources of our virtues are also the sources of our faults. Let it be said that she was sometimes undisciplined in speech, and sometimes misunderstood her friends. We will remember that she came to us Puritans, Quakers, self-restrained people, from a demonstrative and enthusiastic nation of Europe, and that we are quite as likely to have misunderstood her. Let us remember, too, the constant strain and stress of her hard-working life in a profession of all others trying to nerves and spirits. And if she demanded much of others she was harder on herself. After toilsome days she often studied into the small hours of the night to keep herself at the high-water mark of knowledge which she conscientiously exacted of herself.

In 1883 her children induced her to give up a life of such incessant exertion, to close her school of vocal art, to take a trip to Europe for relaxation, and on her return to take only private pupils. Her visit to Europe at this time illuminated the remaining years of her life; everywhere she met with warm friendship and cordial admiration. When she returned, it was to a peaceful home, where loved children and grandchildren could often come to see her, where she received pupils through the day, and lived alone with one faithful, loving German servant to whom she was both friend and mother. It was a quiet, retired but peaceful life. She had always been simple and unworldly, full of humanity and taking delight in small pleasures, such as lie within the reach of all. The companion of princes, the friend of the first statesmen and philosophers, poets and musicians of Europe, the beloved of Clara Schumann and our own Anna Jackson, found joy in making one poor German girl happy and in being made happy by her. "We go to the Park in the hot summer days, Paulina and I; we sit down by the water, and under the trees and hear the birds sing; we look at the children on the flying-horses and we visit the Zoo. In the winter if we are tired or lonesome Paulina and I will go to the opera. Sometimes we do go to see Buffalo Bill, and we laugh and shake all over, and that rests us."

Mrs. Seiler left us on the morning of December 21, 1886, at two o'clock. She had been ill for nearly two weeks, but few persons had known of it, and it was a surprise to nearly every one. She had often said she hoped she might not live beyond the age of sixty-five, and her wish was granted. Her disease was spinal meningitis, and she was unconscious from the beginning of her illness to its close. For her we could ask nothing better. She escaped the languors and disabilities of old age; she never tasted death. At the brief funeral service, I longed to hear some voices of those who had loved her and whom she had trained sing the beautiful hymn, "Oh Spirit freed from Earth."

After her hard-working, self-denying life, crowded with services to her fellow-men, and faithful to the end, she has entered into immortality. For, what Dr. Furness said of her in beautiful words (which I must not try to quote accurately, but I am sure I caught his idea) is the great truth: What she thought or believed about immortality is of less consequence, than that she lived a life which must keep the soul near to God, here and hereafter.

Extracts from a Biographical Sketch of Madame Emma Seiler, by Charlotte Mulligan.

"The death of Madame Seiler, which occurred in Philadelphia recently, deprives the world of one of the most remarkable women of the century. Every teacher of the voice in America, every student who has made a specialty of the throat and vocal apparatus, knows the value of Madame Seiler's discoveries and her books upon these subjects are the standard authority. 'Not one of us has improved upon her work, with all our efforts,' said Dr. Lennox Browne to us, three years ago, in London, 'and she stands still the peer of the greatest of us all.' In this testimony hundreds of other physicians would agree, and the world of science has long known the importance of her researches, and accorded her an honorable position among its savans. Garcia was the discoverer of the laryngoscope, but Madame Seiler applied it, and followed out a course of study that, when presented to the world, greatly facilitated the efforts of those who were endeavoring to understand the vocal action. 'The greatest living authority upon the voice,' Garcia himself, styled her his friend and colaborer, and the encomium was rightly hers.

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"During her early life Madame Seiler became deeply interested in the study of medicine, her father being at that time physician to the court of Bavaria. It was considered almost a sin in that age for a woman to learn anything about the structure of the human frame, and every tendency towards the acquisition of such knowledge was promptly checked. These restrictions greatly hampered the young girl, but she found opportunity to read books from her father's library, and before her marriage had acquired an extensive knowledge. The voice appears always to have interested her particularly, and she was first attracted to the subject by the song of a pet bird. Her own description of the way in which she arranged to see the throat of a human being after death, illustrates the persistency with which she prosecuted her studies. Going to spend some time with an aunt, she made friends with a medical student in the town, and to him confided her desire. He, at the risk of being discovered, procured a throat and took it to the house late one night, when the old aunt had retired. 'Two weeks we worked together,' she said, 'examining the muscles, dissecting them with the greatest care and studying every detail.' This study was always done at night, but the time Madame Seiler counted as most precious to her, for it developed her understanding of a subject that was of the greatest importance, yet not at all familiar even to professional men. For several weeks after this experience her work was constantly interrupted, and she struggled with many bitter trials. Her mind was not inactive, however, and she formed theories then that later on she demonstrated to be facts. Acoustics to her became a science that offered the greatest possible interest, and she studied the inflections in the cries in birds and beasts until they became a perfect language to her. Falling water, the different sounds in the atmosphere, and the myriad tones from the insect world, all had for her their harmonies or lacked the essentials of perfect tones. She heard in nature what is shut off from ears that are duller than hers, and she lived in a world upon the border of which we can only stand. The human voice, according to Madame Seiler's view, had never yet been developed to accomplish even half of which it was capable. Some of her theories were exemplified in her own case, and up to the last year of her life, she could produce superb tones, that rang and vibrated with wonderful power and beauty. The production of such tones required constant work, but once they were acquired they were well worth the labor and discouragement that attended the study. We have never yet heard a pupil, who had studied with this famous woman, who did not show either in the speaking or singing voice, some of the remarkable qualities that she knew the voice could be made to possess. One of these was richness of tone, a peculiar concentration that demanded attention, and an effect of power combined with sweetness. Madame Seiler possessed it to a remarkable degree, and imparted it to all those who had the intelligence to study with confidence in her great ability. The voice in speech was second only to the voice in song, and she laid great stress upon the care that young children should have when they are beginning to discriminate between sound and noise. No great singer ever came directly from Madame Seiler's care, because she paid most attention to those qualities which tend to make a voice retain its beauty and freshness. When those were acquired, then the accessories were undertaken, but many a pupil tired of the preparation, and other masters built upon her enduring foundation, reaping a glory that never could have been theirs but for her conscientious work. Madame Seiler was also a woman who had lived all her early life among scientific men in Europe who appreciated her mind and made much of her. Her life in this country was one of comparative isolation. She could not understand the lack of reverence and respect with which she came in contact, especially in younger people, and she sought her chief happiness among her books. The end came peacefully, and the bright, gifted woman fell quietly asleep. Her death falls heavily upon many throughout the country, for she had been a great benefactor to hundreds, who, through her instrumentality, have learned the true use of the voice. It is difficult to believe that her work is completed, to realize that all is over, that she is removed forever from this world. As one of the many who knew her value, who appreciated her true nature and wonderful knowledge, we pay a parting tribute as friend and pupil."

Extracts from a Biographical Sketch of Madame Seiler, by Harriet Hare McClellan.

"In passing from the highest tones of the falsetto register, still higher to the head tones, she was the first to observe a change in the motions of the organ of singing, which she discovered to be due to a sudden closing together of the vocal ligaments to their middle, 'with their fine edges one over the other, leaving free only a third part of the whole glottis immediately under the epiglottis, to the front wall of the larynx.' The foremost part of the glottis formed an oval orifice which with each higher tone seemed to contract more and more, and so became smaller and rounder. It was objected to this result of her observation that such a contraction of the glottis was only possible by means of 'cartilages and muscles,' but that such cartilages and muscles as could render an action of that kind possible were not known. Madame Seiler fully admitted the soundness of this objection, while she was, after repeated trials, more and more convinced of the correctness of her own observation; so she began anew to study the anatomy of the larynx in dissected subjects and was rewarded by finding within the membranes of the vocal ligaments certain fibres of muscle which she called the aryteno-thyroid interna, and which have also been found by other observers. They consist of muscular fibres, sometimes finer, sometimes thicker, and are often described in recent works on laryngoscopy as continuations or parts of one of the principal muscles of the larynx, but her chief discovery was of certain small cuniform cartilages within the membranes of the vocal ligaments, and reaching from their junction with the arytenoid cartilages to the middle of the ligaments. She states that she found these always in the female larynx, and that they undeniably work the shutting part of the glottis, but as they are only now and then fully formed in the male larynx, it follows plainly that only a few male voices are capable of producing the head tones. She adds that observation in the microscope revealed in those larynxes in which the cuniform cartilages were wanting, parts of a cartilaginous mass or the rudiments of a cartilage in the place indicated, and accounts for the cartilages not having been discovered earlier, by the fact that the male larynx was most commonly used by anatomists for investigation, as its muscles are more powerful and its cartilages firmer than in the female larynx.

"Thus she proved her point, and better still she succeeded, by patient effort and persevering practice, of which she was unsparing now that she had discovered the cause of her inability to sing [the attempt to carry upward the throat tones beyond their proper limit] in once more recovering her voice. Certainly if proof were demanded of the truth of her theory, or the practical value of her method, it need be sought no further than in the fact of her having succeeded so completely in the restoration of her own voice, a task recognized by all singing teachers as infinitely more difficult than the original training of an untried organ. At last she who understood the art of singing could sing again—and a glad song she sang!

"She has spoken for herself as to this portion of her experience and it seems most appropriate to quote her own words:

"'As I had had for many years the best teaching, both German and Italian, in the art of singing, and had often sung with favor in concerts, I was led to believe myself qualified to become a teacher of this art, but I had hardly undertaken the office before I felt that while I was able to teach my pupils to execute pieces of music with tolerable accuracy and with the appropriate expression, I was wanting in the knowledge of any sure starting point, any sound principle from which to proceed in the special culture of any individual voice. In order to obtain the knowledge which thus appeared to be requisite in a teacher of vocal music, I examined the best schools of singing, and when I learned nothing from them that I did not already know, I sought the most celebrated teachers of singing, to learn what was wanting; but what one teacher announced to me as a rule was usually rejected by another. Every teacher had his own peculiar system of instruction. No one could give me any definite reason therefor, and the best assured me that so exact a method as I sought did not exist, and that every teacher must find his own way through his own experience. In such a state of darkness and uncertainty to undertake to instruct others appeared to me a manifest wrong, for in no branch of instruction can the ignorance of the teacher do greater injury than in the teaching of vocal music. This I unhappily learned from my own personal experience when under the tuition of a most eminent teacher I entirely lost my voice, whereby the embarrassment I was under, so far from being diminished, was only increased. After this misfortune, I studied under Frederick Wiek, in Dresden (the father and instructor of Clara Schumann), in order to become a teacher on the piano, but while I thus devoted myself to this branch of teaching exclusively, it became from that time the aim and the effort of my life to obtain such a knowledge of the human voice as is indispensable to a natural and healthy development of its beautiful powers.

"'I availed myself of every opportunity to hear Jenny Lind, who was then dwelling in Dresden, and to learn all that I could from her. I likewise hoped from a protracted abode in Italy, the land of song, to obtain the fulfillment of my wishes, but beyond certain practical advantages, I gathered there no sure or radical knowledge.

"'In the French method of instruction, now so popular (1868), I found the same superficiality and uncertainty that existed everywhere else. But the more deeply I was impressed with this state of things, and the more fully I became aware of the injurious and trying consequences of the method of teaching followed at the present day, the more earnestly was I impelled to press onward in search of light and clearness in this dim domain.

"'Convinced that only by the way of scientific investigation the desired end could be reached, I sought the counsel of Prof. Helmholtz, in Heidelberg. This distinguished man was then engaged in a scientific inquiry into the natural laws lying at the basis of musical sounds. Prof. Helmholtz permitted me to take part in his investigations, and at his kind suggestion I attempted by myself, by means of the laryngoscope, to observe the physiological processes that go on in the larynx during the production of different tones. My special thanks are due to him that now, with a more thorough knowledge of the human voice, I can give instruction in singing without the fear of doing any injury.'"

Mr. Rosengarten presented to the Society the laryngoscope used by Mrs. Seiler, *which was stated to be the first ever used in America.* At the conclusion of the memoir, the President invited those present to a light collation that had been prepared.

And the Society was adjourned by the President.

Stated Meeting, December 4, 1891.

Present, 11 members.

Mr. RICHARD VAUX in the Chair.

Correspondence was submitted as follows:

A letter of acceptance of membership from Prof. George Forbes, London, November 1, 1891.

A letter from the Coast and Geodetic Survey Office, Washington, D. C., asking for exchanges, which request was granted.

The following were ordered to be placed on the Proceedings Exchange List:

Massachusetts Agricultural College, Amherst, Mass.; Agricultural Experiment Station, New Haven, Conn.; Agricultural Experiment Station, Lincoln, Neb.; Agricultural Experiment Station, College Park, Md.; Agricultural Experiment Station, Raleigh, N. C.; Agricultural Experiment Station, Auburn, Ala.; Agricultural Experiment Station, Starkville, Miss.; Agricultural Experiment Station, Fayetteville, Ark.; Agricultural Experiment Station, Laramie, Wyo.; Agricultural Experiment Station, Providence, R. I.; Agricultural Experiment Station, Tucson, Ariz.; Agricultural Experiment Station, Experiment, Ga.; Agricultural Experiment Station, Ames, Iowa; Agricultural Experiment Station, Fort Collins, Colo.; Agricultural Experiment Station, Auburn, Ala.; Agricultural Experiment Station, Brockings, S. Dak.; Agricultural Experiment Station, Corvallis, Oreg.; Botanische Verein, Provinz Brandenburg, Berlin, Prussia; Bowdoin College Library, Brunswick, Me.; Library of the University of Lyons, France; Museo Oaxaqueño, Oaxaca, Mexico; American Museum Natural History, New York City, N. Y.; New Jersey Natural History Society, Trenton, N. J.

A circular from the American Chemical Society, New York, announcing a meeting to be held in New York city on December 29 and 30, 1891.

Letters of envoy were received from the Geological Survey of India, Calcutta; Académie des Sciences, Amsterdam; Observatorium der K. K. Nautischen Akademie, Triest; Society of Natural Sciences, Buffalo; Secretary of State, Washington, D. C.

Letters of acknowledgment were received from the Comité Géologique de la Russie, Imperial Russian Geographical Society, St. Petersburg (135); Prof. A. E. Nordenskiold, Stockholm (134, 135); R. Danish Geographical Society, Copenhagen (135); Musée Royale d'Histoire Naturelle de Belgique, Bruxelles (129–134); Académie R. des Sciences, Amsterdam (131–134 and Transactions, xvi, 3); K. K. Militär-Geographische Institut, Wien (131–134); K. K. Sternwarte (135); K. K. Astron. Meteorolog. Observatorium, Triest (131–133, 135); Naturforschende Gesellschaft des Osterlandes, Allenburg (135); Prof. F. Reuleaux, Berlin (134); Naturwissenschaftliche Verein, Bremen (135); K. Sächsisches Meteorologisches Institut, Chemnitz (135); Verein für Erdkunde, Dresden (135); Naturforschende Gesellschaft, Freiburg i. B. (135); Naturhistorische Gesellschaft, Hanover (135); Verein für Thüringische Geschichte und Altertumskunde, Jena (135); Dr. Julius Platzmann, Leipzig (135); R. Accademia di Scienze Lettere ed Arti, Modena (135); R. Comitato Geologico d'Italia, Prof.

Guiseppe Sergi, Rome (135); Prof. Gaston Maspero, Paris (135); Société des Sciences Naturelles et Archæologiques de la Creuse, Guéret, France (134); Prof. E. Mascart, Bureau Central Météorologique de France (135); Sir Henry W. Acland, Oxford, Eng. (135); Prof. J. P. Postgate, Cambridge, Eng. (135); Department of Science and Art, Royal Astronomical Society (135), Mr. Charles Leland, London (134, 135); Royal Dublin Society (135); Royal Society of Edinburgh, Royal Observatory, Mr. James Geikie, Edinburgh (135); Vermont Historical Society, Montpelier (134); Prof. Elihu Thomson, Swampscott, Mass. (135); Prof. James Hall, Albany, N. Y. (134); Rochester Academy of Science (135); Mr. Henry Carey Baird, Philadelphia (131–135); Wyoming Historical and Geological Society, Wilkes-Barré (135); California Academy of Sciences, San Francisco (131–135).

Accessions to the Library were announced from the Naturforscher Verein, Riga, Russia; K. K. Sternwarte, Prag; Osservatorio Marittimo, Trieste; Bayerische Botanische Gesellschaft, München; Société Neuchateloise de Géographie, Neuchatel; Direzione Générale della Statistica, Prof. Guiseppe Sergi, Rome; Prof. Paul Topinard, Paris; R. Academia de la Historia, Madrid; Philosophical Society, Cambridge, Eng.; Geological Society, Mr. Henry Wilde, London; Hon. George E. Foster, Halifax, N. S.; American Oriental Society, New Haven; Wesleyan University, Middletown, Conn.; Buffalo Society of Natural Sciences; College of Pharmacy, Philadelphia; U. S. Bureau of Education, Smithsonian Institution, Washington, D. C.; Historical Society, Mr. C. S. Wake, Chicago; California Academy of Sciences, San Francisco; Geological Survey of Arkansas, Little Rock; Observatorio Astronomico Nacional de Tacubaya, Mexico.

A photograph for the Society's Album was received from Mr. Samuel Wagner.

The decease of the following members was announced:

J. H. B. Latrobe, Baltimore, August, 1891.

Dr. D. Humphreys Storer, Boston, September 10, 1891, æt. 87.

Moncure Robinson, Philadelphia, November 10, 1891, æt. 89.
Rev. Thomas Hill, Portland, Me., November 21, 1891, æt. 73.

The Curators presented the following report:

HALL OF THE
AMERICAN PHILOSOPHICAL SOCIETY,
104 SOUTH FIFTH STREET.

PHILADELPHIA, November 28, 1891.

The Curators, having fully considered the matter of the Peale Stone Age Collection now on deposit at the Academy of Natural Sciences, and all the facts relating thereto, as requested by resolution of November 6, are of opinion that a resolution should be passed requesting the return of said deposit to the custody of the Society in accordance with the terms of the bequest of the late Mrs. Peale.

PATTERSON DU BOIS.
J. CHESTON MORRIS.
R. MEADE BACHE.

On motion, the Society

Resolved, That the return of the Peale Stone Age Collection from its temporary place of deposit, the Academy of Natural Sciences, be now requested.

The Annual Report of the Treasurer was presented and referred to the Committee on Finance.

Mr. Price moved that the consideration of the report from Dr. Cope's Committee be deferred until the next stated meeting.

Dr. Cope read the report.

The subject was discussed and Mr. Price's motion was then carried.

On motion of Dr. Hayes, it was

Resolved, That the Secretaries present at the next meeting a report in writing of the cost of issuing the Proceedings quarterly and of such extra number not including the text and report a form to meet postal laws.

And the Society was adjourned by the presiding member.

Carey and Two of His Recent Critics, Eugen V. Böhm-Bawerk and Alfred Marshall.

By Henry Carey Baird.

(Read before the American Philosophical Society, November 20, 1891.)

Permit me, this evening, to ask your attention to a brief examination of the recent criticisms of Carey by two economists—the one an Austrian, the other an Englishman. Although these two writers treat the economic problem, each from an entirely different standpoint, one is as remote from an appreciation of the truth as the other; and further, neither recognizing what constitutes the great fundamental principle in Carey's system, they have both left his position unassailed, as indeed it is unassailable. The Austrian is Böhm-Bawerk, Honorary Professor of Political Economy at the University of Vienna; the Englishman, Alfred Marshall, Professor of Political Economy at the University of Cambridge.

Prof. Böhm-Bawerk has published two ponderous treatises, the first intended to be destructive of other men's reasonings and theories, and is entitled, "Capital and Interest, a Critical History of Economical Theory;" the second, designed to be constructive of theories of his own, is entitled, "The Positive Theory of Capital"—whatever a "positive theory" may mean, seeing that man's vision, mental as well as ocular, being limited, and thus short of the capacity to take in the whole situation, he can have no absolute or positive knowledge—nothing more than his poor faculties permit of. Mr. Böhm-Bawerk's first book, as translated by Prof. Smart of Glasgow, makes of text, 8vo, 428 pages; the second, as translated, 8vo, 426 pages, while a distinguished professor of political economy, who thinks well of the author's labors, has recently assured me that the marrow of these 854 pages might have been put into forty pages. Such is the thoroughness of this Austrian *savant* that he inflicts upon the student of economics twenty-one times as many words as the ideas he possesses are worthy of in the presentation. As for myself, I can say that I have carefully and critically read the whole of these dreary pages—dreary because of an ever-recurring sense of the unsoundness of the author's premises, as well as of his conclusions.

The net result of Dr. Böhm-Bawerk's "Capital and Interest," wherein he charges Carey, in what he says of interest, of being guilty of "a tissue of incredibly clumsy and wanton mistakes," is that "*Present goods possess a greater value than future goods;*" that a "*loan is a real exchange of present goods against future goods;*" and "*Present goods possess an agio in future goods. This agio is interest.*"

Such is the actual product of 428 pages of the most complex, confusing, narrow, hair-splitting, and arrogant criticism, criticism, too, by a man who has himself built up a superstructure which rests upon a fallacy. This fallacy consists in the fact that the writer has included in and treated under "Interest" things that are not interest at all. Interest is the compensation paid for the use of the instrument called money, and its substitute, credit, always expressed in a money of account, *and for them alone.*

This instrument, money, is the great instrument of association—that one thing, the possession of which, with its quality of universal acceptability, in highly organized—civilized—society, commands all other things to which we attach the idea of value. To talk of the rent of a house, a farm, or a garden, the freight or passage paid to a railroad, or a steamship, or a steamboat company, or proprietor, or the porterage in a cart, or a wheelbarrow, as interest, is to add a new and most vicious element of confusion to that despair of thoughtful men, that fruitful parent of misery to mankind, the "Dismal Science." The very word *agio,* which Dr. Böhm-Bawerk would apply to all manner of goods, wares and merchandise, had its origin with reference to a money of account, and to this hour it can be applied to or qualify no manner or form of thing not expressed in a money of account.

Further, Dr. Böhm-Bawerk has jumbled up the profit that a capitalist can make out of his own business ventures over and above the profit imagined to be properly due to his own time and labor, with the interest problem. Thus does he further and hopelessly bemuddle the subject of interest. He calls this profit, which is not interest at all, interest, and which it is impossible to separate from the results of the personal exertions, sagacity, experience, and risks of the capitalist—"natural interest." Where, in nature, will he find interest, where trade, money, credit, houses, ships, railroads, tools, wagons, wheelbarrows, textile fabrics—where, I would ask, without the application of human labor, any single commodity to which we attach the idea of value? Are not civilized society and all its appliances for forwarding trade, commerce, production and consumption, purely the work of man, and hence artificial? Is not this *natural interest* a collocation without meaning? Is not this doctrine of Dr. Böhm-Bawerk's, to use his own words, as applied to Carey, "one of those theories which cast discredit, not only on their authors, but on the science that lets itself be seduced into credulous acceptance of them, not so much that it errs, as for the unpardonably blundering way in which it errs?" For one, not only do I think that it is so, but to me it is a source of wonder and amazement, that the perpetrator of such blundering can criticise others in the severe and arrogant terms in which Dr. Böhm-Bawerk has done.

But what is to be thought of his treatment of Carey? Why, that it is simply infamous, for the reason that the necessary preliminary to refuting and denouncing him as guilty of a "tissue of incredibly clumsy and wanton mistakes" has been his misrepresentation. In order to refute him, he has been forced to attempt to make it appear that Carey was guilty of the stupidity of treating *distribution,* as Dr. Böhm-Bawerk has done, as *interest,* not *distribution.* What Carey himself calls "the law of distribution," he calls "Carey's interest theory." After quoting what Carey distinctly states regarding *distribution,* and which he calls such, he comments as follows: "On these preliminary facts, then, Carey builds his great law of interest; that, with advancing economical civilization, the rate of profit on capital—that is, the rate of interest—falls, while the absolute quantity of profit rises" (the interjected words, "that is, the rate of interest," being Dr. Böhm-Bawerk's, not Carey's). Carey distinctly and emphatically says: "*Interest is the compensation paid for the use of the instrument called money, and for that alone.*" And again: "When a man negotiates a loan, he obtains money for which he pays interest; when he borrows the use of a house, he pays rent; when he hires a ship he pays freight."

This dictum of Carey's is not merely clear and to the point, but it is in accordance with the common understanding of mankind. To change it as Dr. Böhm-Bawerk has attempted to do, is to bemuddle and confuse the subject. Before he and his translator obtain the right to arraign Carey as "a confused and blundering writer," it is incumbent on them both to show that his definition is wrong, and that Dr. Böhm-Bawerk's definition is correct, and the only correct one. Until they have done so, their denunciations obviously prove their own incapacity properly to criticise a man of Carey's originality, lucidity, power, and far-reaching influence upon mankind.

Of the numerous economists whose doctrines Dr. Böhm-Bawerk has attempted to criticise, none has he denounced in terms so opprobrious as those applied to Carey and his distinguished disciple, E. Peshine Smith, and yet of all these men, the philosophy of none but Carey and Smith is capable of explaining the real cause of interest, or of clearing up the confusion into which Dr. Böhm-Bawerk has become involved regarding value.

Interest owes its existence to precisely the same cause and conditions as does money—the necessity under which man stands for association and combination with his fellow-men. But for this necessity there would be no interest, no money, indeed no political economy. Any system, or pretended system, of political economy which is not grounded on this great principle of association, this overmastering condition of man's nature, is false and misleading, a delusion and a snare—a system of confusion leading not only to further confusion, but to the wreck of the hopes, the rights, the civilization of mankind. The system of Dr. Böhm-Bawerk does not even remotely recognize it; he has not even the faintest glimmer of it, although all political economy is and must be concerned about it. He has dropped out of his system the great fundamental law, the great dominating fact as to the existence of man in society. His system is therefore of necessity not only useless, but worse than useless.

The second treatise of Dr. Böhm-Bawerk, "The Positive Theory of Capital," gives us, as a net result, the old and exploded wage-fund theory of the economists, with, as an annex and as a result of his interest theory of present goods possessing an agio in future goods, the effects of extension of processes of production and the number of producers to be provided for during all these imaginary processes—extended or non-extended, though they be. In fact, he has added to, not decreased, the complication which arose out of the unsound and even absurd wage-fund theory, involving, as it did, a fixed "national subsistence fund."

Attempting to bolster up the theory of saving as a source of capital, Dr. Böhm-Bawerk has no real conception of the actual source of capital. His whole theory is antagonistic to the truth that wealth consists in the power of man to obtain mastery over nature; and that capital is the instrument by means of which that mastery is acquired; and further, that capital accumulates in the exact ratio that consumption follows production, and that matter takes upon itself new and higher forms—what we term consumption and production being mere transformation of substance; in other words, the more continuous and rapid the motion of society, the greater the power to accumulate capital and to acquire wealth.

An entire "book" is devoted to the discussion of "Price," in which even a definition of that vital word is wanting, the evidence being therein presented, in abundance, that the author is quite unaware of the fact that price is the expression of the power of a commodity to command money in exchange, and is always expressed in a money of account.

While two entire volumes are filled with discussion looking towards the effort to establish the cause of interest and of the rate of interest, Dr. Böhm-Bawerk has not even the most crude conception of why it is that people are obliged to borrow money or credit, or goods, or rent houses, or factories, or why one man buys and another man sells labor power. If he had recognized association with his fellow-men as the most dominating necessity of man's nature, and that money, with its qualities of universal acceptability, and of almost perfect divisibility and aggregation, was the necessary instrument of association, he would not have inflicted upon mankind such a tissue of learned fallacy in reference to "present goods" and "future goods," labor wages and the wage-fund theory. Above and beyond all, he would not have made those fundamental errors as to interest, which is paid only for the use of money or credit expressed in a money of account, but which he has jumbled up with the hire of all sorts and kinds of goods, wares and merchandise. He does not even know why "present goods" possess what he calls an *agio* in "future goods," *i. e.*, because of the necessity under which man stands for association and combination with his fellow-men.

Marshall.

Under the title of "Principles of Economics," Prof. Marshall, of the University of Cambridge, has published the first volume, 754 pages, of a treatise in which no great broad principle is presented, in which no end of petty details are given, and in which not a single clear and valuable analysis of economic phenomena is to be found; and in which an entire absence of the true capacity for analysis is shown. The profundity of

Prof. Marshall may be judged from the fact that he says: "It makes indeed little real difference to the life of a family whether its yearly income is £1000 or £5000." No one but an economist could enunciate such non-sense, and still retain his position as an authority in a high department of knowledge.

His book, largely accepting the doctrines of Ricardo, is full of apologies for him, and for his inaccuracy of statement. For instance, he says:

"His exposition is as confused as his thought is profound. He uses words in artificial senses which he does not explain, and to which he does not adhere, and he changes from one hypothesis to another without giving notice. If, then, we desire to understand him, we must interpret him generously, more generously than he himself interpreted Adam Smith. When his words are ambiguous, we must give that interpretation which other passages in his writings indicate that he would have wished us to give them."

It is quite proper that a teacher who can talk in this style should have no difficulty in deciding that Carey and others who have refuted Ricardo do not understand him. After myself reading "Ricardo" more than thirty years ago, I told Mr. Carey that I could not understand what he was driving at. His reply was, "Ricardo did not himself understand." Nor do I think he did. Confusion in language involves confusion not merely in argument, but in thought; and in no other department of knowledge but that of political economy, would it be possible for one who needs such apologies, as those made for Ricardo by Prof. Marshall, to become the founder of a distinct school.

The blunders which Mr. Marshall has made with reference to Carey and Frederick List, and especially as to the indebtedness of the former to the latter, are most remarkable.

For instance, he says Carey was born in Ireland, when, had he taken the least trouble to examine any biographical notice of him, he would, at a glance, have seen that he was born in Philadelphia. Then he asserts that List's "Outlines of a New System of Political Economy," a tract published in Philadelphia, 1827, and its wide circulation were "the beginning of his fame, as it was of the systematic advocacy of protectionist doctrines in America," whereas this movement was commenced in 1819, and Mathew Carey was one of the originators of it; and three years before the appearance of List's tract, or in 1824, the first really protective tariff enacted in the United States was passed.

Then he says that this publication of List's was made ten years before the publication of Carey's first important work, his "Principles of Political Economy," and adds, "Carey owes many of his best thoughts on protection to List."

Now, Carey's attention to economic subjects commenced in 1835, when he published his "first important work," the "Essay on the Rate of Wages," and there is not a particle of evidence that he ever read the insignificant little tract of Frederick List. If he ever did he wholly failed to profit by it, as in all of his earlier books and papers he advocated the doctrine of *laissez nous faire*, never having publicly declared his adhesion to protection until the publication of "The Past, the Present, and the Future" (1848). Nevertheless, in each of his early books will be found the germs of those vital and far-reaching principles which he so grandly developed in his "Principles of Social Science," his progress from 1835 to 1860, and even to 1875, having been steadily onward. By the beneficent practical working of the tariff of 1842, he was, in 1844, induced by the logic of events to range himself on the side of protection as a necessary national policy. But it was not until 1847 that he was able to reconcile it to economic theory.

In 1847, when he had outlined his law of the occupation of the earth, which has completely overthrown the basis upon which rested Ricardo's theory of rent, he readily emerged from the last vestiges of a belief in so absurd a theory applied to an artificial society as *laissez nous faire*. Lying in bed one morning, picturing to himself the settlers on the sides of the hills, moving down into the valleys and approaching each other, as wealth, power and civilization grew, he realized the vital importance of bringing the consumer to the side of the producer, and, as he said to me, "I jumped out of bed, and, dressing myself, was a protectionist from that hour."

The fact is Carey, not having studied German until 1856, List's "National System of Political Economy," published in Germany in 1841, was to him a sealed book until 1851, when a French translation by Richelot appeared in Paris. Carey's copy of this book in the Library of the University of Pennsylvania, with his pencil marks in it, showing passages which he considered striking, clearly proves that he made but little use of it.

But the question of Carey's position as a social philosopher is not to be determined by whether or not he picked out from some other investigator one idea here or another there, but by his philosophy as a whole. His great merit does not consist in the fact that he has demonstrated that association and combination with his fellow-men is the greatest need of man, or that in the utilization of labor power—the most perishable of all commodities—is to be found the measure of the growth of a people in wealth, power and civilization ; or that money, the instrument of association, by giving utility to billions of millions of minutes, which without it would be wasted, acts as a great saving fund for labor ; or that a necessary condition of advance in civilization is that man passes from the use of poor tools, including poor lands, to the use of good tools, including good lands ; or that value is the measure of the power of nature over man, and is to be found in the cost of reproduction, while utility is the measure of man's power over nature ; or that, with the development of this last-named power, distribution takes place under a law by virtue of which to labor goes a large proportion of a larger yield—freedom thus growing with the growth of wealth and civilization.

It is not by reason of the clear demonstration of any one of these great truths, or of all of them, but of their demonstration *plus* the interlocking and the interweaving of these vital truths into one great and harmonious whole. Thus and thus only is it that he has presented a system of social philosophy deeper and broader than that of any other economist from the days of Plato and Aristotle down to our own time. By this touchstone —fundamental truths with their relations to each other, worked out into a complete system—is it that Carey is to be judged, and judged rightly and justly, and not by mere verbal criticism, or by an attempt to prove that an idea here or another one there was previously promulgated by some other teacher.

A great admirer of Frederick List, for what he had done in building up the German Empire—a work without which Bismarck, Von Moltke, and William I would never have been heard of in history—Carey had but a poor opinion of List's "National System of Political Economy," for the very good reason that it lacked just what he had aimed to present in his own books, and what are absent in Prof. Marshall's volume, broad, deep and enduring fundamental principles, interlocked and interwoven into one grand and harmonious whole, like Carey's own great and noble "Principles of Social Science." Indeed, no such voluminous writer on social subjects as Carey has ever lived and written who has paid so little heed to the writings of other economists. His own economic and statistical library, now in the Library of the University of Pennsylvania, will bear me out in this statement. Colwell collected the writings of political economists; Carey collected those of travelers, historians, statisticians and scientists; and to these he went for the material out of which to demonstrate those great principles which will ever bear his honored name.

How far Carey has been successful in impressing his philosophy upon the people of the United States, and upon the national policy, is well depicted by a recent and far from friendly critic as follows: "Measured by results," says Prof. Levermore, "the Carey school, and not its opponent, has achieved success in the United States. For thirty years, the stone which the builders rejected has been the head of the corner. Carey and his friends never captured our colleges; but, for a generation, they had dominated five-sevenths of the newspaper offices, a pulpit far more influential than the professorial chair. The arguments to which Carey gave form and eloquence are in the mouths of more than half the business men and farmers of our country; and, in the last Presidential campaign, the Republican party reaffirmed the extremest principles of the Carey school, including even the rancor towards England, with a violence and absoluteness that would probably have surprised Carey himself" ("Political Science Quarterly," Dec., 1890, pp. 572, 573).

The reason for this is not far to seek. Carey dealt in broad and enduring principles so interlocked and intertwined that any man of ordinary intellect, once captured by them, might ever after during his life bid adieu to the hope of freedom from their intellectual domination.

Nihil est veritatis luce dulcius. Indeed, nothing is sweeter, nothing more delightful, than the light of truth ; and Carey has given to mankind a great body of truth, instinct with life and being, an organic whole demonstrating those principles which govern the well-being, the happiness and the civilization of the human race. The destruction of the foundations of this system demand men of greater power than Eugen V. Böhm-Bawerk and Alfred Marshall. They have not even made a lodgment in the outworks. In the citadel all is calm and serene, without apprehension of successful attack by such incompetent leaders—leaders who lack at once a knowledge of even the elementary principles of economic truth, and the power to group and place in proper relation to each other those things which they do teach, if, indeed, their theories have any connected relations one to another. If they have such relations, these gentlemen have failed to show them.

Vocabularies of the Tlingit, Haida and Tsimshian Languages.

By Dr. Franz Boas.

(Read before the American Philosophical Society, October 2, 1891.)

The following vocabularies were collected by the author when studying the Indian tribes of British Columbia, under an appointment of the Committee of the British Association for the Advancement of Science, appointed for the purpose of investigating and publishing reports on the physical characters, languages, and industrial and social conditions of the Northwestern tribes of the Dominion of Canada. It was decided that in the report of the Committee a brief comparative vocabulary only should be printed. As, however, the languages of the North Pacific Coast of America are little known, the vocabularies may be found to possess some value.

The following alphabet has been used :

The vowels have their continental sounds, namely : *a* as in *father ; e* like *a* in *mate ; i* as in *machine ; ō* as in *note ; u* as in *rule.* In addition the following have been used : *ä, ö* as in German ; *â* = *aw* in *law ;* E = *e* in *flower.*

Among the consonants the following additional letters have been used : *g·*, a very guttural *g*, similar to *gr ; k·*, a very guttural *k*, similar to *kr ; q*, the German *ch* in *Bach ;* H, the German *ch* in *ich ;* Q, between *q* and H ; *c* = *sh* in *shore ;* ç = *th* in *thin ; tl* an explosive, dorso-apical *l ; dl* a palatal, dorsal *l.* ' following a consonant designates the u position of the organs of articulation.

I. ENGLISH-TLINGIT.

STIKEEN DIALECT.

A.

above, on top of, ka.
Acer tlrā'tlrē.
adam's apple dlētu'q(1) kagu'ntlē(2) = neck (1) ? (2).
afraid (akū ti) qētl.
again dētsō
ahead ıān.
Alnus kē'cic.
always dj'ētlu'k, yūk·a.
Anas boschas kindētcunē't = moving straight up.
—— *clypeata* k·in.
—— *histrionica* ts'utsk.
ancestor acukua.
angry k·'ant—wa nuk.
ankle k·'ōs t'aktl = foot knuckle.
Anser t'ā'wak·.
apron, woman's, cūqe't'a.
—— *dancing,* sᴇ'n(1)k·ēt(2) = ? (1) apparel (2).
apparel, wearing, k·ēt.
Arctostaphylus uva ursi tinʜ.
arm, hand, djin.
armor, wooden, tlrā'tlrē (= Alnus).
—— —— *of parallel sticks,* sᴇ'n k·ēt (see *apron*).
—— *held in mouth,* k·'a(1)koē't(2) = mouth (1).
Arnica cordifolia an(1)ka(2)nā'gu (3) = town (1) on (2) medicine (3).
around, outside, da.
I walk around house hīt da ya qoa gūt.
arrow tcunē't = moving straight.
—— *double-pointed,* tcunē't k·'atlā'-k·ē.
ashes k·'an ltē' = fireplace.
Astur atricapillus kyēdju'k.
Atlda, name of a place.
aurora k·'an(1)yiq(2)k·ū(3)watē(4) = fire (1) like (2) out of doors (3) color (4).
—— gyīts'ō'k.
axe cᴇnqoā'rī.
—— *stone,* kyē't'ō.

B.

baby g·ata gua'tsgō (male and female).
back dik·.
—— *of hand* djin kōtl.
bad tlētl wu c k'ᴇ = not good.
badger nōsk.
bark gan da = wood around.
basket for blankets nē'etl.
—— *for berries* k·ak'.
bat tsik'rēditā'n.
to bathe dᴇcūtc.
baton of shaman wū'sag·a'.
beach tl'ēn'ē'tē = sand place.
bear, black, ts'ēk.
—— *grizzly,* qūts.
—— *white (polar),* cāq.
beard k·'atatsā'ıē.
beaver ts'ikrēdē'.
bed yē'at = something to lay on (Chilkat).
bedroom īt.
bee gandasā'dji.
belly yūra'.
belt sī'gī.
berry tlēk'.
—— *salmon,* wutst'ān tlēk'.
—— *black,* gawa'k· (Rubus).
—— *dried,* atka qōk·.
—— *black,* t'ōtc tlēk' = blackberry.
Betula glandulosa tlēri's.
—— attā'rī.

bird tō′tli.
—— *a species of, with red wings*, kōn.
black t′ōtc (see *soot*).
blanket tl′ē.
—— *cedar bark*, tsātlk k·′ō′ū.
—— *martin skin*, k′ōq k·′ō′u.
—— *Chilkat*, nā′qēin.
Blennius sp., dlūt′.
blind tlk·ōctēn.
blood ci.
to blow (*wind*) dō′wanuk
to blow uq.
blue ts′ōyi′qatē (ts′ō? yiqatē = colored).
—— *jay* k·′eck‘.
board for drying salmon ganirē′t = smoke place.
bone s′ak· (see *tall*, *short*).
boom s′E′sa tō s′ā′gē = sail in oblique.
bow of canoe cEkE′.
bow sEk·s.
bowstring sEk·s nā′sē = bow guts.
box kēt, tlak·t.
—— *large*, tluk·t tlēn.
bracelet kīs.
Brachyrhampus marmorata tc′īt.
braid ca kEsī′t (ca = head).
brains tlak·ēgī′.
breakers tīt ra tl′ēk· (tīt = wave).
breast Hē′tk·a.
breath dEsē′uk.
brother, elder, unu′q.
—— *younger*, kik‘.
brother-in-law (wife's brother) kan.
brush Hī′t′a.
—— *for clothing* at k·a Hī′t′a.
Bubo virginianus tsisk‘.
Buccinum tl′itlk‘.
bucket k·‘ē′ca.
butterfly tlētlu′.
by and by yīdEtqE′ñga, tlīts′a′.

C.

calf of leg ts′ē′yu.
Caltha palustris atagUē′k·ē.
cambium of Tsuga sEk·.
Canace obscura nukt.
canoe yāk‘.
—— *Tlingit*, sīt.
—— *Haida*, wutsdē′.
Cardium Nutalli (cockle) g·′atl ka′tsk.
cariboo wutsi′H.
carpet nētlītl′i′tī.
to carry in hand ran—tEn.
cat dūc (Chinook).
cedar, yellow, qār.
—— —— *young*, tlEqrE′tē.
cedar bark tīr.
—— —— *prepared for weaving mats* rūt.
cedar (*and spruce*) *root* qāt.
—— —— *hat* qāt ts′āq.
Ceryle Halcyon tlaqanēts′ē′.
chair ka ra kī′djet = on top of which one sits.
chatterbox k·′a tlēyō′s = mouth playing (see *to lie*).
cheek wac.
chief ank·ā′ō (see *rich*).
child g·it′a′.
chin tēg·.
Chiton Stelleri cā′u.
—— *tunicata* kōr.
Circus Hudsonicus qēq.
clear, it is, weather, a ka wa qats.
cloud gūts (see *heaven*).
cloudy k·ū tlī gūts = it is out of doors cloudy.
club g·′uts (see *crabapple tree*).
coal t′ōtc (see *black*).
cold sia′t.
Colymbus glacialis k·Eg·ē′it.
column, heraldic (totem post) kōtē′ra.
comb qēdo′.
common people īcā′n (see *poor*).
cone of Picea ts′ōtsā′ne.
to cook (at—)saē′.
copperplate tina′.
cormorant yōk·.
corpse narū′.

cotton goods s'ᴇ'sa (see *sail*).
Cottus sp. wēk·.
council atkaqtoā'k.
country ā'n(ē).
cousin (father's sister's child) at.
—— (mother's sister's child) tlak'. (see *sister*).
crab s'ā'u.
crabapple tree g·'uts.
crescent (see *moon*).
cross (minded) k·'ān—raō (see *angry*).
crow ts'ᴇ'quētl.
crown of head ca kī = head top.
to cry g·āq.
Cychrus longicollis as k·'tō yik ca' = woman in the woods; as k·'tō = woods, ca = woman.

D.

dagger tsā'g·atl.
to dance a—tl'ēq.
dance of shaman iqt dāidē'dē.
dancing apparel tl'ēq k·ēt.
danger at sea kūtlēqē'tlcᴇn.
—— name of Yētl's mother, K·ōtsō teriᴇ't.
daughter sī (probably child, said by mother).
day yigᴇri' (see *noon*, *to-day*).
daylight k·ēwa'.
dead (na) na.
deaf tlk·otl'ᴇqtc.
deer k·okā'n.
dentatia tē'k·ē.
difficult tli tsē.
dish grease g'ᴇkᴇnē'.
—— *of mountain goat horn* tlī'nēt ts'ik'.
dishes nūk'.
diver ts'uts.
to do sī, yē—sinē'.
dog kyētl.
doll sī (see *daughter*).
door k·'ahā't.
dragon fly tlk·acēcqā'wu = no man head-hair. They are said to sing: tlētl(1)qat(2)ca(3)caqawu (4) = not (1) I (2) on (3) head hair (4) = no hair is on my head.
to dream a—djūn.
to drink tana'.
drum gā'u.
dry wa qōk.
duck g'uts.
dust tc'ēʜ, k·es'ē'dja.

E.

eagle tc'āk'.
—— *black*, tc'āk'(1)iē's(2) = eagle (1) black (2).
ear gūk.
earring djāc.
east wind nānaqē't.
—— tl'ak·ak·a'q (Chilkat).
easy tlētl tli tsē = not difficult.
to eat (at—) qa.
ebb tide renatlē'n.
eggs of lice ʜīts.
elbow t'ēr.
elk tsisk'.
Empetrum nigrum qitlēwu'ts'ē.
empty aqu'ktlē.
end cᴇ.
Epilobium angustifolium k·ō'kān nā'k' = deer medicine.
ermine da
evening qā'na
excrement hā'tlē.
eye wak·.
eyebrow ts'ē.
eyelashes wak· qā qē'q'ō.
eyelid, lower, wak· tᴇri.
—— *upper*, wak· k·a'.

F.

face rᴇ.
far (na) tlē.
far out into the sea dēkyī.
fast rᴇsiyē'k.
fat, for greasing face, rᴇ nēts'ē'.

father īc.
father-in-law rū.
fathom wāt (see *tall*, probably *length*).
—— (from elbow over breast to finger) k·āt'ē yiq ku wāt.
—— (from shoulder over breast to finger) qik cE gu'ntlē yiq ku wāt.
—— (shoulder to finger of same arm) qik cE yiq ku wāt.
—— (elbow to finger of same arm) tcik·ē yiq ku wāt.
feather k·'oā'tl.
feather bed k·'oā'tlriā't = feather place.
to feel, I feel better, ag·a ctuq dēnōk.
fern tsāts.
to fight g'an.
finger tl'ēk· (see *toe*).
—— *first*, tc'ēq.
—— *second*, tl'ēk·(1)tlēn(2) = finger (1) great (2).
—— *third*, tl'ēk·(1)g'a'tsgō(2) = finger (1) small (2).
—— *fourth*, wun ka tc'ēq (see *first finger*).
fire k·'ān.
fire drill tōutlē' (see *round*, and *to turn round*).
fireplace k·'an i'tē = fire place.
fish, fresh-water, hin tak'a'tē.
—— *a small species,* kH'ē'ta.
fish line kyē'u.
—— —— *of kelp,* tlEra'nē.
fishotter nukcēyā'n.
flood tide dāk·nEdē'n.
flounder tsE'nt'ē.
to fly dē'k·ēn.
foot k·'ōs.
forehead kāk'.
fox nag·āts'ē' (borrowed).
friend qonē'.
frog Hīqtc.
in front of k·'ē'yē (Chilkat).
frost kaquā'n.
Fucus vesiculosus tarē'dē.
fuel gan (k·'an ? = fire).
full cawahik.
fur seal q'ōn.

G.

Gallinago Willsoni gūtsrē tōtlī = heaven bird.
gens tān.
get up! cē'ndE !
girl cātk'.
to give djēt—tē.
——*give me to drink!* hāhēa qa tana' !
to go gōd, at.
I go to town ān(1)k·'ē'yē(2)dē (3)qoa(4)gūt(5) = town (1) in front of (2) ?(3) I (4) go (5) (Chilkat).
good (rE) k'E.
good-natured (tlī) an.
grandfather, mother, tlētlk'.
grandson cqa'nkē.
grass sō'uk·.
grease ēqē'.
gull kyē'tlEdī'.
gutts nāsē'
GutscEtla, Chilkat name = horizon mother.

H.

Haida Dēkyina' = people far out seaward.
hail kadE'ts.
hair ca qā'wu = head hair.
hairdress of shaman k'īts.
half cu'rō.
halibut tcātl.
hand djin.
Harelda glacialis yāau'nē.
HaricanE'kō = old woman under us, a mythical person.
hat ts'āq.
—— *war hat, shaman's hat,* wak·(1) k·ēt(2) = face (1) wearing apparel (2).
to haul in sī'yik·.

he hu, hōtc, qsᴇtē′.
head ca.
head ornament used in dances ca k·ēt.
to hear aq, aqtc
heart tēk·.
heaven gūtsᴇrē′ = cloud place.
heavy (re) datl, (tli) tsē′.
heels k·’ētak‘.
heron tlak‘.
herring rā′u.
herring rake ʜī′tla (see *brush*).
high water ran k·’ᴇtwada′.
his tō(—ri).
hoof aguē′ntlē.
hook, halibut, naq.
—— *round,* t’ēq.
horizon k·ū gāts.
—— gutscᴇ = sky end.
horn cēdē.
horse gyūdā′n (Chinook); dik· ka ra kidjēt (Sitka) = back upon sit.
house hit.
—— *dug out part in centre of,* tāk·.
humming bird tag·atg·iya′.
hungry, probably: ran : *I am hungry* qat ran owa ha ; *it makes us hungry* haēt ran ā wu si ha ; *if I am hungry* qat ran hē′nē.

I, J.

I qat, qatc.
ice t’ēk·’.
icicle k’iri t’ē′k’ē = above ice.
inside tō, g·ē.
it is inside white a g·ē ru.
instrument rᴇrē′t.
island k·’āt.
ivory cuqdu′k.
jaw, lower, q’ats.
just a short time ago, resū′.

K.

kelp gic.
—— *swimming apparatus of,* kutlt’ē′.
kelp cake tlāk·a′sk.
kettle, wooden, ōq’akā′gante.
kidneys kahā′gō.
killer (Delphinus Orca) kyīt.
knee kyīr.
kneejoint sā′rē.
kneepan ca k·unū′k’ō.
knife tlta.
—— *large,* wēks, gwa′tla.
knothole in a board k·ats.
to know aqtc = to hear often.
—— cᴇgōk = to understand.
knuckles (djin) kagu′ntl.
Kyinastl’ac, name of a man.

L.

labret g·ak‘.
—— *silver nail,* k·’annōq (k·’a = mouth).
—— *large plug,* k·’a nd’āk·’a′.
ladder dzēt.
Lagobus albus k·’ētsauwa′.
lame tlᴇk·a′tck.
language yuq’atᴇ′ñgi (see *to speak*).
large tlēn, yēk‘ tligē′ (?).
to laugh (at—) cō′uk·.
to leave k·ōwatē′n.
Ledum palustre ts’ikc’ etldī′n.
left hand, ts’ᴇtnᴇqī (djin).
leg k·’ōs.
—— *of animals* atca′kari.
—— *above knee* k·ats.
leggings k·’ōs k·ēt = leg clothing.
liar k·’ā tlē′yē s’a′tē = mouth play master.
life tsēn.
light tlētl wu dᴇtl = not heavy.
lightning ʜētl’ē′gu = thunder bird opens his eyes.
like yiq = similar to.
Lina sp. tāg ’n wē′s’ = sun lice.
lip, upper, k·’a tlō (k·’a = mouth).
to listen (at—) si .′q (from aq = to hear).
little ga′tsgō.

liver tl'ōk·.
long ku wa′t, ye—ku wat (see *fathom*).
—— ku darē′t.
long ago tc'ōtlā′k.
a long time (dē) tc'āk'.
loon cuwā′n.
louse wēs'.
low water ran ūwa tlā.
lungs kyēgū′.
Lupinus ka′ntak·.
Lycopodium clavatum k·ō′kan sī′gī = deer belt.

M.

to make sī.
man k·a, tlēingi′t.
many k·tōq.
—— *men* k·u ciri tihē′n.
—— *things* at ciri tihē′n.
married, baptized, hīn qᴇrōdōwatē′ = face put into water.
martin k'ōq.
mashed kaqᴇ′k'tl.
mask wuk· katadu′k = face not perforated.
mast sᴇ′sa (tō) a′sē = sail in tree.
master s'a′tē.
—— *of the upper world* Tahī′t.
mat, made of cedar bark, g·ātc.
match, rubbed cedar bark, g·ātc.
may be—gūtl.
meat dlīr.
medicine nāk'.
Mergus sarrator hin yikag·u′ = water rim.
midnight tatᴇrī′n (tāt = night).
mind tōrū′.
mink tlēnik'u′qū.
month dīs.
moon dīs.
—— *new,* kā′wakis = all out.
—— *first crescent,* wutsik·ē′n.
—— *half,* dīs cu′rō.
—— *full,* dīs ran rā′wawᴇt.
moon, last crescent, rārē kā′nakis.
morning ra k'ē′naēn; ts'ō tāt = blue night.
mortar t'ēk·'a ria′ti = pounding place; ka qᴇ′guaret = rubbing upon place.
mother atlī′.
mother-in-law can.
mould tlaq.
mountain goat tōwē′.
—— *horn* tlīnē′tl.
mouse, shrew, kag·ā′k·.
—— kuts'ī′n.
mouth k·'a.
much tlēq.
mud ts'ēʜ, k·utlk.
mussels rāk.
my aq (—ri).

N.

nail qak·.
naked kᴇtldarᴇ′k.
navel kō′utl.
neck dlētu′q.
necklace s'ak· sēt = bone necklace.
nephew (sister's child) k·atlk'.
—— (brother's child) g·it'a′ = child.
net g·ē′wū.
news nēg.
night tāt.
no tlēk'.
noon yigᴇrī′.
north wind is blowing qōn dōwanu′k.
nose tlō.
—— *ornament* tlō n nas.
—— —— *of shaman,* wak· k·ēt = face ornament.
nostril tlō tōru tlī.
not tlētl.
nothing tlēk'.
now hē′idᴇt, yā′ridᴇt.

O.

oak duk·.
oar aqa kdarᴇ′t = long paddle.

oblique s'ā'gē.
æsophagus tlēkatcu'q'ō.
Oidemia perspicillata k·āq.
—— *sp.* kitc ka ru = wing on white.
Olachen sāk.
old man cān.
—— *woman* cā'wat cān.
on top of ka.
—— *I put it on top of,* akayiqa'ō.
one eyed tlēcauwa'k·ē.
to open one's eyes tl'ik'.
to open a salmon tlag·ᴇ'ts.
opposite kikᴇ'.
otter kucta.
—— *people* kucta k·a = otter man.
our ha (—ri).
outside da.
—— *the house* k·ū.
owl, white, k'ak'.

P.

to paddle adlqa'.
paddle aqa'.
to paint nēguō'tl; kᴇ—cᴇʜī't (see *brush*).
painter nēguō'tl s'a'tē = painting master.
paint, black, for face, t'ōtc = soot.
—— *red, for face,* tlēk.
palate ky'ē'k·tlᴇn.
palm of hand djin t'āk· (see *plant*).
Parmelia s'ē'qōnē.
Parus (titmouse), k·ā tōrū' = man's mind.
perforation of nose tlō tō rū tlī.
pestle (ka)t'ē'k'a = (upon) pounder; (ka) qē'gua = (upon) rubber.
Pica Hudsonica ts'ēg·ē'nē.
to pick gūk.
pipe ts'ēk· da kēt = smoke around box.
place for something rerē't, riā'ti.
plant of foot k·'ōs t'āk (see *palm*).
plate k·'ēyē't = something in front of (Chilkat).
plate made of slate tᴇts'ē'k.
point tlō.
Polygonatum tlēk'wa hintē = water berry.
Polyporus as tak·a'di = tree biscuit.
poor icā'n, k·'anickidē'q.
porcupine qatla g'ᴇ'tc = hair sharp.
porpoise tcītc.
post gādz'.
to pretend to be rich (tc'ᴇ) ck·'a—tli nēk'.
—— *to be hungry* (tc'ᴇ) tō—ran s ha.
—— *to be a Tsimshian* Ts'ōtsqᴇ'nqc—tliē'q.
puffin qēik.

Q.

quiver guē'tl.

R.

rabbit g āq.
racoon s'āq.
rafter kaqrēt.
rain sē'u.
rainbow kiteqanag·ā't = many colored wing.
it is raining (dāg) sētē'n.
raspberry tlēk' we'dē.
rattle, made of puffin beaks, djin kaqᴇ'ta (djin = hand), dje kaqᴇ'ta.
—— *shaped like a skull,* cēcō'q.
raven yētl.
razor k·arēyi'qa.
to recover from sickness (wu) nēq (see *to save*).
red k·'an yiq atē = fire-like color.
reeds tlak·ridzē.
rib ts'ōk·.
Ribes qahēwu'.
rich ank·ā'ō (see *chief*).
ridge of house s'ērᴇtō'.
right hand cīrᴇnēqī (djin).
ring, finger, tl'ēk· ka kīs = finger on ring (see *bracelet*).

ring, foot k·'ōs ka kīs = foot on ring.
rock (*small island*) nō.
roof gan, hit ka = house-top.
rotten tl'ok·.
round tōutlcān (see *to turn round*).
to rub with pestle ka—tlᴇqᴇk'tl.

S.

sail s'ᴇ'sa (see *cotton goods*).
salmon qāt.
—— *humpback,* tcāts.
—— *spring,* g·at.
—— *hooknose,* tl'ō'uk.
—— *dog,* thītl.
—— *white,* t'ā.
—— *dried,* atk·'ēci qōk (qōk = dry).
salt ētl qōk = dry sea.
sand tl'ē'u.
satiated çāwa hik.
to save nēq.
Saxidromus s'ō'uk? gātl.
scraper ʜī'ts'a.
sea ʀᴇk·ā'k, ētl.
—— *heavy,* āgōwatā'n.
seal tsā.
sea lion tān.
sea otter yuqtc.
to see tēn, sētē'n, tlī tēn.
septum tlō t'aka'.
shaman iqt.
shark tūts'.
sharp tlag'ᴇ'ts.
sheep, big horn, djᴇ'nū.
sheets s'ᴇ'sa ka rē'gsē.
shell sp.? iē's.
Cik·'ā' tlūtō', a point near Sitka.
shoe tītl.
shore line hin k·'a'cō (hin = water).
short ku watl.
shoulder qikca'.
sick nēk'.
sinew, thread, tas.
to sing (at—) ci.
sister, elder, tlak.
skin dōuk.
skull ca s'ak· = head bone.
—— *of a corpse* ca k·ᴇqā'gō.
sky, clear, akawaqa'ts.
—— gutsᴇrᴇ = cloud place.
slave gō'uq.
to sleep ta.
sleepy (ʀᴇ) ta owaha'.
small ga'tsgō.
to smell tsīnē'ky.
smoke ts'ēk·.
to smoke sk·a da ts'ēk· = mouth around smoke.
smoke hole gāt, gān.
—— *roof of smoke hole* ganē'tlē.
snail tāk·.
snake tl'ut tlā'k·.
snow dlēt.
it is snowing ara kawa dan.
son g·it'a' (probably child, said by father).
son-in-law kan, sēq'u'q (?).
song of shaman iqt k·'a cī'reē.
soot t'ōtc.
Sorbus kᴇltcanē't.
soup, made of berries, qu'ktlē.
south wind is blowing ʀᴇ'ndēu dō'wanuk.
sparrow-hawk ganō'k.
to speak yug'a—tᴇñ, ʀᴇka'.
Spermophylus Parryi tsātlk'.
spider k·asēst'ā'n.
spirit yēk'.
spoon citl.
—— *large bailer,* cīn.
—— *short,* cᴇ'ca.
sprout wuts.
squid nāk'.
—— *used for bait* nᴇq nāk'.
squirrel kanātltsā'k.
—— *a small species,* tlk·ōqwē'tsa.
to stand gya.
stand up! gyidā'n!
star k·utaq'a'renaha.
to steal tā'ō.
to steer yūru tlaa'.
steering-paddle ʀᴇdī'gā.

stern of canoe gyikka′.
Sticta pulmonara acakarē′ci.
stockings tl'ēg'u′n.
storm ara ōdētē′.
stone thE.
stout ku tla.
straight, upright, kin de tcun.
—— *ahead* rān de tcun.
stomach yuru′.
stop crying c'ītlk'E′tl.
storehouse in the woods tcEtl.
stranger t'auyā′t.
strawberry cak'.
street dē.
strong (*rope, etc.*) tlī wu′s.
—— (*man*) tlī tsē′n (see *life*).
summer k·utā′n.
sun (ra) gān.
the sun is shining (dag) gān.
sunset rē anaHi′H.
sunrise ky'ē anaHi′H.
swan g·uk·tl.
sweat t'ār.
sweat-lodge qār.
sweet tli nukts.
sweetheart tsērī′.
to swim rāndat'E′tc.

T.

tail tl'ēt.
tall (yē)—s'ak· ku wat = bone long.
temples wak·co′ (wak· = eye).
then adaqai′ō.
their hastō (—ri).
they has, hastc.
thief tā′ō s'a′tē = stealing master.
thin qun.
thine i(—ri).
to think of somebody su—s'ēt'E′n.
thou woe′, wo ·c.
thumb gō′uc.
thunder, thunderbird, Hētl.
tide hāt.
tired (wu tl) quē′tl.
Tlaqkāic, Chilkat name = perpetual man's father.
Tlingit tlēingi′t.
tobacco g·āutc.
to-day iā′yigEri.
toe k·'ōs tl'ēk = foot finger.
together wūctēn—ta.
—— *we laugh,* at tō ta cō′uk·.
to-morrow sērē′nk·.
—— *day after,* sērē′nk· tliraakEtē′n.
tongue tl'ōt.
tooth ōq.
town ān (see *country*).
trap iē′q.
tree k·ats.
tribe na.
—— *the heavenly,* k·ē′wa k·ā′oqā′wō.
Tringa ayahī′a.
trout k·'oā′t.
trunk k·ō′uk·ōk·.
Tsimshian Ts'ōtsqE′n.
Tsuga rEn.
to turn round tōutl (see *round, fire-drill*).
to turn back, on foot, k·uq k·atudaa′t.
—— k·aqudigu′t.
—— *in canoe,* k·uqritla′.
the tide turns ara kān dīda′.
twins wūtc kikrE′dē = two together opposite.

U.

Ulva k·'atc.
uncle (father's brother) sā′ni.
—— (mother's brother) kak.
up dē kī.
uvula nūt'ari.

V.

Vaccinium Vitis Idæa nēgū′n.
—— *uliginosum* ts'īk'a′qk'.
—— *ovalifolium* kanat'ā′.
Valeriana tltcanislā′k'.
vein ts'ikc.
vertebra dik· s'ak· = backbone.
very lēq. sltē′.

Viburnum acerifolium k·ᴇqwē′q.
village, winter, tak’anē′.
—— *summer,* k·’utā′n.
voice sēk.

W.

to walk gōd, at.
wall gy’īrī′.
warm (rᴇ) t’a′.
warrior g·’ān s’a′tē = fighting master.
water hin.
wave tīt.
we ohān, ohā′nc.
weak tlētl wu tli tsēn = not strong.
west wind sā′naq.
wet (ti) tl’ᴇk·.
whale yār.
whistle tō uq sirēt = into plow place.
white ru, tlēd yiq atē′ = snow-like color.
widow, widower, hītltsatsēcā′wat.
willow tc’ātl.
wind ky’ētlca′.
wing kitc.
wing of nose tlōgūtc.
winter tāk (see *year*).
to wish sigō′, gācu′.
wolf g·ō′utc.
woman cā′wat.
—— *a man, who is in the habit of eloping with women,* cā s’a′tē = woman master.
woodpecker gan da da gūg‘ = wood around (= bark) around pick.
worms tl’uk·.
wrist djin t’ak·tl.

Y.

to yawn akyē′t.
year tāk (see *winter*).
yellow kyētl ha′tlē yiq atē = dog excrement-like color.
yes ā.
yesterday tatgᴇ (see *night*).
—— *day before,* tatgᴇ tliraakᴇ′t.
you riwā′n, riwā′ntc.
young ga′tsgō.
—— *man* rᴇdᴇ′k‘.
your rī (—rī).

II. ENGLISH–HAIDA.

Skidegate Dialect.

(Note.—The words followed by a K. are Kaigani dialect.)

A.

above gī.
—— *it is,* ca ē′tsi.
to accompany g·āk’ā′it.
Acer tlk·ātlk (borrowed from Tlingit) K.
adam’s apple k·agᴇ′n sku′tsē = lung bone.
adze qot’a′.
afternoon sᴇn tā′tsera gā′ista.
again ī′sᴇñ
alive qai′nᴇñga.
all tlō′qan.
Alnus kā′ac (borrowed from Tlingit) K.
always wa gye′na.
Anas boschas tha K.
—— *clypeata* ʜit.
—— *histrionica* k·’ᴇ′cg’utk.
ancestor tlsta dē tsi′nga = long ago my grandfather.
ankle gy’atl t’amᴇ′l = leg knuckle.
another k·a′lrō.
Anser tlgyitgū′n.
antlers nacā′ñrē.

antlers, many pronged, g'at g·oa'qa gig·'ā'ñrai = deer's manifold antlers.
anus k'asē'.
apparel, wearing, gya.
apron of woman dlgyītgyitlgya (dl t'ā'tsē).
apron for dances k·'antsētlqā'gya (gya = wearing apparel).
Arctostaphylus uva ursi dinq (borrowed from Tlingit) K.
arm below elbow ʜi, ʜiā'i.
—— *above elbow* ʜi tlrī.
armor, wooden, for breast, tcidlkit.
—— —— *for belly,* k·'antsētlqā'gya (see *apron*).
—— *made of sea lion skin,* k·'ēt'ī't (k·'ēt = sea-lion).
armpits sk·ut.
Arnica cordifolia ʜit hauā'c.
arrow, with bone or metal point, ts'ī'-talᴇñ.
—— *blunt, for birds,* k·'u'ñgal.
ashes dltᴇ'tlqēt.
aunt (mother's sister) āo = mother.
—— (father's sister) sk·āñ.
aurora g·ōt qalga dā'nt'atl.
axe gyētl dsāō.

B.

baby k·ā'qa (see *weak*).
back skuā'ē, gyi'ñguta.
—— *vertebra* gyi'ñguta sku'tse = backbone.
—— *of house* na stlᴇñ = house back.
—— *of hand* sl'ō'na.
bad dā(rañga).
bald head skaqā's.
ball, to play at, gūt kitl k'a'tsu.
—— *played with seal meat,* qōt at gūt kitl k'a'tsu.
bark of Tsuga ʜi; hā'l K.
—— *of other trees* k·'ō'tsē.
basket, small, for berries, k·'ā'itas.
—— *large, for berries,* k·'ē'gū.
basket qin.
bat k·'ātltsōqa'la.
baton of shaman t'ask·'.
beach gyitl.
bear, black, tān.
—— *grizzly,* qō'ots (borrowed from Tlingit).
—— *polar,* ha'l'un.
beard sk·'ē'ōrē(n).
beaver ts'ᴇñ.
bed thēidā'n = sleep instrument.
beetle :hansk·ea'l K. = face dirt.
before this ku'nrasta.
belly tātl.
belt (dl)dsgā'wa K.
berry g·ān(a); hān(a) K.
—— *cranberries* dlā'ē.
—— *dried,* g·an hi'l g·ata.
—— *boiled,* g·an galᴇ'nsᴇl.
birch attā'ri (borrowed from Tlingit) K.
bird qēt'ē't.
—— *a bird with red wings* s:hā'ltset K.
black (tl)k·ātl, (s)k·ātl.
black cod sk·il.
bladder k·ōg·ᴇ'n sk'an.
blanket gyā'atk.
—— *Chilkat,* nā'ʜin (borrowed from Tlingit).
Blennius sp. :hacī'n K.
blood g·ā'i.
blue gō tlrātl.
blue jay tl'ᴇ'njūt.
body, the whole, tēā'nē.
to boil, gan; qoa'tlta.
boiled food galᴇ'nsᴇln.
bone skū'tsē.
bow tlk·ē'it.
bowstring tlk·ē'it t'ā'tsē.
box g·ōta, dā'ota.
bracelet, copper, ʜalslgya'.
brain k·as'ᴇ'ntsᴇñ, k·atlᴇ'nts'ᴇñ.
to break down qu'ndata.
the sea breaks (heavily) g·ā'lu g·u'ñ-gᴇ (yū'ᴇn).

breast k·an.
brothers and sisters k·'ā'tlqa.
brother tā (said by sister).
elder brother guā'i (said by brother).
younger brother dā'(ōrᴇᴅ) (said by brother).
second brother gūctnᴇñ k·atleqagas(?).
third brother gūct lā'na(?).
brother-in-law k·eā'= sister's husband (said by man).
—— tlᴇ'nara = sister's husband (said by sister).
Bubo Virginianus gutgunē'st K.
Buccinum ckᴇtsk' K.
bucket g·ā'na.
bush tlkyi'n(ra).
butterfly stlak·a'm.
buttocks k·'atltsō.
button blanket guñ la'ñgō gyā'atk.
by and by k'oā'i.

C.

calf of leg gy'ātl k·ā'u = leg muscle.
Caltha palustris ʜil gī tlᴇgᴇñ = medicine above swim.
canoe tlō'u.
Cardium Nutalli chilhiē'i K.
cat tō'us (Chinook).
cedar, yellow, c:hatlā'n K.
—— —— *young,* ts'ō gyīt·ē.
—— *blanket* lā'ʜial.
—— *bark, used for making mats,* gyīē't.
cedar root dlē'iñ.
Ceryle Halcyon k'ut'u'n K.
cheek, lower part of, ts'i'ta.
—— *upper part of,* k·'a'n ts'i'ta.
chief (nᴇñ)ētlqagidᴀ'.
—— *head-chief,* lā'na ā'ora = town mother.
child gyīt'(ē).
chin tlkā'ē.
Chiton tunicata c:hē'it K.
—— *Stelleri* t'a.
Circus Hudsonica dō:hatlāga' K. = catching bird(?).
cirrostratus k·uē'au.
cirrus iā'n tsē'tla (ā'n = cloud).
clams skā'ē, ky'ū.
clothing, to wash —, tāda'n tsī'gyida.
cloud iān.
coat djit'i'skū.
red cod sk·ān.
small codfish s'ā'ētaē.
large codfish skā'ēnān.
cold quī'.
colored tlrātl.
—— *many,* aqā'i tlrā'tla.
Colymbus glacialis tatl.
come! (used with the imperative) hā'la!
the winter is coming tā'da g·i'lga.
cone of pine ctl'ack'ᴇ'mal.
to cook by means of heated stones sītl; gya'galañ.
copper plate t'ā'ō.
cormorant ky'ā'lau.
cotton wood tl'al.
Cottus sp. k·'āl.
—— —— tl'ā'ma.
cousin sk·āñ = father's sister's and mother's brother's daughter.
—— usqu'ñ = mother's brother's child.
—— lᴇra'n = father's sister's and mother's brother's son.
Mother's sister's child = brother.
Father's brother's son = brother. Elder or younger brother are used according as cousin is elder or younger than self.
crab k·'uct'ā'n.
crabapple k·ē'iq.
—— *tree* k·ē'yintl.
cranberry ta.
crane, and Gallinage Wilssoni, dᴇl (borrowed from Tlingit) K.
crazy dladlgua (see *land otter*).

crow k'ā'ltsEda.
crown of head tl'El k·ā'tsē.
to cry sk·ā'yētl.
to cut off (neck) (qil)k·'ē'tl.

D.

dagger k·'ā'otl.
to dance Hiā'tl.
(shaman's) dance (sk·ā'g·at) wīkatsō.
dancing leggins gy'ātl gya = leg dancing ornament.
danger at sea c:hā'noakEn K.
daughter-in-law dzīrōnā'n.
dawn sEn gītlEñga (nō'kua).
day sEn.
—— *all day long* sEn sg·ā'sg·ō.
it is daylight k·ā'dēga.
dead g·'ōt'utl.
deer g·'at.
Delphinus Orca sk·ā'g·a; chān K. (see *shaman*).
dish k·ā'itla = wide open.
—— *carved on both sides* k·ā'itla k·ō'la = dish forehead.
dog qa.
dog fish k·'ā'qata.
dog salmon ck'Ek.
doll gyīt; gEdē's (children's language).
dolphin sk·ul; k·'āñ.
door gy'ū; stEñ.
—— *in heraldic column* gy'ū qa'l = door hole.
down (feathers) tE'nrō; g·E'nrō.
dragon fly dē'gua t'ā'mā'l = sun louse K.; mā'mats'ikyē (borrowed from Tsimshian).
to drink qutl.
drum gā'udjau.
dry g·'ā'(ga).
duck qā'qa.
dusk aga'lgua.
dust, dirt, sk·ea'l.

E.

eagle g·ōt; :hōt K.
eagle black :hōt tlrātl K.
eagle gens gyītena'(c).
ear gyū.
opening of ear k·ā'tlē.
earth, ground, k·'uī' (see *island*); tlga.
earthquake tlga i'ldEñ.
east wind k·'a'ratsg·a.
to eat ta.
to eat together uā'ras.
ebb tide gyitlraHi'tl.
edge of box clEñ.
upper edge of blanket sī'dE.
egg k·ā'u.
lice eggs djāc.
elbow Hī tsEguī' (Hī = arm).
elk tci'cku.
Empetrum nigrum :hackā'wa.
to enter k·adl (see *to walk*).
ermine tlEk·, tlqa.
evening sEn Hī.
excrements kwā'rau.
eye qa'ñg(ē).
eyebrow skiā'tsē.
eyelashes qa'ñga dlt'a gutcē.
eyelid qa'ñga g·ā'al = eyelid.

F.

face qañg(a).
fall tcā'nut k·arat (see *winter*).
to fall over k·'ā.
to fall from ēsg·oē'.
far dzīñga.
fat tlk·ō'na.
father (said by man) k·uñ.
—— (said by woman) qāt.
father-in-law k·ō'nē (see *son-in-law*).
fathom Hī rōdlagī't (Hī = arm).
—— *half,* dī ky'ē'ōrē dlōg'ē'ta = my median line of body fathom.
—— (measure from left shoulder to top of finger of right hand) sk·al dlō (sk·al = shoulder).

feathers, pubis, g·ā′u.
female sexual organs kā′u ; tsō′u (children's language).
a certain festival gyā′ist.
—— —— gag'uē′ta.
to fight rā′Hitla.
—— *together* gūtg·an ıā′Hitla.
figure k·'ēda.
finger sl k·'a′ñē = hand finger.
—— *first,* sli k'uā′ns (sli = hand).
—— *second,* yak·'olā′na.
—— *third,* qēigā′us = weak.
—— *fourth,* sli gō′uts (sli = hand).
fire-drill tlkiā′k'ē.
fireplace k·aē′qēt.
firewood ts'ā′nō.
fish tcitl.
—— *fresh-water,* tc'ē′na.
—— *salt-water,* sk·'ā′tlan.
fish knife tā′g·atаō.
fish line of kelp, tlgai.
fish otter ts'ōwu′lEk'.
fish roe tcā′ē.
fish trap, bottle-shaped, sk'aıā′ō.
fish trap, large, gyī′rau.
flat g·a.
flesh gyērī′.
fleshy gyēıā′ulgō′u.
flood tide gā′etliHit.
fly dē′idEn.
fog iā′n(Eñga).
food ga ta′.
foot st'ā′ē.
footprint st'a sEl.
forehead k·ul.
forenoon sEngā′ē.
fox naga′tsē (borrowed from Tlingit).
frame tlk·a.
my friend ta′quē.
frost g·alE′ñgudatl.
to fry citl.
—— *on stones* citl g·uta′ = fry stone.
Fucus vesiculosus t'al (borrowed from Tlingit) K.
fur seal k·'oā′n.

G.

gambling sticks sEn.
to give ē′ista.
to go k·a, i′sk·as, gEnd'aHi′t (?).
let us go hā′la d'ā′lEñ gEnd'aHi′t s'añ.
good lā.
grandchild t'agyE′n.
grandfather tcin.
grandmother nān.
grass k·'an.
gravel sqat'E′ldañ.
green gan tlratl = yellow ; g·ōtlratl = blue.
greenstone (*jadeite*) dlk·ā tlō′u.
gull ck·'in.
gums ts'Eñ k·'ul = teeth skin.
gun dzī′gū.
Gyins : hā′noa (the wife of Nenkyilstlas).

H.

Haida qā′eda.
hair k·as k·'ē′tl = head hair.
—— *dress of shaman* gyiētl.
half yā′kō.
—— *moon* k·uñ gēnEroā′ē.
halibut qā′kō, :hāk' K.
halloh! ai′diñga !
hand sli, slā′ē.
Harelda glacialis ā′ñgıñgē.
harpoon k·'ā.
—— *line* k·'ā tl'ā′tsē.
point of salmon harpoon k'udE′nkyīl.
hat dā′dzEñ.
—— *ring* dā′dzEñ ski′lga.
he la.
head k·'ā′tsē.
—— *ring of red cedar bark* tEntlgyik·a′ldE.
to hear gū′dEñ.
heart tēk'ō′gō.
her la.
heels st'a kōsē′ (st'a = foot).

to help etlwa.
heraldic column gyā'rañ = standing upright.
herring ī'nañ.
it is high water skuā'ga (rilgEn).
hips k·ātlu'l skū'tsē (skū'tsē = bone).
hook, for fishing halibut, tā'ō.
iron hook stīl tā'ō.
hole qal.
hoof of deer g·'āt st'ā'gun (st'a = foot).
horizon k·uēHdzi'nrau.
horn (see *antlers*).
horse gyūdā'n (Chinook).
house na.
—— *dug out part in centre of,* dā'a.
—— *front* na qañ = house face.
humming-bird qEktgyīā' (borrowed from Tlingit) K.
hungry k·'oē'ta.
husband tlāl.

I.

I dē(a), tlā'(a).
ice g·al(ga).
indeed? ōdja?
Indian of the interior ts'ak's.
inside k·ā'tlēk, nā'gust K.
instrument tan.
interstices between fingers sli iātk·asē'.
intestines k'ēs.
invitation to autumnal festival la'gyinem.
iron ire'ts.
island guā'ē.

K.

K·atlEnsk·u'n, name of a place.
kelp tlk·iā'ma.
—— *cake* qā'eda gu'lra = Haida tobacco.
kettle ck·'El.
—— *wooden boiler,* ck'El gan.
—— *wooden,* tā'utaqal; sk'a'lgal.
kidney tcā'ē.
to kill tē'aqan.
knee k·'ulō'.
—— *pan* k·'ulō k·arāñ.
—— *joint* gyal k·uld'E'ñgō = leg joint.
knife sqā'u.
—— *made of shell* taqā'ō.
to know u'nsēda.
I do not know ā'ya.
knuckle d'amE'l.
Kushtaka (*otter people*) gEgyiī't K.

L.

lake sū.
Lā'nas = the town, place near Rose Point.
lance tcea'tl.
land tlga.
land otter sdlgū.
large yū'an.
to laugh k'ā.
leaf dlk·'a'ñgual.
Ledum palustre hi'lk·agen K. = mouse neck.
left hand slā'nēgi slā'ē.
leg, above knee, thil.
—— *below knee,* gy'ātl.
dancing leggins gy'ā'tlgya = leg wearing apparel.
leg of table tlga.
lid of box tā'uta k·ā'al = box lid.
to lie k·'ōrat, kētlHidā'n.
liar k·'ōrat hā'era = lie master.
lightning sqēt g·āuldañ.
to like stat'E'l.
Lina sp. djuwēt'amā'ē.
line tl'ā'tsē.
lip, upper, h'ō'tsēqun.
—— *lower,* k'ō'uta.
liver tētl'Elkul.
lobe of ear gyū st'ā'ē = ear foot.
long sk·'a, dziñ.
—— *ago* tlsta.
loose cuvā'c.

lost gā'u.
louse t'am.
low water tsē'qoa.
lungs k·ā'genskē'ga (see *adam's apple*).
Lupinus gᴇ'ndō.
Lycopodium clavatum g·'at dldsgā'-wa = deer belt.
lynx tlgyan dā'udjā'ē (tlgyan = forest).

M.

to make da, gyiñ, g·ōtlra.
man ē'tliñga, k·'ᴇl.
—— ga; for instance, k·'oā'la ga = raven gens man.
many skō'l (only referring to men).
—— k·oā'n (referring to any thing including men).
—— yū'an (referring to any thing including men).
martin k·'ō'u.
mask nītca'ñgō.
master lrā'ēra.
mat lgūc.
meat gyērī'.
median line of body ky'ēō'rē.
medicine ʜil.
midnight g·al yā'kō.
mind gū'dᴇñ.
mine tēnᴇ'ñga; nā'ra.
moccasin st'ā tlk'u'nkyē (st'ā = foot).
moon k·'uñ.
—— *new*, k·'uñ ihai'lōgᴇn.
—— *first crescent*, k·'uñ k·ēqatlg·a = the moon opens his eyes.*
—— *last crescent*, k·'uñ ihailōda'l-gᴇn.
—— *begins to be full* k·'uñ g'aisgō-gi'lga.
—— *is shining* k·'uñdlan.
more ī'sᴇñ.
morning sᴇn aē'qᴇn.
mortar dā'rō.
mosquito ts'era'ltᴇquan.
mother ā'ō.
mother-in-law dzīrōnā'n (see *daughter-in-law*).
mountain t'ē'is; tldērā'u.
—— *goat* ky'i'ñrē.
—— *sheep* mat' (borrowed from Tsimshian).
mouse ka'gan.
—— tsīgul ā'ora (ā'ora = mother).
mouth qētl'ē'.
mud tcān.
muscle k·ā'u.
Mytilus edulis :hal K.

N.

Na ēku'n, Rose Point.
nail sli g'u'n = hand nail.
naked k·oonā'nō.
nape ts'ē'kyē.
navel sgil.
near ā'qan.
neck qil.
needle sln.
nephew (man calls his sister's child) nād.
—— (man calls his brother's child) gyit.
—— (woman calls her brother's child) usqu'ñ.
—— (woman calls her sister's child) gyīt.
net a'qat.
night g·āl.
—— *it is*, g·ā'lga.
nipples tl'ᴇ'nwai.
no gaū'anō.
Nontlem qālēta'.
noon sᴇn tā'tsēra.
north wind k·'āʜustē' ga, qu'stcga.
nose kun.
nostril kuntsqul.
not gᴇm.
notch of arrow stlqu' tsē.
now (a)ūwia't.

O.

oak tcā′uañ.
oar ādl dzi′nda = paddle long.
ocean sī.
œsophagus tl'ᴇlqō'ts'ᴇl.
Oidemia perspicillata c'i′ndᴇtl K.
Oidemia sp. gā′oq K.
olachen cā′u.
old k·'ā′i.
—— *clothing* k·'u′lzu.
—— *man* nᴇn k·'ā′ia.
on gūd.
—— *top of* u′nsē, gī.
one squn, sqa′sgō, sqoā′nsᴇñ.
open k·a.
to open one's eyes k·ē′qatlg·a.
another one gyina k·'a′lrō.
outside :hadōsi K.
owl, white, k'āk' (borrowed from Tlingit) K.

P.

paddle ādl.
to paint k'ōtlā′nō.
red paint for face (qañ) mā′tsa.
black paint for face (qañ) k·'ā′tsa.
palate sē′ıñgatsē.
palm of hand sli k·ā′rān (sli = hand).
Parmelia k'āltsdēlē′dja.
partridge, ptarmigan; ck·ā′u.
Parus tatl·lā′nsgyēt.
penis tsī′tsī.
people qā′ēdqa.
perforation of nose kun qal = nose hole.
—— *of ear* gyū qal = ear hole.
pestle dā′rnō; dā′rnō ts'ᴇñ.
petticoat cā′ata lgyēgyiā′qa = woman's petticoat.
pile of fuel ts'ā′nō sqa.
pillar, erected in commemoration of deceased, qāt.
pipe qē′tlᴇñ g·ā′eudā′ō = mouth smoke box.
to piss tsē′gᴇñ.
plant of foot st'a k·ara′n (st'a = foot).
poker kyitsqᴇla′ñgō.
Polygonatum ct'ā′u hā′na = witch-craft berry.
porcupine :hatlgᴇts (borrowed from Tlingit) K.
porpoise sk·ul.
to possess (tla) da, k·ē′i, (dē) ran.
post, in house, k·'ōtg·a′ñgō.
potlatch wā′tlqatl.
pregnant, she is, l tātl gyīt'ē′ (gyīt'ē′ = child, l tātl = her belly).
puffin k·oqᴇ′n; k·oana′ K.
pupil of eye qa′ñgē l tān karē′i.

Q.

Qoia g·a′ndla = Raven water, a river on Queen Charlotte Islands.
quartz tlk·a k·'ā′tsē (tlk·a = stone).
quiver ts'ītalᴇ′ñ darā′ō = arrow box.

R.

rafter ts'ān sk'ā′gēt.
rain dādl.
rainbow tā′wᴇl.
rain wind (generally east) qē′u.
raspberry hān gyit'ē′ = berry small.
rattle, raven, sīsa′.
—— *shaman's,* dlkum hitaga′ñgō.
—— *puffin beak's,* tlᴇ hitaga′ñgō.
—— *skull-shaped,* k·'ēl hitaga′ñgō.
raven qoia′; yētl (borrowed from Tlingit) K.
—— *gens* k·'oā′la(c).
to recover from sickness ñgā′istl; lgila.
red sqēt.
reed k·'ān tl'akida′ = grass wide.
rib qē′wē.
Ribes hā′iwa (borrowed from Tlingit) K.; k·'ētguā′n K.

ridge of house, formed by a long board, tlgī'tlai.
—— *of upper part of ear* gyu tlk·un = ear ridge.
—— *of nose* kun tlk·un = nose ridge.
right, it is all right, tE'mqEn.
—— *hand* sqōlgyīlā'nā.
river k·ā'ura.
to roast fish dlgū.
roof na ū'na = top of house.
—— *inside of,* na k·arā'n.
rope of spruce roots k·u'ntla.
—— *of cedarbark* k·oa'ē.
—— *around food box* tāut īya'ñgrē.
rotten s·ā'ga ; gu'nraga.
round g·ā·s, g·ē (see *full moon*).
Rubus, Vaccinium uliginosum, han hā'ulas = berry sweet.
to run k·ā'Hit.

S.

saliva tl'an.
salmon tcīn.
—— *a small species,* c:hoā'gank K.
—— *hooknose,* tāi.
—— *humpback,* ts'īt'ā'n.
—— *white,* tā'un.
—— *smoke-house for,* tā'na nā'i.
—— *weir,* Hiā'i (the centre occupied by the fish trap *gyirau*).
—— *berry* sk·ā'uran.
salt tā'ñga g·ā'ga = dry sea.
sand tās.
Saxidromus squalidus ky'ū.
scalp k·ās'E'l.
scared tlquā'k·a.
scraper of deer bone gyitsratē'skō.
scrotum k·'utlē k·'al = testicle skin.
sea tā'ñga.
—— *far out into the,* sīakō.
seal qōt (borrowed from Tsimshian).
sea lion k·ēt, k·āē.
—— *hat* sqā'tsē dadzEñ.
—— *armor made of the skin of,* k·'ōg·agya'.
sea otter k·ō'u ((?) see *martin*).
to see k·iñ, k·ea'ñ.
self tlōo, ā'gEn.
septum kun tE'ñgarē.
to sew tl'El, gya tl'El.
shaman sk·ā'g·a.
shark k·'āt ; k·'ā'qata ā'ora = dog-fish mother.
she la.
sheath of dagger k·'āotl k·'al = dagger skin.
shells, burned and chewed with tobacco, guā'ga.
ship k·'ē'i.
short k·'ōdzā'ō.
shoulder sk·al.
sick st'ē.
sinew qā'ē.
to sing sqalā'ñ, k'atsā'ō.
sister, djās (said by brother).
sister-in-law tlE'nara (brother's wife, said by brother and *vice versa*).
—— tsi'ñga (brother's wife, said by sister and *vice versa*).
to sit k·'aū'ō.
skate sqā'na.
skin k·'al.
skull k·a skū'tsē = head bone.
sky k·oiē' k·arā'n.
slate tlk·a s'ā'ga = stone rotten (soft).
slave qaldE'ñga.
to sleep t'ēi.
sleep tlk·'ag·a.
sling tsawu'ñ.
small gāu gE'tsō.
to smell sku'ngudEñ.
smoke g·ā'ēu ; gyinē'it.
—— *hole* gyinadā'i.
snail ct'E'la K.
snake si'ga.
snipe ayahī'a.
snow d'arā'ō.
son-in-law k·ō'nē.
soot k·ayū'cian.
soul catcher k·'angitlkigya = breast dancing ornament.

berry soup ac.
to speak kyētlkul.
—— *to somebody* sō′ta.
spear shaft kīt′ū′.
to throw spear kīt.
sparrow hawk skyā′mskun.
Spermophylus Parryi tsatlk‘.
spider k·’utlsiā′ñ.
spike of pine giā′.
spoon slā′gul.
large spoon slā′gul g·aniā′lō, slā′gul g·anᴇ′l.
spring k·’in rad, k·’in rē′da (k·’in = summer).
sprout ck·’ā′u K.
squall t’ā′tsō k·ōē′wē (t’ā′tsō = wind).
squid nū K.
squirrel da′sqa ; gᴇtltsā′k K.
to squirt yi′ltᴇñ.
to stand gyā′rañ.
star k·’ē′itsāō.
shooting star k·’ē′itsāo kwā′rau = star excrement.
starfish sk·’ā′am.
to steal k·’ō′tlta.
stomach gy’ē′tsē.
stone tlk·a, g·ōta′.
storehouse in forest gya′c halā′ñ.
storm qastl.
story k·’ā′ēg·añ.
strawberry hil dāhā′ñ.
street gy’ū.
strings for tying up blanket, handle, (dl)t’ā′ts(ē).
strong dakuya′.
stump of tree, a fallen trunk, k·’ā′qō.
summer k·’in, k·’in yā′kō.
sun dzidlg·oē.
suspensor of dagger k·’ā′otl t’ā′ts.
swan titl’u′n.
sweet hā′ulas.
sweetheart k·’atal′ra.
to swim (bird, wood) tlᴇgᴇ′ñ.

T.

table gata dā′n = it eat instrument.
tail of bird, whale, ky’ī′ta, sky’ēā′ō.
—— *of fish* st’ā′i = foot.
to talk kyētlkul.
talker kyētlkul lrā′era = talking master.
tattooing gyīda′.
temples near eyebrow skya′ts qōta.
—— —— *tragus* gye′lsᴇntā′rē.
testicles k·’utlē′.
there ēs’.
therefore k·’a′gan.
thicket tlkyan ts’īgᴇ′nga yū′an.
thief k·ōtlta lrā′era = steal master.
thing gyi′na.
thirsty k·’ādō.
thorn dā′a, dā′ñga.
thread gy’ētlā′ō.
to throw with stones tsā wa′ñga (see *sling*).
thumb slī k’usē′.
thunder hē′lañ ; kaqē′gᴇl.
tide koā′kia′.
the tide turns koa′tlk·at ltā′ra.
Tlk·āgilt = *Stone beach;* Skidegate.
toad tlkyan k’ōst’ān = forest crab.
tobacco gul.
toes st’ā k·’a′ñgē = foot finger.
to-morrow dā′rgatl.
tongue t’ā′ñgᴇl.
tongs, for taking stones out of fire, tlk·a tsō = stone tongues.
too g·ē′dᴇñ.
tooth dz’ᴇñ.
molar tooth dz’ᴇñ k·ā′tsk·ul.
town lā′na.
tree k·ēt, k·ā′ē.
trout tā′tl’at.
twice stiñgᴇn.
twins ntsā′ta qē′g·a stiñ.

U.

Ulva k·’ātc.
uncle (father's brother) k·uñ = father.

uncle (mother's brother) k·ā.
unmarried man dlʜiān.
—— *woman* sk'ᴇñ k·a'nda.

V.

Vaccinium ovalifolium tltān
—— *Vitis Idaca* sk·ā'uran gyīt'ē' = salmon berry small.
valley tl'ā'dan.
vein g·ā'i nsg·erē' = blood vein.
Veratrum guā'iga K.
Viburnum acerifolium tlā'ē K.

W.

to walk k·a.
wall na ta gul = house side.
warm ky'ē'ina.
warp qā'i.
warrior gutl'i'sta.
—— rā'ʜitlta lrā'era = fighting master.
to wash tlñ.
—— *one's hands* sltlā'ɴᴇñ.
wasp sral, c:hal K.
water g·andl.
wave g·ā'ēu.
we ētl, t'alᴇ'ñgua.
weak k·āqa(ga').
weft k·'ōdā'i.
wet ʀᴇdzī'gʟñ.
whale kūn.
—— *fabulous, with five fins*, wāsk·.
what gōsu, gōg'us.
where gyīnū'.
whistle sk·ā'na.
white g·'ā'da.
—— *man* irē'ts qā'ētra = iron man.
—— —— k·'ᴇl g·adā'a = man white.
who gyī'stō.
why gō'gusg·anō, g·ā'tlᴇntlā'ō.
wide tlak·id '.
wife dj'ā.
wind tātsā'ō.
—— *seaward*, tatsā'ō sg·a.
—— *catpaw*, tatsā'ō sk·ada'lga.
—— *landward*, tatsā'ōgītl.
—— *increasing in strength* t'atsē'lga.
wing ʜē'i; st'ā'rūn.
winter tā'da; sʟñ gā'rat.
to wish stā'tᴇl.
witchcraft ct'ā'u K.
wolf gō'utc; hō'utc (borrowed from Tlingit) K.
woman dj'ā'ata.
woodpecker clōtsg·adā'ñ.
wood tlkyān.
worm cik; sk·ā'ra.
wrist ʜāē k·'ōld'ᴇ'ñgō = arm joint.

Y.

year tā'da (see *winter*).
yellow g'an tlratl.
yes â; ō; ā'ñga.
yesterday dā'rgatl tlgā'ē.
day before yesterday sta g·al stiñ·ge'lgen = two nights ago.
you, pl. dalᴇ'ñ.
young gyī'tg·ē; ītᴇ'ʀᴇn.

III. ENGLISH-TSIMSHIAN.

A.

above lᴇqa'.
to accompany stōl.
across tsag·a'.
adam's apple slā'uq.
adze of stone tasᴇʀ ᴇm lâp = adze of stone.
to adopt sᴇwulā'isk = make relative.
afraid bas, *pl.* lᴇbas.
afternoon tla dā'otl gyā'muk.

again tla(1)gyik(2) = perfect sense (1) then (2).
against tqal.
—— (*hostile*) lEbi′lt.
ago, a few days, g′E′rdata.
—— *a few weeks,* gyetqā′utq.
—— *a year, long ago,* gye k′â′otl (k′â′otl = year).
—— *long,* tlā′gyigyat.
air ha.
all tqa′nē.
to allow Enâoq (see *to consent*).
I allow him to come Enâ′yō dEm k·ā′ēdEks.
also dī.
always tlā′wula.
ancestor, female, nag·an tsē′esk·um (see *grandmother*).
—— *male,* nag·an yētk·um (see *grandfather*).
and (connecting nouns, etc.) dītl, g·antl.
—— (before words designating human beings) dīs, g·ans.
—— (connecting sentences) ada.
angry tlō′ontē.
animal iē·ts′Esk.
ankle hEmho′m.
to answer dīlEmaqtl.
antlers qaqā′ns.
arm an′o′n.
—— *above elbow* lEbEo′n.
armor of elk skin k·′Etlā′n.
to arrive batsk.
arrow hāuā′l.
—— *bird arrow,* t′ē′es.
to ascend a river g·′a′la.
to ascend a mountain maqtl.
ashes ōK′nEk·sEk·.
ashore tsE′rEn.
to ask KErK′taq.
Asuwā′lgyat (a fabulous monster belonging to the gens K·anha′da, *raven*) gyat = person.
at (referring to distant objects) ga, gasga.
at (referring to present objects) da.
aunt (mother's sister) = mother.
——(mother's brother's wife) nEktā′.
—— (father's brother's wife) nâ′os.
autumn ksō′ot.
axe, European, gyēgyâ′otk = lengthwise fastened.
—— *stone,* dahE′rEs.

B.

baby, male, gyinē′es.
—— *female,* wok·′ā′uts = without labret.
back k·′â′o.
backward gyi′lEks.
bad hada′q.
to bail ts′ē′yuk.
bailer ha(1)ts′ē′yuksa(2) = instrument (1) bailing (2).
bark, match, gyīmst.
basket, for berries, iū′sEl.
—— *for fish,* tsElā′.
—— *of cedarbark, for carrying household goods when traveling,* dō′otlk.
to be nē, nēnē′.
bear, black, o′l.
—— *grizzly,* mEdī′ek.
—— *fabulous (?) white,* mEs′o′l.
—— *gens,* gyispotuwE′da.
beard ēmq.
to beat time k·ansp′a′.
beaver sts′âl.
because (a)wul.
bed halēlā′tlk.
bee ap (borrowed from Tinne).
beforehand gu′ldEm.
behold! rakstanā′!
belly bEn.
to belong to wāld.
below gyēek.
berries, dried, gEnē′gu (atl).
Bilqula Lalgyimē′l.
bird ts′ō′wots.

bird, all flying animals, lEpā′yeky.
black t'ō′otsk.
—— *paint for face* qtō′ots.
blackberries mā′e.
blanket gus.
—— *white,* gus mâks.
—— *sea otter,* gus ptlōn.
—— *Chilcat,* gus(1)naikyi′m(2) gyā′muk(3) = blanket (1) sun (3); naikyim, evidently from na′qin, Tlingit.
blind sū′Ens.
blood itlē′.
blue kuskua′sk.
boards in bottom of canoe ktsâ′oks.
bone sâ′yup.
book sā′wuns.
boom t'uksitlē′.
boots ts'â′oqs (see *foot*).
on both sides laqaq.
bow hāukta′k.
—— *of canoe* gyits'â′iq.
bowstring tē′es.
box for food k·alEi′rEnk·.
—— *for blankets* qpē′is.
boy wōmtlk.
brain wunEg·ā′us (see *head*).
branch anē′is, *pl.* ananē′is.
—— *of river* lōts'ār.
—— —— ts'ā′tlē.
bread anā′ē.
breast k·ā′yek·.
breath ksEnātlk.
bridge tsaja(1)k·anē′qs = across (1).
to bring da k·â′edEks (da = at, k·â′edEks = to come).
broom had'ō′osk = instrument sweeping.
brother (called by brother) weky.
—— (called by sister) tlE′mktē.
brother-in-law (husband's brother) tlg·Egâ′otks.
—— (wife's brother) tlg·uag·atlā′m.
brown srloqlâ′p (see *stone*).
bucket ō′mtlElt.
bullhead (a fish) g·'ayē′et.
burial of shaman in house or cave ts'Em lâp = in rock.
burning the dead mālk.
—— —— *payment for,* qmālg'Eck = receive for being burned.
to burn (v. n.) gua lak (see *fire*).
—— *burning leggings,* Gualgaba′qs (traditional name).
to bury lō an'o′n = into hand.
bush species (?) qtlätl.
by and by hāuwē′nē.
—— tladzE.

C.

calf of leg hâ′EnEr.
to call hō′otk, *pl.* hukhō′otk.
—— *I call his name,* nsuwā′tkada (see *name*).
calm gyaks.
to camp gyâ.
to move camp lâyek.
cane, walking, k·ā′at.
cannibal qgyat = eat people (Olala).
canoe qsâ.
Haida canoe qsâ Em Haida.
canoe moves stern foremost läntk.
cañon ts'alā′sEr.
cape k·ā′maks.
carriage ts'e′ktsik (Chinook).
to carry into ts'ElE′m(1)ga(2) = into (1) at (2).
—— *in flying* tikyepā′ik (see *to fly*).
to carve gyetlk, *pl.* gyetlgyetlk.
carving knife hagyetla′ = instrument carving.
cat tō′us (Chinook).
to catch salmon spaqtl.
causative — En.
—— — g·an.
cataract ts'Em(1)hō′otseq(2) = in (1) ? (2).
cedar g·Elā′r, *pl.* g·Elā′r.
—— *bark* hat'ā′l.
a certain g'âlt.
chair halī′d'a (d'a = to sit, ha = instrument).

channel, narrow strait, mE'qtla.
cheek, lower part, wundâ'.
—— *upper part,* teā'l.
cherry g·'Elā'mst.
to chew k·'ā'un.
chief sEm'â'yit.
child tlguâ'mElk, *pl.* k'apEtgErEtlk.
—— *of chief* tlguwā'lksek.
chin tqlakwak (kwaq = lip).
clams ts'äq.
to close one's eyes ts'ē'ep.
cloud, overcast sky, sa.
—— *cirrus,* wukts'E'n.
club, war-club, k·auwā'i.
coat kōtā's.
cold, to feel, qkua'tko.
to come k·â'edEks.
—— *from* wātk, *pl.* amiā'an (see *from*).
—— *down* kwänt.
common things skEtg Em gâ.
company nā'tatl, *pl.* natā'tltatl.
to consent Enâ'oq.
to continue tlāwula wāl = always do.
—— tlāwula hāu = always say.
copper plate haya'tsk.
cormorant k·ag·ā'.
corner amō'.
—— *of house* amō's.
council lEsā'osk, wulg·ak·â'st.
—— *combined with feast* g'ElEgā'-yetl.
councilman (next to chief in rank) lEgagī'gyat (gyat = person).
country k·a'lts'apt (see *town*).
cover of anything ât.
cow mEsmō'os (Chinook).
crab k·Elmâ's.
crabapple mâlkst.
crane k·'asqâ'os.
crest (*of gens*) ts'apk (see *town, people*).
crow k·'auqâ'n.
crown of head mEsEmā'.
to cry wihâ'ut = great say, *pl.* bâk.
—— *for sorrow* t'â'oqtlk Em bâk.
cup haa'ks = drink instrument.
to cut k·'ōts, *pl.* k·'ask·'ōts.
to cut off qtsak·â'ts.
to cut open pē'atl.

D.

day sa (see *cloud*).
dagger k·'ad Em dō'osk.
dance halā'it.
dancing blanket gus halā'it.
—— *hat* amhalā'it = used in dance.
—— *leggings* k·aqselks Em sī (sī = leg).
daughter = female child.
dead ts'ak.
deaf ts'ē'eq.
my dear! (*male*) nād.
—— (*female*) dātl.
deep tlEp.
deer wan, *pl.* wan.
—— *fawn* kusts'ē'ek.
to die ts'ak, *pl.* dEr.
dish, carved, k·ai'itl.
—— —— *large,* k·aiitlē'ek.
—— *of mountain sheep horn* stata's.
to do wāld.
dog has, *pl.* hasha's.
door lEksâ'q (see *out*).
double gu'lba.
downward tgyē.
—— ya'g·a.
down a river gī'si.
dreadful hats'E'ks (see *ugly*).
to dream ksuwE'q.
to dress up nō'otk, *pl.* k'anō'otk.
to drink aks, *pl.* laa'ks.
drum nâ'otl.
to dry (v. a.) sigE'r.
duck mē'Ek.
—— nanā'at.
—— *black,* amgyī'ek.
—— *spotted,* g·ag·awē'.
dust yō'op.

E.

eagle qskī'yek.
ear mō.

earhole ts'ᴇm mō = in ear.
perforation of ear nak·aga mō.
east gīsiya'sk (gī'si = down river).
easy ē'ᴇpᴇn.
to eat yā'wiqk, *pl.* tqâ'oqk.
—— *in compounds*, q —.
—— *something* gap.
—— *up* tsātlt.
egg tlgᴇma't.
elbow sk·ā'nēis.
(*person*) *elder than self* sē'elgyat (gyat = person).
elderberry bush sk·an lâ'ots (k·an = tree, lâ'ots = elderberry).
elderberry lâ'ots.
elk siâ'n.
to elope da (see *with*).
to enter ts'ē'en, *pl.* lam ts'aq.
European k·'amksī'oa (borrowed from Hedltsuk ?).
evening skī'yetlaks.
eye wul'ᴇ'l.
eyebrow lᴇgyī'l.
eyelashes nâ'mᴇl.
eyelid, lower, sk·ā'ul.
—— *upper,* lᴇqaâ'l.

F.

face ts'al, *pl.* k·ats'altsa'l.
to fall k·ā'ina, *pl.* lē'ina ; sa(1) k·ā'-in(2) = suddenly(1) to fall(2).
far t'a, *pl.* t'ad'a'.
—— warait'a'.
to fasten dsē'ep.
—— *to* dsē'ep tqal (= against).
fat (n.) yā'i.
father nᴇguā't.
—— *address*, ā'bō.
father-in-law tlāms.
fathom g·ā'it.
—— *half fathom* k·'ā'yek = breast.
—— (left elbow to tip of finger of right hand) disk·a'nēis (see *elbow*).
fear bast.
feathers lī.
to fell (a tree) k·'ōtstl (k·an).
female (only referring to human beings) ksᴇm —.
few abō'o.
to fight wuldō'yitk.
—— *with fists* dal.
fin of fish nᴇk·auwā'i (see *paddle*).
—— *Delphinus Orca* nē'iq.
to find, to reach, to receive, wa.
finger kuts'ō'atl.
—— *first,* hats'ē'ek·.
—— *second,* ksin'ā'k·.
—— *third,* hastā'leks.
—— *fourth,* tlgō'uskai.
to finish g·ā'ōdē, g·ag·ā'ōdē.
fire lak.
—— *is burning* gua'lak.
—— *to start fire* sᴇgua'lga lak (sᴇ = to make).
fire drill tkī'en.
—— —— *stick of,* nᴇ sī'ētkī'en = foot of fire drill.
fireplace ts'ᴇm la'k = in fire.
fish lōwᴇ'lᴇm(1)ts'ᴇm(2)aks(3) = in(2) water(3).
fish hook t'ā'wil.
flag (*European*) atlo'm(1)gyamuk (2) = sail(1) sun(2).
flanks sitlk.
flat tga, *pl.* d'aqtqa.
Flatheads d'aqtqa = the flat ones.
flounder daqs.
flower mᴇtsaqalā'i.
to fly kyᴇpā'ek.
fog yē'en.
to follow yā'ak.
food wunē'ia.
foolish mᴇwa'tsa (wa'tsa = land otter).
foot sī (Nass : sā'ē) tsâ'oqs (see *plant*).
forehead wâpq.
forenoon serliaqs.
fork hayā'wiqk = instrument eat.
fox naratsē' (borrowed).

friend nEsē′bansk.
frightened bas.
fringes on upper part of blanket for tying it t'â.
fringes on pants, etc., hatlâ′.
from wātk (see *to take from*).
fruit, species(?) ksī′u.

G.

gambling with sticks qsEn.
—— *sticks* qsEn sâ′yup = gambling bone.
—— —— *the trumps, sticks without marks*, g·ā′ē.
—— —— *marked with three rings* ksī, tsErda′m.
—— —— *marked with three rings, the central one broken at one side*, k·'o′dsiqt.
(*to gamble with sticks*): *shuffling and dealing out*, sā′ritsū.
—— —— —— *to choose one stick*, gū′sEn.
gens ptēq.
to get a "douceur" gyiā′iq.
ghost bā′laq. *pl.* bilbā′laq.
gills k·'ā′usq.
girl tlgua hanā′aq = little woman; wōk·'ā′uts = without labret.
to give gyEnā′m, *pl.* gyengyenā′m.
—— *food* gyī′En.
glabella lō spEq lEgyī′l (lEgyī′l = eyebrow).
glacier s'iā′n.
glad lō(1)ama(2)k·â′ot(3) = in(1) good(2)heart(3), *pl.* lō amā′m k·ak·â′ot.
to go k·ā.
—— *go!* ndâ! *pl.* ndâ′sEm.
to go into a boat lō′k·Em (lō = into).
—— *on a road* yāk, *pl.* liyā′k (see *to follow*).
—— *out of house* ksEr = out.
god sEmâ′yit kE laqa′ = chief above.
good âm, *pl.* amâ′m.
goose, black, hā′aq.
—— *white*, tlē′wun.
grandchild tluktā′ayen.
grandfather niya′.
grandmother nts'ē′etsō.
grass kEyâ′qt.
great wī, *pl.* wud'a′.
great grandchild ō′olis.
great grandfather ō′olis.
grease of olachen k·'ā′wutsē.
grease bag of sea-lion guts sinck-sâ′sk.
green mEtlē′itk.
greenstone nEhâ′n.
grouse maqmē′eq.
to guess gō (see *to shoot*).
gull k·ak·ō′um.
gum for chewing skyan.
gun k·ap'Ela′.
guts k·al'â′os.

H.

Haida Haida.
hail ts'ats'a′.
hair lī.
—— *of scalp* k·ā′us (see *head*).
half qpī′yē.
—— *white* qpīmâ'k.
—— *cuttlefish* (*a crest*) qpīhatsalt.
halibut tqā′ō.
—— *hook* yig·a′.
haliotis pElha′.
hammer, stone, tEqtl.
hand an'o′n.
—— *back of*, lEqsEnē′itl.
handle of paddle g·ā′lon.
to hang yaq, *pl.* yā′iaq.
happy lō ama k·â′ot (see *glad*).
Harelda glacialis an'anē′eq.
hat k·ā′it.
to hate lElā′leqs.
hawk qtsō wotsk.
haws ralā′ms.
he, present, nē′EdEt.
—— *absent*, nē′Edga.

head t'ᴇmk·ā'us.
headdress amhalā'it = used in dance.
to hear nᴇqᴇnō'.
hearsay amᴇk·ad.
—— *in compounds*, —k·a.
heart k·â'ot.
heavy p'a'lᴇk·s.
heel tō'upqs.
Heiltsuk Wutsda'.
heraldic column ptsān.
here ya'gua.
hermaphrodite k·anâ'ts.
herring skᴇ.
—— *rake* ky'ᴇdᴇ'.
high gyeps.
hip t'ᴇmba'.
to hit, arrow, bātsk (see *arrive*).
homesick wīgyatk.
hoof of cow k·asᴇsī'm.
—— *of deer* k·anā'q.
horse gyudā'n (Chinook).
house wālp, *pl.* hōwā'lp.
—— *place in the rear of the*, stō'op'ᴇl.
humming-bird ts'ᴇ'pts'ᴇp.
hungry k'tē, *pl.* luk'tē.
to hurt sg·ā'yigs.
husband naks.

I.

I nᴇ'riō.
ice t'ā'ō.
in ts'ᴇm.
—— ts'ᴇlᴇ'm.
inside ts'ᴇlᴇ'm.
instep lᴇqsnē'eqs.
instrument ha—.
—— k·an—.
to intend r'ap = must, anything serious, habitual.
interior, inside of, ts'ār, *pl.* ts'ᴇts'ā'r.
intestines hat (see *womb*).
into lō.
—— *to carry*, ts'ᴇlᴇ'm ga.
iron t'ō'otsk (see *black*).
island lᴇks d'a', *pl.* lᴇkshūwa'n = alone sitting.
island, large stand, lᴇqlᴇksd'a'.
it nē'edᴇt.

J.

jackknife haqpa'qt.
jay, blue, kuskua's.
just da.

K.

kelp-cake tlā'ask.
kidney lᴇpᴇ ts'a't (see *stomach*).
to kill ts'ak, yets (see *dead*).
killer (Delphinus Orca) nē'iqtl (see *fin*).
kingfisher tsiâ'lk.
knife hatlebī'esk = instrument smoothing.
—— *butcher*, ha k·'ōtsa'mē (ha = instrument, k·'ōts = to cut, a'mē = meat).
knothole in board anē'is (see *branch*).
to know wulā'i.
Kwakiutl Gagō'otl, t'ad'a' = those far away.

L.

labret k·'ā'uts.
—— *perforation for*, nak·'ag a a'q (see *mouth*).
ladder k·anā'qs.
landslide tlâ.
large wī lē'ks (wī = great).
to laugh sis'a'qs, *pl.* lasaa'qs.
law wulᴇlâ'.
leaf ia'nᴇs.
to leave dā'wult, *pl.* k·adā'wult.
—— gdaqs.
—— wātk (see *from*).
—— *the house* ksᴇr, *pl.* ksâq (see *out*).
left hand (nᴇ)me'tekiawan (ᴇm an'o'n).
leg (a)sī'.

leg above knee k·ᴇlg·ā′isil.
—— *below knee* tᴇmtlā′m.
to lie down nâk, *pl.* lātlk.
lightning ts'ā′mtē.
to like sa′ra.
lip, upper, kwaq.
little tlgua.
liver pē.
long wī nak' (wī = great).
—— *time* sk·ana′q, n'aga′.
to look nē′etsk, *pl.* neknē′etsk.
—— *after somebody moving away* kuō′tlstakᴇlā′atl.
to look up man nē′etsk.
to love hasā′oknᴇnan.
lungs dep.

M.

to make ts'ap, *pl.* ts'apts'a′p.
—— *the same* wilawa′ldet.
—— sᴇ —, *pl.* g·asᴇ′—.
—— *(to catch and dry) salmon* sᴇhâ′n, *pl.* g·asᴇhâ′n.
——*a fist to somebody* t'a′gyil an'o′n-(2)ts'al(3) = arm(2) face(3).
man iō′ot, *pl.* iō′ota.
many hāldᴇ, wihāldᴇ (wī = great).
marmot kuī′yuk.
to marry naksk (see *husband*).
martin iē′nē.
mask amē′lᴇk· = used at night.
mast k·an ᴇm atlo′m = tree of sail.
master miā′n.
mat of cedar bark sk·an.
meat sa′mē.
midnight sᴇrlg·aā′tk.
milk ksᴇm a′ks = woman water.
miserable, good for nothing, k·a′mste.
—— *in compounds,* k·am —.
misfortune happening q—ka.
to miss guā′ades, *pl.* gutguā′ades.
to mistake for gun.
a monster of the sea ts'ᴇm a′ks = in water.
month gy'a′muk (see *moon, sun*).

moon gy'a′muk ᴇm hō′open = sun of night.
morning k·antlā′k·.
mortar nᴇbᴇts'ē′.
mosquito gyī′ek = piercer.
mother nâ′e.
mother-in-law tlāms.
mountain sqanē′is.
mountain goat mᴇ′tē (see *sheep*).
—— —— *young,* wākʜ.
mountain lion nā′osō.
mouse wuts'ē′ᴇn.
mouth kutl'ā′q (see *lip*).
mud lōa′ky.

N.

nail (of finger) tlᴇqs.
—— *of toe* tlᴇqs ᴇm sī.
name wā.
narrow, long and, mᴇ′qtla.
a narrow opening lōtlkō′ol.
neck t'ᴇmlā′nē.
neckring of cedar bark lō′ē (borrowed from Kwakiutl).
nephew (sister calls sister's son) = son.
—— (brother calls brother's son) = son.
—— (sister calls brother's son) tlguslē′s.
—— (brother calls sister's son) tlguslē′s.
Neqno′q, Nᴇqno′q, *supernatural beings.*
nest nlō′otlk.
net, large, tk·ātl.
—— *small,* pᴇ′na.
night hō′opᴇn.
night atk.
nimbus mē′ᴇk.
no ā′yen.
no (adj.), atlgᴇ.
noise bō = any noise.
—— qstā′meq (of falling objects).
noon lᴇbarē′it sqet'ā′ gya′muk.

north gE'rElka.
north-northwest wind gyitErane'etsk (see *Tongas*).
nose ts'aq.
—— *ridge of,* ktō'usk Em ts'aq.
nose ornament k·alk·tsitlō'osk.
nostril tsEm ts'aq = in nose.
not atlgE.
notch of arrow hanemâ'ul.
now gyā'wun.
Nusqē'mta (of the Bilqula legends) mE.

O.

œsophagus nā'ata.
olachen rE.
—— ha lEmātk = saviour.
old (*man*) wud'a'gyat (Em iō'ot) = great people.
on top of laq (also beginning all names of islands).
on (*against*) tqal.
the one who tEi'n.
only g·am.
to order gun.
otter wa'tsa (see *foolish*).
out of ksâ.
outside gye'laq.
over, across, lē'r'an.
overcast ts'ē'ebe sa = close eye heaven.
owl qpâlrEmtlk.

P.

to paddle wā'i.
paddle wā'i.
paint, red, for face, mEs'ā'wus.
palate atlēnā'.
palm of hand ts'Em an'o'n = in hand.
pants p'aqs.
parents nEguā'at (see *father*).
to be particular whom one's child is to marry nālEgyidahā'u.
to pay qtkâ.
paying for burial to gens of father dē'wul (see *to burn*).
people gyat.
—— *who lived long ago* tEtlgyat.
—— ts'apt.
—— *common,* waā'iEn.
pestilence haiatlilā'qs (*borrowed from* Kwakiutl).
pestle sī'ist.
to pierce gyetlk, *pl.* gyetlgyetlk.
pipe (a)qpēiā'n = eat smoke.
to pity ramrâ'd.
place of kEnE — (kun —, Gyitksan dialect).
—— — k — (only in geographical names).
—— (where something is frequently done) kspE —.
—— (where something is kept) — ndE.
plant of foot ts'Em tsâ'oqs = in foot.
to play k·amē'elEk = to speak good for nothing.
to play with somebody sila k·amē'elEk.
poor guē'E.
porcupine ā'wat.
porpoise dsīi'r.
potlatch yā'uk.
powder ō'mElak (see *fire*).
prairie laq nEp'a' (laq = on).
to prepare guldEm k·a'wun = beforehand ready.
to pretend sis.
pretty amapa's (see *good*).
principal man.
to pull sā'ik.
—— *up* man sā'ik.
to pursue lōyā'ek, *pl.* lōhyā'ek = into go on road.
to put into ts'E'lEm = into.
—— lōsgE'rE (lō = into).

Q.

quick t'ēn.
—— *to run,* alōbā'n t'ē'n.

R.

rabbit k·a.
raccoon dsâ′olky.
rain wās.
rainbow mā′qaē.
rapids dâ′eks.
rattle seso′ (borrowed from Tlingit?).
raven k·āq.
—— *as deity* Tqē′msEm.
—— *gens* K·anha′da.
rays of sun sisī′ gyamuk = feet of sun.
ready k·a′wun.
to receive, eat, q——.
receiving payment for burial qdē′wul.
—— qlō an′o′n.
to receive taa′qtl.
red mEsk.
relatives wulā′isk.
remains mān.
to request gunâ′ (see *to order*).
to return iē′tlk.
—— *into* lō iē′tlk.
rib ptal.
rich amawā′l = well to do.
right hand nEsimiā′uwan (Em an′o′n).
river g·′ala a′ks = ascending water, *pl.* g·′ala aka′ks.
—— *up* (locative), gīgya′nē.
—— *on the River Ksia′n,* ts′Em siā′n.
to roll down gyā′agEltk.
roof awā′lp = house cover (ât).
—— laqa wālp = top of house.
round tkwia′tlk, *pl.* tkwiyitlye′tlk.
rowlock k·anwā′l = instrument paddling.
to run ba, *pl.* otl.
—— *into canoe* lōk·Em ba.
—— *away* gy′ē′eqk.
—— —— *with somebody* da ba.

S.

safe mâtk.
sail atlo′m qsâ = sail boat.
saliva pōksk.
salmon hân.
—— *spring,* hânhisō′ont.
—— *berry* mEk′â′qs.
salt mân.
—— tlkum lâp (lâp = stone).
the same nenē′etl.
sand ā′us.
to save lEmā′t.
to say hā′u.
—— ia.
scalp qâ′lē.
scar tlē′eky, *pl.* tlētlē′eky.
to scold wī Em hā′ut = great say; (cf. *to cry*).
scraper of stone for dressing skins halogya′tlqan.
to scream aya′wa, ayaluwāda.
sea qā′tla (obsolete).
—— laq mân = on salt.
sea egg a′sōt.
seal rE′la.
—— *big,* tō rE′la.
—— *young,* k·′oâ′tk·.
sea lion t′ē′epEn.
sea otter ptlōn.
secretly dak·′ā′mtsEn.
—— *leave,* tikyē′eqk.
to see nē.
seldom wag′E′rEdEt.
self gyilE′ks = back (in reflexive verbs).
—— lEp.
—— *myself* lEp nE′riō.
to send hā′yets.
—— *a present* yā′wus.
separate lEksgya′t (gyat = people).
septum ndā′o ts′aq (ts′aq = nose).
—— *perforation of,* nag·′ag′ Em ts′aq.
to sew tlō′opk.
shaman suwa′nsk.

shame! tsâq!
shavings k·am tlEbī'esk = useless shaven.
sheep mE'tē.
sheets tēhatlo'm (see *sail instrument*).
to shoot gō (see *to guess*).
shore of lake ts'oq (qtsaqtl, Gyitksan).
short tālpk.
shoulder t'Emg·ā'ē.
sick sī'epk.
sickness hasī'epk.
to sing lī'ēmi.
Sisiutl (double-headed snake) Laqaqua'sa = both sides head.
sister (called by sister) tlE'mktē.
—— (called by brother) tlkā'uk.
to sit d'a, *pl.* wan.
skin anā's.
sky ts'Em laqa' = in above.
slave qā'a (tqalwā'alEmqtl?).
to sleep qstoq, *pl.* laqstâ'oq.
slime of snail yetl.
slope, gentle, wulōtla'p.
slow lāltk.
small ts'ō'osk (also, *young of animals*).
—— tlgua.
smoke p'ēiā'n.
to smoke qp'ēiā'n = to eat smoke.
smoke hole a'la.
to smoothen tlE'lEp.
smoothened tlEbī'esk.
snail hatsaE'rElt.
snake matqalā'ltq.
snow mā'dEm.
something gâ (see *what*).
—— ky'En.
sometimes k·aqpa.
son = male child.
soot g'âm.
sorrow t'âqtl.
south hā'iwas (see *rain*).
southeast gī'si hā'iwas (gīsi = down river, wās = rain).
span, thumb to second finger, sâ'ols.
sparrow-hawk qskya'msEn (borrowed from Tlingit?).
to speak a'lgiaq, *pl.* ala'lgiaq.
—— hāu.
—— *together* sarait hāu.
—— *against somebody* lEbi'lt hāu.
spider skyet.
spring kwana'ks (aks = water).
spoon of mountain-goat horn haa'ks = instrument drink.
spruce sE'mEn, *pl.* sEmsE'mEn.
squid hats'a'lt.
squirrel dasq.
to stand hā'yitk, *pl.* maqsk.
star piā'ls.
starfish k·amā'ts.
to stay d'a, *pl.* wan (see *to sit*).
—— *for a while* g·'ad'a = a while stay.
—— *to camp on beach* dsoq.
—— *boat, staying* (not moving, on water) lâ'o.
to steer hadā'i.
stockade dâ.
stomach ts'al.
stone lâp, *pl.* lEplâ'p.
to stop (v. a.), gyilâ'gō.
story adā'wuq.
stranger lEksgyat = separate people; *pl.* hagulEgya't.
strap for basket k·anauwa'lē.
to strike t'ō'os.
to succeed, to be able to do anything, aqtl.
to suck nEbEmâ'.
suddenly sa.
summer sōnt.
sun gyā'muk.
—— *rises* tlaksewā'ntk gyā'muk.
—— *sets* tkiā'sa.
swallow sEpEqī' Em aks (aks = water).
to sweep d'ō.

T.

tail ts'ōp.
to take ga, *pl.* doqtga (see *at*).
to take away sētqa iā'gok(?).
to take into ts'ᴇ'lᴇm ga = into at.
to take from fire asti.
to take off blanket saga't.
tall wīnak (wī = great).
—— nᴇptlaqtl.
to taste baq.
tattooing on breast gyetlk·ā'yek (see *to pierce*).
—— —— *arm* gyetlo'n.
to teach sᴇ wulā'i = to make know.
to tear down (a house) k·oa'lt.
—— *to pieces* pē'ᴇl.
tears ksīl.
to tell matl.
temples wulksitlā'ntk.
then kyek.
—— adawu'l.
they dᴇp nē'ᴇdᴇt.
thimble k·antlō'obes = sew instrument.
thin, lean, ksa sā'yup (sā'yup = bone?).
thirsty lōgᴇ'rᴇn aks ts'ᴇm aq (aks ts'ᴇm aq = water in mouth).
thou nᴇ'rᴇn.
to throw into fire tqē'el.
thumb mâs.
thunder k·alaplē' ᴇm laqa' = thunderbird in heaven.
thunderbird k·alaplē'ep.
the tide falls ts'â aks (aks = water).
the tide rises lēks aks (it grows the water).
to tie, fasten, ts'ē'ep.
sometime tlana'k.
Tinne ts'ᴇts'a'ot = those in the interior.
tired sōnâ'tl, *pl.* k·asōnâ'tl.
to da.
toad k·anâ'o.
tobacco, Indian, wundâ'.
tobacco, European, wundâ k·'ᴇmksī'oa.
to-day sēigya'wun.
together sarā'it.
to-morrow tsegyets'ē'ip (see *yesterday*).
—— *day after,* tsenatâ' tsegyets'ē'ip.
Tongas land and man gyiteranēts.
Tongas woman suwa't (borrowed from Tlingit = woman).
tongue dū'ᴇla.
tooth ua'n.
lower row of teeth ua'n ᴇm lakī'etl.
upper row of teeth ua'n ᴇm laqa'.
top of anything g·a'lon (obsolete, now only "handle of paddle").
—— man 'laqa'.
town k·'alts'a'p, *pl.* k·'alts'apts'a'p.
tragus nᴇk·'â'pᴇn mō (mō = ear).
to go traveling hat'ā'qs.
tree k·an, *pl.* k·ank·a'n.
trousers of skin p'aqs tqa (see *pants*).
to try, to examine, sᴇntsaai'lisk.
to turn back tkwia'tl (see *round*).
to turn over g·'aphā'yetk.
twins ksēt'ᴇpqadâ'l (from *two*).
—— sᴇwīhâ'n = making many salmon.

U.

ugly sqats'ᴇ'r.
uncle (father's brother) nᴇguā't = father.
——(mother's brother) nᴇbē'ip.
under tlᴇr.
unmarried wōk·'â'lekyetk.
upward baq.
to use hâ.

V.

valley tlkut'ē'en.
vein k·ag· ᴇm itlē' (itlē = blood).
very sᴇmra'l.
—— *in compounds,* sᴇm —.

visible nēsa′p.
to visit g'a k·â′edEks = for a while come.

W.

wait! hawē′nē (see *by and by*).
to wait liē′tl.
to walk ya (see *to follow*).
to want (ha) sā′rau.
war uldō′yet.
warm gyā′muk (see *sun*).
watching liē′tlks (see *to wait*).
water aks.
wave g·â′op.
we NE′rEm.
wearing apparel gus.
weir for catching seals with falling tide dsīs.
west qpa′la.
whale tlpōn.
what gâ.
when? nda.
—— *future*, tsēdE′nda.
—— *past*, adE′ndade, adE′ndaē.
where wul.
where? ndā.
for a while g'a, lām.
white mâks.
who? which? gō, nā.
whose natl.
whole tqa (see *all*).
widow, widower tsEnEs ts'ak.
wife naks (see *married*).
wife, first (principal wife), sima′naks (mian = master, naks = wife).
—— *second, third wife*, k·alna′ks.
wind pask.
—— *a certain* (direction doubtful), gEgtā′tk.
windpipe haā′lagyaq = speaking instrument.
wing k·'ak·'ā′i.
—— *feathers* lī Em k·'ak·'ā′i.
to wish hasā′q.
with da.
without wō ——.
wolf kyebā′ō.
—— *gens* laqkyebā′o = on the wolf.
woman hanā′aq, *pl.* hanā′naq.
womb hāt.
woodpecker kitlwuē′ansk; sEmgyī′ek = spruce pecker.
to wrestle baq.
wrist NEqpā′ra an'o′n.
to write d'am.

Y.

year k'âtl.
yes ō.
—— *said from a distance* haā′ = in a high key.
yesterday gyets'ē′ip (see *to-morrow*).
—— *day before*, natâ′da gyets'ē′ip.
you NE′rEsEm.
young man sō′pas (Em iō′ot).
—— *bear* sōntlk (Em ol).
—— *animal* tlgEm.

TSIMSHIAN TEXTS.

WULAQTLÂ′TK (where a misfortune happened by a landslide), INVERNESS.

Tla	lâ′yiksga	Ts'Emsia′nga	amia′t	gasga	Ksiā′nga	nu	wul
Having	left	the Tsimshian	come from they	from	the Skinar	(past)	where

g·asEhâ′ntga.	Adawul	g'a	lât	gasga	gyā′atsga;	ada
they make salmon.	And then	for a while	they camp	at	there;	and

tlgō′otlg Em	hanā′aqsga	g'âltga	sEm′â′gyitga,	gō′ga	sEm-
the child	woman	of a certain	chief,	which	very

lEgyidahā′wutga.	Tla	hō′opEtga	dak·'a′mdsEn
he was particular whom she should marry.	(Perfect)	night	secretly

k·â′EdEksga g′â′ltga ā′m a sōpā′s Em iō′otga. Adat k·âsga wul
comes a certain nice young man. And he goes where

nâ′gasga tlguā′lksga. Ada hā′ut gasga dEmt de batga. Adat
lies the chief's daughter. And he says (?) with run him. And
(elope with him).

enâ′oqtga. Adawul k·adā′wutltga. Tla t wasga nawālptga,
she consents. And then they left. (Perfect) they having reached his house,

adawult tqal ha′yint gasga gye′laqga, adaEl ts'ē′entga, ada
and then he against makes her stand at outside, but he enters, and

hā′us dEp nâ′otga dīs nuguâ′t: "Ayentl nak·anuwā′nē,
say (plural) his mother and his father: "Did not you (past) make work you
(go for her sake),

nat?" "Hā′yetga da gya′larat," dā′yaga. Adawul ksâ otlga
my dear?" "She stands at outside here," he replies. Then out run

tlemktī′yetkgatga. Adawult ts'E′lEm ctō′oltga. Adawul
his sisters. And then into she accompanies them. And then

tqâ′oqgatga asga lōmā′msga k·agâ′otga. K·antlä′kga. Adawul
they eat being in good hearts. It is morning. Then

k·â′EdEksga tlgua wud'agya′tga, KsEmwuts'ē′enga wā′atga. Ada
comes a little old person, Female Mouse her name. And

hā′utgat: "Tqē′el g·antsemō′nt!" ada wa′lsga tlguā′lksga;
she says: "Burn your earring here!" and she does so the chief's daughter;

adaElwu′lt asti daqtga tlgua wud'ā′gyatga. Adawul hā′utga:
but then she from fire she takes it the little old person. Then she says:

"Dātl! Wulā′yenē, gō tEi′ngā′dEnt?" "Avent," dā′yaga.
"My dear! do you know, who the taker of you here?" "No," she replies.

"HatsaE′rEldEt," dā′yaga. Ada sEm-ba′sga tlguā′lksga. Ada
"The snail," she answered. And very afraid the chief's daughter. And

hā′usga KsEmwuts'ē′enga: "Ndâ′e! gy'ē′eqkEn! atlgE waraidâ otl,
it said the female mouse: "Go! run away! not far run,

wul dsoqs dEp nEguā′dEn. Da yā′kEn stō′op'El atlge
where stay (plural) your parents. Just walk on road back of house not

nēsa′ba na liyā′gEsEmt yag·a. Ye′tlEt. Nenē′etl lō
visible (past) you went (plural) downward. There is slime. The same in

yā′kEn baq k·â sqanē′esit ada mE le′r'an yā′get! Nēnē′ wul
go on road up go mountain that and you over go! It is where

ds′oqs dEp nEguā′dEn gyē′egEt." Adawul wā′lesga
stay on beach (plural) parents below." And then she does

tlgua′lksga. Sis lām ksErgaga′. AdaElwu′l bātga.
the chief's daughter. She pretends after a while to go out. But she runs.

Sem- lō yā′tgatga na matldEsga tlgua wud'ā′gyatga. Tlana′ksga
Exactly in she goes (past) she told the little old person. Having some time

wāldga, adawu′l guā′desga na′kstga. Adat wul wulā′isga
done so, then he misses her her husband. And he then knows

gy'e′eqgatga. Adawult sag·ā′it hukhō′otkgasga tqanē′esga nE wī
she had escaped. And then together he called them all his great

ts'a′ptga. Adawul lōliā′gEtga. Tla sEmt wātga
tribe. Then they pursue her. (Perfect) exactly she reaches

tlgua′lksga sEm laq'o′sga sqanē′isga, da nEqnâ′etga wī
the chief's daughter the very top of the mountain, just she hears great

qstâ′mEqga. Adawult gō′usga ts'Et lōyā′yet. Adawu′la tgye
noise. And then she guesses that they pursue her. And then down

bāt gasga sqanē'isga. AdaEl tlā'wula hā'usga wī qstā'mEqga;
she runs from the mountain. But always sounds great noise;

ada gyilEks nē'etsgEtga: rakstanā'ga! tla yik·ayā'sga wī tlâ'oga;
and back she looks: behold! (perfect) down comes great landslide;

k·ank·a'nga liē'natga ada wu'd'a lEplâ'opga gyikgyā'gEltgatga. Adawu'l
trees fall and great rocks roll down. Then

ayawa'sga hanā'aqga; tlat nē'etsga wul dsoqs dEp nEguā'dga,
screamed the woman; (perfect) she sees where stay (plural) her parents,

asgEt gun lōk·Em; g·ag·ā'ōditgasga ts'Em g·aqsâ'ogE. Adawul
she ordering to go into canoe; they finish (have gone) into the canoes. And then

dī gun a'qtlgatga. Adawul lō'k·em g·'aphā'yetget gasga
also towards (into) she succeeds. Then go into turns round at

qsâ'os nEgua'tga. Mâtgaga, adaEl wul wī tlâ'osga nE wul
the canoe of her father. She is safe, but where great landslide (past) where

dso'qtga. Ada gyilgs nEknē'etsgatga, rakstanā'ga! wī hä'ld Em
they had been. And back they look, behold! great many

hats·aE'rEltga k·anuwā'ltga. Adawu'lt matltga tlgua'lksga wula
snails make happen it. And then she tells the chief's daughter why

wā'ltga. Ada nē'nētga da Wulaqtlâ'otga wulawā'ldet.
it happened. And it is at Inverness where it happened.

K·anuwā'de da wul-q-tlâ'ot-k-at.
It makes name at where landslide-misfortune happening.

Prayer 1.

Neqno'q, Neqno'q; sEm'â'yits, sEm'â'yits! ramrâ'dEn! tgyē nē'e
Neqnoq, Neqnoq; chief, chief! have mercy! downward look

wal tlErE'nt n ts'ā'pEnt.* Man sā'ikya sī'Ent, ada ma d'ō ts'ānt!
doing under you thy people Up pull thy foot, and off sweep thy face!

Prayer 2.

Neqno'q, Neqno'q; sEm'â'yits, sEm'â'yits! ramrâ'dEn! ā'yen
Neqnoq, Neqnoq; chief, chief! have mercy! else nobody

tEE'n qsEpēiā'nEksEn tlE'rEnt! Neqno'q! ramrâ'dEn!
the one to make you receive smoke under you! Neqnoq! have mercy!

Prayer 3.

Lō sā'ikya na ksEnā'tlgEnt, sEm'â'yit! dEm wul gya'kset!
Into draw thy breath, chief! (future) that it be calm!

Before dinner the Tsimshian burn some food as an offering for Neqnoq. After having done so they pray:

Wa, sEm'â'yits! dEm gā'bEn guaa qpiyē ga'bEnmēE. Tawā'l
There, chief! (future) you eat this part of our food. That is all

mān da gua'a; tawā'l mān da gua'a tlguanēe. Gyī'EnEm!
left at here; that is all left at here to your child. Give us food!

* Instead of n ts'ā'pEnt, I heard also nEsEgya'tEnt = *your people made by you.*

Satirical Song, Mocking the Inhabitants of Meqtlakqatla Emigrating with Mr. Duncan to Alaska.

1. Ōyeya, ōyeya, â.
Ōyeya, ōyeya, â.

Gyilâ′dsE wigya′tgEn.
Do not (future) be you homesick.

AtsEda lâ′yegEn, tsEda suwā′dEn.
When you will leave, when will be you a Tongas woman.

2. Ōyeya, ōyeya, â.
Ōyeya, ōyeya, â.

ME tsE g·am yā′wus dī
You will only send a present also

Atl gEnē′guatl ndE sineksâ’k.
Of preserved berries kept in grease bag (*sea-lion guts*).

3. Ōyeya, ōyeya, â.
Ōyeya, ōyeya, â.

Gyilâ na wī hā′utgEn!
Do not (past) you cry!

Wul gyinad’ā′s Caledonia.
Because they left behind Caledonia.

Tlatsēdē qga′nEgEn.
When you will have eaten rotten salmon heads.

4. Ōyeya, ōyeya, â.
Ōyeya, ōyeya, â.

Gyilâ′na wa k·â′dEn dâ
Do not be foolish

Gō lEbElt hā′usEm da Indian Ē′edzEn.
Who against you talk the Indian Agent.

A MYTHIC TALE OF THE ISLETA INDIANS.

By Albert S. Gatschet.

(*Read before the American Philosophical Society, December 18, 1891.*)

The study of the Indian languages of New Mexico has been neglected more than that of other sections of our wide territory and it is with much satisfaction that I present in print the first continuous text worded in one of them, that of Isleta Pueblo. It is a dialect of the Téwan, or, as it is called in J. W. Powell's classification, the Tañoan family, with a translation and with a paraphrasis, which is more comprehensible to the general reader. The source from which the two portions of the tale were obtained is mentioned in the "Comments," with all the particulars needed.

Text I. The Boy-Antelope.

Kamäntchu' yowa' natüei' we ai'; hu'ba wi'si Pi'-'li
It is said somewhere a village there (was); and two "Bighead"

u'-unin t'hü' ai. Pi'-'li upiû'^{n}u-ide a-u'kwimban yuwi'n'a
young people lived there. "Bighead" the girl being pregnant not any (had)

ä'napa hukwa'hi pa'nat; bepapa'-u uba' pa' ai huä'tcheban,
place to be delivered; her elder brother then prairie to took (her),

hu'ba u'kwoban. Wi'wai bepapa'ba matcheba'n
and she bore a child. Hereupon her elder brother brought (her) back

tüei, u'-u mā'shuban pa' ai. Hu'ba wi'm'a
to the village, the babe he left prairie upon. Then a

ta'li'ora-ide u'-u t'aba'n, hu'bak a'wa ö-ukĕmiba'n.
female antelope the babe found, and she brought it up.

Wiba'-a wi'm'a shü^{n}-i'de shütche'mik ta'lī'ora t'ha'ban
Once a hunter while hunting a she-antelope met

wim'a a ü'-a-u fiĕ'rk. Ye'de ü'wa-u-ide wi'ĕra-i tamni'n
(and) a boy along with (her). That boy was a runner antelopes

ai'ti t'hurī'm. Shü-au'ti makwibā'k nakā'tchau wi'ban
than faster. From the chase when he returned notice he gave

kie'nda ta'-i-kabe'-ide, betu'winiban wie'n t'hü' we-i' shi'mba
at once to the town-cacique, (who) proclaimed: four days after all

ta'-inin ishû shanhi'nap: "wi'm'a ü'wa-u-ide tchie'minap
the people on a hunt should start: "(that) a boy was going about

tamni'n an, hu'ba inabä'wa î'shierhinap." Wie'n t'hü we'-i
antelopes with, and we want to seize him." Four days after

shi'mba tüei'-ide u' fier, 'li'o fier, süa' fier ishü-miba'n,
the whole pueblo, children with, women with, husbands with to hunt went,

ibi t'a taba'n, bi'tchu î-u'beban î'pie t'a
they the antelopes found, but were told, that not the antelopes

χüĕramhi'nab, wei'ba-i-i ü'wa-u shie'rhinap tin. Ta'liora'-ide
they should hurt, merely the boy to get hold of try. The female antelope

ana' katchaba'n, hu'ba ü'wa-u u'miban, be-e' 'lipwĕrhi'nnap.
was informed, and the boy she told not to leave (her).

Ta tamni'n inakwî'er p'i-amba'n, hitüe'rwemik buorti'm
Then the antelopes began to run, and while they ran in a ring

ta'liora'-ide ü'wa-u u'miwe. "Na'yan kin wu'hi tün-ü'χ-
the female antelope the boy called (to her). "Presently we will run north-

tü'^{n}na-u; hu'bak inshu'minak, nātü^{n}āk kake'-i kwimba'hi
west; and while we pass (the ring) on the line your mother will stand

shie'rnai, hu'bak a shu'miwe-ifier, akwei'tchebi, hu'bak u'
on the left side, then as you pass (the line) you will fall down, and there

kake'ba hashie'rehi." — Hu'bak ba hu'na pu'aban. — Ka
your mother will catch you." — And (so) it occurred. — That's

hui'kiēm.
your tail.

Text II. The Race of the Two Champions.

Ka'pio kawe'-ide na tü'wiban ʞɹe' shamba'k.
"Cold-Hearted" the chief, the earth pierced through (and) above came out.

Shamba'g pa-hwi'e muba'n, hu'ba kai'ban "Shi'ba
After emerging a lake he saw, and he named (it) "Tears

fûn'-a-i," hu'ba yeti' itai' we'ban nabat'hü' tü'ei.
dark," then thence (his) people he took to the white pueblo.

Ye'dit'hü ta'ban wim'a natü'ei we ai', na'dshûr' tü'ei,
Here they found another village being there, the yellow village,

yo-u-a' i-uwe'-siēm tai'nin pa'-in it'hüpan a'-i. Hu'bāk
where wicked people were living. Hereupon

nadshu'ri tü'ei wesie'mnin î-ukwiewi' a'-uban nabat'hü'
the yellow pueblo, the wicked people, racers invited, of the white

tü'ei hi'tai we'-in an. Wi'en t'hü' ibemaküamba'n,
pueblo its people (to be) with them. Four days did they make ready,

hû'bak shi'mba ibe'tüyiban, hu'bak imî'ban natchû'ri
then all assembled, then proceeded to the yellow

tü'ei. Nabad'hü' tü'ei tai'nin an natchû'ri tü'ei
pueblo. The white pueblo people (and) the yellow pueblo

tai'nin an yu'na kûmna' kiĕrba'n, ibenahumiba'n;
people thus their clothing laid down, they did bet;

hu'bak natchû'ri tü'ei pi'eni-ai hu'li'mihi'nab;
and the yellow pueblo (expected ?) to be victorious;

natchû'ri tü'ei tai'nin ibe'wa humiba'n, hitu'mik
of the yellow pueblo the people their lives staked, saying

pa'y'a 'limba'-î 'ludehina'b natü'ei fi'er, en hi'ria-a
that who was beaten would be burnt the village with, with property

we'-in. Nabat'hü' tü'ei hûra ibe'wa humiba'n, wi'en
his. The white pueblo also their lives staked, (and) four

t'hü' we-i' kwie'win inwû'rihiei. Shi'mba tai'nin
days after the racers were to start. All the people

hitü'tcheban, witchunaida'd kwî'ewnin hinmakü'ᵘ ai. Hu'bak
assembled, of both sides the racers were ready. Hereupon

thü' be'kti hinûri'ban, wi'm'a na'hwe'-iakin tai'nin himi'ban,
the next day (they) arrived, on one eminence the people went,

hu'bak yeti' a'wan wi'tad inmi'ban. Wi'wai wi'm'a
and from there onward (the racers only) went further. (From) Another single

na'hwe'yak i'nkimbak, natchû'ri tü'ei kwiewi'de be ta'kie
eminence when they disappeared, of the yellow pueblo the racer into a hawk

peba'n. Pi'enabĕ tüba-u' i'nmimik, shumieifie'rk
changed himself. Some distance towards east when they had gone, when he passed by

tua'mban nabat'hü' tü'ei kwiewi'de: "Hahahā', ta-u'ide!
he said of the white village to the racer: "Hahaha! antelope!

hakû' tieremi'k! me'tchu awa' wa'nhi hue'bai."
good by! perhaps you will reach the east."

Hue'bai inwa'mban hue'bai kwie'r tü'-u hinmabo'rîbak;
The east having reached from east towards north they turned;

takie'de tch'ûm' mî'mi-e-i hue'bai kwî'er tü'-u;
the hawk flew ahead from east towards north;

pie'nnak în'mimik wi'm'a 'lio'-u-ide nabat'hü' tüei'ti
halfways having gone one old woman from the white pueblo

tua'mban ta-u'ide. Ta-u'ide bewi'niban hu'bak ye'de
spoke to the antelope. The antelope stopped and that

'lio'-u-ide wi'-en'a u'wîr wie'tcheban, u'bemîk
old woman four reed-pipes gave him, telling (him)

ufetchihî'nab wî'ba hue'bai pie'nnai, wi'ba hue'-û-i
to light (them) one from east (when) halfways, one from north

pie'nnai, 'ba hue'nai pie'nnab, 'ba hue'kwi pie'nnai.
halfways, one from west halfways, one from south halfways.

Wi'wai ta-u'-ide tüĕ'ɹweban hue'bai kwiĕr pie'nnai;
Again the antelope ran east towards some distance;

mi'mik wi'p'a i'wîr fe'tchiban; ifa'ribak be fi'
while running one reed-pipe he lighted; when he had done clouds

ye'niban, hio-ati'n mi'mik benamakwĕrkie'-iban,
arose, (and) a short way moving on did wrap in (both),

nö^{n}'amin. Yo-a'btinbak pa' 'lu'laidewa'na, ta-u'-ide
it darkened. After a while rain fell in heavy drops, the antelope

beta'n bai'tin besu'rban; t'a' hue'-u-i wa'nhi
shook itself and then wiped off (the moisture); almost the north-point going to reach

pa'nab, takie' kü'wan, takie' mo'bak shi'mba pati'n
nearly, the hawk it met, the hawk it found all over wet

tu'la'ak arû'mig. Shumiei'fierk tû-a'mban: "Hahaha'!
on a cottonwood tree crying. As he passed it said (to him): "Haha!

haku' tieremi'k, yu'ni nu' siĕ'rnin i-uta'manin;
good by! in this way men treat each other,

me'tchu hue'nai a wa'nhî;" hu'bak ta'-uide bepi'kûrwan,
perhaps the west-point you will reach;" then the antelope started,

hue'nai kwir bemabuo'rimik takie'-ide bakiiweba'n.
the west towards veering about the hawk overtook (it).

Shumiei'fier û'beban: "ta'-uide, ta'sim aku' tieremi'k!
As he passed by he shouted: "antelope, now good by!

Yu'ni nu' siĕ'rnin ibe-i-utama'nin. Me'tchu hwe'kui
In this manner men act towards each other. May be south

a wa'nhi!"
you will arrive!"

Takie′-ide shuba′n wi′wai; ta-u′ide be-î′-eniban, hu′bak
The hawk passed by again; the antelope arose (from the ground), then

iwi′r fetchiba′n, wi′wai bena′ p'i′ pe′ban, nü′^{n}amim.
(another) reed-pipe he lighted, again did cloudy it become, it darkened.

Hu′bak ta-u′ide bemadü^{n}aru′itin bepi′kûrwan, wi′wai
Then the antelope did roll itself on the ground did start on a run, again

hwe′kui wa′nhi pa′nai takie′ kü′wan shi′mba pa′tinmûk
at the south arriving nearly the hawk it met all over wet

aru′mig, beshu′rmik tu'la′-ag ik. "Hako′amiam!
screaming, wiping himself on a cottonwood tree while sitting. "Try (again)!

yu′ni nû siĕ′rnin yut'ama′nin! t'a′ ha′ku tie′rĕmik; sîm
in this manner men act towards each other! now good by; again

me′tchu hwe′kui a wa′nhî." Wî′wai ta-u′ide be madü^{n}a-
perhaps to the south you get will." Again the antelope while rolling

rume′tin bepiku′rban, wi′wai wä′kwi wa′nhi pa′nab, takie′de
itself started to run, again at the south going to arrive almost, the hawk

bakiiweba′n. Shumie′ifier t'a′-û tu′amban tu′mig: "haku′
caught up with. As he passed to the antelope he spoke saying: "good

tieremi′k, hiu′ni nu′ na′dshur' tü′ei sü^{n}a′nin i-utama′nin."
by, in this way of the yellow pueblo the people treat each other."

Wi′wai wä′kui kwiĕr pie′nnab ta′-uide mî′mik wibaki′n
Again south towards some distance the antelope while going another

iwîr′ fätchiba′n, wi′wai bänamakoarkiei′ban, nö′amim;
reed-pipe lighted, again clouds formed, (and) it darkened;

we′bai wa′nhi pa′nai takie′ kü′ban. Shumiei′fier
(when) at the east it was to arrive nearly the hawk it overtook. As he passed by

takie′ tu′amban tumî′k: "Ta′sim haku′ tieremi′k! yu′ni nu′
to the hawk it spoke saying: "Again good by! in this way

nabat'hü′ tü′ei tai′nin i-utama′nin."
the white pueblo people treat each other."

Hu′bak shuba′n; ta′-in wa′nhi pa′nat, i-o-a′ hintai′
Then it passed by (him); when on the point of arriving where they were to be

pe′hi pana′t, takie′-ide wamba′n tü′ai, ta′-uide we′-i
changed into people, the hawk arrived behind, the antelope just

wĕri′mmik. Takie′-ide wa′na wi′m'a naʞre′yak; ta-u′ide
starting (again) The hawk arrived on one eminence; when the antelope

wĕri′mmik takie′-ide bepiku′rban. Wi′wai wi′m'a naʞreya′k
started the hawk began to run. Again to another eminence

nabat'hü′ tü′ei ü′waide wiĕri′bak, t'ai′nin bamu′tcheban;
of the white pueblo the boy (runner) arriving, the people perceived (him);

natchu′ri tü′ei tai′nin hitû^n′we: "Hita′ nabat'hü′ tü′ei
of the yellow pueblo the inhabitants said to themselves: "Now the white village

kina′ we i′tin na′ wem." Nabat'hü′ tü′ei tai′nin tu′ban:
ours now surely our own is." The white pueblo people said:

"Nabat'hü' tü'ei kwiewi'de tch'ûm' î'hi, na'dshûri tü'ei
"The white pueblo racer ahead is going, the yellow pueblo

kina' we i'tin na' wem." Wî'tchuna ida'd tai'nın
ours now surely ours is." On both sides the people

i-u'shu mi'ban, hu'bak i-u'shue nabat'hü' tü'ei ü'waide
to meet (the racers) went, and they met the white pueblo boy

tch'û'm i'hik ta'-in wa'mbak. Nabat'hü' tü'ei hata'
ahead coming when arriving (at the starting place). The white pueblo then

wie'n tü' we'-i shi'mba nadshu'ri tü'ei wĕsi'emnin
four days after all of the yellow pueblo wicked (people)

hitü^{n}ibe'itin hi'lu'deban natü'ei fierda't. Bî'tchu wi'm'a
were gathered (and) were burnt the village with. But one

wesî'emide wĕ t'hate'wa, hu'ba wĕ 'lu'deba; hu'ba ye'ti-i'ku
wicked (fellow) not was found, hence not was burnt; and from then

nya'n t'hü' kim we'siem t'hü'm.
to this day we have bad (people) living.

Translation of the Mythic Tale.

I.

Somewhere, at one time, there was a village, they say, and two "Big Head" (Pi'-'li) children lived there. One of them, the "Big Head" young woman, being with child, was unable to find some spot where she could be delivered; so she was taken by her brother to the prairie, where she was delivered. He left the babe upon the prairie and took his sister back to the village. A female antelope, finding the infant, brought it up.

Once a passing hunter met a female antelope, the boy being with her. That boy could run faster than any antelope, and when the hunter reached home he notified a clan-chief, who ordered that four days after all the people should start out on a hunt, "for a boy has been seen strolling with antelopes and we must get hold of him." Four days after, the whole pueblo, men, women and children, went out on a hunt and found the antelopes. They were told not to wound or slay any of the antelopes, but to try to catch that boy only. The female antelope having noticed this enjoined the boy not to part from her side. When the other antelopes began to run in a ring, that antelope called the boy to her, and said to him: "Now we will go to the northwest, and when we pass the line of the hunters your mother will stand on the left side, and, as if passing, you will fall to the ground and your mother will catch you." And so it was done. Now it is your turn!

II.

The clan-chief of the "Cold-hearted people" made his way through the earth's crust and came to the surface. After emerging from there he saw a lake and named it "Dark Tears," and then he took his clan to the

"White Pueblo." Near it he found another village, the "Yellow Pueblo," inhabited by people skilled in witchcraft. Then the Yellow Pueblo of wizards challenged the people of the White Pueblo to have a race with them. They prepared themselves during four days, when they gathered to proceed to the Yellow Pueblo. And the White Pueblo people and the Yellow Pueblo people deposited their garments on the ground and made bets. The Yellow Pueblo people expected victory with certainty, and put their lives at stake, proclaiming that the party conquered would be burnt, together with their village and all their property. Four days after the racers were to start. The people all assembled and the racers of both parties made themselves ready. The next day the crowds of people ascended a hill, whereas the racers alone went onward from there.

When on their race they descended from another hill and were lost sight of, the racer of the Yellow Pueblo transformed himself into a hawk. When they had gone quite a distance east, he overtook Antelope, the champion racer of the White Pueblo, and said to him: "Hahaha! good-by, Antelope! Perhaps you will be alive still when you reach the east point." Having attained that goal they turned from east to north; Hawk flew ahead of Antelope, and when they had gone halfway an old woman from the White Pueblo stopped Antelope and spoke to him. She gave him four ceremonial reed-pipes, and told him to light one of them when halfway from east to north, another when halfway from the north, another when halfway from the west, and the last one when halfway between south and east, the starting place.

Starting again, Antelope ran towards the east for some distance and lighted one of the pipes while on the run. When he had finished smoking it clouds arose which moved onward and enveloped both racers, so that it became dark. A while after rain began to fall in heavy drops. Antelope shook his body and wiped off the moisture. When on the point of reaching the goal at the north, he fell in with Hawk, who was dripping wet and sat on a cottonwood tree screaming. Passing by, Antelope said to Hawk: "Halloo! good-by! this is the way men treat each other, and perhaps you may reach the west point." Antelope started again, veered around towards the west and was overtaken by Hawk, who shouted to him: "Antelope, now good-by! in this manner men act towards each other; may be you will arrive south sometime!" Hawk passed by and Antelope arose from the ground, lit another reed-pipe, which brought on cloudiness and darkness again. Antelope, after rolling on the ground, started on his run again, and when he had arrived nearly at the south he overtook Hawk, wet all over from the torrential rain, screaming and wiping the water off while sitting on a cottonwood tree, and said to him: "Try it once more! In this manner people act towards each other; now good-by, perhaps you will get to the south point."

Again Antelope rolled on the ground and started out, and when on the point of reaching the south he was overtaken by Hawk. Hawk passed him and said: "Good-by! this is the manner by which the people of the Yellow Pueblo treat each other."

When they had arrived at the place where human form had to be reassumed Hawk arrived second, and Antelope was on the way of setting out again. Hawk came upon a hill and when Antelope started, Hawk (who was transformed into a man) began to run. The boy racer of the White Pueblo, who had been Antelope, was now sighted by the people, and the inhabitants of the Yellow Pueblo said among themselves: "Now the White Pueblo is certainly our own!" But those of the White Pueblo said: "Our racer is ahead of the other and the Yellow Pueblo is now ours to a certainty." The people of both sides who went to greet the racers, met the boy of the White Pueblo ahead of his rival when both came to the starting place.

Four days after this all residents of the Yellow Pueblo of wizards were gathered and burnt, and their village also. But one of their wicked number could not be found, and hence was not burnt; and from that time until now we therefore have some wizard people living.

Comments on the Mythic Tale.

The mythic tale embodied in the above pages is very popular among the Isleta Indians, and I obtained it from one of them, Henry Kendall, who, in 1885 and for some years previous, was a pupil of the Indian Training School at Carlisle, Pennsylvania. Considering his youthful years, he showed remarkable intelligence, and could reply to almost all the questions I propounded to him on the language and ethnology of his native tribe.

The legend is divided into two parts. I have placed the description of the adventures of the boy-antelope before the main story, though I obtained it as a secondary appendix to the same, and have to state that this part is incomplete at its end, for it does not mention the capture of the boy by the Isleta hunters, which had been the cause for sending them out on a hunt. He and his mother were called "Big Head" on account of their bulky hair, flowing loosely around their heads, which made the boy's head appear to be of preternatural size when the wind was blowing into his hair during a race.

The words, "now it is your turn," have no reference to the story, but indicate that the tale is finished and that another narrator has his turn to count another story. In the original these words convey the idea: "That is your tail," ka hui′kiēm.

As to the legendary migration of the "Cold-hearted" clan out of the bowels of the earth towards the "Lake of the Dark Tears," the Indians of Cochití and Taos, New Mexico, are acquainted with it also, and relate that the lake was to the north, in what is now Colorado, and that they saw it themselves. That populations originated from the earth and crawled out of it through an opening, is a myth very frequently found in both hemispheres. It is very conspicuous for instance in the mythology of the Iroquois and Maskoki tribes in the eastern portion of the United States, and among the Yokat, the Pomo and the Wintún in California.

Where the White and the Yellow Pueblo were nobody can tell, but the colors may be significative, for the Indian tribes of the West possess a peculiar color symbolism. The Indians of Isleta exhibit certain colors by means of paint on their faces and garments; so the red-eye section uses red and white; the black-eye section, black and white; the earth gens, white and yellow; the maize gens, white, yellow, red, sometimes also black.

Their symbol colors for the points of the compass are white for the east; from there they go to the north, which is black; to the west, which is blue, and to the south, which is red.

The race proposed by the yellow or witchcraft pueblo and performed by representatives of both towns is a race around the world. The story is told very graphically and the oft-repeated exclamations and taunts which one runner shouts to his rival are ceremonially used up to our day, though some of the terms are remnants of an archaic dialect. The reed-pipe, cigarette or calumet is a piece of reed three to four inches long, which is filled with tobacco and smoked only for ceremonial purposes. Many are now found in the sacrificial caves of the New Mexican Indians. It is thought to have the power to bring on rain-showers after a drought, but can be lit only by ministrants of sun worship. In fact all rain-clouds originate from its smoke and the carrizo-pipe plays an important rôle throughout the Pueblo legends.

In another version of the same story, which Mr. Charles F. Lummis has published in the September number of *St. Nicholas* (1891, pp. 828–835), the reeds were handed to the boy, not by an old witch, but by a mole, who for this purpose crept out of his burrow and accompanied his gift by well-meant advice.

The people of the Kapio gens or clan are called the strong, cold-hearted or persistent people on account of the persistence and energy which they evinced in digging their way through the crust of the earth up to its sunlit surface, following the behests of their clan-chief. There are many of these clans in the Isleta Pueblo, and A. F. Bandelier has heard the names of fourteen, whereas from Kendall's indications I obtained the Indian names of eight only, the Kapio among them. All gentes seem to belong either to the red-eyed or to the black-eyed section. Of the other clans we name the shi'u tai'nin or *eagle people*, the na'm tai'nin or *earth people*, the i'-e tai'nin or *maize people*, and the hu'makun or *game people*.

According to Mr. Lummis' version, the white pueblo divided the spoils of the witch pueblo with the Isleta Indians, and later on removed to their village themselves. Such a removal to Isleta is also reported of some remnants of the Tigua people, though the principal pueblo of these was near Bernalillo, on the bank of the Rio Grande.

The two runners represent some nature powers interfered with by the raingods, as the winds or the storm clouds chasing each other in the skies. The direction taken by the hawk and the antelope is the same as that by which the calumet smoke is blown out by the participants in the quarterly sun-worship festival.

The wording of the two stories is incomplete in several respects. So the transmutation of the racers into animals for the purpose of outdoing each other is not expressly mentioned, although the story cannot be understood without it. The other version also states that the boy-child left by his uncle and mother upon the prairie, was carried to the antelopes by a coyote, after which a mother antelope, who had lost her fawn, adopted the tiny stranger as her own.

By an ingenious act of the mother antelope the boy was surrendered again to his real human mother; for when the circle of the hunters grew smaller around the herd, the antelope took the boy to the northeast, where his mother stood in a white robe. At last these two were the only ones left within the circle, and when the antelope broke through the line on the northeast, the boy followed her and fell at the feet of his own human mother, who sprang forward and clasped him in her arms.

To acquire a correct pronunciation of this and other Tañoan (or Tehuan) dialects is not a very difficult task for Americans, after they have succeeded in articulating the ʞ, ʇ and ɹ, as sounds pronounced with the teeth closed; the ɹ is uvular besides. ä, ö, ü are softened vowels or Umlaute; â, î, û indicate a hollow, deep sound of a, i, u, and ĕ is the e of *butler*, *sinker;* ‘l is an l pronounced by pressing the fore part of the tongue against the palate; ˉ and ˘ mark length and brevity of vowels.

To give a full glossary and grammatic explanation of the texts is not within the scope of this article. But some of the more necessary elucidations are as follows:

Substantives descriptive of persons, of animals and of inanimate objects seen to move spontaneously, are made distinct in the singular number by the suffix -ide, in the plural by -nin, "many"; while inanimates are in the plural marked by -n, and in the singular show no suffix. In verbs, the ending -ban or -wan points to past tense, -hinap, -hinab, -innap, to a subjunctive or conditional mode, and a final -k to a participle.

The Sun Worship of Isleta Pueblo.

There is so much similarity among the New Mexico Indians in appearance, customs, manners and ceremonial, that we need not be surprised at the equality of sun worship among all their pueblos, which is shared even by the Quéra Indians, who speak languages differing entirely from those of the Tañoan family. So a sketch of the Isleta sun worship will do for all of them.

The town of Isleta now holds about 1040 inhabitants and is divided in two parts by a wide street, called the plaça. The northern portion is inhabited by the Isleta medicine-men or "fathers" (ka-a′-ide, plural kai′nin), the southern by the Laguna medicine-men, who are called so for having acquired their art in Laguna, a Quéra pueblo. The differences in the ceremonial of both sections, each of which has a separate medicine house, are slight, and during the ceremonies the two "schools" of medicine-men supplement each other. They are subject to the watchful care of the captains of war, of whom there are four or five in each of the two sections.

There are four annual periods of ceremonial sun worship in their pueblos, and every one of them is followed by a dance. The first of these festival periods occurs in September, the second in December, the third in February, because wheat is planted in the month after; the fourth, less important, a short time after the third. They last four days, not including the dance, and are evidently instituted for the purpose of influencing the sun deity in favor of granting a bountiful crop to the Indians.

Both medicine houses are long-shaped, running from west to east, where the entrance is. The fire burns not in the middle, but at the eastern end, the chimney being to the left of the entrance. In the roof a square opening is left for the sunlight to penetrate. Women are admitted to the house, but everything that is non-Indian is excluded; none of the white man's dress or shoes are admitted; the participants have to enter without moccasins and to wear the hair long.

The ceremony takes place at night, and begins with the following act of worship to the sun (tu′ɹide); each medicine-man carries a short buckskin bag filled with half-ground cornmeal; he is strewing the contents on the floor before the public, while an allocution is held to the sun, moon and stars. The Indians grasp the meal from the ground, and breathe upon it to blow off any disease from their bodies, for it is thought the meal will absorb or "burn" any disease invisibly present. Then the medicine-men throw the rest of the cornmeal in a line or "road," while "sowing" it on the ground to the sun. When all the meal is spent, they blow again upon their hands and *breathe up health* from them. This is done during four consecutive nights, during which the medicine-men abstain entirely from eating, drinking and sleeping, but are allowed to smoke. The calumet or reed-pipe, which is presented during the above act, is lighted and the smoke puffed first to the east, then to the north, west, south, then to the sky and to the centre of the earth. No moon worship exists among these Indians.

On the fifth day commence the dances, which are held under a large concourse of people and last from eight P. M. to four o'clock in the morning. The medicine-house holds about three hundred people, and nobody is allowed to leave before the above-mentioned hour, when the conjurers allow the people to breathe fresh air.

[In each word of the Isleta text, the emphasized syllable is marked by an *acute* accent standing after the vowel.]

Stated Meeting, December 18, 1891.

Present, 15 members.

President, Mr. FRALEY, in the Chair.

Correspondence was submitted as follows:

Letters of envoy were received from the Académie des Sciences, Cracow; K. Akademie der Wissenschaften, Wien; Schlesische Gesellschaft für Vaterländische Cultur, Breslau; K. Sächsische Gesellschaft der Wissenschaften, Leipzig; Geological and Natural History Survey of Canada, Ottawa.

Letters of acknowledgment were received from the Tashkent Observatory (135); Societas pro Fauna et Flora Fennica, Helsingfors, Finland (135); K. Zoologisch-Botanisch Genootschap, The Hague (135); R. Netherland Museum of Antiquities, Leiden (135); K. P. Meteorologische Institut, Berlin (135); Naturhistorische Verein, Bonn (134); Turin Observatory, Académie Royale des Sciences, Turin (135); Prof. William Boyd Dawkins, Manchester, Eng.

Accessions to the Library were reported from the Mining Department, Melbourne, N. Z.; Geological Survey of India; K. Akademie der Wissenschaften, Wien; Académie des Sciences, Cracow; Botanische Verein der Provinz Brandenburg, Berlin; Naturforschende Gesellschaft, Freiburg, i.B.; Verein für Kunst und Alterthum, Ulm; Accademia R. delle Scienze, Turin; Bowdoin College, Brunswick, Me.; Agricultural Experiment Stations at Amherst, Mass., Providence, R. I., New Haven, Conn., State College, Pa., College Park, Md., Fayetteville, Ark., Lafayette, Ind., Starkville, Miss., Topeka, Kas., Lincoln, Neb., Laramie, Wyo., Tucson, Ariz.; Free Public Library, Jersey City; New Jersey Natural History Society, Trenton; Mr. Henry Phillips, Philadelphia; Director of the Mint, Commissioner of Labor, Washington, D. C.

The death of Dom Pedro d'Alcantara, December 4, 1891 (born December 2, 1825), was announced.

The Secretaries presented for the Proceedings a paper by Dr. A. S. Gatschet, entitled, "A Mythic Tale of Isleta," New Mexico.

New nomination, No. 1232, was read for the first time.

The Library Committee presented the following minute:

STATED MEETING, DECEMBER 12, 1891.

On motion of Dr. Greene, the Committee was authorized to report to the Society that in its opinion it was desirable that an appropriation of five hundred dollars should now be made for the purchase of books of reference.

After examining into the condition of the Library, the Committee was of the opinion that the work necessary to place the Library again in order, after its removal and storage, had been satisfactorily performed and was progressing properly. That the work necessary in that connection to be properly performed requires both time and care. That some delay had been occasioned by the necessity of giving greater accommodation for certain classes of the books than had been originally assigned to them.

So much of the communication as related to an appropriation of money was referred to the Committee on Finance.

Curator Morris made a statement referring to the condition of the cabinets of the Society and exhibited a number of objects, including a pantograph belonging to Thomas Jefferson. In conclusion he requested an appropriation of $300 for the ensuing year to enable the Curators to rehabilitate the collection.

On motion, the request was referred to the Committee on Finance.

The President reported that owing to the indisposition of the Treasurer, the Finance Committee had not been able to audit the accounts and to report appropriations for the coming year, but that they would be presented at the ensuing meeting.

Curator Morris moved that the Society request the return of the Poinsett collection from the Academy of Natural Sciences, where it is now on deposit, subject to call, and of the numismatic collection from the Numismatic and Antiquarian Society of Philadelphia.

The matter was discussed, and Dr. Cope raised the point of order that the Society had fixed 8.30 this evening for the consideration of the Report of the Committee on the Publications of the Society and that the time had passed.

He therefore requested the report should be taken up and considered.

Curator Morris then withdrew his motion.

The report referred to was then presented by Dr. Cope.

The President stated that he had received a letter from the Treasurer on the subject of the finances of the Society, and asked the pleasure of the Society if it should be read.

Dr. Frazer moved that the letter of the Treasurer be read after the debate had taken place.

Dr. Morris rose to a point of order that no report had been presented to the Society or received by it; that before resolutions be considered there should be a report before the Society.

The President stated his impression as to how the matter stood.

Dr. Morris calls for the reading of the report and asks for the information the Committee was instructed to report.

Dr. Cope states that he read to the Society the original report some months ago, since which time amendments have been made to it.

Mr. Dudley stated that in the absence of the Treasurer matters relating to the finances of the Society should not be pressed to a conclusion, and moved that the whole matter be laid over until the next meeting and be made a special order.

Dr. Frazer objects that the motion is not in order.

The President decided, no point of order could be taken pending the motion to postpone.

The vote being taken was decided in the negative, and the yeas and nays being called for, the vote stood for the motion, 4; against, 8. So the motion was lost.

Dr. Morris then called for the reading of the report of the Committee.

Dr. Cope states that the report he makes is the report of the Committee.

Dr. Morris asks if the report is in writing.

The President states all reports must be in writing.

Dr. Morris moves that the report be referred back to the Committee to report to the Society at the second meeting in January, 1892.

The President states that there is no continuous report, no full text, and that the matter as presented by the Chairman was disjointed and likely to lead to misapprehension. That a portion of the resolutions was out of order as affecting the laws of the Society.

Dr. Barker made some remarks.

The question being put on Dr. Morris' motion, the resolution was adopted.

And the Society was adjourned by the President.

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Stated Meetings Held.

LIST OF SURVIVING MEMBERS

OF THE

AMERICAN PHILOSOPHICAL SOCIETY,

HELD AT PHILADELPHIA

FOR

PROMOTING USEFUL KNOWLEDGE.

Corrected to January 2, 1891,

BY

HENRY PHILLIPS, JR.,

A Secretary of the Society.

List of surviving Members of the American Philosophical Society held at Philadelphia for Promoting Useful Knowledge.

The addresses here given so far as known are at the present time. Corrections of this list are respectfully solicited.

A name printed in *italics* indicates that the Society is uncertain as to whether such member is still living and desires information on the subject.

The Society will be happy to receive *photographs* of such of its members as have not already sent.

A

Name.	*Date of Election.*	*Present Address.*
1687. ABBÈ, CLEVELAND	July 21, 1871,	Army Weather Bureau, Washington, D. C.
2170. ABBOTT, CHARLES C.	Dec. 20, 1889,	Trenton, N. J.
1463. ABBOTT, HENRY L.	April 18, 1862,	New York City, N. Y.
1809. ÅCKERMAN, RICHARD	July 21, 1876,	Stockholm, Sweden.
1713. ACLAND, HENRY W.	Jan'y 17, 1873,	Oxford, England.
2128. ADAM, LUCIEN	Dec. 17, 1886,	Rennes, France.
2081. ADAMS, H. B.	May 21, 1886,	Baltimore, Md.
1238. ADAMS, JOHN COUCH	Jan'y 21, 1848,	Cambridge, England.
1381. *Adamson, Rev. John C.*	July 13, 1856.	
1779. AGASSIZ, ALEXANDER	April 16, 1875,	Cambridge, Mass.
1642. AGASSIZ, ELIZABETH.	Oct. 15, 1869,	" "
1701. AGNEW, D. HAYES	April 19, 1872,	Philadelphia.
1886. AIRY, GEORGE BIDDLE, SIR	July 18, 1879,	Greenwich, England.
2091. ALBRECHT, PAUL	May 21, 1886,	Hamburg, Germany.
1812. ALCANTARA, DOM PEDRO D'	Oct. 20, 1876,	Paris, France.
1860. ALISON, ROBERT H.	May 3, 1878,	Ardmore, Pa.
1869. ALLEN, JOEL ASAPH	Sept. 20, 1878,	New York, N. Y.
1571. ALLEN, HARRISON	Jan'y 18, 1867,	Philadelphia.
1776. ALLISON, JOSEPH	April 16, 1875,	"
1927. AMES, CHARLES G.	Jan'y 21, 1881,	Boston, Mass.
2064. ANDERSON, GEORGE B.	Feb'y 19, 1886,	West Point, N. Y.
1655. ANDERSON, GEORGE W.	Oct. 15, 1869,	Rosemont, Pa.
1576. ANDERSON, M. B.	Jan'y 18, 1867,	Rochester, N. Y.
2164. ANGELL, JAMES B.	Oct. 18, 1889,	Ann Arbor, Mich.
1122. *Angelis, Pedro de.*	Jan'y 17, 1840,	*Buenos Ayres.*
2102. ARGYLL, DUKE OF.	May 21, 1886,	London, England.
1761. ARMSTRONG, WM. GEORGE	July 17, 1874,	Newcastle-on-Tyne, England.
1996. ASHHURST, JOHN.	Jan'y 18, 1884,	Philadelphia.
2012. ASHHURST, RICHARD L.	April 18, 1884,	"

B

	Name.	Date of Election.	Present Address
1995.	BACHE, RICHARD MEADE	Jan'y 18, 1884,	Philadelphia.
1832.	BACHE, THOMAS HEWSON	Feb'y 2, 1877,	"
1630.	BAIRD, HENRY CAREY	Jan'y 15, 1869,	"
1991.	BAIRD, HENRY M.	Jan'y 18, 1884,	New York, N. Y.
2015.	BAKER, JOHN R.	April 18, 1884,	Philadelphia.
2075.	BAKER, WILLIAM S.	May 21, 1886,	"
1157.	BANCROFT, GEORGE	July 16, 1841,	Washington, D. C.
1936.	BARBER, EDWIN ATLEE	April 15, 1881,	West Chester, Pa.
1818.	BARCENA, MARIANO	Feb'y 2, 1877,	Mexico.
1741.	BARKER, GEORGE F.	April 18, 1873,	Philadelphia.
2011.	BARKER, WHARTON	April 18, 1884,	"
2144.	BARNARD, WILLIAM T.	May 20, 1887,	Baltimore, Md.
1902.	BARTHOLOW, ROBERTS	April 16, 1880,	Philadelphia.
1133.	BARTLETT, W. H. C.	April 17, 1840,	Yonkers, N. Y.
2119.	BASTIAN, ADOLPH	Dec. 17, 1886,	Berlin, Germany.
1934.	BEAULIEU, PAUL LEROY	April 15, 1881,	Paris, France.
1968.	BELL, ALEXANDER GRAHAM	July 21, 1882,	Washington.
1966.	BELL, JOSEPH SNOWDEN	July 21, 1882,	Philadelphia.
1802.	BELL, LOWTHIAN	April 21, 1876,	Newcastle-on-Tyne, England
2149.	BIDDLE, ALEXANDER	Feb'y 17, 1888,	Philadelphia.
2154.	BIDDLE, ARTHUR	Dec. 21, 1888,	"
2173.	BIDDLE, A. SYDNEY	Dec. 20, 1889,	"
1920.	BIDDLE, CADWALADER	Oct. 15, 1880,	"
1831.	BIDDLE, CRAIG	Feb'y 2, 1877,	"
2134.	BILLINGS, JOHN S.	Feb'y 18, 1887,	Washington, D. C.
2157.	BLAIR, ANDREW A.	May 17, 1889,	Philadelphia.
1554.	*Blair, Thomas S.*	Jan'y 19, 1866,	*Pittsburgh, Pa.*
1669.	BLAKE, WILLIAM PHIPPS	Oct. 21, 1870,	New Haven, Conn.
1790.	BLASIUS, WILLIAM	Oct. 15, 1875,	Philadelphia.
1700.	BLODGET, LORIN	April 19, 1872,	"
1444.	BÖHTLINGK, OTTO	Jan'y 17, 1862,	Leipzig, Germany.
2047.	BONWILL, W J. A.	Oct. 16, 1885,	Philadelphia.
1852.	*Borgnis, J. A.*	Oct. 20, 1820,	*Paris, France.* (?)
1126.	BOYÉ, MARTIN H.	Jan'y 17, 1840,	Coopersburg, Pa.
1826.	BRACKETT, CYRUS FOGG	Feb'y 2, 1877,	Princeton, N. J.
2083.	BRANNER, JOHN C.	May 21, 1886,	Little Rock, Ark.
2195.	BREZINA, ARISTIDES	May 21, 1886,	Vienna, Austria.
1636.	BRINTON, DANIEL G.	April 16, 1869,	Philadelphia.
2069.	BRINTON, JOHN H.	Feb'y 19, 1886,	"
1745.	BRITTON, J. BLODGETT	Oct. 17, 1873,	"
2080.	BROOKS, WILLIAM KEITH	May 21, 1886,	Baltimore, Md.
1881.	BROWN, ARTHUR ERWIN	April 18, 1879,	Philadelphia.
1333.	BROWN-SEQUARD, E.	Jan'y 20, 1854,	Paris, France.
1614.	BRUGSH, HENRI	Jan'y 15, 1869.	Berlin, Prussia.
1547.	BRUSH, GEORGE J.	Jan'y 20, 1865,	New Haven, Conn.
1653.	BULLOCK, CHARLES	Oct. 15, 1869,	Philadelphia.
1452.	BUNSEN, ROBERT W.	Jan'y 17, 1862,	Heidelberg, Germany.
2008.	BURK, ISAAC	Jan'y 18, 1884,	Philadelphia.
2007.	BURK, JESSE Y.	Jan'y 18, 1884,	"
1378.	BURMEISTER, HERMANN	April 18, 1856,	Buenos Ayres, S. A.
1938.	BUTLER, WILLIAM	April 15, 1881,	West Chester, Pa.

C

1788.	CAMPBELL, JOHN LYLE	July 16, 1875,	Crawfordsville, Ind.
1606.	CANBY, WILLIAM MARRIATT	Oct. 16, 1868,	Wilmington, Del.

Name.	Date of Election.	Present Address
2051. CANNIZZARO, TOMMASO	Oct. 16, 1885,	Messina, Italy.
1731. CAPELLINI, GIOVANNI	April 18, 1873,	Bologna, Italy.
1796. CARLL, J. B. F.	Oct. 15, 1875,	Pleasantville, Pa.
2130. CARRILLO, CRESCENCIO	Dec. 17, 1886,	Merida, Yucatan.
1911. CARSON, HAMPTON L.	April 16, 1880,	Philadelphia.
1707. CASSATT, ALEXANDER JOHNSON	Oct. 18, 1872,	"
2147. CASTNER, SAMUEL, JR.	Dec. 16, 1887,	"
2152. CATTELL, J. McKEEN	May 18, 1888,	Media, Pa.
1675. CATTELL, WILLIAM C.	Jan'y 20, 1871,	Philadelphia.
1908. CHANCE, HENRY MARTYN	April 16, 1880,	New York, N. Y.
1783. CHANDLER, C. F.	April 16, 1875,	" "
1778. CHAPMAN, HENRY C.	April 16, 1875,	Philadelphia.
2132. CHARENCY, HYACINTH DE	Dec. 17, 1886,	St. Maurice les Charency France.
1522. CHASE, THOMAS	Jan'y 15, 1864,	Providence, R. I.
2111. CHILDS, GEORGE W.	Dec. 17, 1886,	Philadelphia.
2158. CLARK, CLARENCE H.	May 17, 1889,	"
1717. CLARKE, THOMAS C.	Jan'y 17, 1873,	New York, N. Y.
1983. CLAYPOLE, E. W.	Jan'y 19, 1883,	Akron, Ohio.
2048. CLEEMANN, T. M.	Oct. 16, 1885,	Philadelphia.
1999. COHEN, J. SOLIS	Jan'y 18, 1884,	"
2005. COLERIDGE, LORD	Jan'y 18, 1884,	London, England.
1555. COPE, EDWARD D.	Jan'y 19, 1866,	Philadelphia.
1367. COPPÈE, HENRY	Jan'y 18, 1856,	Bethlehem, Pa.
2129. CORA, GUIDO	Dec. 17, 1886,	Turin, Italy.
1474. CORNELIUS, ROBERT	Oct. 17, 1862,	Philadelphia.
1867. COUES, ELLIOTT	Sept. 20, 1878,	Washington, D. C.
1662. COX, J. D.	Vpril 15, 1870,	Toledo, O.
1672. COXE, ECKLEY B.	Oct. 21, 1870,	Drifton, Pa.
1836. CRANE, THOMAS F.	Feb'y 2, 1877,	Ithaca, N. Y.
1393. CRESSON, CHARLES M.	April 17, 1857,	Philadelphia.
2100. CROOKES, WILLIAM	May 21, 1886,	London, England.
2172. CRUZ, FERNANDO (of Guatemala)	Dec. 20, 1889,	Washington, D. C.
1439. CURWEN, JOHN	April 18, 1861,	Warren, Pa.

D

1567. DA COSTA, J. M.	Oct. 19, 1866,	Philadelphia.
1354. DANA, JAMES D	July 21, 1854,	New Haven, Conn.
1806. DANNEFELD, C. JUHLIN	April 21, 1876,	Stockholm, Sweden.
1516. DAUBRÉE, A.	July 17, 1863,	Paris, France.
1811. DAVENPORT, SAMUEL	Oct. 20, 1876,	Adelaide, S. Australia.
1557. DAVIDSON, GEORGE	Jan'y 19, 1866,	San Francisco, Cal.
1980. DAVIS, WILLIAM M.	Jan'y 19, 1883,	Philadelphia.
1923. DAWKINS, WILLIAM B	Oct. 15, 1880,	Manchester, England.
1468. DAWSON, JOHN W	April 18, 1862,	Montreal, Canada.
2131. DELGADA, JUAN DE DIAS DE LA RADA Y.	Dec. 17, 1886,	Madrid, Spain.
991. *Del Rio, Andres*	Oct. 15, 1830,	*Mexico.*
854. *De Montgèry*	Oct. 20, 1820.	
1964. DE ROSNY, LÉON	July 21, 1882,	Paris, France.
1876. DES CLOIZEAUX, A.	Oct. 18, 1879,	" "
2045. DE VERE, M. SCHELE	Oct. 16, 1885,	University of Virginia.
2013. DICKSON, SAMUEL	April 18, 1884,	Philadelphia.
1341. DOHRN, C. A.	Jan'y 20, 1854,	Stettin, Prussia.
2108. DOLLEY, CHARLES S.	Dec. 17, 1886,	Philadelphia.

Name.	*Date of Election.*	*Present Address.*
2089. DONNER, OTTO.	May 21, 1886,	Helsingfors, Finland.
1946. DOOLITTLE, C. L.	Oct. 21, 1881,	Bethlehem, Pa.
1839. DOUGLASS, JAMES, JR.	April 20, 1877,	Spuytenduyvil, N. Y.
1924. DRAPER, DANIEL	Oct. 15, 1880,	New York, N. Y.
1787. DROWN, THOMAS M	July 16, 1875,	Boston, Mass.
1918. DU BOIS, PATTERSON	Oct. 15, 1880,	Philadelphia.
1878. DUDLEY, CHARLES BENJAMIN . .	Jan'y 17, 1879,	Altoona, Pa.
1921. DUDLEY, THOMAS H	Oct. 15, 1880,	Camden, N. J.
1615. DÜMICHEN, JOHANNES.	Jan'y 15, 1869,	Strasburg, Germany.
2063. DUNCAN, LOUIS	Feb'y 19, 1886,	U. S. Navy.
1573. DUNNING, GEORGE F.	Jan'y 18, 1867,	Farmington, Conn.
1727. DUPONT, EDOUARD	April 18, 1873,	Brussels, Belgium.
2086. DURUY, VICTOR	May 21, 1886,	Paris, France.
1679. DUTTON, CLARENCE E	Jan'y 20, 1871,	Washington, D. C.

E

1560. EARLE, PLINY.	April 20, 1866,	Northampton, Mass.
2105. EASTON, MORTON W.	Dec. 17, 1886,	Philadelphia.
1917. ECKFELDT, JACOB B	Oct. 15, 1880,	"
1825. EDDY, HENRY T.	Feb'y 2, 1877,	Cincinnati, O.
1686. ELIOT, CHARLES W.	April 21, 1871,	Cambridge, Mass.
1981. EMMONS, S. F.	Jan'y 19, 1883,	Washington, D. C.
1405. *Evans, Edmund C.*	Jan'y 21, 1859.	
1943. EVANS, JOHN	Oct. 21, 1881,	Hemel Hempstead, Eng.

F

1273. *Farnum, Joseph W.*	Jan'y 17, 1851,	*Camden, N. J.*
2180. FIELD, ROBERT PATTERSON . . .	May 16, 1890,	Philadelphia.
1901. FLINT, AUSTIN, JR	April 16, 1880,	New York, N. Y.
1621. FLOWER, WM. HENRY.	Jan'y 15, 1869,	London, England.
1875. FOGGO, EDWARD A.	Oct. 18, 1879,	Philadelphia.
1170. FRALEY, FREDERICK	July 15, 1842,	"
1912. FRALEY, JOSEPH C.	April 16, 1880,	"
1551. FRANCIS, JAMES B	April 21, 1865,	Lowell, Mass.
1695. FRAZER, PERSIFOR	Jan'y 19, 1872,	Philadelphia.
2171. FRIEBIS, GEORGE	Dec. 20, 1889,	"
1459. FROUDE, J. A.	Jan'y 17, 1862,	London, England.
2179. FULLERTON, GEORGE S.	May 16, 1890,	Philadelphia.
1739. FULTON, JOHN.	April 18, 1873,	Johnstown, Pa.
1914. FURNESS, HORACE HOWARD . . .	April 16, 1880,	Philadelphia.
1130. FURNESS, WILLIAM H.	April 17, 1840,	"

G

1063. *Galvez, Mariano*	Oct. 21, 1836,	*Guatemala, C. A.*
1988. GARRETT, PHILIP C	April 20, 1883,	Philadelphia.
2014. GARRISON, JOSEPH F.	April 18, 1884,	Camden, N. J.
2079. GATES, M. E	May 21, 1886,	Amherst, Mass.
1025. GATSCHET, ALBERT S.	Oct. 17, 1884,	Washington, D. C.
1897. GEIKIE, ARCHIBALD	Jan'y 16, 1880,	London, England.
1803. GEIKIE, JAMES.	April 21, 1876,	Edinburgh, Scotland.
1339. GENTH, FRED. AUGUSTUS.	Jan'y 20, 1854,	Philadelphia.
2067. GENTH, F. A., JR.	Feb'y 19, 1886,	"
1355. GIBBS, OLIVER WOLCOTT.	July 21, 1854,	Cambridge, Mass.
1587. GILL, THEODORE NICHOLAS . . .	July 19, 1867,	Washington, D. C.
1800. GILMAN, DANIEL C.	April 21, 1876,	Baltimore, Md.
1940. *Giraldes, J. P. C. Cassado de.* . .	July 20, 1827.	

Name.	Date of Election.	Present Address.
1950. GLADSTONE, WM. EWART	Oct. 21, 1881,	London, England.
2162. GOODE, G. BROWN	Oct. 18, 1889,	Washington, D. C.
1835. GOODELL, WILLIAM	Feb'y 2, 1877,	Philadelphia.
1680. GOODFELLOW, EDWARD	Jan'y 20, 1871,	Washington, D. C.
1271. GOULD, BEN. APTHORPE	Jan'y 17, 1851,	Cambridge, Mass.
1851. GRAY, ELISHA	Jan'y 18, 1878,	Chicago, Ill.
1605. GREEN, TRAILL	Oct. 16, 1868,	Easton, Pa.
1504. GREEN, WILLIAM HENRY	April 17, 1863,	Princeton, N. J.
1880. GREENE, WILLIAM H.	April 18, 1879,	Philadelphia.
2155. GREGORIO, IL MARCHESE ANTONIO DE	Dec. 21, 1888,	Palermo, Italy.
2159. GREGORY, HENRY D.	May 17, 1889,	Philadelphia.
1229. *Grimaldi, Ceva*	Oct. 16, 1846,	*Naples, Italy.*
1939. GRISCOM, WM. WOODNUTT	April 15, 1881,	Haverford, Pa.
1815. GROTE, AUGUSTUS RADCLIFFE	Oct. 20, 1876.	
2090. GUBERNATIS, ANGELO DE	May 21, 1886,	Florence, Italy.
1488. GUYANGOS, PASCUAL DE.	April 19, 1861,	*Madrid, Spain.*

H

Name.	Date of Election.	Present Address.
2034. HAECKEL, ERNEST.	Oct. 16, 1885,	Jena, Prussia.
2066. HAGAN, H. A.	Feb'y 19, 1886,	Cambridge, Mass.
1658. HALE, EDW. EVERETT	Jan'y 21, 1870,	Roxbury, Mass.
1709. HALE, HORATIO	Oct. 18, 1872,	Clinton, Canada.
1853. HALL, ASAPH	Jan'y 18, 1878,	Washington, D. C.
1795. HALL, CHARLES EDWARD	Oct. 15, 1875,	Westport, N. Y.
1356. HALL, JAMES	July 21, 1854,	Albany, N. Y.
2027. HALL, LYMAN B	Jan'y 16, 1885,	Haverford, Pa.
1412. HAMMOND, WILLIAM A	Oct. 21, 1859,	New York, N. Y.
1337. HARDING, GEORGE	Jan'y 20, 1854,	Philadelphia.
2136. HARRIS, JOSEPH S.	May 20, 1887,	"
1827. HART, JAMES MORGAN.	Feb'y 2, 1877,	Cincinnati, O.
1510. HARTSHORNE, HENRY.	July 17, 1863,	Philadelphia.
1764. HAUER, FRANZ RITTER VON.	Oct. 16, 1874,	Vienna, Austria.
1681. HAUPT, HERMANN.	April 21, 1871,	Washington, D. C.
1862. HAUPT, LEWIS M.	May 3, 1878,	Philadelphia.
2082. HAYES, R. SOMERS.	May 21, 1886,	New York, N. Y.
2071. HAYS, J. MINIS	Feb'y 19, 1886,	Philadelphia.
2165. HAZLEHURST, HENRY	Oct. 18, 1889,	"
1985. HEILPRIN, ANGELO	April 20, 1883,	"
1734. HELMHOLTZ, HEINRICH	April 18, 1873,	Berlin, Prussia.
1497. HILGARD, J. E.	April 17, 1863,	Washington, D. C.
1963. HILL, HAMILTON ANDREWS	April 21, 1882,	Boston, Mass.
1501. HILL, THOMAS.	April 17, 1863,	Portland, Me.
2110. HILPRECHT, HERMANN V.	Dec. 17, 1886,	Philadelphia.
1768. HIMES, CHARLES FRANCIS	Oct. 16, 1874,	Carlisle, Pa.
1663. HITCHCOCK, CHARLES HENRY	April 15, 1870,	Hanover, N. H.
2040. HOCKLEY, THOMAS	Jan'y 16, 1885,	Philadelphia.
2160. HOFFMAN, WALTER J.	Oct. 18, 1889,	Washington. D. C.
1453. HOFMANN, AUGUST WILLIAM.	Jan'y 17, 1862,	Berlin, Prussia.
2068. HOLLAND, JAMES W.	Feb'y 19, 1886,	Philadelphia.
1898. HOLMES, OLIVER WENDELL	Jan'y 16, 1880,	Boston, Mass.
1624. HOOKER, JOSEPH D.	Jan'y 15, 1869,	London, England.
1652. HOPPER, EDWARD	Oct. 15, 1869,	Philadelphia.
1607. HORN, GEORGE HENRY	Oct. 16, 1868,	"
2070. HORNER, INMAN.	Feb'y 19, 1886,	"
1257. HORSFORD, EBEN NORTON	Jan'y 19, 1849,	Cambridge, Mass.

Name.	Date of Election.	Present Address.
1941. HOTCHKISS, JEDEDIAH.	Oct. 21, 1881,	Staunton, Va.
1696. HOUGH, GEORGE W.	Jan'y 19, 1872,	Chicago, Ill.
1698. HOUSTON, EDWIN J.	Jan'y 19, 1872,	Philadelphia.
2143. HOUSTON, HENRY H	May 20, 1887,	"
2034. HOVELACQUE, ABEL	May 21, 1886,	Paris, France.
1843. HUMPHREY, H. C.	July 20, 1877.	
2116. HUNFALVY, PAUL	Dec. 17, 1886,	Buda-Pesth, Hungary.
1441. HUNT, THOMAS STERRY	April 19, 1861,	New York, N. Y.
1623. HUXLEY, THOMAS HENRY	Jan'y 15, 1869,	London, England.
1426. HYRTLE, JOSEPH.	July 20, 1860,	Vienna, Austria.

I

2052. IM THURN, EVERARD F.	Oct. 16, 1885,	Georgetown, British Guiana
1773. INGHAM, WM. ARMSTRONG. . . .	April 16, 1875,	Philadelphia.

J

2010. JAMES, EDMUND J	April 18, 1884,	Philadelphia.
1933. JANNET, CLAUDIO	April 15, 1881,	Paris, France.
2049. JAYNE, HORACE	Oct. 16, 1885,	Philadelphia.
1954. JEFFERIS, WILLIAM W	Jan'y 20, 1882,	"
1942. JONES, CHARLES C., JR.	Oct. 21, 1881,	Augusta, Ga.
2017. JORDAN, FRANCIS, JR.	April 18, 1884,	Philadelphia.

K

1989. KANE, ELISHA KENT.	April 20, 1883,	Kane, Pa.
2169. KEANE, JOHN J.	Dec. 20, 1889,	Washington, D. C.
1348. KEATING, WILLIAM V	April 21, 1854,	Philadelphia.
2021. KEEN, WILLIAM W.	July 18, 1884,	"
1962. KEIM, GEO. DE BENNEVILLE. . . .	April 21, 1882,	"
2118. KEIPERT, HENRI.	Dec. 17, 1886,	Berlin, Prussia.
1161. KENDALL, E. OTIS	Jan'y 21, 1842,	Philadelphia.
1708. KING, CLARENCE	Oct. 18, 1872,	New York, N. Y.
1537. KIRK, JOHN FOSTER	July 15, 1864,	Philadelphia.
1284. KIRKWOOD, DANIEL	April 18, 1851,	Riverside, Cal.
1767. KÖNIG, GEORGE A	Oct. 16, 1874,	Philadelphia.
1971. KOPP, HERMANN.	Oct. 20, 1882,	Heidelberg, Germany.
2167. KRAUSS, FRIEDERICH S	Dec. 20, 1889,	Vienna, Austria.

L

1026. *Labouderie, J.*	April 19, 1833,	*Paris, France.*
1694. LAMBERT, GUILLAUME.	Jan'y 19, 1872,	Louvain, Belgium.
1858. LANDRETH, BURNET.	Jan'y 18, 1878,	Bristol, Pa.
1781. LANGLEY, SAMUEL P.	April 16, 1775,	Washington, D. C.
1721. LA ROCHE, C. PERCY	Jan'y 17, 1873,	Rome, Italy.
1334. LATROBE, JOHN H. B.	Jan'y 20, 1854,	Baltimore, Md.
1711. LAUTH, FRANZ JOSEPH	Oct. 18, 1872,	Munich, Bavaria.
1974. LAWES, JOHN BENNETT, SIR . . .	Jan'y 19, 1883,	Rothamstead, Herts, Eng.
1595. LEA, HENRY CHARLES.	Oct. 18, 1867,	Philadelphia.
1738. LE CONTE, JOHN.	April 18, 1873,	Berkeley, Cal.
1737. LE CONTE, JOSEPH.	April 18, 1873,	"
1477. LEE, THOMAS JEFFERSON	Oct. 17, 1862,	Washington, D. C.
2125. LEEMANS, CONRAD.	Dec. 17, 1886,	Leyden, Holland.
1986. LEHMAN, AMBROSE E.	April 20, 1883,	Philadelphia.
1263. LEIDY, JOSEPH.	Oct. 19, 1849,	"
2182. LELAND, CHARLES G.	May 16, 1890,	London, Eng.
2174. LE MOINE, J. M.	Dec. 20, 1889,	Quebec, Canada.
1382. LESLEY, J. PETER	July 13, 1856,	Philadelphia.
1376. LETCHWORTH, ALBERT S.	Jan'y 18, 1856,	"

Name.	Date of Election.	Present Address.
2085. LEVASSEUR, EMIL	May 21, 1886,	Paris, France.
1415. LEWIS, FRANCIS W.	Jan'y 20, 1860,	Philadelphia.
1953. LEWIS, SAMUEL SAVAGE	Jan'y 20, 1882,	Cambridge, England.
1383. *Leyburn, John.*	July 13, 1856,	*Baltimore, Md.*
1756. LOCKYER, JOSEPH NORMAN	April 17, 1874,	London, England.
1728. LONGCHAMPS, SELYS DE	April 18, 1873,	Liége, Belgium.
1255. LONGSTRETH, MIERS FISHER	April 21, 1848,	Sharon Hill.
1872. LONGSTRETH, MORRIS	Sept. 20, 1878,	Philadelphia.
1015. *Lorin, Theodore*	April 20, 1832,	*Paris, France.*
1926. LOVERING, JOSEPH	Jan'y 21, 1881,	Cambridge, Mass.
1977. LOWELL, JAMES RUSSELL	Jan'y 19, 1883,	" "
2019. LUBBOCK, JOHN	July 18, 1884,	London, England.
2003. LUDLOW, WILLIAM	Jan'y 18, 1884,	U. S. A.
1629. LYMAN, BENJAMIN SMITH	Jan'y 15, 1869,	Philadelphia.

M

Name.	Date of Election.	Present Address.
1058. *Macedo, J. L. DaCosta*	April 15, 1836,	*Lisbon, Portugal.*
1994. MAISCH, JOHN M.	Jan'y 18, 1884,	Philadelphia.
1970. MALLERY, GARRICK, JR	Oct. 20, 1882,	Washington, D. C.
2042. MALLET, JOHN WM.	Jan'y 16, 1885,	University of Virginia, Va.
1847. MANSFIELD, IRA FRANKLIN	Jan'y 18, 1878,	Cannelton, Pa.
1857. MARCH, FRANCIS ANDREW	Jan'y 18, 1878,	Easton, Pa.
1861. MARKS, WILLIAM D	May 3, 1878,	Philadelphia.
1604. MARSH, OTHNIEL C	Oct. 16, 1868,	New Haven, Conn.
2078. MARSHALL, JOHN	May 21, 1886,	Philadelphia.
1922. MARTINDALE, ISAAC C	Oct. 15, 1880,	Camden, N. J.
1018. *Martinez, Juan Josè*	April 20, 1832,	*Spain.*
1885. MARTINS, CHARLES	July 18, 1879,	Montpellier, France.
2184. MASCART, E.	Dec. 19, 1890,	Paris, France.
1572. MASON, ANDREW	Jan'y 18, 1867,	New York, N. Y.
1929. MAY, ADDISON.*	Jan'y 21, 1881,	West Chester, Pa.
1654. MAYER, ALFRED M	Oct. 15, 1869,	Hoboken, N. J.
2107. MCALISTER, JAMES	Dec. 17, 1886,	Philadelphia.
1928. MCCAULEY, EDWARD Y	Jan'y 21, 1881,	"
1685. MCCOSH, JAMES	April 21, 1871,	
1888. MCCREATH, ANDREW S.	July 18, 1879,	Harrisburg, Pa.
1821. MCKEAN, WILLIAM V.	Feb'y 2, 1877,	Philadelphia.
2004. MCMASTER, JOHN BACH	Jan'y 18, 1884,	"
1677. MEEHAN, THOMAS	Jan'y 20, 1871,	"
1335. MEIGS, MONTGOMERY C	Jan'y 20, 1854,	Washington, D. C.
1903. MERRICK, JOHN VAUGHAN	April 16, 1880,	Philadelphia.
1947. MERRIMAN, MANSFIELD	Oct. 21, 1881,	Bethlehem, Pa.
1744. MESSCHERT, MATHEW HUIZINGA.	Oct. 17, 1873,	Douglassville, Pa.
2142. MICHAEL, HELEN ABBOTT.	May 20, 1887,	Philadelphia.
2175. MITCHELL, JAMES T.	Feb. 21, 1890,	"
1461. MITCHELL, S. WEIR	Jan'y 17, 1862,	"
1735. MOMMSEN, THEODORE	April 18, 1873,	Berlin, Prussia.
2114. MONIER-WILLIAMS, MONIER	Dec. 17, 1886,	London, England.
1791. MOORE, GIDEON E	Oct. 15, 1875,	New York, N. Y.
2029. MOORE, JAMES W	Jan'y 16, 1885,	Easton, Pa.
1841. MOREHOUSE, GEORGE R	April 20, 1877,	Philadelphia.
1054. *Morelli.*	Jan'y 15, 1836,	*Naples, Italy.*
1976. MORRIS, J. CHESTON.	Jan'y 19, 1883,	Philadelphia.
1577. MORTON, HENRY	Jan'y 18, 1867,	Hoboken N. J.
2121. MUCH, MATTHÆUS.	Dec. 17, 1886,	Vienna, Austria.
1866. MUHLENBERG, F. A.	Sept. 20, 1878,	Philadelphia.
2120. MUELLER, FRIEDERICH	Dec. 17, 1886,	Vienna, Austria.

Name.	Date of Election.	Present Address.
1486. MUELLER, F. MAX	Jan'y 16, 1863,	Oxford, England.
1892. MUONI, DAMIANO	Jan'y 16, 1880,	Milan, Italy.
2062. MURDOCK, J. B.	Feb'y 19, 1886,	U. S. Navy.
1937. MURRAY, JAMES A. H.	April 15, 1881,	Oxford, England.

N

2087. NADAILLAC, MARQUIS DE	May 21, 1886,	Paris, France.
1575. NEWBERRY, JOHN S.	Jan'y 18, 1867,	New York, N. Y.
1852. NEWCOMB, SIMON	Jan'y 18, 1878,	Washington, D. C.
1582. NEWTON, HUBERT ANSON	April 19, 1869,	New Haven, Conn.
1703. NICHOLS, STARR HOYT	July 19, 1872,	New York, N. Y.
2060. NIKITIN, SERGE	Feb'y 19, 1866,	St. Petersburg, Russia.
1805. NORDENSKIÖLD, ADOLF ERIC	April 21, 1876,	Stockholm, Sweden.
1712. NORRIS, ISAAC, JR.	Oct. 18, 1872,	Philadelphia.
2106. NORRIS, WILLIAM F.	Dec. 17, 1886,	"
2046. NORTH, EDWARD	Oct. 16, 1885,	Clinton, N. Y.

O

2072. OLIVER, CHARLES A.	Feb'y 19, 1886,	Philadelphia.
1715. OLIVER, JAMES E.	Jan'y 17, 1873,	Ithaca, N. Y.
2135. OSBORN, HENRY F.	Feb'y 18, 1887,	Princeton, N. J.
1581. OSBORN, HENRY S.	Jan'y 18, 1867,	Oxford, O.
2039. OSLER, WILLIAM	Jan'y 16, 1885,	Baltimore, Md.
1801. OWEN, P. CUNLIFFE, SIR	April 21, 1876,	London, England.
1212. OWEN, RICHARD	Jan'y 17, 1845,	" "

P

1868. PACKARD, A. S., JR.	Sept. 20, 1878,	Providence, R. I.
1578. PACKARD, JOHN H.	Jan'y 18, 1867,	Philadelphia.
1331. PAGET, JAMES, SIR.	Jan'y 20, 1854,	London, England.
1984. PANCOAST, WILLIAM HENRY	Jan'y 19, 1883,	Philadelphia.
1593. PARDEE, ARIO	Oct. 18, 1867,	Hazleton, Pa.
1673. PARIEU, ESQUIRON DE	Jan'y 20, 1871,	Paris, France.
2036. PARVIN, THEOPHILUS	Jan'y 16, 1885,	Philadelphia.
2056. PASTEUR, LOUIS	Oct. 16, 1885,	Paris, France.
2035. PATTERSON, C. STUART	Jan'y 16, 1885,	Philadelphia.
1282. PATTERSON, ROBERT	April 18, 1851,	"
1320. *Patterson, Thomas L.*	April 15, 1853.	*Cumberland, Md.*
1772. PEARSE, JOHN B.	Jan'y 15, 1875.	Boston, Mass.
1722. PEMBERTON, HENRY	Jan'y 17, 1873,	Philadelphia.
2104. PEÑAFIEL, ANTONIO	May 21, 1886,	Berlin, Prussia.
1777. PENINGTON, EDWARD	April 16, 1875,	Philadelphia.
2073. PENNYPACKER, SAMUEL W.	May 21, 1886,	"
1518. PENROSE, R. A. F.	July 17, 1863,	"
2059. PEPPER, EDWARD	Feb'y 19, 1886,	Paris.
1666. PEPPER, WILLIAM	July 15, 1870,	Philadelphia.
951. *Pereira, Josè Maria Dantes*	April 18, 1828,	*Lisbon, Portugal.*
1705. PETER, ROBERT	July 19, 1872,	Lexington, Ky.
1824. PHILLIPS, HENRY, JR.	Feb'y 2, 1877,	Philadelphia.
1859. PIERCE, C. NEWLIN	May 3, 1878,	"
1760. PLATT, FRANKLIN	July 17, 1874,	Philadelphia.
2127. PLATZMAN, JULIUS	Dec. 17, 1886,	Leipzig, Germany.
2053. POMIALOWSKY, JOHN	Oct. 16, 1885,	St. Petersburg, Russia.
1539. PORTER, THOMAS CONRAD	Oct. 21, 1864,	Easton, Pa.
2044. POTTS, WILLIAM JOHN	Oct. 16, 1885,	Camden, N. J.
2097. POSTGATE, J. P	May 21, 1886,	Cambridge, England.
1216. *Poussin, William Tell*	Jan'y 17, 1882,	*Paris, France.*

Name.	Date of Election.	Present Address.
2161. POWELL, J. W.	Oct. 18, 1889,	Washington, D. C.
1619. PRESTWICH, JOSEPH	Jan'y 15, 1869,	Shoreham, England.
1592. PRICE, J. SERGEANT	Oct. 18, 1867,	Philadelphia.
1780. PRIME, FREDERICK, JR	April 16, 1875,	"
2088. PULZSKY, FRANCIS	May 21, 1886,	Buda-Pesth, Hungary.
1758. PUMPELLY, RAPHAEL	April 17, 1874,	Newport, R. I.

Q

973. *Quadrada, Francisco de Paolo* . .	Oct. 16, 1829,	*Madrid, Spain.*
1143. *Quaranta, Barnardo.*	Jan'y 15, 1841,	*Naples, Italy.*

R

1448. RAMSAY, ANDREW C.	Jan'y 17, 1862,	London, England.
1736. RAND, THEODORE D.	April 18, 1873,	Philadelphia.
1849. RANDALL, F. A.	Jan'y 18, 1878,	Warren, Pa.
1644. RAWLINSON, GEORGE, ...	Oct. 15, 1869,	Oxford, England.
1765. RAWSON, RAWSON W	Oct. 16, 1874,	London, "
2099. RAYLEIGH, LORD	May 21, 1886,	Essex, England.
1784. RAYMOND, ROSSITTER W	April 16, 1875,	New York, N. Y.
1585. RAYNOLDS, WILLIAM F.	April 19, 1867,	Detroit, Mich.
1591. READ, JOHN MEREDITH	July 19, 1867.	
2077. REED, HENRY	May 21, 1886,	Philadelphia.
1842. REED, THOMAS B	April 20, 1877,	"
1889. REMSEN, IRA	July 18, 1879,	Baltimore, Md.
1485. RENAN, ERNEST	Jan'y 16, 1863,	Paris, France.
1948. RENARD, A	Oct. 21, 1881,	Brussels, Belgium.
1343. RENARD, CHARLES	Jan'y 20, 1854,	Moscow, Russia.
1890. RENEVIERS, E	July 18, 1879,	Lausanne, Switzerland.
1816. REULEAUX, F	Feb'y 2, 1877,	Berlin, Prussia.
2122. RÉVILLE, ALBERT	Dec. 17, 1886,	Paris, France.
1500. RICHARDSON, BEN. WARD	April 17, 1863,	London, England.
1808. RILEY, CHARLES V	April 21, 1876,	Washington, D. C.
1957. ROBINS, JAMES M	April 21, 1882,	Philadelphia.
1025. ROBINSON, MONCURE	Jan'y 18, 1833,	"
1364. *Rogers, E. P*	April 20, 1855.	
1390. ROGERS, FAIRMAN.	Jan'y 16, 1857,	Newport, R. I.
2177. ROGERS, ROBERT W	Feb. 21, 1890,	Carlisle, Pa.
1906. ROGERS, WILLIAM B., JR	April 16, 1880,	Philadelphia.
1462. RÖHRIG, F. L. O.	April 18, 1862,	Los Angeles, Cal.
2050. ROLLETT, HERMANN	Oct. 16, 1885,	Vienna, Austria.
1907. ROOD, OGDEN N	April 16, 1880,	New York, N. Y.
1732. ROSSI, GIOVANNI BATTISTA. . . .	April 18, 1873,	Rome, Italy.
1718. ROTHERMEL, PETER F.	Jan'y 17, 1873,	Limerick P. O., Pa.
1838. ROTHROCK, JOSEPH T	April 20, 1877,	Philadelphia.
1264. RUSCHENBERGER, WM. S. W. . . .	Oct. 19, 1849,	"
1620. RUTIMEYER, CARL L.	Jan'y 15, 1869,	Basel, Switzerland.
2109. RYDER, JOHN A	Dec. 17, 1886,	Philadelphia.

S

1766. SADTLER, SAMUEL PHILIP	Oct. 16, 1874,	Philadelphia.
2148. SAJOUS, CHARLES E.	Feb'y 17, 1888,	"
2103. SANCHEZ, JESUS	May 21, 1886,	Mexico, Mexico.
1563. SANDBERGER, FRIDOLIN	April 20, 1866,	Würtzburg, Bavaria.
1033. *Santarem, Viscount*.	July 19, 1833,	*Lisbon, Portugal.*
1958. SARGENT, CHARLES SPRAGUE . .	April 21, 1882,	Brookline, Mass.
1730. SAUSSURE, HENRI DE.	April 18, 1873,	Geneva, Switzerland.
1877. SCHORLEMMER, C.	Oct. 18, 1878,	Manchester, England.

Name.	Date of Election.	Present Address.
1498. SCHOTT, CHARLES ANTHONY . . .	April 17, 1863,	Washington, D. C.
1864. SCHURZ, CARL	Sept. 20, 1878.	
1725. SCLATER, PHILLIP LUTLEY. . . .	April 18, 1873,	London, England.
1919. SCOTT, LEWIS A.	Oct. 15, 1880,	Philadelphia.
2112. SCOTT, W. H.	Dec. 17, 1886,	Princeton, N. J.
1870. SCUDDER, SAMUEL HUBBARD. . .	Sept. 20, 1878,	Cambridge, Mass.
1656. SEIDENSTICKER, OSWALD	Jan'y 21, 1870,	Philadelphia.
1883. SEILER, CARL	April 18, 1879,	"
1704. SELLERS, COLEMAN	July 19, 1872,	"
1533. SELLERS, WILLIAM.	April 15, 1864,	"
1770. SELWYN, ALFRED R. C.	Oct. 16, 1874,	Montreal, Canada.
1333. SEQUARD, E. BROWN.	Jan'y 20, 1854,	Paris, France.
2057. SERGI, GIUSEPPE.	Oct. 16, 1885,	Rome, Italy.
1965. SÈVE DE BAR, EDOUARD	July 21, 1882,	Brussels, Belgium.
2076. SHARP, BENJAMIN.	May 21, 1886,	Philadelphia.
1944. SHARPLES, PHILIP PRICE	Oct. 21, 1881,	West Chester Pa.
1960. SHARPLES, STEPHEN PASCHALL. .	April 21, 1882,	Boston, Mass.
2002. SHARPLESS, ISAAC	Jan'y 18, 1884,	Haverford, Pa.
1514. SHEAFER, PETER WENRICH . . .	July 17, 1863,	Pottsville, Pa.
1792. SHEPPARD, FURMAN.	Oct. 15, 1875,	Philadelphia.
1797. SHERWOOD, ANDREW	Oct. 15, 1875,	Mansfield, Pa.
1822. SHIELDS, CHARLES W.	Feb'y 2, 1877,	Princeton, N. J.
1532. *Shinz, Carl*.	April 15, 1864,	*Strasburg, Germany*. (?)
2124. SIMÉON, REMI	Dec. 17, 1886,	Paris, France.
1414. SMITH, AUBREY H.	Jan'y 20, 1860,	Philadelphia.
2146. SMITH, EDGAR F.	Oct. 21, 1887,	"
1544. SMITH, GOLDWIN.	Jan'y 20, 1865.	
1789. SMITH, STEPHEN	Oct. 15, 1875,	New York, N. Y.
2141. SMYTH, ALBERT H.	May 20, 1887,	Philadelphia.
1742. SNOWDEN, A. LOUDON	Oct. 17, 1873,	"
2009. SNYDER, MONROE B..	Jan'y 18, 1884,	Philadelphia.
1720. SPOFFORD, A. H..	Jan'y 17, 1873,	Washington, D. C.
1949. STALLO, JOHN B..	Oct. 21, 1881,	Cincinnati, O.
1446. STEENSTRUP, J. J. S.	Jan'y 17, 1862,	Copenhagen, Denmark.
1990. STEVENS, WALTER LECONTE . . .	Jan'y 18, 1884,	Brooklyn, N. Y.
1840. STEVENSON, JOHN JAMES.	April 20, 1877,	New York, N. Y.
2168. STOKES, SIR GEORGE G.	Dec. 20, 1889,	London, England.
1167. STORER, D. HUMPHREYS	April 15, 1842,	Boston, Mass.
1834. STRAWBRIDGE, GEORGE	Feb'y 2, 1877,	Philadelphia.
1559. STRONG, WILLIAM	Jan'y 19, 1866,	Washington, D. C.
1820. STUART, GEORGE.	Feb'y 2, 1877,	Philadelphia.
1527. STUDER, BERNARD.	April 15, 1864,	Berne, Switzerland.
2093. STUER, DIONYS.	May 21, 1886,	Vienna, Austria.
2094. SUESS, EDWARD	May 21, 1886,	" "
2023. SYLE, E. W.	July 18, 1884,	Philadelphia.
1844. SYLVESTER, J. J..	July 20, 1877,	Oxford, England.
2092. SZOMBATHY, JOSEF.	May 21, 1886,	Vienna, Austria.

T

1786. TATHAM, WILLIAM P.	April 16, 1875,	Philadelphia.
1846. TAYLOR, WILLIAM B.	Oct. 19, 1877,	Washington, D. C.
2098. TEMPLE, RICHARD CARNAC . . .	May 21, 1886,	Upper Burmah, India.
2006. THOMAS, ALLEN C..	Jan'y 18, 1884,	Haverford, Pa.
1807. THOMPSON, ELIHU	April 21, 1876,	Lynn, Mass.
1993. THOMPSON, HEBER S.	Jan'y 18, 1884,	Pottsville, Pa.
1726. THOMPSON, HENRY.	April 18, 1873,	London, England.

Name.	Date of Election.	Present Address.
1755. THOMPSON, ROBERT ELLIS	April 17, 1874,	Philadelphia.
1754. THOMSON, FRANK	April 17, 1874,	Philadelphia.
1723. THOMSON, WILLIAM	April 18, 1873,	London, England.
1909. THOMSON, WILLIAM	April 16, 1880,	Philadelphia.
1530. THURY, A.	April 15, 1864,	Geneva, Switzerland.
1688. TILGHMAN, BENJAMIN C	July 21, 1871,	Philadelphia.
1233. TILGHMAN, RICHARD A	April 16, 1847,	"
1657. TILGHMAN, WILLIAM M.	Jan'y 21, 1870,	"
2176. TIMMINS, SAMUEL	Feb. 21, 1890,	Arley, near Coventry, Eng
2123. TOPINARD, PAUL.	Dec. 17, 1886,	Paris, France.
2065. TOPPAN, ROBERT NOXON.	Feb'y 19, 1886,	Cambridge, Mass.
1597. TOWNSEND, JOSEPH B	Jan'y 17, 1868,	Philadelphia.
1955. TOWNSEND, WASHINGTON	Jan'y 20, 1882,	West Chester, Pa.
1691. TROWBRIDGE, WILLIAM P	Jan'y 19, 1872,	New York, N. Y.
2024. TRUMBULL, HENRY CLAY	July 18, 1884,	Philadelphia.
1973. TSCHERMAK, GUSTAF	Oct. 20, 1882,	Vienna, Austria.
9183. TURRETTINI, THEODORE.	Dec. 19, 1890,	Geneva, Switzerland.
2166. TUTTLE, DAVID K	Oct. 18, 1889,	Philadelphia.
2163. TYLER, LYON G	Oct. 18, 1889,	Williamsburg, Va.
1529. TUNNER, PETER	April 15, 1864,	Leoben, Austria.
1602. TYNDALL, JOHN	April 17, 1868,	London, England.
2138. TYSON, JAMES	May 20, 1887,	Philadelphia.

U

2185. UNWIN, WILLIAM C	Dec. 19, 1890,	London, England.

V

2000. VAUX, RICHARD.	Jan'y 18, 1884,	Philadelphia.
1475. VIRCHOW, RUDOLPH.	Oct. 17, 1862,	Berlin, Prussia.
1646. VOGT, CARL.	Oct. 15, 1869,	Geneva, Switzerland
2115. VON MELTZEL, HUGO	Dec. 17, 1886,	Koloszvar, Hungary.
1670. VOSE, GEORGE LEONARD.	Oct. 21, 1870,	Boston, Mass.
2186. VOSSION, LOUIS	Dec. 19, 1890,	Philadelphia.

W

2034. WAGNER, SAMUEL	Jan'y 16, 1885,	Philadelphia.
1748. WAHL, WILLIAM H.	Jan'y 16, 1874,	"
1724. WALLACE, ALFRED R	April 18, 1873,	Croydon, England.
2156. WARD, LESTER F.	May 17, 1889,	Washington, D. C.
2179. WAYLAND, HEMAN L.	May 16, 1890,	Philadelphia.
2033. WEIL, EDWARD HENRY	Jan'y 16, 1885,	"
2117. WEIL, G	Dec. 17, 1886,	Heidelberg, Germany.
2028. WEISBACH, ALBIN	Jan'y 16, 1885,	Freiburg, Saxony.
1975. WESTWOOD, JOHN O	Jan'y 19, 1883,	Oxford, England.
1639. WHARTON, JOSEPH.	April 16, 1869,	Philadelphia.
1637. WHITE, ANDREW D.	April 16, 1869,	Ithaca, N. Y.
1818. WHITE, I. C	Jan'y 18, 1878,	Morgantown, W. Va.
1487. WHITNEY, JOSIAH DWIGHT . . .	Jan'y 16, 1863,	Cambridge, Mass.
1502. WHITNEY, WILLIAM DWIGHT. . .	April 17, 1863,	New Haven, Conn.
1659. WHITTIER, JOHN GREENLEAF . .	Jan'y 21, 1870,	Amesbury, Mass.
1863. WILDER, BURT GREEN	May 3, 1878,	Ithaca, N. Y.
2151. WILLIAMS, TALCOTT	May 18, 1888,	Philadelphia.
2178. WILLIS HENRY.	Feb. 21, 1890,	"
1489. WILSON, DANIEL.	Jan'y 16, 1863,	Toronto, Canada.
2150. WILSON, EDMUND B	Feb'y 17, 1888,	Bryn Mawr, Pa.
2041. WILSON, JAMES C.	Jan'y 16, 1885,	Philadelphia.
1747. WILSON, JOSEPH M.	Jan'y 16, 1874,	"

Name.	Date of Election.	Present Address.
2137. WILSON, WILLIAM POWELL . . .	May 20, 1887,	Philadelphia.
1545. WINCHELL, ALEXANDER.	Jan'y 20, 1865,	Ann Arbor, Mich.
1896. WINTHROP, ROBERT C.	Jan'y 16, 1880,	Boston, Mass.
2140. WIREMAN, HENRY D.	May 20, 1887,	Philadelphia.
1561. WISTER, OWEN JONES	April 20, 1866,	"
1884. WOOD, RICHARD.	April 18, 1879,	"
1762. WOODWARD, HENRY.	July 17, 1874,	London, England.
1751. WOOTTEN, J. E.	Jan'y 16, 1874,	Reading, Pa.
1854. WORMLEY, THEODORE G.	Jan'y 18, 1878,	Philadelphia.
1932. WURTS, CHARLES STEWART . . .	Jan'y 21, 1881,	Philadelphia.
2061. WYCKOFF, A. B.	Feb'y 19, 1886,	U. S. Navy.

Y

1904. YARNALL, ELLIS	April 16, 1880,	Philadelphia.
1759. YOUNG, CHARLES AUGUSTUS . . .	April 17, 1874,	Princeton, N. J.

PROCEEDINGS

OF THE

AMERICAN PHILOSOPHICAL SOCIETY

HELD AT PHILADELPHIA

FOR

PROMOTING USEFUL KNOWLEDGE.

Vol. XXX.

JANUARY TO DECEMBER, 1892

PHILADELPHIA:
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BY MAC CALLA & COMPANY.
1892.

PROCEEDINGS

OF THE

AMERICAN PHILOSOPHICAL SOCIETY,

HELD AT PHILADELPHIA, FOR PROMOTING USEFUL KNOWLEDGE.

Vol. XXX. January, 1892. No. 137.

Stated Meeting, January 1, 1892.

Present, 9 members.

President, Mr. Fraley, in the Chair.

Correspondence was submitted as follows:

Letters of acknowledgment from the Institut Egyptien, Cairo (134); Museum Teyler, Harlem, Holland (135).

A photograph for the Society's Album was received from Prof. Albert H. Smyth, Philadelphia.

Accessions to the Library were reported from the Académie des Sciences, Cracow, Austria; Naturwissenschaftliche Verein des Reg.-Bez. Frankfurt, Germany; Hydrographische Amt des Reichs-Marine-Amts, Messrs. Friedländer und Sohn, Berlin; Gartenbauverein, Darmstadt; Deutsche Gesellschaft für Anthropologie, Ethnologie, etc., Munich; Société Hollandaise des Sciences, Harlem, Holland; Biblioteca N. C., Florence, Italy; R. Accademia dei Lincei, Biblioteca N. C. V. E., Rome; Société Americaine de France, Société de Geographié, Rédaction "Cosmos," Paris, France; Philological Society, Cambridge, England; Royal Astronomical, Meteorological, Geographical Societies, Lords Commissioners of the Admiralty, "Nature," London; Manchester Geographical Society; Theological Seminary, Andover, Mass.; American Statistical Association, Dr. William Elliot Griffis, Boston, Mass.; Museum of Comparative Zoölogy, Cambridge, Mass.;

Newport Sanitary Protection Association; Hartford Theological Seminary, Travellers Insurance Co., Hartford, Conn.; Yale University, Prof. H. A. Newton, New Haven, Conn.; University of the State of New York, Albany; Cornell University, Ithaca, N. Y.; American Chemical Society, Historical Society, Meteorological Observatory, New York; College of Pharmacy, Messrs. Lea Brothers & Co., Editor of the "Medical and Surgical Reporter," Editor of "Pennsylvania County Court Reports," Prof. E. D. Cope, Philadelphia; Johns Hopkins University, Editor of the "American Journal of Philology," Baltimore, Md.; Department of State, Washington, D. C.; Agricultural Experiment Stations, Morgantown, W. Va., Experiment, Ga., Auburn, Ala., Raleigh, N. C., Lafayette, Ind., Corvallis, Oreg., Ames, Ia., Fort Collins, Colo., Berkeley, Cal.; Observatorio, Rio de Janeiro.

The following were reported as duly elected Officers and Councilors of the Society:

President.

Frederick Fraley.

Vice-Presidents.

E. Otis Kendall, W. S. W. Ruschenberger, J. P. Lesley.

Secretaries.

George F. Barker, Daniel G. Brinton, Henry Phillips, Jr., George H. Horn.

Curators.

Patterson Du Bois, J. Cheston Morris, R. Meade Bache.

Treasurer.

J. Sergeant Price.

Councilors.

Richard Wood, William V. McKean, Richard Vaux,
Isaac C. Martindale.

Councilor for two years, vice Aubrey H. Smith, deceased.

William P. Tatham.

The report of the Finance Committee was presented, and the appropriations for the year ending November 30, 1892, passed.

Nominations for Librarian being in order, Dr. Morris re-nominated Mr. Henry Phillips, Jr., and Prof. Cope nominated Mr. B. S. Lyman, and the nominations were closed.

Pending nomination for membership 1232 and new nomination 1233 were read.

Prof. Cope offered for the Transactions a paper entitled " A Synopsis of the species Tied, genus Cnemidophorus."

On motion, the paper was referred to a Committee, to be appointed by the President at his leisure.*

Prof. Cope presented for the Proceedings a paper by Prof. George Baur (of Worcester, Mass.), on the "Taxonomy of the genus Emys, C. Dumeril."

Curator Morris exhibited a variety of objects from the cabinets of the Society.

Dr. Cope suggested that when a paper is presented through a member of the Society for publication, in case of its non-acceptance, it should be returned to the member offering the same, and not sent to its author.

And the Society was adjourned by the President.

* The President subsequently appointed as such Committee, Drs. Ryder, Jayne and Sharp.

The Temperate and Alpine Floras of the Giant Volcanoes of Mexico.
(*Being a Report from the Committee on the Michaux Legacy.*)

By Prof. Angelo Heilprin.

(*Read before the American Philosophical Society, January 15, 1892.*)

Hemsley, in the fourth volume of his report on the botany of Mexico nd Central America, enumerates 130 species of flowering plants, exclusive of sedges and grasses, which reach or pass beyond the 10,000-foot line on the slopes of the four principal volcanoes of the Mexican Republic—Orizaba, Popocatepetl, Ixtaccihuatl and the Nevado de Toluca.* This enumeration is based mainly upon the data found on the labels of the various collections illustrating the region, and omits passing citations; it is thus, necessarily, to an extent incomplete, but yet it is an admirable survey of the general features of this upper flora. To Hemsley's list the following species enumerated by Liebmann as occurring on Orizaba can, I think, be safely added,† although possibly a few of the species require redetermination before their position or synonymy can be satisfactorily established.

	FEET.
Ranunculus Hookeri	10,000
Ranunculus llaveanus	10,000
Cerastium sp.?	14,000
Arenaria decussata	10,000
Arenaria leptophylla?	12,000
Oxalis latifolia	10,000
Trifolium amabile	10,000
Lupinus leptophyllus	10,000
Fragaria Mexicana	10,000
Potentilla sp.?	14,000
Alchemilla venusta	10,000
Alchemilla vulcanica	10,000
Alchemilla hirsuta	10,000
Echeveria mucronata	10,000
Sedum sp.?	10,000
Epilobium repens	10,000
Mentha sp.?	10,000
Gaura sp.?	10,000
Pimpinella sp.?	10,000
Dauca montana	10,000
Hydrocotyle Mexicana	10,000
Eryngium sp.?	14,000

* "A Specimen of the Mountain Flora of South Mexico and Central America—Biologia Centrali-Americana," "Botany," iv, pp. 282–298, 1887.

† "Vegetation des Piks von Orizaba," *Botanische Zeitung*, 1844; also translated and abridged in Hemsley's Report, iv, pp. 145–150.

	FEET.
Sesseli sp.?	12,000
Œnanthe sp.?	12,000
Viburnum sp.?	10,000
Cornus sp.?	10,000
Stevia arbutifolia	12,000
Erigeron scaposus (Aster rivularis)	10,000
Bidens sp.?	10,000
Dahlia variabilis	10,000
Chrysanthemum (?) sagetum	10,000
Cnicus Jorullensis	10,000
Hieracium abscissum	10,000
Tagetes clandestina	10,000
Baccharis Jalapensis	10,000
Diodia sp.?	10,000
Gaultheria procumbens	10,000
Pernettya (Gaultheria) ciliata	14,000
Phacelia sp.?	14,000
Solanum stoloniferum	10,000
Lamourouxia Jalapensis	9,500
Pinguicula sp.?	10,000
Castilleja integrifolia	10,000
Castilleja scorzonerifolia	10,000
Castilleja sp.?	14,000
Verbena pulchella	10,000
Prunella vulgaris	10,000
Plantago Mexicana	10,000
Juniperus Mexicana	14,000
Govenia speciosa	9,500
Spiranthes sp.?	10,000
Serapias sp.?	10,000
Tigridia pavonia	10,000
Tillandsia sp.?	10,000
Bomarea hirtella	10,000
Agave sp.?	10,000

The approximate elevations as recorded by Liebmann are, with little doubt, given in French feet. This placing does not materially alter the positions of the plants in question. To Liebmann's list I would add the following, obtained by myself and my associates during a recent exploration of the Mexican volcanoes (1890):

	FEET.
Echeveria gibbiflora? (or E. secunda?) on Ixtaccihuatl	14,200
Œnothera tetraptera on Ixtaccihuatl and Popocatepetl	11,000–11,500
Symphoricarpus microphyllus on Popocatepetl	10,500
Lonicera filosa on Popccatepetl	10,500

	FEET.
Erigeron maximus on Popocatepetl................	11,200
Baccharis concava on Popocatepetl................	11,000
Gnaphalium oxyphyllum on Orizaba................	13,500
Senecio salignus on Ixtaccihuatl....................	13,200
Arbutus spinulosus on Popocatepetl................	10,500
Alnus castanæfolia on Popocatepetl................	10,500
Draba aretoides (?) on Ixtaccihuatl..................	13,200

A number of other plants, such as Habenaria prasina, Platanthera nubigena, P. longifolia, Malaxis gracilis (among orchids), have been cited by Martens and Galeotti from the peak of Orizaba, so that the total list is brought close up to 200 species. I have in the table that follows appended the approximate elevations at which the plants occur, relying largely upon the data furnished by Hemsley. The letters that precede the names of the species have reference to the special mountain peak upon which the plants were found: O., Orizaba; P., Popocatepetl; I., Ixtaccihuatl, and T., Nevado de Toluca. The author wishes in this connection to express his indebtedness for various forms of assistance to Messrs. Thomas Meehan, John H. Redfield, Isaac Burk and Witmer Stone, members of the Academy of Natural Sciences.

	To 10,000 FEET.	10–12,000 FEET.	12–13,000 FEET.	13–15,000 FEET.
O. Ranunculus geoides......		9–12,000		
O. R. Peruvianus...........			12,500	
O. R. Hookeri..............	10,000			
O. R. llaveanus............	10,000			
O. R. sp.?......				14,000
O. Nasturtium impatiens....		11–12,000		
O. " Orizabæ......		12,000		
O. Draba myosotidioides....			12–13,000	
P. " Popocatepetlensis..		12,000		
T. " Tolucensis........				8–14,000
I. " aretoides? (also O.)				13,200
O. Sisymbrium canescens....		12,000		
O. " Galeottianum.		8–11,000		
T. Erysimum macradenium..			12–13,000	
O. Viola ciliata............	10,000			
O. " sp.?.....				14,000
T. Cerastium andinum......			13,000	
O. " orithales......		12,000		
O. " vulcanicum...		10–12,000		
O. " sp.?...........				14,000
O. Arenaria alsinoides.......		10–12,000		
O. " decussata.......	10,000			
O. " bryoides.......			12,500	

	To 10,000 FEET.	10-12,000 FEET.	12-13,000 FEET.	13-15,000 FEET.
T. Arenaria bryoides				14-15,000
P. " "		11,500		
O. " leptophylla ? ...		12,000		
O. Colobanthus Quitensis....		12,500		
O. Oxalis latifolia	10,000			
T. Geranium potentillæfolium	9-10,000			
O. Trifolium amabile........	10,000			
T. Lupinus bimaculatus		12,000		
O. " elegans	9-10,000			
O. " glabellus........	9-10,000			
P. " Mexicanus.......		10-11,000		
T. " montanus	9-10,000			
O. " vaginatus		12,000		
P. " "		12,000		
T. " "		12,000		
I. " "		12,000		
O. " leptophyllus.....	10,000			
O. Fragaria Mexicana.......	10,000			
O. Spiræa discolor...........		10-12,000		
O. Rubus trilobus...........	10,000			
O. Potentilla ranunculoides..		12,000		
O. " Richardii			12,500	
O. " sp.?				14,000
O. Alchemilla orbiculata.....		12,000		
O. " Sibbaldiæfolia.		9-12,000		
O. " venusta	10,000			
O. " tripartita	10,000			
O. " vulcanica.....	10,000			
O. " hirsuta	10,000			
O. Acæna elongata..........				14,000
O. Heuchera Orizabensis....			11-12,500	
P. Ribes Jorullensis		10-12,000		
T. " "		10-12,000		
O. " "				13,500
O. Echeveria mucronata.....	10,000			
I. " gibbiflora ? (E. secunda ?)				14,200
O. Sedum sp.?.............	10,000			
P. Œnothera tetraptera		11-12,000		
I. " "		11-12,000		
O. Epilobium repens........	10,000			
O. Mentha sp.?	10,000			
P. Fuchsia microphylla......	10,000			
O. " mixta	10,000			

	To 10,000 FEET.	10-12,000 FEET.	12-13,000 FEET.	13-15,000 FEET.
O. Gaura sp.?	10,000			
O. Lopezia hirsuta	10,000			
O. Microsechium ruderale	9-10,000			
O. Pimpinella sp.?	10,000			
O. Dancus montana	10,000			
O. Hydrocotyle Mexicana	10,000			
O. Eryngium eymosum	8-10,000			
O. " protæflorum		12,000		
T. Tauschia Coulteri		10,500		
O. Sesseli sp.?		12,000		
O. Œnanthe sp.?		12,000		
O. Ottoa œnanthoides		12,000		
O. Peucedanum Tolucense			12,500	
O. Viburnum sp.?	10,000			
O. Cornus sp.?	10,000			
O. Abelia floribunda	10,000			
P. Symphoricarpus microphyllus		10,500		
P. Lonicera filosa		10,500		
O. Galium gemmiflorum	10,000			
O. Didymæa Mexicana	10,000			
O. Ageratum adscendens		10-11,500		
O. " arbutifolium				13,500
P. " "		11,000		
I. " "				13,200
O. Stevia monardiæfolia		8-12,000		
O. " arbutifolia		12,000		
O. Eupatorium adenochætum	8-10,000			
O. " grandidentatum	10,000			
O. " Orizabæ		10-11,000		
O. Haplopappus stoloniferus		8-12,000		
O. Chionolæna lavandulacea				12,500-15,000
I. " "				13,200
O. Gnaphalium oxyphyllum				14,000
O. Sabazia sarmentosa		9-11,000		
O. Achillea millefolium	10,000			
P. Baccharis concava		11,000		
O. Erigeron scaposus	10,000			
P. " maximus		11,200		
O. Senecio chrysactis			12-13,000	
I. " "				13,200
O. " cirsioides				14,000
P. " Galeottii		11,500		

	To 10,000 FEET.	10–12,000 FEET.	12–13,000 FEET.	13–15,000 FEET.
O. Senecia Galeottii.........		12,000		
O. " gerberæfolius				10–15,000
O. " helodes..........		11,500		
O. " multidentatus			9–12,500	
O. " Orizabensis			10–12,500	
O. " procumbens......				12–15,000
T. " "		10–11,000		
I. " salignus				13,200
O. Bidens sp.?.............	10,000			
O. Dahlia variabilis.........		10–11,000		
O. Chrysanthemum (?) segetum	10,000			
T. Cnicus nivalis............		11,400		
O. " "				14,000
O. " Jorullensis........	10,000			
P. Hieracium Mexicanum ...	10,000			
O. " abscissum	10,000			
O. " niveopappum .			13,000	
O. " thyrsoideum ..		12,000		
O. Tagetes clandestina......	10,000			
O. Lobelia nana			11–12,500	
O. " Orizabæ	9–10,000			
O. Diodia sp.?.............		11,000		
O. Gaultheria procumbens...	10,000			
O. Arctostaphylos pungens..			12–12,500	
P. Arbutus spinulosus		10,500		
O. Pernettyia pilosa		9–12,000		
O. " ciliata........				14,000
O. Pyrola Sartorii	9–10,000			
O. " secunda	8–10,000			
O. Chimaphila umbellata....	6–10,000			
O. Buddleia lanceolata	10,000			
O. Halenia alata............	9–10,000			
O. " nudicaulis		9–12,000		
O. " nutans..........	9–10,000			
O. " paucifolia		9–12,000		
O. Polemonium grandiflora..		9–12,000		
O. Cobæa minor............	10,000			
P. Phacelia pimpinelloides ..	10,000			
O. " " ..			12,500	
I. " " ..				13,200
O. Echinospermum Mexicanum..................	10,000			
O. Lithospermum distichum.		11–12,000		

	To 10,000 FEET.	10–12,000 FEET.	12–13,000 FEET.	13–15,000 FEET.
O. Solanum verrucosum		10–12,000		
O. " stoloniferum ?...	10,000			
O. Saracha umbellata	10,000			
O. Lamourouxia Jalapensis..	9,500			
O. Pinguicula sp.?	10,000			
O. Calceolaria Mexicana	10,000			
O. Pentstemon gentianoides .		9–12,000		
O. Mimulus glabratus			12–12,500	
O. " Orizabæ		10–12,000		
O. Veronica serpyllifolia				14,000
O. Castilleja lithospermoides.		12,000		
O. " pectinata		10–12,000		
O. " Tolucensis......		.		13,200
T. " "				14,200
O. " integrifolia	10,000			
O. " scorzonerifolia ..	10,000			
O. Pedicularis Orizabæ......		12,000		
O. Verbena teucrifolia		10,500		
O. " pulchella	10,000			
O. Salvia biserrata		9–10,500		
O. Scutellaria cœrulea	9–10,000			
O. Stachys repens		9–11,000		
O. Prunella vulgaris	10,000			
O. Plantago Mexicana	10,000			
O. Peperomia Lindeniana....	10,000			
O. Persea Orizabæ		7–10,500		
O. Arcenthobium campylopodum.....		10–11,000		
O. " cryptopodum.....		10–11,000		
O. " oxycedri ..		12,000		
O. Euphorbia Orizabæ	8-10,000			
O. Urtica chamædryoides....	10,000			
O. " spiralis	10,000			
O. Pilea vulcanica..........	10,000			
O. Parietaria Pennsylvanica .	10,000			
O. Alnus acuminata	7–10,000			
O. " Jorullensis		12,000		
P. " castanifolia........		10,500		
O. Quercus floccosa	8-10,000			
O. " glabrescens	8–10,000			
O. " Orizabæ	8–10,000			
O. " reticulata	8–10,000			
O. Salix cana		11–12,000		

	To 10,000 FEET.	10–12,000 FEET.	12–13,000 FEET.	13–15,000 FEET.
O. Salix latifolia............		12,000		
P. " paradoxa?..........		10,500		
O. Juniperus tetragona......				12–14,000
O. " Mexicana......				14,000
P. " "		11,500		
P. Pinus ayacahuite		11–12,000		
O. " "				13,500
P. " Hartwegii				13–14,000
O. " Montezumæ (also P. & I.).........				10–14,000
O. " patula		10–12,000		
O. Abies religiosa (also P. & I.).................		12,000		
O. Govenia speciosa.........	9,500			
O. Habenaria vulcanica.....		10–12,000		
O. " prasina.......			12,800	
O. Platanthera nubigena			12,500	
O. " longifolia....			12,500	
O. Malaxis gracilis...			12,500	
O. Spiranthes ochracea			12,500	
O. Serapias sp.?	10,000			
O. Tigridia pavonia.........	10,000			
O. Tillandsia sp.?...........	10,000			
O. Sisyrinchium scabrum....	10,000			
O. Bomarea acutifolia	7–10,000			
O. " hirtella.........	10,000			
O. Agave sp.?..............	10,000			
O. Echeandra terniflora		11,000		
O. Allium glandulosum		9–12,000		
O. Stenanthium frigidum....			9–12,500	

From the preceding it will appear that, exclusive of grasses and sedges, there are approximately :

	FEET.
5 species which pass beyond........................	14,000
28 " " " "	13,000
46 " " " "	12,000
97 " " " "	11,000
115 " " " "	10,000
199 " " about reach or pass beyond.............	10,000

By far the greater number of the species enumerated in the preceding list are cited from the Citlaltepetl (the "Star Mountain"), or Peak of Orizaba, as it is commonly known, which, from the specially favorable conditions surrounding its position, has attracted the attention of botanists more than any other mountain of Mexico. With its base buried in the luxuriant forests of the eastern *tierra caliente,* it presents an unbroken botanical front to the line of perpetual snow, 15,000 feet above the sea, and thus exhibits in beautiful sequence the different vegetal zones which climate more particularly has marked out. There is probably no other mountain in the world which so thoroughly presents the essentials of a study of mountain floras as Orizaba; the luxuriance of growth at its base, the high level to which the forest zone attains, and the isolation, due to volcanic structure, of the peak itself, are the specially distinguishing features of this summit. So far as the temperate and alpine floras of the other giant mountains of Mexico are concerned—Popocatepetl, Ixtaccihuatl and the Nevado de Toluca—there is no question that they are very closely related to the similar floras of the Star Mountain, as indeed it would naturally be expected they would be. Of this correspondence I have satisfied myself through a personal examination of the floras *in situ;* unfortunately, the conditions attending the ascent of these mountains were such as to prevent us from making more than "sample" collections, but they illustrate in a broad way the general features of the vegetation. All four summits rise from the table land through a zone of pine forest. On the western slope of Orizaba, or towards the town of San Andres Chalchicomula, we found the pines, with *Pinus Montezumæ* (var. *macrophylla*—the common long-leaved species), *P. Teocote* and *P. pseudostrobus,* to begin as a distinct zone, at an elevation of some 9000 feet, occupying nearly the same position on the western slopes of Popocatepetl and Toluca; on Ixtaccihuatl the line descends approximately 500 feet lower. There can be little question, it appears to me, that the limitation downward in these special cases is not so much dependent upon climatic conditions as it is upon certain physical peculiarities of the surroundings and the artificial means that have been resorted to for the removal of the native growth. The vast accumulation of ash and dust-sand which to-day envelopes the plateau base of the mountain, deposited as a disintegration downwash from above or as a wind sediment from below, lends itself at best to the development of but a scant vegetation; large areas are wholly barren, while others are redeemed only by a withered and scattered growth of grass and insignificant herbs. Over these lower areas trees are but distant ornaments. That this limitation of 9000 feet is not the actual or natural boundary of the pine zone is shown by the condition of the eastern face of the mountain, which descends from the plateau, or by the face of the plateau itself. Thus, on the hills about the town of Orizaba, at an elevation of some 4800 feet, we observed *Pinus pseudostrobus*—a form closely related to *P. Montezumæ,* and also entering into the composition of the lower pine woods of the Citlaltepetl—growing in great profusion; and on the steep southern face of the plateau descending to the volcano of Jorullo, we followed *Pinus Montezumæ* or *P. occidentalis* to the level of 4000 feet, or perhaps even lower—far below the upper level which the palms attain in certain parts of Mexico.*

* We observed a palmetto-like form, probably a Brahea, growing abundantly on the

The extended vertical distribution of the pines is very remarkable, not less so than the abrupt limitation southwards of the genus. If the identification of the common form of British Honduras and of Cuba (*Pinus Cubensis*) with *P. Montezumæ* (*P. occidentalis*) be considered correct—for which, however, there appears to be considerable doubt—and similarly, the identification of this last with the species (or one of the species) growing in the upper vegetal zone of Orizaba, etc., then the range of a single species is made coincident with that of the entire genus—indeed, so far as the western hemisphere is concerned, with that of the entire family or tribe. Nor is there, probably, another instance known of a perennial having an equivalent range of 14,000 feet, or upwards of two and a half miles.* Humboldt places the lower limit of *P. Montezumæ* in Mexico at 4092 feet (at very nearly the position in which I found it below Buena Vista on the road connecting Ario de Rosales with the hacienda of La Playa, base of Jorullo), and its upper limit, as determined by him on the Cofre di Perote, at 12,936 feet.† Liebmann places the upper limit, on the northwestern side of the Peak of Orizaba, still higher, or at about 14,000 feet.‡ I am not certain that we observed, whether on Orizaba, Popocatepetl, or Ixtaccihuatl, the common "long-leaved Mexican pine" at anything like this elevation; certain it is that while this species enters, with the *P. Teocote* and *P. pseudostrobus*, very largely into the formation of the *lower* pine woods of the mountains in question, at elevations of from 9000 to 11,000 feet or thereabouts, it is distinctly succeeded in the upper zone by the very common short-leaved form (*Pinus Ayacahuite*) and *P. Hartwegii*. That these various forms have been repeatedly interchanged by botanists and travelers is positive; nor, indeed, in the present uncertainty regarding the species of Mexican pines, would it be safe to assert that all these species are really distinct. We also found the upper limit of the pines on Orizaba to be close on the 14,000-foot line, but on the adjacent Sierra Negra, which faces the peak of Orizaba on the south, the tree line appears to rise fully two or three hundred feet higher. As Liebmann observes, the trees become in a measure dwarfed, though never shrubby or prostrate. At an elevation of 13,200 feet, where they

limestone mountains west of Yautepec (on the ridge separating that town from Cuernavaca), at an altitude of 6500 feet; the same species appears still higher, 7000–7500 feet, on the similar calcareous soil of the region about (north of) Tehuacan. At both localities the palm, together with the Viznaga (*Viznaga mammillaris*), and the organ cactus, forms the predominant feature of the vegetation; the stem rises to some 30–35 feet. Liebmann states that Corypha and Chamærops are both found on the highlands of Mexico at an elevation of 8000 feet. Hemsley is probably correct in referring one of these forms to Brahea; the other may be a Chamædorea, but it seems to me more likely to be a true Sabal. Drude has, perhaps, doubted the accuracy of Liebmann's observations, since he makes no mention of any Mexican palm rising above 5000 feet ("Die Geographische Verbreitung der Palmen," in "Petermann's Mittheilungen," 1878; "Handbuch der Pflanzengeographie," 1890).

*The Oregon pine or Douglas fir (*Pseudotsuga Douglasii*) extends its habitat from the sea level on the Pacific coast to an elevation of nearly 10,000 feet in Colorado.

† "Views of Nature," Bohn's edition, p. 315.

‡ If French feet, then more nearly 15,000 feet.

still formed groves or thickets, they rose to a height of certainly not less than 30–40 feet. Roezl, as quoted by De Candolle (Parlatore, in the "Prodromus," xvi, ii, p. 400), and Hemsley give, it appears to me, too great an elevation for the pines on Popocatepetl and Ixtaccihuatl, 13–14,000 feet; the first figure more nearly represents the true limitation. Felix and Lenk * delimit the zone on Popocatepetl at about 250 feet above the ranch of Tlamacas, or, according to their statement, at almost exactly 13,000 feet; my own observations place the line somewhat higher, 13,160 feet †—or about 100 feet lower than the point where we met with the last pines on Ixtaccihuatl.

At no other point on the earth's surface do the pines attain such an extreme elevation as on the Mexican volcanoes; indeed, if we except the *Juniperus fœtidissima* found by Thomson in the Spiti Valley, Himalayas, at an altitude of 15,000 feet, the entire group of the Coniferæ almost everywhere falls far below this line. Barring exceptional cases, the uppermost trees on the Himalaya, as in north temperate regions generally, are conifers, but these virtually cease at an elevation of some 12,000 feet, ‡ although flowering plants continue for still 7000 feet higher. On Mt. Ararat, according to Drude, the uppermost trees are birches, poplars and willows, and not conifers, § the tree line on the northwestern face of that mountain being situated somewhat below 8400 feet. On the extinct volcanic summit of the San Francisco mountain (Northcentral Arizona, lat. 35° 20′), with an elevation of 12,794 feet, Hart Merriam found the timber line at approximately 11,500 feet, marked by the disappearance of the fox-tail pine (*Pinus aristata*) and Engelmann's spruce (*Picea Engelmanni*). A somewhat higher level is, perhaps, reached by the balsam (*Abies subalpina*) in Colorado—12,000 feet. ‖

The point of most interest that suggests itself in connection with the distribution of the Mexican pines is the distinctness of the forms from those occurring in the region lying to the north. With barely an exception ¶ all the species occurring on the lofty volcanoes are endemic to the Mexican (Centrali-American) region, and are consequently not found in the pine tracts of the Rocky Mountain system. In view of the longitudinal

* "Beiträge zur Geologie and Paläontologie der Republik Mexico," p. 20, 1890.

† It is interesting to note in this connection that Von Gerolt, who made the ascent of Popocatepetl in 1833, places the *limit of vegetation* on that mountain at 12,614 (English) feet, not including "a mossy plant, *Arenaria bryoides*, which is occasionally found some hundred feet higher." Egloffstein, "Geology and Physical Geography of Mexico," 1864, p. 25.

‡ Schlagintweit observed the last groups or "woods" of these trees at an elevation of 11,800 feet, although cultivated specimens of *Populus Euphratica*, grown in the gardens of the monastery of Mángnang, were found nearly 2000 feet higher, at 13,460 feet ("Sitzungsber. Münch. Akad.," 1865, i, p. 258). This investigator places the limit of Phanerogams on the Gunshankar Peak (lat. 31° 23′, long. 80° 18′) at 19,237 feet (*op. cit.*, 1867, p. 516, also in "Results of a Scientific Mission to India and High Asia").

§ "Handbuch der Pflanzengeographie," p. 402.

‖ C. S. Sargent, "The Woods of the United States," p. 132, 1885.

¶ *Pinus cembroides* ranges into the Santa Catalina mountains of Arizona (3500 feet elevation).

direction of these mountains and the fact that they are continued by a plateau system of elevations of from 6000–8000 feet into the very heart of the volcanic area, this circumstance appears a little remarkable; its explanation is possibly to be sought in the same series of conditions which have determined the endemic character of the alpine flora generally of the Mexican and South American summits. In the case of such hardy perennials as the pines, however, it is more difficult to account for the anomaly than in that of the seemingly much more pliable herbaceous plants, which are commonly assumed to lend themselves more readily to changes or modifications as the result of alterations in the physical conditions of their surroundings. The comparatively recent origin of the Mexican volcanoes proves that the floras which they carry must be of equally recent date; it follows, therefore, as a corollary that if the components of these floras are derivatives from preëxisting floras still extant, such modifications of structure as they have undergone must have been rapid in their formation—more rapid, probably, than is generally allowed for modifications of this kind. Can it, perhaps, be assumed that the special characteristics and conditions which belong to elevated volcanic cones are conducive to rapid change? It is true that not all the volcanic summits of Mexico are of equivalent age, and it can probably be assumed that some are of even considerably greater age than others (although possibly belonging to the same period of geological time); thus the worn-off and effaced summit of the Ixtaccihuatl, without doubt, long antedates such perfect cones as Orizaba and Popocatepetl; and the serrated ridges of the Ajusco, or their continuations, bear a similar relation to the series of more or less perfect cones and bosses which are distributed over the plateau north of the line occupied by them. Possibly the existing flora was first developed on such ancient slopes, whence by a gradual transference it gained the position which it now holds (largely modified and altered in form).

It must be admitted, however, that our knowledge on these points is still so limited that it can scarcely originate more than speculation or surmise; it no more explains the present problem than it answers the question: Why are the pines limited to the northern hemisphere—or more definitely, why the North American pines cease so abruptly in Nicaragua? What are the special conditions which prevent them from spreading further southward, and why is the upper zone of the Andes destitute of these trees? Indeed, the endemic character of the Mexican conifers and the absence of their immediate representative in South America might suggest to some an origination wholly independent of a true North American stock—an origination suggestive of a former Atlantis. The presence of pines in some of the West Indian islands—Cuba, Jamaica, Santo Domingo, and again in the Canary Islands*—might, moreover, be taken in evidence of a trans-Atlantic land connection having actually

* *Pinus Canariensis*, the last of the three-leaved pines from the western region of the Old World.

existed at a comparatively modern period. Botanists have, indeed, long since pointed out the relation existing between the modern coniferous flora of North America and the equivalent Miocene flora of Europe—a relationship which might almost be considered an equivalency—and have even hinted at the possible derivation of the one from the other.*

The singular distribution of the pines makes it certain that neither their vertical nor their horizontal (or longitudinal) range is determined by conditions of temperature alone, or, perhaps, even primarily. Humboldt has plainly stated this fact: "This absence from the southern hemisphere of the true Abietineæ, of the Juniperineæ, Cupressineæ and all the Taxodineæ, as likewise of the Torreya, of the *Salisburia adiantifolia*, and of the Cephalotaxus among the Taxineæ, vividly reminds us of the enigmatical and still obscure conditions which determined the original distribution of vegetable forms. This distribution can by no means be satisfactorily explained, either by the similarity or diversity of the soil, by thermal relations, or by meteorological conditions." † Mr. Thomas Meehan has repeatedly insisted that the timber line on mountains is not essentially a fixture determined by climate, but depending more particularly upon special topographic features of the surroundings—the character of the soil, amount of downwash, exposure to storms, etc. The critical comparison of different timber lines, taken in conjunction with vertical distribution, shows that this contention is at least largely true. The abrupt termination of the forest on some of our mountain heights, whether high or low—as for example on the Rocky Mountains or on Mt. Katahdin—and the continuance of trees of still noble proportions practically to the very limits of disappearance, point very strongly to this conclusion, a conclusion which is further supported by the reappearance in many places (of the same region) of the identical forest in positions considerably more elevated (and presumably much better adapted to a special development). The irregular height to which the "Waldregion" attains on the Alps and on other mountains of Southcentral Europe is certainly attributable at least as much to topographic (physiographic) as to climatic conditions. Thus, on the main body of the Central Alps (46°–47° N. lat.), the limit of trees is found at approximately 6400 feet; in the Southern Alps of Dauphiné (45° N. lat.), at 8200 feet (in places only 5550 feet); on the Illyrian Alps, of Karst, Austria (46° N. lat.), at 5000 feet, and on the Dinaric Alps of Bosnia (44° N. lat.), at 5300 feet. So, again, on the Jura mountains, in lat. 47°, this limit is reached at 4900 feet, whereas on the Altai, in lat. 50°, it rises nearly 1500 feet higher, or to 6400 feet. ‡

The limitation to height of herbaceous plants parallels the history presented by trees. It is generally assumed in their case that the line of

* Hildebrand, "Die Verbreitung der Coniferen," "Verhandl. d. natur. Vereines der preuss. Rheinlande und Westphalens," xviii, p. 377, 1861.

† "Physiognomy of Plants," in "Views of Nature," p. 321, Bohn edition, 1850.

‡ Grisebach, "Vegetation der Erde," i, pp. 180 *et seq.*, 1884.

perpetual snow is the determinant of absolute or greatest elevation, but this is not strictly the case. Thus, it is well known that in the Swiss Alps phanerogamic plants are found nearly 2700 feet above the snow line; the beautiful mountain pink (*Silene acaulis*) has been met with at an elevation of 11,382 feet,* and *Androsace glacialis*, a primulaceous plant, at 11,406 feet, on the Piz Linard (Grisons). Indeed, Heer has determined not less than a hundred species (or approximately that number) of flowering plants (representing twenty-three families) as growing on the Rhætic Alps above the snow line (9060 feet), and Martius has recorded twenty-four species from the Grands Mulets, Mont Blanc, on elevations ranging from 10,540 to 11,300 feet.†

So far as the Mexican summits are concerned, I think it may be safely asserted that the tree or timber line is not an absolute one; in other words it is not one which is determined by the natural conditions of growth of the plant itself, but rather it is dependent upon purely local causes. It is scarcely conceivable, for example, that on Orazaba, where at an elevation of upwards of 13,200 feet the trees were still 30–40 feet in height, an additional 500–600 feet should so materially alter favorable (climatic) conditions of growth into unfavorable ones as to produce extermination; indeed, we must assume that this change is even much more rapid, for at the very verge of the timber line the pines, although necessarily harboring a considerable number of small specimens, still easily measured 20–30 feet. This condition we found repeated on Popocatepetl and Ixtaccihuatl, most markedly, perhaps, on the latter mountain; I am positive that some of the uppermost pines here, very close to the disappearing line, were not less than 40–50 feet high, if not higher. Again, on Popocatepetl, as has already been remarked, the timber line ceases a little above 13,100 feet, the trees themselves being of rather inconsiderable height. On an equivalent height on a spur of the Sierra Tlamacas,‡ however, the pines are still noble foresters, and on the Sierra Tlamacas itself, off in the direction of Ixtaccihuatl, they rise to elevations several hundred feet higher. There is little doubt in my mind that the actual limitation on the summits here referred to is mainly determined by such physiographic conditions as steepness of slope, downwash of soil, exposure to the cold waters of melting snows, storms, etc. How much higher, under more favorable conditions, the tree line might have attained, I am unable to say; but it is interesting to note that such as it is, it is virtually the most elevated tree line in the world. §

* Humboldt, "Views of Nature," p. 318. I met with this plant (summer of 1891) in various parts of Greenland, between lat. 69° and 77° 40′, growing from the sea-level to an elevation of 1500-2000 feet.

† Grisebach, *op. cit.*, i, p. 167.

‡ Crossed just before reaching the ranch of Tlamacas.

§ This statement, perhaps, requires modification. Pöppig, from manuscript data submitted to him by Engineer Benjamin Scott, asserts ("Reise in Chile, Peru and auf dem Amazonenstrome," ii, p. 80) that on the Peruvian Andes, near the hamlets of Huaylillas de Potosi and Uchusuma, treelets of (?) *Polylepis racemosa* are found at elevations of 15,863

In the north temperate regions the timber line, where marked by the disappearance of conifers at all, seems to characterize indiscriminately the zone either of pines or firs (spruces); probably in the greater number of instances the latter are the most far-reaching trees. In the Harz mountains, the Riesengebirge, the Böhmerwald, the Jura mountains, and in many parts of the Alps, Carpathians and Pyrenees the firs are the delimiting zone of forest; but again, in other parts of the Alps and Pyrenees, in the Tátra (Central Carpathians), the Altai, and on many of the mountain crests of the Mediterranean region, the pines (notably *Pinus cembra*) considerably overtop the firs, even if they do not form that distinct vegetal zone which is constituted by the latter. In North America, perhaps even more than in Eurasia, do the firs constitute the uppermost coniferal zone, a zone which is so eminently defined on the higher elevations of the Appalachian system of mountains (White mountains, Black mountains of North Carolina). In the Rocky mountains the pines and firs both attain the timber line, but the latter predominate by far as a zone-making element; indeed, on many of the more elevated summits the pines only sporadically mingle in with firs. It is the more interesting, therefore, to find that on the still higher summits of Mexico the reverse order obtains. The zone of firs (consisting of *Abies religiosa*), as I had occasion to observe on Orizaba, Popocatepetl, Ixtaccihuatl and the Nevado de Toluca, virtually ceases at about 11,500–12,000 feet,* or two thousand

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and 15,915 feet, or nearly 150 feet higher than the *Saxifraga Boussingaulti*, from the slopes of Chimborazo, which Humboldt considered to be "the highest growing phanerogamic plant in the world" ("Views of Nature," p. 234). Again, Humboldt himself observed occasional specimens of tree-like Verbesina on Pichincha at an elevation of nearly 14,400 feet ("Kleinere Schriften," p. 57). It seems likely that the measurements of altitude in both of these cases are given too high a value; at any rate, the more recent surveys of the Andean summits have, in nearly all cases, tended to diminish rather than to increase the formerly accepted measurements. Raimondy reports *Sambucus Peruviana* and *Polylepis racemosa* from an elevation of 14,390 feet on the Peruvian Andes; *Polylepis tomentella* was observed by Weddell at 14,710 feet, and *P. lanuginosa*, by Jameson, on Chimborazo, at 13,965 feet. Most of these upper trees are dwarfed, scarcely attaining more than a few feet in height, and, indeed, the actual timber line falls considerably below the elevations here given. Humboldt makes the interesting observation that in the region about Quito trees 45–60 feet in height are rarely met with above some 8800 feet. At Chicla, on the Peruvian Andes (13° degrees south of the Equator), at an elevation of 12,200 feet, Ball observed but a single tree, *Sambucus Peruviana*, a form closely related to the common black elder of Europe ("Notes of a Naturalist in South America," p. 101, 1887). In remarkable contrast to these cases of special elevation is the condition of the forest vegetation on Kilima 'Njaro, on approximately the third degree of south latitude. According to Dr. Hans Meyer, the "average limit of the forest belt is about 9500, the extreme limit imposed by the climatic conditions being some six or seven hundred feet higher" ("Across East African Glaciers," p. 132, 1891); phanerogamic plants are, however, found on the same mountain up to 15,420 feet (*op cit.*, p. 167). In the Sunda Islands (Java, Sumatra, Borneo), which lie almost under the Equator, as is well known, the timber line also falls below 10,000 feet, although individual mountain summits rise 2000 and 3500 feet higher.

* We met with the last spruces on Ixtaccihuatl at approximately 11,500 feet; the lowest were found at about 9200 feet, or very nearly 1000 feet lower than we observed them on the peak of Orizaba. I have no doubt that the species in question is found at

feet below the line of the pines, and yet more below that of the last junipers.*

We observed the last specimens of this genus (*Juniperus tetragona*) covering the bare rocks of Orizaba at some little distance beyond the actual tree line. It is not always easy to determine just what are the causes which operate towards establishing and regulating the succession of special vegetal zones on mountain slopes any more than it is possible, in our present knowledge, to explain the anomalies of succession on the horizontal plain stretching towards the Pole. The law of parallelism in horizontal and vertical succession, which Humboldt first formulated, and which was founded on the perception of climatic influences almost alone, while it touches the broader aspects of the problem, does not essentially explain the detail; nor can it be said that the modification of this law, defined by an excess or decrease of solar illumination, the horizontality or verticality of the solar rays, etc. (as elaborated by Wahlenberg, Grisebach and others), any more explains the special contradictory features of this distribution. Preoccupation or first possession of a region by a special group of plants has doubtless much to do with the problem; it is an important factor towards determining supremacy, and must, therefore, largely regulate the outcome from a competitive struggle for existence.

The oaks of the Mexican volcanoes occupy the lower pine belt, ranging to about 10,000 feet. We obtained three species on Orizaba—*Quercus reticulata*, *Q. Orizabæ*, and a third form which we have not yet been able to identify. Above 8000 feet they are comparatively rare and no longer form forests, such as are to be met with in the lower region of 4000–6000 feet. In the more or less open dustcountry below the pines—*i. e.*, below where the pines appear on the western slope of Orizaba, about 9000 feet—they are still fairly abundant, forming groves and copses, but once entering the pines they appear only as stragglers. The same condition prevails on Popocatepetl and Ixtaccihuatl. Associated with the oaks are one or more species of alder, *Alnus Jorullensis* and *A. castanifolia;* we found the former a tree of some 15–20 feet height, extending up to 12,000 feet or more. The second form, which is now generally looked upon only as a variety of *A. Jorullensis*, and which we found on Popocatepetl at an elevation of about 11,000 feet, is a member of the flora of the Peruvian Andes—one of the very few plants which are common to the two regions.

As regards the non-arboreal vegetation of the Mexican summits, the list of species given at the beginning of this paper sufficiently illustrates

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a very much lower altitude than where we actually observed it; indeed, it appears that Humboldt and Boupland met with it not far from the forest of Chilpanzingo, south of the Mexican plateau, at an elevation of barely more than 4000 feet.

* It is true that Schiede mentions the tree as rising to the timber line on Orizaba (Parlatore, in De Candolle's "Prodromus"), but I believe the statement to be erroneous. Galeotti's observations, which accord almost exactly with my own, place its limit at some 12,200 feet. Hemsley, on the other hand, reduces the elevation to 10,500 feet, a figure which is 1500 feet too low.

its character. A few remarks from personal observation may not, however, be amiss. We found the most varied flora—*i. e.*, in the region above 8000 feet—on Popocatepetl, and it was here, too, that the vegetation presented itself in its most luxuriant aspect.* Taking the physiognomy of the four summits into one general consideration, it may be said that the most noticeable or distinctive plants are two or more species of Senecio and a lupine (*Lupinus vaginatus*). The yellow flowers of the former and the blue of the latter were an ornament to the vegetation almost everywhere between 10,000 and 12,000 or 13,000 feet. *Senecio chrysactis*, a graceful plant 3–4 feet in height, reaches the limit of pines on all four of the loftiest summits, rising somewhat higher, seemingly, than *S. Galeottii.*

These yellow "asters," with the tall lupine, form a compact undergrowth to the upland pines, especially where the latter have been in one way or another thinned into groves, leaving patches of open country in their midst. In such localities the vegetation is truly luxuriant, and the eye is charmed by the brilliancy of color which is everywhere manifest. The horseman traverses a flowering prairie with his animal buried to its flanks in the rank growth ; on Popocatepetl, more particularly, is this the case. Above 13,000 feet we found the greatest number of species in flower on Ixtaccihuatl. Here, immediately about our night's camping ground, at an elevation of approximately 13,200 feet, we found a veritable garden. The ground was decked with a profusion of the blood-red *Castilleja Tolucensis*, the carmine *Echeverria gibbiflora* (or *E. secunda?*) and the yellow *Ageratum arbutifolium*, while from the rock-fissures protruded tufts of *Asplenium trichomanes* (var. *majus*)—the only fern we were fortunate enough to secure for our collections—and partially concealed masses of *Chionolæna lavandula*, *Phacelia pimpinelloides*, etc. The moisture which here accumulates from the melting snows combines with a favorable position and exposure to sunlight towards a specially luxuriant growth. At the base of the boulder mass which marks the last stage in the ascent of the Nevado de Toluca—consequently at an altitude of 14,200 feet—we found the ground similarly carpeted with flowers, noticeably so with clumps of *Castilleja Tolucensis*, but at this elevation the general aspect of the region was far less cheerful and inviting than on Ixtaccihuatl. There was little or no grass or moss, and the Castillejas and Echeverrias merely occupied sand spots between the lichen-covered rock débris. The last flowers to disappear on Orizaba, so far as our own observations extended, were the *Castilleja*, already mentioned, and a *Draba* (*D. arctoides* or *D. Popocatepetlensis*), both of which follow close to the snow line, or very nearly to 15,000 feet—possibly even above this point. The last-named plant was also found on Popocatepetl and Ixtaccihuatl, but at a somewhat lower level (13,000–13,200 feet).

* I have no doubt that the eastern face of Orizaba—the side from which Liebmann and Galeotti made their ascents—is much more prolific in plant life than the one turned towards the dry and dusty table-land (the side of San Andres Chalchicomula), whence our party scaled the summit.

Among the more distinctive vegetal features of the lower volcanic slopes may be cited the dense bushes or thickets of *Arbutus spinulosa* and (the rigid) *Symphoricarpus microphyllus,* which border the rough mule-ways for long distances at (approximately) the 11,000 foot level, characterizing there a partial zone of their own. We found the ericaceous plants particularly abundant on Popocatepetl. With them is associated the magnificent red-flowering honeysuckle (*Lonicera filosa*), a stately plant 4–6 feet in height, which is certainly one of the most attractive growths of the region. To this zone succeeds a belt of composites, characterized by a special development of *Baccharis concava* and *Erigeron maximus.* It need hardly be said that the zonal lines—if, indeed, they are really worthy of such characterization—are not well differentiated; the plants of different belts mix in well with one another, so that everywhere there is considerable overlap. Nor do the same plants always occupy the same positions on the different mountains. Still, an approximation to zonal separation is to an extent manifest, especially where the maximal development of any series of plants is reached.

One of the most beautiful plants of the roadside, most abundant, perhaps, between 11,000 and 12,000 feet, is a pink evening primrose (probably *Œnothera tetraptera)* with flowers somewhat smaller than those of a rose; the plant can, indeed, be appropriately designated the "alpine rose" of the Mexican mountains, as it is not unlike in general appearance a wild rose, though provided with only four petals. Its showy blossoms constitute one of the glories of the mountain roadways, but it is not entirely absent from favored open spots of the lower regions. We met with the plant abundantly in the meadows about Patzcuaro, at an elevation barely exceeding 7000 feet. Here it was associated with *Jussieua repens, Cuphea procumbens, Sisyrinchium micranthum* (?), *Baccharis conferta,* etc.

The preponderating element in the upper Mexican flora is made up of forms which distinctly represent the temperate and Arctic regions, and not of modifications (suited to a more rigorous climate) of the lower or basal floras of the same region. This is the condition which is found to characterize the high mountain floras of tropical regions generally, as distinguished from those of temperate climes, and for reasons which have been well pointed out by Engler in his exhaustive treatment on the development of the vegetable world.* Most of the Mexican plants occurring above 10,000 feet, while they are to a very great extent congeneric with the forms of temperate North America, are specifically almost wholly distinct. Indeed, the relationship with the plants of the much more distant Andean summits, so far as the recurrence of identical specific forms is concerned, appears to be considerably more intimate than it is with the forms belonging to the north. The reason for this is to me at the present time entirely conjectural.

* "Versuch einer Entwickelungsgeschichte der Pflanzenwelt," ii, 1882.

The following species are found on the Andean summits from New Grenada to Peru or Bolivia :

Ranunculus Peruvianus.
Sisymbrium canescens.
Cerastium Andinum.
Arenaria alsinoides.
Colobanthus Quitensis.
Trifolium amabile.
Alchemilla orbiculata.
" Sibbaldiæfolia.
" tripartita.
" hirsuta.
Acæna elongata.
Ottoa œnanthoides.
Tauschia nudicaulis.
Lobelia nana.
Halenia elata.
Saracha umbellata.
Mimulus glabratus.
Veronica serpyllifolia.
Alnus acuminata.
" Jorullensis.
Sisyrinchium scabrum.

—about ten per cent. of the entire flora. In view of the distance which separates the two regions—some 900 to 2400 miles—this is, after all, not such a small number ; indeed, the wonder is rather that so many alpine forms should have found it possible, in the region of the tropics, to cross the depression of the Isthmus of Panama.

Observations on the Chinantec Language of Mexico.

By Daniel G. Brinton, M.D.

(*Read before the American Philosophical Society, January 15, 1892.*)

Name.—The folk-name *Chinanteca*, plural of *chinantecatl*, is a word in the Nahuatl language meaning, "inhabitants of Chinantla," which latter signifies a spot enclosed by cane hedges or palisades. By extension, the common term for "village" was *chinamitl*, as they were usually protected by such light defenses. The Chinantecs, therefore, as a nation, are known to us only by the name applied by their neighbors, the Aztecs, to their chief town.

The assertion of Orozco y Berra that they were also called *Tenez* arose from a misunderstanding of the letter of Hernando de Barrientos to Hernando Cortes (1521). Barrientos was not among the Chinantecs proper, but in another *chinamitl* in Chiapas.* Still other *Chinanteca* are mentioned as resident in Nicaragua. This Nahuatl word has absolutely no ethnographic significance.

Several authors have confounded these Chinanteca with the "Tzinacanteca," or Bat-people, a Maya tribe in Tabasco and Chiapas. The two are nowise related.

Location.—Their country was located in the mountains of the eastern portion of the State of Oaxaca and on the frontiers of the present State of Vera Cruz. Their neighbors on the north and east were Nahuatl-speaking tribes, on the south the Zapotecs and Mistecs, and on the west the Mazatecs and Cuicatecs, the latter supposed to be a distant branch of the Zapotec stock. Within these boundaries was a wide variety of climate, ranging from the torrid vales of the *tierra caliente* up to the chilly regions of the high sierra, where we find one of their villages with the significant name "Holy Mary amid the Snows," Santa Maria de las Nieves. The village of Chinantla itself is situated in a wild and mountainous district where the climate is cool and rainy.† Orozco y Berra gives the names of thirty-four other towns inhabited by them.

History.—The Chinantecs are an extremely ancient people who have resided on the spot where the Spaniards found them from the earliest period of the traditional history of Mexico. We first hear of them as having been conquered by Ahuitzotzin, ruler of Mexico. This event according to the chronology of Torquemada, who is our authority for it,‡ took place in the year 1488.

They were treated by their conquerors with the utmost severity and cruelty, of which the historian Herrera cites several instances.§ They were glad, therefore, on the appearance of the Spaniards to throw off the yoke of the Mexicans and lend their aid to the invading strangers.

Culture.—The Chinantecs are described as a rude savage people, living in huts constructed of branches of trees, and devoid of the culture of their neighbors on either hand, the Zapotecs or the

* See the letter of Barrientos in the *Cartas y Relaciones de Hernando Cortes.* Edition of Don Pedro de Gayangos, Paris, 1866, pp. 204, 205 and notes.

† E. Mühlenpfordt, *Mexiko*, Bd. ii, s. 214.

‡ Juan de Torquemada, *Monarquia Indiana*, Lib. ii, cap. lxiii.

§ *Historia de las Indias*, Dec. iii, Lib. iii, cap. xv.

Nahuas. Their principal weapon is said to have been lances of unusual length which they handled with singular dexterity.

Literature.—The first to reduce the Chinantec language to writing was Brother Francisco Saravia. He was a native of Seville, in Spain; by trade a cabinetmaker, in that capacity he emigrated to the City of Mexico, where he married and carried on a prosperous business. The death of his wife, when he was about thirty-five years of age, led him to renounce the world, and in 1574 he joined the order of Dominicans. Having been assigned to the province of Oaxaca, he devoted himself to studying the language of the Chinantecs, and in collecting them from the caves and ravines in which they lived into villages where they could cultivate the soil. His success was great, and the natives regarded him with equal love and reverence. For fifty years of his long life he labored among them, and when he died in 1630, at the ripe age of a nonagenarian, he left in the archives of his order a number of MSS. in and upon the language. Of these we have the titles of a *Catecismo*, an *Arte*, a *Confesionario* and *Sermones*. Probably the most important was his *Gran Homilario Chinanteco*, a copy of which he placed in every one of the parishes under his care, so that the native sacristan could read the homily when the priest should be prevented from attending. More interesting to the historian doubtless was his autobiographical sketch of the tribe written under the title *Noticia de la Conversion de la Nacion Chinanteca y sucesos acaecidos en ella al Autor.*

I do not know of a single copy of any of Saravia's writings; and what is more remarkable, Father Nicholas de la Barreda, who precisely one hundred years after Saravia's death printed in Mexico the only known book in the language, had never even heard of his predecessor's labors, and states specifically in his Prologue that he had not found so much as a word written or printed in this tongue.

Barreda himself is said to have been a native of Oaxaca, and began his missionary work among the Chinantecs about 1708. For a score of years he had been cura of San Pedro de Yolos, when his book appeared—*Doctrina Christiana en Lengua Chinanteca* (4to, Mexico, 1730). Of this only two copies are known to be extant, from one of which I possess a careful MS. copy by the hand of the late Dr. C. Hermann Berendt. This learned Americanist had commenced a study of the tongue, and left a few notes upon it, which have also been of some service to me, although they are quite fragmentary.

The tongue is not included in Pimentel's *Cuadro Descriptivo de las Lenguas Indigenas de Mexico*, and there is no specimen of it accessible to students of linguistics. It appears, therefore, worth while to present a short description of its character; the more so as this seems different from many American tongues on account of the singular simplicity of its construction. In fact, I entertain some doubts whether Barreda's version represents correctly the idiom in its pure form. It certainly reveals no such difficulties as he speaks of, and resembles strongly a jargon in which inflections and syntactic relations have been reduced to their lowest terms. Several of the translations of the early missionaries have proved, on examination, to be in a jargon or trade language of a tribe, and not in its real speech. This may be the case here.

The Language.—The Chinantec tongue appears to have no affinity with any of its neighbors. It is described as guttural, rough in enunciation and difficult to learn. Barreda says in his Prologue that many of the priests assigned to parishes in the nation tried in vain to acquire it, and, failing in this, attempted to introduce the Nahuatl among the Chinantecs; and that this proving a failure, had asked for other fields of labor. He himself, after twenty years of study, had succeeded but moderately in mastering it, but adds that he had exercised the utmost care in translating the *Doctrina*, submitting every word in it to the most intelligent natives of his parish. The dialect he employed was that of Yolos, which differed, but not greatly, from that of other portions of the nation.

The pronouns are but slightly developed—a fact in marked contrast to most American tongues. The same form serves for both the personal and the possessive pronouns, and it is probable that there is no distinction between their singular and plural number, although a slight difference is sometimes indicated.

PRONOMINAL FORMS—PERSONAL AND POSSESSIVE.

I,	*na.*	We,	*nah.*
Thou,	*no.*	You,	*no.*
He,	*quia.*	They,	*quiaha.*

It is noteworthy that the pronoun of the third person, *quia*, may be used for either the second or the first in its possessive sense; thus, *vi chaaqui quia*, "for his sins," instead of *vi chaaqui na*, as a translation of "for my sins." So again, *animas quia*, as a translation of "our souls." This is analogous to the language of children, who do not clearly distinguish persons, and often refer to themselves in forms of the third person instead of the first.

The interrogative is *he*, which also serves as a relative, and with the addition of the adverb of place, *la*, here, forms the demonstrative, *hela*, this, as *hela cna in*, "this first one." The demonstrative "that" is usually given by *da* or *nda*.

The indefinite pronoun *cha*, some, some one, somebody, is frequently prefixed, often apparently in a collective or distinctive sense, as *chañuh*, "some man" or men, *i. e.*, people in general; *charuhno*, "thy neighbor;" *chazaquiun*, "somebody bad"—the devil; *chajhian*, "somebody else."

In all cases the possessive pronouns are suffixed to the nouns.

The verbal forms appear to vary considerably. A terminal *e* or *a* appears to mark the infinitive, as *pane*, to chastise; *ngueihna*, to kill. The imperative is characterized by the pronoun, as

Phua ha cala phua na.
Say thou as say I.

The reflexive has the pronoun before and after the verb:

Na juanih na.
Me bow I.
(I bow myself.)

The interrogative form is thus:

Cale cuihno ñuh quiaha?
Didst know thou man her?
(Didst thou know her husband?)

Ca-cuim-ba-na.
I did know him.

In these sentences *ca* is the sign of the preterit, as again in the following sentence:

Ma ca-mea testamento ñuh u?
Did thy father make a will?

Where the present form of the verb is *mea*, to make.

Prepositions.

The prepositions are properly such, being prefixed to the nouns, and separated from them.

In, *no;* as, *no toho,* "in the belly;" *no caliz,* "in the calix" (sacred cup); *no chaaqui,* "in sin."

On, *ni;* as, *ni altar,* "on the altar;" *ni muicui la,* "on this world."

Into, *lei;* as *hiñi lei gotan tan vino lei muian,* "(the) bread into flesh and (the) wine into blood."

Before, in the presence of, *quiani;* as *quiani jhian quecha,* "before other persons." Before, in time, *gean.*

After, in time, *quêin.*

Conjunctions.

And, *tan.*

Also, *jalabajna;* as, *jalabajna na ñina,* "also I am poor."

Numerals.

	Cardinals.	*Ordinals.*
1	*cna,*	*hela cna in.*
2	*tno,*	*hela tno in.*
3	*nne, nei,*	*hela nne in.*
4	*quiu,*	*hela quıu in.*
5	*ña,*	*hela ña in.*
6	*ñiu,*	*hela ñiu in.*
7	*nyaa,*	*hela nyaa in.*
8	*ñna,*	*hela ñna in.*
9	*ñu,*	*hela ñu in.*
10	*nya,*	*hela nya in.*
20	*nyanya.*	
40	*tno laa.*	
50	*tno laa nya.*	
60	*nne la.*	
70	*nne la nya.*	
80	*quiu la.*	
100	*ña la.*	
200	*nya la.*	

Texts.

The Lord's Prayer.

Phui ñuhu nah ñujui quinno, qualin cuiá hela xi-no; quœhe
Lord father our heaven it in, may blessed that name-thy; come
nah ñujui quiehe; quali heli hahà muycuila, jalabajna ñujui; quœhe
us heaven thy; may that will earth on, also heaven; give
hi nah chaháchahá, tan ih-no chaaqui quiee nah, can jhiala in nah
bread us all the time, and wilt-thou sins forgive us, just as we

chazaquiun quiani nah ; tan za ton-no nah qûehi vi chaaqui ; qui mi nah
sins pardon against us ; and not thou us bring to sin ; take us
phui Dios geila he zaquiu.
Lord God all this evil from.

Extract from the Doctrina of Barreda.

Porque se hizo hombre el hijo de Dios ?	He vi caleñuhne Jna Dios ?
Por librarnos de los manos del Demonio, y por redimir nos del pecado.	Vi caquinne nah quaacha lin, tan vi caquinne nah ni chaa qui.
Que hizo Nuestro Señor Jesu-Christo para librarnos ?	He camea phui nah Jesu Christo, vi caquinne nah ?
Padeció muchos tormentos, fué crucificado, murió y fué sepultado.	Cangûinne ñule Juahui, cajanqua ni cruce, cajone, can cahanne.
Que hizo nuestro Señor Jesu-Christo despues que murió ?	He camea phuinah Jesu Christo, qua male jonne ?
Al tercero dia despues que murió, rescûscitó, y á las quarenta dias despues que resuscitó subió á los cielos y se sentó á la mano diestra de Dios padre todo poderoso.	Nne mui qua male jonne, cagnihi, tan tno la mui qua male cagnihi cangaa na ñujui, tan cahuiaà quaa cha Dios mii geilaha li mea.
Viendrá otra vez nuestro Señor Jesu-Christo á este mundo ?	Nijhea que tno phui nah Jesu Christo, mui cuila ?
Otra vez hà de venir quando se acabe el mundo, á tomar cuenta á todos los vivos y muertos para darles el cielo para siempre á todos los que guardaron bien sus mandamientos; y á los que no los guardaron bien, les dará para siempre penas en el infierno.	Cna que, nijhea mui cha in mui cui, jhea quià quenta geilan cha xan, tan cha jon, cha queh ñujui geila muiba geilan cha ca hah quiu mandamiento quiaha ; tan hi chaza cahah quiu, queh geila muiba juahui nya jui.
Como murió nuestro Señor Jesu Christo ?	Ihiala cajonne phui nah Jesu Christo ?
Murió como hombre ; no murió como Dios; porque Dios no puede morir.	Cajonne calan cha, aza cajonne calan Dios, chavi Dios aza li jonne.
Si Dios no puede morir, como murió nuestro Señor Jesu Christo ?	Ze Dios aza li jonne, ihiala ca jonne phui nah Jesu Christo ?
Aunque nuestro Señor Jesu Christo era Dios, era tambien hombre, y asi pudó morir como hombre, y no pudó como Dios ; porque Dios nunca puede morir.	Gni cu jua phui nah Jesu Christo yha Dios, ja hala jna yba ñuhne; vihe jna le jonne calan chañu, tan aza li jonne calan Dios ; chavi Dios aza li jonne jua lei que.

Quando muere la gente en este mundo, tambien mueron sus almas?

Ma jonnencha muicuila, jabala jna jon anima quiaha?

No mueron sus almas, sinó solamente el cuerpo muere; porque no puede morir el alma.

Aza jon anima quiaha, ma jna la ha gotamba jonne; vi aza li jon anima.

Y cuando muere el cuerpo, muere para siempre?

Tan ma jonne gotan, jonne cnaphue?

No puede morir para siempre, porque el dia que se acabe el mundo, resuscitaran todos los cuerpos, y se juntaron con sus almas, ya para nunca mas morir.

Aza li jonne cnaphue geila muiba, vi quiaha mui cha in muicui, jna tno nigni cala geila gotan, tan nigni cnaha animas quiaha, vi aza jua cna li jonne.

Adonde van las animas de los defuntos quando mueren sus cuerpos?

Jhia cha animas cha jon ma jonne gotan quiaha?

Las animas de los buenos van al cielo para siempre, porque guardaron bien lo que manda la ley de Dios; y las almas de los malos van al infierno, porque no guardaron bien lo que manda la ley de Dios.

Animas chaqui vn cha ñu jui geila muiba, chavi hah quiu he quiu hu tà ju quiaha Dios; tan animas cha zaquiun cha nya jui, chavi za hah quiu he quiu hutà ju quiaha Dios.

* * * * *

Que es cielo?

He ñu jui?

Cielo es un lugar lleno de mucho y grande gloria; lleno de todo genero de bienes, y de todo genero de alegria, en donde está Dios nuestro Señor, la Santissima Virgen, todos los Angeles y todos los Santos. Allí van las almas de los buenos que sirvieron à Dios à descansar para siempre, que nunca se podrá acabar.

Nujui cna namba, canlè ñu phueli gloria, canlè cala geila juayanchij, thia nhuiaa phui nah Dios, xa ñujui, geilan angeles, tan geilan santos. Nda cha animas chaquiun, cha camea ta quiaha Dios, ma hine cala geila muiba, aza jua li chan.

English-Chinantec Vocabulary.

Alive, *chaxan*.

All, *geila, geilan, lagei; geila hejna*, "all these things;" *geila balimea*, "all-powerful."

And, conj., *tan*.

Bad, *azaquiu, zaquiu, chaaquiu* (= not good).

Because, *chavi*.

Believe, to, *changa*.

Belly, *toho;* "in the belly of the virgin," *ño toho xa muinne*.

Bird, *ta*.

Blood, *muian, muien;* "by the blood," *muien no* (*mui* = water and woman).

Body, *gotan;* "in body and soul," *gotan tan anima quiaha*.

Boy, *quana*.

Bread, *hiñi.*
Breast, *chij.*
Brother, *run.*
Child, *yun.*
Day, *muiba.*
Dead, *ma-jon, cha-jon.*
Devil, *zaquiun* (see "bad"); *chalin* (see "sick").
Die, to, *jon-ne.*
Drink, to, *nguhu.*
Ear, (*la*)*quaha.*
Earth, *muycui.*
Eat, to, *cuhu.*
Eye, *manihi.*
False, a lie, *azacha* (= not true).
Father, *ñuh* (= man); *mii; Dios mii,* "God the Father."
Fire, *gêi.*
Foot, *tehi.*
Full, *canlé.*
Girl, *mui yun* (= female child).
Give, to, *quæ, quæ he.*
Good, *quiu.*
Grandfather, *nyuh.*
Grandmother, *nyaa.*
Great, *phue;* superlative, *ñu phueli.*
Hand, *quaha;* "open thy hands," *janquaha!* "In thy hands I place my soul," *nquaha na animaquia.*
Head, *gui;* "throw water on the head of the child," *yaha mui ni gui yun.*
Heart, *haha.*
Heaven, *ñujui, nahui.*
Hell, *nyajui.*
Herb, *ha.*
House, *nu.*
How, *jhiala, cala;* how long, *ja mui.*
Husband, *ñuquia* (= consecrated man, *i. e.*, by the Church).
If, *se.*
Infant, *chimina.*
Join, to, *cun* (= to marry).
Know, to (saber), *ñih.*
Know, to (conocer), *cuih.*
Kill, to, *ngueihna.*
Live, to, *xan.*
Magician, *gin.*
Make, to (Span. hacer), *mea.*
Man, *ñuh. cha-nu*
Meat, flesh, *gno.*
Money, *cu.*
Month, *zei.*
Moon, *zei.*
Mother, *xa, xaha.*
Mountain, hill, *maa.*
Much, *ñu, ñule.*
Name, *xi; hi xi no?* "What (is) thy name?"
Nephew, niece, *nyaa.*
No, *aza, za.*
Nothing, *aza-he.*
Now, *na.*
Or, *qua.*
Pay, to, *qui-hi, quei.*
Place, *namba.*
Poor, *ñin, ñina.*
Pudenda feminæ, *yuh.*
Pudenda viri, *cnu.*
Relation, a, *ruh, run* (= brother).
Shoulder, *cà.*
Sick, *chah.*
Sin, *chaaqui.*
Small, little, *miha.*
Son, *jna.*
Soon, *naba.*
Speak, to, *phua.*
Steal, to, *êehi.*
Stick, wood, *ma.*
Stone, *cnu.*
Sun, *mañui.*
Tears, *mui nii* (= water, eyes).
Town, *jui.*
True, *cha.*
Uncle, aunt, *heaya.*
Virgin, *muinne* (v. woman).
Water, *mui.*
When, *ma.*
Where, *jhia.*
Wife, *muiquia* (see "husband").

With, *enaha.*
Wizard, *lan.*
Woman, *mui, cha-mui.*
Word, *ju; cna ju,* "one word"
Work, to, *ta.*
Year, *gni.*
Yes, *xa, jna, ma* (*iba* = it is).

On the Mazatec Language of Mexico and its Affinities.

By Daniel G. Brinton, M.D.

(*Read before the American Philosophical Society, January 15, 1892.*)

In the northeastern corner of the State of Oaxaca lies a mountainous tract, watered by numerous streams, known from earliest times by its Aztec name *Teutitlan,* the Divine Land, or The Land of the Gods, and officially now as the district Teutitlan del Camino. It has about 26,000 inhabitants, a large proportion of whom are of native blood. These speak three radically different languages—the Cuicatec, which is probably a dialect of the Zapotecan stock; the Chinantec, which stands alone, and the Mazatec, of which nothing whatever has been known, and which it is my aim to examine and, if possible, classify in the present study.

The material I have for the purpose is an unpublished vocabulary, collected by a Danish officer, who was in the service of Maximilian, and which has been obligingly furnished me by Mr. Alphonse Pinart, whose extensive researches in American linguistics are well known. The only published materials in existence are two translations of the Lord's Prayer into different dialects of the tongue. These have been reprinted by Pimentel, Bancroft and other writers. Their precise provenance is unknown; as for the vocabulary, it was obtained at Huantla, northeast of the town of Teutitlan.

Names.—The name Mazatecatl—plural, Mazateca—means "Deer People" in the Aztec or Nahuatl language. It may have been given them by their Nahuatl neighbors on account of their land abounding in deer; or, as some say, because they worshiped the figure of a deer—that is, had a deer totem among them. There were other Mazatecas living in the present State of Tabasco, and yet others in the State of Guerrero; but we have no reason to suppose that those "Deer Peoples" were at all related to these in Teutitlan. What they called themselves, if they had a collective tribal name, we do not know.

Nor is it certain why their country was referred to by the Aztecs as "The Land of the Gods." It seems likely that it was on account of the numerous temples that existed there, and the unusually devotional character of the natives. The remains of these ancient religious structures and of the artificial mounds which supported them still bear witness to this, and two of their villages yet bear the names San Antonio de los Cues and San Juan de los Cues, the term *cues* (a Haytian word) being applied by the Spaniards to artificial mounds. The former is situated in the valley of the Rio Salado; the latter in an adjacent valley. Unfortunately, no archæological exploration of them has been reported.*

Their religious character is also referred to by the early Spanish writers. Sahagun describes them as performing remarkable tricks at certain festivals, such as swallowing live snakes and frogs.† Mendieta speaks of their rigid fasts and abstinence from marital relations for fifteen days after the nuptials. The historian Herrera gives the following description of some of their rites:

"In the Province of Teutitlan, where the Mazatec language is spoken, which adjoined that of the Mistecs, they were accustomed to flay the sacrificial victims, and carried the skins to the neighboring villages, asking alms. On the day of a certain important festival, which took place annually, the priests ascended the temple and struck a war drum. At this signal all the Indians who were in the fields had to run to their houses and their town. Then those who had carried the skins of the victims sallied forth and ran about the country till midday, and whenever they caught a person they cut his hair so as to form a sort of crown around his head, and such persons were destined to be sacrificed within one year." ‡

According to Aztec mythology—which is very rarely to be regarded as historical—the natives of Teutitlan were descended from Xelhua, the oldest of the six sons of Iztac Mixcohuatl and his wife, Ilancuey, the venerable pair who dwelt in and ruled the mysterious northern Land of the Seven Caves, called in Nahuatl Chicomoztoc.§

* Another Teotitlan—"Teotitlan del Valle"—is found in Oaxaca. It was so called from the temple of a famous divinity, which was erected on the summit of a high rock near by. This was the goal of numerous pilgrims, and, according to Señor J. B. Carriedo, "fué uno de los santuarios de mas estima y de mas nombre en la gentilidad." *Estudios Historicos del Estado Oaxaqueño.* Tom. i, pp. 15, 16.

† *Historia de Nueva España.* Lib. ii, Apendice.

‡ *Historia de las Indias Occidentales*, Dec. iii, Lib. iii, cap. 15.

§ Mendieta, *Historia Eclesiastica Indiana*, Lib. ii, cap. 33.

This Xelhua was a mighty man—one of the "Giants,"—and was surnamed the Builder, for he it was who constructed the famous Pyramid of Cholula. He is also referred to as chief of the Olmeca, an unknown, ancient people.

We need attach little importance to these old stories, and will find it more profitable to turn to the language of the Mazatecas to discover their affiliations.

In investigating its possible analogies with other idioms, I have been somewhat surprised at the relationships which it certainly discloses. These are not with the Zapotec-Mixtec stock, as I have (erroneously) stated in my work, *The American Race*,* but with two quite remote and independent stocks.

The one of these is the Chapanec, which was spoken in the present State of Chiapas, and also at the time of the conquest by many thousand natives, who occupied the shores of Lake Managua and Fonseca Bay, in Nicaragua, where they were known as Mangues and Orotinans. The dialects of this stock are closely akin to each other.

The second list of affinities point to a still more remote and unexpected relationship. The Mangues had as neighbors beyond the Cordilleras, in Costa Rica, a group of related tribes—the Talamancas, Borucas, Bribris, Vizeitas, etc., whom I shall call, collectively, "Costa Rican." These have been satisfactorily shown by Dr. Max Uhle, Dr. A. Ernst and other students to be not distantly connected with the important Chibcha stem of New Granada, which, at the conquest, was widely extended over that Province, and is the only linguistic stock of South America whose presence in North America has been proved.†

After presenting the vocabulary furnished me by Mr. Pinart and the texts offered by Pimentel I shall pursue the comparisons of the stock of terms thus supplied.

English–Mazatecan Vocabulary.

Arm, ***chale.***
Bad, ***minda.***
Banana, ***nacha'.***
Beans, ***nahma'.***
Beard, ***tza' á.***
Black, ***twna.***
Blue, ***iso.***
Boy, ***indidi*** (see "Son").
Bread, ***chu hi.***
Breast (chest), ***animale.***

* *The American Race: A Linguistic Classification and Ethnographic Description of the Native Tribes of North and South America*, p. 142 (New York, 1891).

† See *The American Race*, pp. 184-186.

Brown, *schene'*.
Cactus, *nan' da*.
Cat, a, *chito*.
Chief, *chicunai*.
Church, *inai*.
Clothing, *nikye*.
Clouds, *ifi*.
Cow, *ngchaha'*.
Daughter, *tzadi* (see "Girl").
Day, *gunichi*.
Dead, *coviu*.
Die, to, *cuiyane*.
Dog, *nanya*.
Door, *chutoa*.
Ear, *schical*.
Earth, *nangi*.
Egg, *cho'*.
Evening, *gischo*.
Eye, *schca*.
Eyebrows, *tza ixpan* (?).
Father, *tata*.
Finger, *noon-tza* (see "Hand").
Fire, *nii*.
Foot, *tzócó*.
Forehead, *ten*.
Girl, *tzadi*.
God, *naina'*.
Gold, *naleto*.
Good, *dani*.
Green, *tzare'*.
Hall, *tzinayo*.
Hair, *coshe'*.
Hand, *tza*.
Hat, *tzingye*.
Head, *tku*.
Heaven, *gami*.
Here, *ihndi*.
Hill, *nindo*.
Iron, *quicha*.
Large, *tsea*.
Leaf, *schcatiya* (= ear-tree).
Light, *ase'*.
Lightning, *kuata*.
Lungs, *nyesi*.
Maize, *name'*.
Man, *chii*.
Meat, *yoje*.
Money, *to*.
Moon, *sa*.
Morning, *tanhya*.
Mouth, *tzoa*.
Night, *nhyu*.
Nose, *nitu*.
Onion, *tatzo*.
Palm, *schahe'*.
Paper, *schuhu'*.
Plantain, *nacha'*.
Plaza, *titzi*.
Pretty, *da*.
Rain, *tzi*.
Red, *ini*.
River, *dahoe*.
Road, *diya*.
Sea, *dachicu*.
Sheep, *chitzanga*.
Sierra, *gihya*.
Silver, *tonschua*.
Small, *tua*.
Snow, *dundya*.
Son, *indi* (see "Boy").
Star, *ningutzea*.
Stone, *noyo*.
Summit, the, *garonindo*.
Sun, *sui*.
Teeth, *niiyu*.
There, *hani*.
Thigh, *chamila*.
Toe, *noontzoco* (see "Foot").
Tree, *iya*.
Tobacco, *nahnu*.
To-day, *gandai*.
Tomato, *chiti*.
Town, *naschananda*.
Turkey buzzard, *nikye*.
Ugly, *chiu*.
Water, *nanda*.
White, *chuhua*.
Wind, *to*.
Woman, *chu*.
Year, *guno*.
Yellow, *sine*.
Yesterday, *gohia*.

The personal pronouns are:

I, *gāa'*.	We, *gahi*.
Thou, *gahye'*.	You, *gahini*.
He, *he*.	They, *niahne'*.

Of the possessives I find the following:

Mine, *na*.	His, *le'*.
Thine, *li*.	Our, *nahan*.

The numerals are given thus:

1	*go'*.	8	*hi*.
2	*ho'*.	9	*nyaha'*.
3	*ha'*.	10	*te*.
4	*nihu'*.	11	*tengo*.
5	*ŭ*.	15	*chu*.
6	*hŭ'*.	20	*cung*.
7	*yato'*.	30	*kate*.

There are two versions of the Lord's Prayer given in Pimentel's *Cuadro Descriptivo de las Lenguas de Mexico*. They evidently have been made by different persons, and represent different dialects of the tongue, and apparently neither is in that of Huantla, where the vocabulary was obtained. Both, however, are clearly Mazatec, and the differences disappear considerably on analysis.

They are as follows:

A.

"*Nadmina naina ga tecni gahami; sandumi ili gatirrubanajin nanguili; cuaha catama janimali, jacunit dic nangui cunit gahami; niño rrajinna tey quitaha najin: qntedchatahanajin gadchidtonajin jacunitgajin nedchata alejin chidtaga tedtunajin: guquimittacuntuajin, tued tinajin cuacha catama.*"

B.

"*Tata nahan, xi nacá nihaseno: chacua catoma ñiere: catichová rico manimajin: catoma cuazuare, donjara batoó cornangui, bateco nihasen: niotisla najin ri ganeihinixtin, tiuto najin dehi: ni canuhi ri guitenajin donjara batoo, juirin ni canojin ri quiteisajin: quiniquenahi najin ri danjin quisanda nongo niqueste Meé.*"

Referring to the first as A and the second as B we may make the following comparisons with words in the Vocabulary:

	A.	B.	Vocab.
Our,	*naina,*	*nahan,*	*nahan.*
Father,	*nadmina,*	*tata,*	*nami* ("cura").
Thou,	*ga,*	*nacá,*	*gahyé.*
Heaven,	*gahami,*	*nihaseno,*	*gami.*
Earth,	*nangui,*	*nangui,*	*nangi.*
Kingdom (thy),	*janima-li,*	*manima-jin.*	
Give (thou),	*niño,*	*nio-tisla.*	
To-day,		*ganei,*	*gandai.*
Us (= to us, of us),	*najin,*	*najin.*	

Turning now to an investigation of the affinities of the Mazatecan, I present the following arrangement of a number of words, with their corresponding terms, in dialects either of the Chapanecan or Chibchan stock. It is noteworthy that very rarely do we find any word which is at all alike in the three. The Mazatecan terms seem to have been derived from two sources radically dissimilar.

Comparison of the Mazatec with the Chapanecan and Chibchan Stocks.

			Chibchan.	
	Mazatec.	Chapanecan.	Costa Rican.	New Granadian.
Arm,	*chale,*	*goloa, ghulua.*		
Banana,	*nacha,*	*noko-tona.*		
Black,	*tuna,*		*turinat,*	*funza.*
Blue,	*iso,*		*dsähe, siona.*	
Breast,	*animale,*		*aniermi, V.*	
Cat,	*chito,*	*txitu.*		
Chief,	*chicunu,*			*chiquy* (priest).
Dead,	*coviu,*	*coijme.*		
Die, to,	*cui-yane,*	*hui.*		
Dog,	*nanya,*	*nombi.*		
Ear,	*schical,*		*sekuke, ikuaga,*	*quhyca.*
Eye,	*scheu,*		*ocua, s'ócvo,*	*upcua.*
Fire,	*nií,*	*nio.*		
Flesh,	*yoje,*	*nbohoui.*		
Foot,	*tsoco,*		*tsuku-nukue, V.*	
Good,	*daní,*	*pami, game.*		
Hair,	*coshé,*		*schá,*	*quyhé.*

			Chibchan.	
	Mazatec.	Chapanecan.	Costa Rican.	New Granadian.
Hand,	*tza,*			*yta.*
Head,	*tku,*	*θokua.*		
Here,	*ihndi,*	*jande.*		
Hill,	*nindo,*	*ndili.*		
Hilltop,	*garomindo,*	*namando.*		
Lightning,	*kuata,*	*koita-pumene.* (thunder)		
Maize,	*nama,*	*name.*		
Man,	*chii,*		*hechiche.*	
Money,	*to,*	*tu-mi.*		
Moon,	*sa,*		*sõ, sie,*	*za* (night).
Mouth,	*tzoa,*	*duũi.*		
Mountain,	*gihya,*	*gua.*		
Night,	*nhyu,*	*nyufui.*		
Nose,	*nitu,*	*nyungu.*		
Rain,	*tzi,*			*siu.*
Red,	*ini,*		*bets-ena, serir-ine.*	
River,	*dahoe,*	*nãju.*		
Road,	*diya,*	*nila.*		
Sea,	*dachicu,*		*deche, dechequ-in.*	
Small,	*tua,*		*txoua-pa, T.*	
Star,	*ningutzea,*	*najuiti.*		
Stone,	*noyo,*	*nyugu, noca.*		
Sun,	*sui,*		*chui,*	*sua.*
Teeth,	*niiyu,*	*niji.*		
There,	*hani,*	*ti-ha.*		
Tree,	*iya,*	*nya.*		
Turkey buzzard,	*nikye,*	*nekatu.*		
Water,	*nanda,* (stream)	*nanda.*		
White,	*chuhua,*		*suruna, suat.*	
Wind,	*to,*	*tiho.*		
Woman,	*chu,*		*soora,*	*sue, güi.*
Yellow,	*sine,*		*psi, shoin-ore.*	
I,	*gãá,*	*saho.*		
My,	*na,*	*nba.*		
One,	*gó,*	*ti-ghé, ticaó.*		
Two,	*hó,*	*haó.*		
Three,	*há,*	*haui.*		

I think that the above comparison will leave no doubt but that the Mazatec is affiliated with both these stocks. With regard to the Chapanecan, no other supposition will explain the substantial identity of the words for:

Fire,	*nii*	and	*nio.*
Water,	*nanda*	and	*nanda* (stream).
Maize,	*nama*	and	*name.*
Tree,	*iya*	and	*nya.*
Lightning,	*kuata*	and	*koita.*
Night,	*nhyu*	and	*nyu-fui.*
Teeth,	*niyu*	and	*niji.*
Stone,	*noyo*	and	*nyugu.*
Cat,	*chito*	and	*txitu.*
Here,	*ihndi*	and	*jande.*
One,	*gó*	and	*ticaó.*
Two,	*hó*	and	*hăó.*
Three,	*há*	and	*háui.*

Not less positive are the identities of the following words of the Mazatecan and Chibchan (Costa Rican) groups:

Sun,	*sui*	with	*chui* or *sua.*
Moon,	*sa*	with	*só, sie* (or *za*).
Ear,	*schical*	with	*quhyca, sehuke.*
Eye,	*schcu*	with	*s'ócvo, ócua.*
Hair,	*coshé*	with	*schá, quyhé.*
Man,	*chi*	with	*he-chi-che.*
Woman,	*chu*	with	*sue, gŭi.*
Rain,	*tzi*	with	*siu.*
Sea,	*dachicu*	with	*dechequ-in.*
Foot,	*tzoco*	with	*tsuku.*

The words for the colors white, black, blue, yellow and red show rather remote, but, perhaps, actual resemblances. They have no analogy whatever with the Chapanecan color terms.

The ethnographic conclusion to which this comparison would lead is that the Mazatecas do not constitute an independent stock, but a branch of the Chapanec group, which was at some early date of its history largely infiltrated with blood of the Costa Rican tribes of South American descent. This may have arisen from the adoption of some large band, which had migrated across the mountains separating Costa Rica from Nicaragua. The Mangue branch of the Chapanecs lived in Nicaragua, in immediate proximity to these mountains, and must have been in frequent relations with the tribes beyond them.

But how explain the extensive journey from Nicaragua to the northern limits of the State of Oaxaca? Here an ancient tradition of the Mangues comes to our aid. It was preserved by Father Remesal in his *History of Chiapas*, and runs to the effect that at a remote time a considerable number of the Mangues departed from the shores of Lake Managua and journeyed to the north, into the territory of the Zoques. Remesal construed this to explain the origin of the Chapanecs of Chiapas; but the traditions of the latter do not acknowledge this derivation, and it is probable that the Mangues referred to some other division of their community. This may well have been that which conveyed a mixed dialect of Mangue and Costa Rican as far as the northern borders of Oaxaca.

We have also early evidence that a band of the Mangues, numbering about four hundred souls, occupied a town in the midst of the Costa Rican tribes, in the valley of Guaymi, fronting on the Golfo Dolce. There they were found by the Spanish explorers in 1563.* Doubtless they absorbed more or less of the language of their rulers, the Guaymis; and the following identities between the Mazatecan and the Guaymi vocabularies (published by Mr. Pinart in the *Revue d' Ethnographie*, 1887) seem conclusive.

	MAZATECAN.	GUAYMI.
Sun,	*sui,*	*shui.*
Moon,	*sa,*	*so.*
Head,	*tku,*	*θokuą.*
Nose,	*nito,*	*nido-ñ.*

If these identifications are correct, they enable us to trace the influence of a South American linguistic stock as far into North America as the northern border of Oaxaca—a discovery full of significance for the history of the aboriginal culture of the central portion of the continent.

* Peralta, *Costa Rica, Nicarágua y Panama en el Siglo XVI*, p. 777 (Madrid, 1883).

On the Taxonomy of the Genus Emys, C. Duméril.

By Dr. G. Baur, Clark University, Worcester, Mass.

(*Read before the American Philosophical Society, January 1, 1892.*)

I have just read Prof. L. Vaillant's paper, "Sur la Signification taxinomique du Genre Emys, C. Duméril" ("Ann. Sc. Nat. Zool. et Pal.," vii^e série, Tome xii, No. 1, Paris, 1891, pp. 51–63). Prof. Vaillant attempts to show that the type of Emys is not *Emys orbicularis* L., as nearly generally admitted lately, but *Testudo picta* Schneider, now generally known under the name of *Chrysemys picta*, and I think he is correct in this. I am, however, unable to follow him in all his other conclusions. I should like to add first, that the name proposed by Brogniart in manuscript, before Duméril had used the French name, les Emydes, in 1804, had been "*Syrinx*." In Isidore Geoffroy-Saint-Hilair's paper on Trionyx, published in 1809, in "Ann. du Mus. d'Hist. Nat., Paris," Vol. xiv, I find the following note on page 3: "On lisoit dans le manuscrit demeuré au secrétariat de l'Institut jusqu'à la publication du volume des Savans étrangers le nom de *syrinx* au lieu de celui d'émyde, mais M. Duméril ayant depuis proposé ce dernier nom, M. Brogniart l'adopta lors de l'impression de son Mémoire."

Besides, I should like to state that the original paper of Brogniart, "Essai d'une classification naturelle des Reptiles," appeared for the first time in 1799, in the "Magazin encyclopédique, ou Journal des Sciences, des Lettres et des Arts," rédigé par A. L. Millin, Vol. vi, pp. 184–201, An. viii, 1799, and was reprinted in the "Bulletin des Sciences, par la Société Philomatique," No. 35, pp. 81, 82, Paris, Pluviose, an 8 de la République, and No. 36, pp. 89–91, pl. vi, Ventose, an 8 de la République (1800).

It was Michael Oppel * who, for the first time, used the fact already noticed by Schöpff, that in *Emys orbicularis* the front portion of the plastron is movable, to distinguish in the genus Emys three subdivisions.

"Subdivisiones secundum scriptores recentissimos.

"(*a*) Sterno antice mobili, *e.g.*, *Emys lutaria*.

"(*b*) Sterno cruciformi, *e.g.*, *E. serpentina*.

"(*c*) Collo longissimo, sub testam arcuate reflexa, non retractili, *e.g.*, *E. longicollis*."

E. serpentina was placed in a new genus, *Chelydra*, by Schweigger, in 1812 ("Königsberger Archiv für Naturwissenschaft und Mathematic," Vol. i, pp. 280, 292, 293, Königsberg, 1812), † and *E. longicollis* in the new genus *Chelodina*, by Fitzinger, in 1826. ‡

* Oppel, Michael, "Die Ordnungen, Familien und Gattungen der Reptilien," München, 1811, p. 11.

† This is the original publication.

‡ Fitzinger, L. T., "Neue Classification der Reptilien," Wien, 1826, p. 6.

Brogniart, who proposed the Latin name "Emydes" in 1805 for Duméril's French name "les Emydes," had given the following species as belonging to it: *E. ferox, E. rostrata, E. matamata, E. lutaria, E. pensylvanica, E. clausa.*

E. ferox and *E. rostrata* belong to *Trionyx* Geoffroy, 1809; *E. matamata* to *Chelus* Duméril, 1806; *Chelys* Oppel, 1811.

It was Merrem * who divided the remaining species of Emys into two groups.†

(*a*) *Emys*—

"Digiti distincti, unguibus acutis.
Rostrum corneum.
Sternum immobile."

* Merrem, Blasius, "Versuch eines Systems der Amphibien," Marburg, 1820, pp. 22, 27. Merrem places the *Testudo lutaria*, with the following synonyms: *Testudo lutaria* L., *T. orbicularis* (?) L., *T. europæa* Schneid., *T. caspica* Gmel, among his Emys, not knowing that in this form the anterior part of the plastron is movable.

† I have to say, however, that Rafinesque had already, five years before, reached the same conclusion in a book which is very rare, but of which my friend, Mr. S. Garman, has a copy. I have to thank Mr. Garman for copying for me the part relating to the Testudinata. The title of the book is "Analyse de la Nature ou Tableau de l'Univers et des corps organisés," Palerme, 1815. On page 75 we find:

"*Cryptephia.* Les Cryptephiens.

"Carapace inférieure à 1 ou 2 valves mobiles; enfermant les membres comme dans une boite.

"G. 3. *Cheliphus* R.; 4. *Uronyx* R.; 5. *Didicla* R.; 6. *Monoclida* R.

"*Emydania.* Les Emydiens.

"Carapace ni coriace, ni à valves mobiles, pieds à doigts libres ou palmés.

"G. 7. *Emyda* R., *Emys* Dum.; 8. *Chemelys* R.; 9. *Chelopus* R.; 10. *Chelyda* R., *Chelys* Dum.; 11. *Cheliurus* R."

Unfortunately Rafinesque did not give the names of any species with the new genera, nor did he give any characters. From a later paper, which was written in 1816, but not published before 1832, we receive some information by Rafinesque (Rafinesque, C. F., "Description of Two New Genera of Soft-shell Turtles of North America," *Atlantic Journal and Friend of Knowledge*, Vol. 1, No. 2, Philadelphia, summer of 1832, pp. 64, 65.

"*Cheliphus* Raf. Water turtles with valved shells, 5 claws and toes to all the feet.

"*Uronyx* Raf. An anterior valve to the shell, toes and claws 5 and 4, tail with a claw. *T. scorpioides*, etc.

"*Didicla* Raf. Bivalve lower shell, toes 5 and 4. Type *T. clausa, odorata*, etc.

"*Monoclida* Raf. Lower shell valvular anteriorly, toes 5 and 4. *T. retziana*, etc.

"*Chemelys* Raf. Warty scales, no valves, 4 toes to all the feet. *T. verrucosa*, etc.

"*Chelopus* Raf. No valve, toes not palmated 4 and 5. *T. punctata*, etc.

"*Cheliurus* Raf. No valves, feet palmated, a long scaly tail. *T. serpentina*, etc."

The group with movable valves, named Cryptephia by Rafinesque, contains, therefore, the genera *Sternothærus* = Cheliphus; *Cinosternum* = Uronyx = Monoclida; *Cistudo* = Didicla, part.

The group in which the valves are not movable, named *Emydania* by Rafinesque, contains the genera *Emys* = Emyda; *Clemmys* = Chemelys = Chelopus; *Chelydra* = Cheliurus.

(*b*) *Terrapene*—

"Digiti distincti, unguibus acutis.
Rostrum corneum.
Sterni lobo anteriore, aut utroque mobili."

Two years later, in 1822, Fleming established the genus *Cistuda** for the tortoises, in which the entrance to the cavity is formed by a lid. *Cistuda* is simply a synonym of Merrem's *Terrapene*, and has to be abandoned therefore.

In 1825, Gray† follows Merrem, adopting the genera Emys and Terrapene (written Terraphene); "*Cistuda* Say" is declared a synonym of *Terrapene*.

In the same year Bell ‡ published an important paper not mentioned by Prof. Vaillant, in which he shows that *T. europæa* Schneid. (*orbicularis* L.) has to be included in "*Terrapene* Merrem, *Cistuda* Say." He says of *T. orbicularis* L.: "On examining sometime since a shell of this species, the first I had seen, which had lost the sternum, I was struck with the appearance of the articular surface from which that part had been removed, and immediately concluded that it must belong to the present group, having a movable breastplate, notwithstanding Merrem, to whom belongs the credit of having separated the 'Box Tortoises' under his subgeneric division Terrapene, retains this species amongst his Emydes, the character of which, on contradistinction to *Terrapene*, is that the sternum is entire and fixed. On consulting Schöpff, I found that, with his usual accuracy, that author had mentioned the movable structure of the sternum, and subsequent observations have established my first conjecture that it belongs to this genus."

Now this leaves no doubt whatever that from 1825 the name Emys could not be applied to T. orbicularis L., but that this species belonged to Terrapene; and since Terrapene Merrem is the same as Oppel's subdivision, with Emys lutaria as type, this species, which is now known as E. orbicularis L., has to be considered the type of Terrapene.

Gray § follows Bell in 1831, but uses now the name *Cistuda* of Fleming, which he calls *Cistuda* Gray, not Cistudo as remarked by Prof. Vaillant.

* It is difficult to say whether this name *Cistuda* is a misprint or not. It could either stand for *Cistula*, from *cista*, the diminutivum of *cista*, which means a small box, or for *Cistudo*, formed in the same way as *Testudo* from *testa*. It seems that Duméril and Bibron introduced the name Cistudo for the first time in 1835.

† Gray, John Edward, "A Synopsis of the Genera of Reptiles and Amphibia," "Ann. of Philos.," Vol. ix, pp. 210-212, London, 1825.

‡ Bell, Thomas, "A Monograph of the Tortoises, having a Movable Sternum, with Remarks on their Arrangement and Affinities," *Zoölog. Journ.*, Vol. ii, pp. 299-310, London, 1825.

§ Gray, J. E., "A Synopsis of the Species of the Class Reptilia," p. 7; published as Appendix to Vol. ix of Cuvier's "Animal Kingdom," edited by Edward Griffith, London, 1831. In the same year appeared another separate edition, with additions: Gray, John Edward, "Synopsis Reptilium, or Short Descriptions of the Species of Reptiles," London, 1831. The original paper was written October, 1830; the second edition of it in January, 1831.

In 1828, Ritgen* subdivided the genus *Emys*, in *Emys* and *Clemmys*, and retained *Terrapene* Merrem.

The following species are united with *Clemmys*: *E punctata, planiceps, glutinata, centrata, subrufa, melanocephala.* Of these *E. punctata* Schöpff = *T. guttata* Schneider, has to be considered as type.

As correctly stated by Prof. Vaillant, *T. picta* Schn. has to be considered as type of Emys, and *Chrysemys* Gray, 1844, becomes therefore a synonym of Emys.

The first author who subdivided the *Terrapene* Merrem, as limited by Bell in 1825, was C. L. Bonaparte,† who separated the American box tortoises under Fleming's name *Cistuda* in 1830 and 1831, from Emys, with *T. orbicularis* as the type.

In 1836, Fitzinger proposed a new name, *Pyxidemys*, to contain the following species: *T. carolina* L. (*T. scheideri* Schweigg., *T. virgulata* Daud.), *Sternothærus trifasciatus* Bell, and *T. amboinensis* Daud. If there would be an objection to the name Cistuda in the sense of Bonaparte, Fitzinger's name *Pyxidemys* ought to be used with the *T. carolina* L. as type. But I think it will be the best to use the name *Cistuda* in the correct form of *Cistudo*.

As a result we have the following:

Emys C. Duméril, s. str.	= Chrysemys (Gray),	Type	*T. picta* Schneider.
Terrapene Merrem	= Emys (Boul.)	"	*T. orbicularis* Lin.
Cistudo Bonap. non Flem.	= Cistudo (Boul.)	"	*T. carolina* Lin.
Cyclemys Bell	= Cyclemys (Boul.)	"	*E. Dhor* Gray.
Clemmys Ritgen	= Clemmys part (Boul.)	"	*T. guttata* Schn.

I have shown some time ago that in *Cistudo major* Agassiz, the zygomatic arch is complete (*Science*, April 3, 1891, p. 190), as in *T. amboinensis* Daud., notwithstanding I believe that the Asiatic and American forms are generically separate. I am unable to say whether *T. amboinensis* Daud. belongs to the genus *Cyclemys* Bell, with *E. Dhor* Gray as type, or not. Prof. Vaillant is inclined to place *T. amboinensis* in a genus distinct from *Cyclemys* Bell, for which he uses the name Terrapene. The correct name would be *Cuora* Gray, introduced in 1855.

The whole question relating to the taxonomy of Emys Duméril may be developed in the following table:

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* "Ritgen, F. A., Versuch einer natürlichen Eintheilung der Amphibien," "Nova Acta Nat. Cur.," Vol. xiv, pp. 257–284, Bonn, 1828.

† Bonaparte, C. L., "Osservazioni sulla seconda ediziona del Regno Animale del Barone Cuvier," Bologna, 1830. And "Saggio di una distribuzione metodica degli Animali Vertebrat Giornale Arcadico di Scienze," etc., Roma, Vol. xlix, 1831.

Emys C. Duméril, 1806.

Emys C. Duméril (Oppel, 1811).

Emys (*subdivisio*) A. Anterior part of plastron movable. Type *T. orbicularis* L. Oppel, 1811.

Emys C. Duméril (Merrem, 1820), including *T. orbicularis* L.

Terrapene Merrem, 1820.

Emys C. Duméril (Gray, 1825).

Terrapene Merrem (Bell, 1825), including the original type *T. orbicularis* L., of Oppel.

Emys C. Dum. Type *T. picta* Schn.

Clemmys Ritgen, 1828. Type *T. guttata* Schn.

Terrapene Merrem (Bell).

Cistuda Bonap., 1830. Type *T. carolina* L.

Terrapene Merr. Type *T. orbicularis* L.

Cistudo. Type *T. carolina* L.

Cyclemys Bell, 1834. Type *E. dhor* Gray.

I place now the views of Boulenger, Vaillant and myself together:

Baur.	*Vaillant.*	*Boulenger.*
Emys C. Dum., s. str. Type *T. picta* (Herrm. MSS.) Schn.	*Emys* C. Dum., s. str. Type *Emys picta* Schöpff.	*Chrysemys.*
Clemmys Ritgen. Type *T. guttata* Schn.		*Clemmys.*
Terrapene Merrem. Type *T. orbicularis* L.	*Cistudo* Gray. Type *Cistudo orbicularis* L.	*Emys.*
Cistudo (Cistuda Flem.) Bonap. Type *T. carolina* L.		*Cistudo.*
Cyclemys Bell. Type *Emys Dhor* Gray.	*Cyclemys* Bell. Type *Cyclemys dhor* Gray.	*Cyclemys*, part.
Cuora Gray. Type *T. amboinensis* Daud.	*Terrapene* Merrem. Type *Terrapene amboinensis* Daud.	*Cyclemys*, part.

The only modification in Boulenger's catalogue necessary is to change his *Chrysemys* in *Emys*, and his *Emys* in *Terrapene*.

Studies in South American Native Languages.

By Daniel G. Brinton, M.D.

(*Read before the American Philosophical Society, February 5, 1892.*)

Introductory.

It is not too much to say that the languages of the native tribes of South America are the least known of any on the globe. The problems they present in their grammatical character and affinities remain the furthest from solution, and the materials to undertake such a task are the scantiest from any equal area on the earth's surface. In spite of the labors of such earnest workers as Von den Steinen, Ehrenreich, Adam, Ernst, Darapsky, Middendorff and others, there are numerous tongues of which we know absolutely nothing, or have but bare and imperfect vocabularies.

In the present series of studies I present a variety of material from either unpublished or rare works, accompanied by such suggestions as to its character and relations as have occurred to me in its preparation, and by some observations on the ethnography of the tribes mentioned. As I am convinced that the only ethnographic classification possible of the native tribes of America is that based on language, I do not hesitate to apply this whenever possible.

I.

THE TACANA GROUP.

In my work on *The American Race*,* I offered the following classification of this group:

Tacana Linguistic Stock.

Araonas,	*Isuiamas,*	*Pukapakaris,*	*Tumupasas,*
Atenes,	*Lecos,*	*Sapiboconas,*	*Tuyumiris.*
Cavinas,	*Maracanis,*	*Tacanas,*	
Equaris,	*Maropas,*	*Toromonas,*	

From this list we must strike out the *Atenes* or *Atenianos* and *Lecos*, as I shall show that these spoke a tongue nowise akin to the

* *The American Race: A Linguistic Classification and Ethnographic Description of the Native Tribes of North and South America.* By Daniel G. Brinton. 1 vol., 8vo, pp. 392 (N. D. C. Hodges, New York, 1891).

Tacana, in spite of some assertions to the contrary by Spanish writers.

Other tribes which should probably be added to this list, as they are located on old maps within Tacana territory and have Tacana names, are:

Carangues, on left bank of Rio Tarabeni.

Chumanos, north of Lake Roguaguado.

Poromonas, on the lower Rio Beni (or Poro).

Samachuanes, on Rio Coroico.

Uchupiamonas, on the Rio Uchupiamona.

Yubamonas, on the Rio Yuba.

The termination *monas* to several of these names is the Spanish plural form of the Tac. *manu*, river, the tribes being named from the streams along which they lived.

In addition to the above I have found that the tribe known as "Guarizas" is to be included among the Tacanas. A series of texts in their language, comprising the Pater, the Ave and the Credo, was found among the papers of Cardinal Mezzofanti, and has been published by Prof. Emilio Teza in his *Saggi inediti di Lingue Americane* (Pisa, 1868). The learned editor states that all his endeavors to identify this language, or to ascertain the location or affinities of the tribe, had been fruitless. A comparison of the Guariza Pater with that in the Tacana, both of which I give on a later page, will prove the very close relationship of the two tribes.

D'Orbigny asserts that "Tacana" is not the name of a tribe, but the name of the language. It is called by Spanish writers of the last century the "Maracani,"* which is apparently not the same as the *Macarañi* of the mission of Santiago among the Chiquitos.

The earliest missionary explorer of the Rio Beni, Fray Francisco de Rosario, wrote a report in 1677, in which he mentions a number of tribes, now extinct, among them the Hucumanos and the Torococyes, whose names indicate them to have belonged to the Tacana stock.†

Location and Number.

The general location of the Tacana group may be described as along the eastern slope of the Cordillera, where it descends to the

* See D'Orbigny, *L'Homme Américain*, Vol. I, p. 374; *Descrip. de las Misiones del Alto Peru* (1771).

† His report was printed in full in Melendez, *Tesoro Verdadera de las Indias*, Tomo III.

valley of the river Beni (otherwise called the Rio Poro, the Rio Pilcopata and the Rio Madre de Dios), and in the valley of the latter on both banks, between South lat. 12° and 15°. At present the Tacana dialect proper is spoken in the towns of Tumupasa and Isiamas; the Araona by the Araonas, who dwell on the banks of the Beni and on those of its western tributaries, known as the Manuripi, Tahuamanu and Uaicomanu; the Cavineño is confined to the mission of Cavinas; the Maropa to the Maropes, in and near the Pueblo de los Reyes, on the right bank of the Beni, about 12° 30′ S. lat., while the Sapis or Sapiboconas appear to have been the most eastern branch of the stock, as they were attached to the mission of the Moxos in the province of that name on the Rio Mamore.

In 1831 the total number of persons speaking the dialects of this stock was about 6000 (D'Orbigny). The majority of these are nominally Christians and have fixed habitations; but the Toromonas, who dwell between the rivers Madidi and Beni, in 12°–13° South lat., are still uncivilized and heathens; so, also, are the Araonas, who are stated to be cannibals and idol worshipers. Their idols are geometrically shaped pieces of polished wood and stone. Their chief deity is "Baba Buada," whom they identify with the wind, *vutana*, and whose home is in the air. He is said to live towards the south and to be the creator of heaven and earth. The general term for divinity is *edutzi*, and there is a *zia edutzi*, god of maize; an *agave edutzi*, god of health, etc. Each *edutzi* has his own *yanacona*, or priest, to superintend the proper rites.*

Loan Words.

The Tacana-speaking tribes have for generations adjoined on the west the once powerful and cultivated Aymaras, and on the north the populous herds of the Panos. The consequences on their tongue have been quite marked. A number of words have been borrowed from both sources; but they are not so frequent nor of such a character as to authorize the supposition of an original unity with either of the stocks named. I give a list of some of these:

Identities in Aymara and Tacana.

	Aymara.	Tacana.
Arm,	*ampara,*	*embai,* **M.**
Body,	*amaya,*	*eami,* **M.**

*E. Heath in *Kansas City Review*, April, 1883; Col. Labré in *Proc. Roy. Geog. Soc.*, 1889; Nic. Armentia, *Explor. del Madre de Dios.*

	Aymara.	Tacana.
Boat,	*huampu,*	*cuambá,* M.
Cold,	*t'aarata,*	*bruada,* T.
Earth (patria),	*marca,*	*mechi,* S.
Green,	*chojna,*	*china,* T.
Heaven,	*alakhpacha,*	*evacua pacha,* T.
House,	*utax,*	*etai,* M.
Island,	*huatta,*	*eda-pupu,* T.
Lightning,	*llipikh-llipikh,*	*jili-jili,* M.
Man,	*chacha,*	*drejà,* M.
Meat (flesh, body),	*aycha,*	*aicha,* T.
Morning (Span. *mañana*),	*maylla,*	*maita,* M.
Night,	*aruma,*	*apume,* M.
Old,	*achachi,*	*esi,* M.
Star,	*huara,*	*erujái,* T.

Identities in Pano and Tacana.

	Pano.	Tacana.
Blood,	*imi,*	*ami.*
Child,	*abaque,*	*ebacua.*
Flesh,	*nami,*	*yami.*
Hill,	*matsy,*	*emata.*
Moon,	*bari,*	*bari.*
Small,	*hata,*	*bata.*
Son,	*omibaque,*	*qui embaque.*
Sun,	*uirti* (star),	*ireti.*
Tongue,	*ãna,*	*eana.*
Uncle,	*cucu,*	*cucu, juju.*
Water,	*jena,*	*ena.*

The only two numerals which can be claimed for the Tacana evidently also belong to the Pano:

	Tacana.	Pano.
One,	*pea,*	*atchou-pé, pa-jü.*
Two,	*beta,*	*ta-bæ, ru-bă.*

The important words for maize, salt, tobacco and banana seem to be borrowed from other tongues:

Maize, *shije* or *dije.*—Probably the Pano *schequi,* which in turn is undoubtedly the Kechua *cherchi,* roasted maize. The grain evidently became known to the Panos as an article of food in this prepared form.

Salt, *banu.*—Apparently a variation of the Arawak *pamu.*

Tobacco, *umasa* or *umarsi.*—Doubtless, from the Tupi *put-uma,* Maypure *iema.*

Banana, *bondare* and *naja*.—The former is the Pano *banara, panala,* and *naja* is the same word with the first syllable omitted ; *banara* is but a corruption of *banana*, an Arawak word.

The color names appear to me irreducible, except that for "green," which has been borrowed from the Aymara.

White,	*pasana.*
Black,	*devena.*
Blue,	*danane.*
Red,	*derena.*
Yellow,	*tidnia.*

A few similarities to the Moseteño, a language spoken by a neighboring stock, may be noted :

	Tacana.	Moseteño.
Fish,	*see,*	*señ.*
Foot,	*euatsi,*	*yú.*
God,	*edutzi,*	*dogit.*
Water (river),	*ena,*	*ogñi.*
Woman,	*epuna,*	*phen.*

But these have little significance.

Phonetics.

All the Tacanan dialects are facile and agreeable in their sounds, differing in this respect from the Aymara and Kechua, both of which are harsh to the European ear and almost unpronounceable to a foreigner. The Araona has no sound which is not capable of correct expression by the Spanish alphabet; but the Tacana has the strong English *th* (as in *this*); a soft, scarcely audible aspirate, and a sound intermediate between *t, d* and *r* (heard in *dudu*, brother; *tata*, father, etc.), while the soft Spanish *th* (as in Span. *ce, ci*) is absent. The *l* is not heard in any native Tacana word.

The statement quoted by D'Orbigny, from a MS. of one of the missionaries, to the effect that the Tacana is one of the most guttural and harshest of languages, is quite incorrect and could not have been intended to apply to any of the dialects of this group.

Pronouns.

The paradigms of the Tacana pronouns are as follows :

I,	*ema.*	We,	*ecuana.*
Of me *or* mine,	*quiema.*	Of us, our,	*ecuanasa.*
For me,	*quiemapuji.*	For us,	*ecuana puji.*

To me,	*ema.*	To us,	*ecuana.*
With me,	*ema neje.*	With us,	*ecuana neje.*
Thou,	*miada.*	You,	*micuana.*
Thine,	*miqueda.*	Your,	*micuanasa.*
For thee,	*mique puji.*	For you,	*micuanapuji.*
To thee,	*mida.*	To you,	*micuana.*
With thee,	*mi neje.*	With you,	*micuananeje.*
He or she,	*tueda.*	That,	*ichu.*
Those,	*tueda cuana.*	Those,	*ichu cuana.*
His or her,	*tuseda.*	This one,	*jida.*
This,	*yhe.*	These ones,	*jida cuana.*
These,	*yhecuana.*	Who?	*aydeni.*

Verbal Forms.

Of all the dialects the Tacana is richest in verbal forms, and its various subdialects are less variable than its neighbors.

Further, Armentia states that all the dialects have a dual number in both verbs and pronouns, but his work does not furnish the means of analyzing the character of this dual. As is well known to grammarians, there are several very different conceptions of duality in language.

The notion of action in the verbal theme undergoes modification by suffixes, thus:

ha, to make, to do.
e-hatani, I am doing (*e* = *ema* = I).
e-hametani, I am ordering it to be done.
aque, imperative, do ye.
atique, go thou and do.

Of such suffixes, *ja* expresses desire or to wish, as:

puti-ja, I wish to go.
dia-ja, I wish to eat.
idi-ja, I wish to drink.

The suffix *ji*, appended to a noun, signifies possession, as *chipilo-ji*, one having money; but reduplicated and suffixed to a verb, it conveys the sense of past time, as:

puti-jiji, he has already gone.
dia-jiji, he has already eaten.

The termination *ti* appears to be that of the reflexive verb :

dama, to cover.
ja damati, to cover oneself.

The neuter is changed to the active signification by the suffix *me :*

manu, to die.
manuame, to kill.
ja manuamejiji, he who has killed another.

Many verbs are compounded by simple juxtaposition, as :

babe, to know ; *quisa*, to tell ; whence :
babequisa, to teach, *i. e.*, to tell what one knows.

The word *babe*, to know, is itself a derivative from *ba*, to see, which also appears in such compounds as *diaba* (from *dia*, to eat), to eat, seeing, *i. e.*, to test or try a food (*probar la comida*); and *batsuatique* (*tsuati* = above), to look upward.

Literature and Texts.

The literature of the Tacanan dialects—if I may apply this term to such meagre material—is widely scattered and difficult of access. Ludewig, in his *Literature of American Aboriginal Languages* (p. 206), speaks of it as a dialect of the Yurucare, with which it has not the slightest affinity. The same author gives the Sapibocona as a dialect of the Kechua (p. 168), and the Maropa as related to the Yuracare.

Of the Tacana proper I have made use of three published vocabularies: 1. That given by H. A. Weddell, *Voyage dans le Nord de la Bolivie* (Paris, 1859). He gives forty words and six numerals, obtained from a party of Tacanas from Ixiamas and Tumupasa, whom he met at Guanay. 2. A vocabulary of one hundred and fifty-seven words and six numerals, by Dr. E. R. Heath, contributed by him to the *Kansas City Review*, April, 1883. 3. A vocabulary of forty-eight words and ten numerals, accompanied by grammatical observations by the Rev. Nicholas Armentia, published in his *Exploracion del Rio Madre de Dios* (La Paz, 1889).

The only printed text I have found is a small octavo of forty-one pages, with the following title :

"Catecismo | de la | Doctrina Christiana | en Idioma Tacana |

por un Misionero del Colejio de | Propaganda—fide de la | Paz de Ayacucho | 1859. | Imprenta de Vapor.—Calle de la Aduana, No. 36.

The text is entirely in Tacana, without the corresponding Spanish, and embraces the Pater, Credo, Salve, Smaller Catechism, Explanation of the Doctrine, the Via Sacra, etc. I have been unable to discover the author.

Further, Armentia gives also vocabularies of the Araona and Cavineño dialects, and Dr. Heath supplies one of the Maropa. For the Sapibocona, I have relied on that printed by Hervas in his *Vocabulario Poliglotto*.

Dr. Heath refers to the great similarity between the Maropa and Tacana dialects, and adds the remark: "The Maropas have many words that have significations widely different; *etra* means bone and also hair; *biya* means a louse, a wasp and urine." Probably there is a difference in accent or inflection, which is not apparent to the European ear, but which to the native indicates which sense is intended.

The version of the Lord's Prayer given below, as well as that of the Creed, are taken from the *Catecismo en Idioma Tacana*, above referred to. I have added an interlinear translation of the former, and also a translation of the latter, as there is evidently some slight change of the customary phraseology.

Lord's Prayer in Tacana.

Ecuanasa tata evacuapachasu, mi canichanapajiji papu mique ebani,
Our father heaven in, thou sacred come thy name,
mique evacuapacha ecuanasa papu, mique enime eni papu ye canasu,
thy heaven (to) us come, thy wish come earth on,
evacuapachasu epuani nime viame. Amen Jesus. Pamapa zinesu ecuanasa
heaven in come (like to?). Amen Jesus. Every day our
equita tucheji jeave ecuanatiaque. Ecuanasa jucha cuana chenubaque,
body food to us. Our sins forgive,
cuaja bata ecuaneda eichenubania ecuanasa manu cuana, ba ecuana
even as we forgive
dajajameji mi juchasu, inasiguaque pamapa madada cuanasu. Amen
remove all evil us from.
Jesus.

Alongside of this I quote the same in the Guariza dialect, from Prof. Teza's work, already mentioned:

Lord's Prayer in Guariza.

Echeza tata evacuepachazu anigi mi, ibbubatagigicapapuini mige evani, echebe pezu papu eyucaini mi reyno, agigicapapuini mige enime eubbazu evacuepachazu batanja. Ecama geabe chinezu tiage echeza jana pugi: echebe jucha gigicuana ichenubage echeza jucha çetahu, tuevata ecama echeza majaycuana eichenubbaza: ecama tucheme age veca par'ajaja juchazu, chuteme jubua ichenume cuanazu ecama viapenege.

It is evident that this is a version by a different hand into a closely allied dialect.

Creed in Tacana.

I believe in the Father God, of all things in heaven and on earth the maker; I believe in the Lord Jesus Christ, His only Son; who was conceived by the grace of the Holy Spirit, and was born of a virgin; he suffered under the power of Pilate; he was crucified; he died; he went down to limbo; from among the dead he arose on the third day; he went up to heaven; there he is seated on the right hand of the Father almighty; whence he shall come to judge the living and the dead; I believe in the Holy Spirit, the holy Catholic church, the communion of all the saints, the pardon of sins, and that our bodies shall rise again, and that life shall not end.

Eama jei eania tata Dios pamapa aji, evacuapachasu ye eausu seguameji; jei eania tata Jesucristo tusa evacua peada quita; bataji puida Espiritu Santasa gracia eje putzu; etsesa cuara Virgen cuinaida; ichenuda cuana vidinaida Pilatosa emesu; tatajiji puida crususu; dapia manujiji puida, limbosu buteida; manujiji cuana dujusu nettianaida quimicha zinesu; soatida evacuapacha, mesa tata pamapa aji bai eni bene cani, da jenettia epueicha eideni cuana, manujiji cuana equisaba puji; eama jei eania Espiritu Santosa, santa Yglesia catolicasu, santo cuanasa aysaida jacti cuanasa jaditati, jucha cuanasa perdon, ecuanasa equita quita eydeyo pupebæ mave eide cani.

Vocabulary—English–Tacana and Dialects.

T. = Tacana (T. W. = Tacana of Weddell); M. = Maropa; S. = Sapibocona; A. = Araona; C. = Cavineño.

Orthography Spanish; *j* = Eng. *h*; *h* scarcely perceptible; *z* = Eng. *th*.

Alive, *eicle'ja*, T.; *escheveve*, M.
All, *pamapa*, T.; *huana'*, M.
Always, *daja-pincha*, T.
Arm, *ebu'e*, T.; *embui*, M. (probably from *ema*, hand).
Arrow, *pisa*, T.; *pizi*, M.
Ascend, to, *tsuati*, T.
Ashes, *etimu*, T., A.; *etiquimuru*, C.
Aunt, *nene*, T., A., C.
Bad, *mada'da*, T.; *emasa'*, M. (= *ma-saida*, not good).
Bark (of tree), *eviti*, T.; *embiti*, M.
Beard, *que'da*, T.; *eüesa'*, M.
Belly, *etu*, T.; *ese'*, M.; *edde*, T. (W.)

Bird, *dia*, T.; *bu'ni*, M.
Black, *devena*, T.; *sebe'mi*, M.
Blood, *ami*, T. and M.
Blue, *danane*, T.; *savame'*, M.
Body, *equita*, T., C.; *ea'mi*, M.; *ecuicha*, A.
Bone, *e'tro*, T.; *etra'*, M.
Bow, a, *pisatri*, T.; *pizatrue*, M. (see *Arrow*).
Boy, *canane*, *edeave*, T.; *dreja've*, M. (see *Man*); *toro*, A.; *ebacuapi*, C. (see *Child; ve* is the diminutive suffix).
Breasts (= mammæ), *atru*, T. and M.
Brother (my elder), *quema-onici*, T.; *be'tri*, M.
Brother (my younger), *quema-cou'*, T.; *chintri*, M.
Brother, *zau*, *uitzecua*, A.; *jau*, *usi*, C.
Canoe, *cua'bua*, T.; *cuamba'*, M., A.; *cuaba*, C. (Aymara).
Charcoal, *etide*, T.; *etesi*, A.; *etirutseve*, C.
Chest, the, *etredu*, T.; *echentru*, M. (breast bone? see *Bone*).
Child, *ebacua*, T.
Cold, *bruada*, T.; *vinna'ma*, M.
Come, to, *pue*, T.; *apueya*, M.; *papu*, T.
Cry, to, *tsia-tsia*, T.; *jejaje*, M. (imitative).
Dance, to, *tiri-tiri*, T. and M. (imitative).
Daughter, my (by father and mother), *onibaquapuna*, T.; *qui-embaqua*, M.; *ebacuepuna*, A., C. (see *Child* and *Woman*).
Day, *tri'ne*, T. and M.; *chine*, S.
Dead, *manujiji*, T. and M.
Deer, *ba'que*, T.; *batru'nu*, M.
Die, to, *manu*, T.
Dog, *vchi*, T.; *pacu*, M.
Drink, a, *ayeidi*, T.; *eidi*, A.; *eigi*, C.
Drink, to, *idi*, *eicli*, T.; *jaischitri*, M.
Duck, a, *se'e*, T.; *zu'zi*, M.
Ear, *edaja*, T.; *eshacue'na*, M.
Earth (land), *medi*, *edua*, T.; *metri*, M.; *mechi*, C., S.; *eua*, *mezi*, A.
Eat, to, *dia-dia*, T.; *chancha*, M.
Egg, *e'ja*, T. and M.
Evening, *trineti'a*, T.; *trinequa*, M. (see *Day*).
Eye, *etradru'ndru*, T.; *etachundru*, M.; *etuachùru*, S. (see *Sister, Elder* and *Hair;* apparently "sister hairs," *i. e.*, eyebrows, eyelashes).
Face, *embu*, T. and M.
Father, my (by son), *rema-tata*, T.; *qui-tata*, M.; *tata*, or *checua*, S. C.
Father, my (by daughter), *rema-tata*, T.; *qui-tata*, M.
Far, *uqueda*, T.; *huazumi*, M.
Feathers, *eina*, T.; *enuqua*, M. (compare *Hair*).
Fingers, *ema*, T.; *emechuja*, M. (= head of hand).
Fire, *qua'ti*, T.; *cua'ti*, M., S., A.; *etiqui*, C.; *otro*, T. (W.) (compare *Ashes* and *Wood*).
Fish, *sisi*, M.; *see*, T.; *jæ*, A.
Flesh (see *Meat, Body*).
Fly, a, *vere-vere*, T.; *bebi*, M. (imitative).
Food, *jana*, T., A.; *etduca*, C.
Foot, *equatri*, T.; *evatri*, M.; *ebbachi*, S.; *euatsi*, A., C.
Forehead, *emali*, T.; *emma'ta*, M. and S.
Forest, *eji'je*, T.; *hayjintru*, M.
Friend, *apare'je*, T.; *epere'je*, M.
Girl, *putu*, *epunave*, T.; *punave*, M.; *ebæzacua*, A.; *ebacuna*, C. (*ve* = diminutive; see *Child, Daughter* and *Woman*).
Give, to, *tia*, T.; *tia'na*, M.
Go, to, *pu'ti*, T. and M.; *puj*, A.; *cua*, C.
God, *eruchi*, S.; *edutsi*, T., A.; *educhi*, C.

Good, *saida, saipiave,* T.; *jundra,* M.
Grass, *nutsa,* T.; *ea'ji,* M.
Great, *aida,* T.; *haymi,* M.
Green, *china,* T.; *schepiëi,* M.
Hair, *echu-ena,* T.; *etra,* M.; *echau,* S. (see *Head, Feather, Wing*).
Hand, *e'ma,* T.; *eme,* M., S., A.; *eme-tucu,* C.
He (pron.), *tu-eda,* T.; *tu-ve,* M.
Head, *echu,* T.; *echuja,* M. and S.; *echua,* A.; *iyuca,* C.
Heart, *masu'mo,* T.; *masumu',* M.; *emofobo,* A.; *eniju,* C.
Heaven, *evacuepana,* S.; *evacuapacha,* T.; *buepo,* T. (W.).
Here, *upi'ca,* T.; *iezu',* M.
Hill, a (or mountain), *emata,* T.; *emina,* M. (probably from *ema,* extremity, point, hand).
Hot, *sina'da,* T.; *zintri-trime,* M.
House, *ejtej,* T.; *etai,* M., A.; *etare,* C.
Husband, my, *quemayavi,* T.; *quiave,* M.
I (pron.), *ema* (active form, *ea'ma*), T.; *e'me,* M.
Ice, *ea'na,* T.
Infant, *canane-chidi,* T. (see *Boy*); *ejanana,* M.
Iron, *peama',* M.
Island, *edapu'pu,* T.; *ischa'pupu,* M.
Jar (Sp. *olla*), *jutu,* T., A.; *emaricaca,* C.
Kettle, *co'to,* T.
Kill, to, *manuame, emanuani,* T.; *mane'me,* M.
Knife, *cuchilo,* M. (Spanish).
Know, to, *babe,* T.
Lake, *bai,* T. and M.; *eubihure,* S. (see *Water*).
Laugh, to, *ydeba'ti,* T.; *yaschi-bati,* M.
Leaf, a, *equena',* M.
Learn, *babe-tsua,* T.
Leg, *etida'da,* T.; *eta',* M.; *etta,* T. (W.).
Lie, to, *bidumimi,* T.; *ea'na,* M.
Lightning, *tseru-tseru,* T.; *jili-jili,* M.; *ilapa,* S.
Love, to, *esbune'ba,* T.; *imbunimbu,* M.
Maize, *dije,* T.; *shije,* M.; *zia,* A.
Make, to (Sp. *hacer*), *ha,* T.
Man, *de'ja,* T., C.; *dreja,* M.; *reanci,* S.; *deja, ecuicha,* A.
Many, *yucua'da,* T.; *dru'je,* M.
Meat, *aicha,* T.; *ea'mi,* M.; *yami,* A.; *erami,* C.
Money, *chipilo,* T.
Moon, *ba'di,* T., A., C.; *lantri',* M.; *bari,* S.
Morning, *matachu,* T.; *mai'ta,* M.
Mother, my (by son or daughter), *quema-qua'ra,* T.; *quicua,* M.; *cua,* S.; *uaua-di,* A.; *cuaha',* C.
Mouth, *aquatri,* T.; *equa'tra,* M.; *ebbo,* T. (W.).
Musquito, *sani* or *di,* T.; *dri,* M.
My, *quema,* T.; *qui,* M.
Name, *ebani,* T.; *embani,* M.
Nails, *ema-tichi,* T.; *eme tichi,* M. (see *Hand*).
Near, *narise,* T.; *drema',* M.
Neck, *eti'pi,* T. and M. and S.
Never, *niquietsunu.*
Night, *liza,* T.; *apume',* M.
No, *ma've,* T. and M.
Nose, *evi-eni,* T.; *evi,* M. and S.
Old, *ecti,* T.; *e'si,* M.
Our, *ecuanasa,* T.
People, *endrani,* T.; *driani qua'na,* M.
Plantain (Sp. *platano*), *nasa,* T.; *naja,* A.; *bondare,* C.
Prairie, *nutsa'ni,* T.
Rain, *nai,* T. and M.
Rattlesnake, *bacua dada,* T.; *sum bacua,* M. (see *Snake*).
Red, *derena,* T.; *utrume,* M.
River, *ena,* T.; *manu,* A.; *exeperearida,* C. (*ena*=water).
Rivulet, *enabaque,* T. (=child-water).

Road, *edidi*, T.; *edisi*, A.; *edigi*, C.
Run, to, *judu'du*, T.; *vandrundu*, M.
Salt, *banu*, T.; *bano*, M.
Say, to, *quisa*, T.
See, to, *ba*, T.; *jam-bati*, M.
Silver, *depe*, T.; *sepe*, A.
Sing, to, *satsu*, T.; *zatru*, M.
Sister, *zatna*, A.; *tatna*, T.; *nasi*, *jane*, C.
Sister, my elder, *quema-du'du*, T.; *drundru*, M.
Sister, my younger, *quematona*, T.; *la'na*, M. (in M. eldest brother says *cani* to his youngest sister).
Sit, to, *aniu'ti*, T.; *animbotia*, M.
Skin, *ebbai*, T. (W.).
Sky, *bueyu'pa*, T.; *embaquapacha'*, M.
Sleep, to, *tabi*, T. and M.
Small, *chicli*, T.; *batavi'chi*, M.
Snake, *bacua*, T. and M.
Son, my (by father or mother), *quema-embami*, T.; *qui-embaqua*, M.; *ena*, A.; *ebacua*, T. C. (see *Child*, *Daughter*).
Soul, *enidu*, T.; *ejiay*, A.; *yata-ecuana*, C.
Speak, to, *mimi*, T. and M.
Squash, a, *je'nu*, T.; *je'mi*, M.
Stand, to, *enutsinejenetsi*, T.; *ne'ti*, M.
Star, *eru'jai* or *etubay*, T.; *buana'vi*, M.; *etujay*, A.; *purari*, C.
Steal, to, *tsi*, T.; *tri*, M.
Stone, *tumu*, T., C., A. and S.; *tuma*, M.
Strong, *tuche'da*, T.; *tretremi*, M.
Sun, *ire'ti* or *ideti*, T.; *isjeti*, M.; *igeti*, C.
Teach, to, *babe-quisa*, T.
Teeth, *etre*, T. and M.; *éche'*, T. (W.) (compare *Bone*).
That, *yehu*, T.; *ichu*, M.
There, *chupia*, *dapiavi*, T.; *ichuzu*, M.
They, *yehu-cuana*, T.; *tuna've*, M.
Think, to, *piba*, T., A.; *adeba*, C.
This, *yhe*, T.; *iye*, M.
Thorn, *aquida*, T.; *acuisa*, A.; *acuija*, C.
Thou, *mi-cla*, T.; *mi-ve*, M.
Thumb, *ema-chuai*, T.; *eme-chuja*, M. (see *Hand*, *Fingers*, *Head*).
Thunder, *etiria'ni*, T.; *ti'ri*, M.
Tobacco, *umar'si*, T.; *umaza*, M.
To-day, *jeave*, T. and M.
To-morrow, *maita-pũicha*, T.; *bantra*, M. (see *Yesterday*).
Toes, *equatri-ritrana*, T.; *evatri-tichi*, M. (see *Foot* and *Nails*).
Tongue, *eana*, T., M. and S.
Tortoise, *dati*, T.; *dra'ti*, M.
Town, *eju'de*, T.; *ejuntre'*, M.; *erere*, A.; *epu*, C. (see *House*).
Tree, *a'qui*, T. and M.; *acui*, A., C.
Uncle, *juju*, T., A.; *cucu*, C. (a celebrated word, probably of Carib origin, on which Martius founded his classification of the "Guck" nations).
Walk, to, *arease'*, T.; *aze*, M.
Warrior, *jamaji tipuji* (a quarrelsome person), M.
Water, *eavi*, T.; *yu'vi*, M.; *euvi*, S., A.; *ena*, C.; *ya'ni*, T. (W.).
We, *ecuana* (dual form, *etsea*) T.; *ecama'*, M.
When, *quietsunu*, T.
White, *pasana*, T.; *paza'me*, M.
Who, *ayde'ni*, T.; *hayse*, M.
Wife, *quema-equani*, T.; *quievane*, M.
Wind, *be'ni*, T. and M. (from this comes the name of the Rio Beni = Wind river).
Wing, *enabay*, T.; *ennambai*, M. (see *Feathers*).
Wish, to, (Span. *querer*), *tsada*, T.
Woman, *epuna*, *a'no*, T.; *a'nu*, M. and S.; *epuna*, C., A.
Wood, *ei'na*, T.; *a'qui* (= tree), M.; *cuati-manu*, A.; *cuati*, C. (see *Fire*).

Work, to, *mudumudu*, T.; *mundru*, M.
Ye *or* you, *micuana*, T.; *mica've*, M.
Year, *mara*, S.
Yellow, *tidnia*, T.; *zahuami'*, M.
Yes, *ehe*, T.; *ee*, M.
Yesterday, *maita püicha*, T.; *maita*, M. (see *To-morrow*).
Young, *edea-ve*, T.; *dreja-veve*, M. (= young man).

NUMERALS.

1, *pea*, *peada*, *peara*, T.; *pembive*, M.; *pebi*, S.; *equene*, Cat.
2, *beta*, T., M. and S.
3, *quimicha*, T.; *camischa*, M. (Aymara).
4, *pusi*, T. and M. (Aymara).
5, *pichica*, T. and M. (Aymara).
6, *sucuta*, T. and M. (Aymara).
7, *siete*, T. (Spanish).
8, *ocho* (Spanish).
9, *nueve* (Spanish).
10, *tunca*, M. (Aymara); *peara tunca*, T.
20, *beta tunca*, M. (Aymara).

TACANA–ENGLISH VOCABULARY.

Aicha, meat, flesh.
Aida, great.
Ami, blood.
Aniuti, to sit.
A'no, woman, wife.
Apareje, friend.
Aquatri, mouth.
Aqui, tree.
Aquida, thorn.
Arease, to walk.
Atru, mammæ.
Aydeni, who.
Ba, to see.
Babe, to know.
Babe-quisa, to teach.
Babe-tsua, to learn.
Bacua, snake.
Bacua-dada, rattlesnake.
Badi, moon.
Bai, lake.
Banu, salt.
Baque, a deer.
Beni, wind.
Beta, two.
Bruada, cold.
Bueyupa, sky.
Dudu, sister (elder).
Canane, a boy.
Cani, sister (by brother).
Chicli, small.
China, green.
Chipilo, money.
Chupia, there.
Cosi, younger brother.
Coto, kettle.
Cuabua, canoe.
Cuati, fire.
Daja-piucha, always.
Danane, blue.
Dapiave, there.
Dati, tortoise.
Deja, man.
Depe, silver.
Derena, red.
Devena, black.
Dia, bird.
Dia-dia, to eat.
Dije, maize.
Eana, tongue.
Ea'na, ice.

Eavi, water.
Ebani, name.
Ebbai, skin.
Ebue, arm.
Echu, head.
Echuena, hair.
Ecli, old.
Ecuana, we.
Ecuanasa, our.
Edeave, young.
Edidi, road, path.
Edaja, the ear.
Edapupu, island.
Edeave, a boy.
Edua, earth, land.
Ehe, yes.
Eicleja, alive.
Ei'na, wood.
Eina, feathers.
Eja, an egg.
Ejije, forest.
Ejtej, house.
Ejude, town.
Ema, or *eama,* I.
E'ma, hand, fingers.
E'ma-chuai, thumb.
Emali, forehead.
Emata, hill.
E'ma-tichi, nails.
Embami, son.
Embu, the face.
Ena, river.
Enabay, wing.
Enidu, soul.
Epuna, woman, wife
Equani, wife.
Equatri, foot.
Equatri-ritrana, toes.
Equita, body.
Eruchi, god.
Erujai, star.
Eshuneba, to love.
Etidada, the leg.
Etide, charcoal.
Etimu, ashes.
Etipi, neck.
Etiriani, thunder.
Etra driendru, the eye.
Etre, tooth.
Etredu, the chest.
Etro, bone.
Etu, belly.
Etubay, star.
Evacuepacha, heaven.
Evieni, nose.
Eviti, bark of a tree.
Ha, to do, to make.
Idi, to drink.
Ireti, sun.
Jana, food.
Jeave, to-day.
Jenu, squash.
Judu'du, to run.
Juju, uncle.
Jutu, jar.
Liza, night.
Madada, bad.
Macta puicha, to-morrow or yesterday.
Manu, to die.
Manuame, to kill.
Manujiji, dead.
Masumo, heart.
Matachu, morning.
Mave, no.
Medi, earth, land.
Micla, thou.
Micuana, you.
Mimi, to speak.
Mudu mudu, to work.
Nai, rain.
Narise, near.
Nasa, plantain.
Nene, aunt.
Niquietsuna, never.
Nutsa, grass.
Nutsani, prairie.
Onibaquapuna, daughter.
Onici, elder brother.
Pamapa, all.
Pea, one.
Peama, iron.

Piba, to think.
Pichica, five.
Pisa, arrow.
Pisatri, a bow.
Pue, to come.
Pusi, four.
Puti, to go.
Putu, girl.
Quara, mother.
Queda, beard.
Quema, my.
Quietsunu, when.
Quimicha, three.
Quisa, to say, to tell.
Saipiave, good.
Sani, musquito.
Satsu, to sing.
Se'e, a duck.
Sinada, hot.
Sisi, fish.
Sucuta, six.
Tabi, to sleep.
Tata, father.
Tia, to give.
Tidnia, yellow.
Tiri-tiri, to dance.
Tona, sister (younger).
Trine, day.
Trinetia, evening.
Tsada, to wish.
Tseru-tseru, lightning.
Tsi, to steal.
Tsia-tsia, to cry.
Tsuati, to ascend.
Tucheda, strong.
Tu-eda, he.
Tumu, a stone or rock.
Uchi, a dog.
Uitzecua, brother.
Umarsi, tobacco.
Upica, here.
Uqueda, far.
Vere-vere, a fly.
Yavi, husband.
Ychu, that.
Ychucuana, those, they.
Ydebati, to laugh.
Yhe, this.
Yucuada, many.
Zatna, sister.
Zau, brother.

II.

THE JIVARO LANGUAGE.

The material which I have to present on this language is entirely from unpublished sources, and is the more valuable as, so far as I know, not even a vocabulary of this important idiom has ever been printed.

The Jivaros (Givaros, Xivaros, Hibaros, Xeberos, etc.) are a numerous and powerful nation, mostly yet in a savage state, who dwell about the head waters of the rivers Paute, Morona, Santiago and other upper affluents of the Marañon, between 2° and 4° 30′ South latitude, where they occupy the eastern slope of the Cordilleras. I have described their general culture and history in my work on *The American Race*, pp. 282–284.

They are said to present the peculiarity of unusual lightness in color, and features of a decidedly Aryan type.* These traits have

* "Aujour d'hui le type caucasique y domine," says Father Joseph M. Magalli, in *L'Année Dominicaine*, Paris, 1888.

been usually explained by a supposed extensive infusion of Spanish blood when their ancestors captured the city of Logroño in 1599 and carried off the white women as wives. More probably they share, with the Yurucares, Tacanas and other Andean nations, the peculiarity of a complexion several shades lighter than that of the Kechuas and Aymaras.

They have been little influenced by European visitors. A recent authority states that there are scarcely a hundred and fifty Christian families in the whole of the immense province of Canolos, a part of which they inhabit, and the area of which is more than 8000 square leagues.*

The sources which I have had at command are two MSS. in the British Museum, the name of the author not given, but from some remarks probably a German Jesuit, who was a missionary to the tribe towards the close of the last century.

The titles are:

"*Vocabulario en la Lengua Castellana, la del Ynga, y Xebera.*" Small 8vo, fol. 35. The vocabulary embraces about 1300 words, and is apparently complete.

"*Gramatica de la Lengua Xebera.*" Same size. This MS. is imperfect, leaves being lacking both at the beginning and the end.

From these MSS. I have prepared the following sketch of this tongue.

PHONETICS.

The sounds of the language are described as difficult to a European and fluctuating in character. The indistinct and alternating nature of certain phonetic elements appears in the Jivaro as in so many American tongues.

In vowel sounds, the *o* is often confounded with the *u*, the *e* with the *i*, and the *e* with the *æ*, which is like the German *ö*. The complex vowel sound represented by *ôu*, as in *pôung*, fire, is especially difficult for a foreigner. The vowels *a* and *o*, when followed by *i*, are often elided.

The consonants *d*, *l*, *r* and *h* are frequently alternated (that is, the one sound may be used at will for the other), or an indistinct sound is uttered, which may approach any one of them. The *n* is

* So says Father Magalli, above quoted, but the knowledge of this writer falls far short of what is requisite when he adds of the Jivaros and Japaros, "Ils parlent tous la même langue, le Quichua" (!).

frequently omitted or uttered so slightly as to be scarcely audible. In the syllables *quec* and *qued* the final consonants are rarely clear, and both often have the sound *q'r*. In the vocabulary the *ŏ* and *sch* should be pronounced as in German.

Nouns.

The relations of nouns are indicated by suffixes, *e.g.* :

Tana, the forest.
Tananquec, to the forest, or, in the forest.
Tanancla, from the forest.

Some words indicate the genitive relation by the termination *qui*.

Nouns may be formed from verbals by the suffix *ni* or *bi*, as *timinlec*, I die; *timipi*, the dead person, the corpse; also by the suffix *asu*, as *dacotalec*, I am ashamed; *dacotasu*, one who is ashamed. The infix *cuda* has the same effect.

The instrumental sense is conveyed by the termination *c*, which is the abbreviation of *quec* or *quecla*.

Seotic, knife.
Seotic quec, with a knife.

"With," in the sense of accompaniment, is expressed by *lec*, as:

Sadasulec, with a married man.
Paparulec, with my father.

Direction from is indicated by the termination *quecla*; "for" or "instead of" by *maleg*, as:

Natquimaleg, for or in place of another.

Pronouns.

The personal pronouns are:

I, *coa*, *qûa*.	We, *cuda*, *queñmoa*, *mapoa*.
Thou, *quenma*.	You, *queñma'ma*.
He or she, *nana*.	They, *nauba*, *nanalosa*, *nanadap'r-losa*.
This one, *asu*.	Those, *asudap'rlosa*.

The possessives are:

Mine, *quaqui*, *ru*, *ca*.	Our, *cudaqui*, *mapoa*.
Thine, *quenmaqui*, *palin*, *ma*.	Your, *quenmamaqui*, *palenma*.
His, *nanaqui*.	Their, *nanaqui*.

The second forms above given are suffixes or infixes, as:

Sudaru, my husband.
Sudapalin, thy husband.
Loantacasu, my desire.
Loantamasu, thy desire.
Loantasu, his desire.

As usual in American languages, there is no relative pronoun, its place being supplied by participial constructions.

Number and Gender.

Names of inanimate objects usually undergo no change in the plural. For persons the plural is formed by adding the suffix *losa* or *nanlosa*. In possessives the plural suffix is often *na*, as:

Hucha, a sin.
Huchaneng, his sin.
Huchanengna, his sins.

Saden, his wife.
Sadena, his wives.

In verbals and verbs the plural termination may be *döc*, as:

Huchapidöc, sinnings.

Anulao, leave me.
Anulaodöc, leave us.

Infixes may be employed in place of these suffixes, especially in nouns derived from adjectives and participles. The most usual of these is a^{t}_{r}, as:

Nambilec, I live.
Nambiasu, he who lives, the living man.
Nambia^{t}_{r}*casu*, those who live, the living.

The syllable *ma*, used either as infix or suffix, also conveys the plural sense, as:

Palen, thine.
Palenma, your.

Feminines are distinguished by the suffix *lu* or *llu*, as *vila*, boy; *vilalu*, girl; *lus*, man; *luslu*, woman. Also apparently by a change of another vowel to the *u*, as we find, *sadalec*, married man; *sudalec*, married woman.

Numerals.

The ancient cardinal and ordinal numbers of the Jivaros were as follows:

1,	*ala.*
2,	*catu.*
3,	*cala.*
4,	*encatu.*
5,	*alacötegladu* (*ala*, one; *ötegla*, hand; *du*, termination).
6,	*intimutu* (the thumb, of the second hand).
7,	*tannituna* (the index finger, of the second hand).
8,	*tannituna cabiasu* (= the finger next the index).
9,	*bitin ötegla cabiasu.*
10,	*catögladu* (= two hands).

This cumbrous plan has long been superseded by the adoption from the Kechua of the names of numbers above five, so that the present numeration is:

1,	*ala.*	5,	*alacötegladu.*	9,	*iskon.*
2,	*catu.*	6,	*sokta.*	10,	*chunka.*
3,	*cala.*	7,	*ganchis.*	100,	*pazai.*
4,	*encatu.*	8,	*pusac.*		

Particles.

A marked feature of this tongue, which it shares with so many others on the American Continent, is the abounding use of particles to modify the meaning of roots and themes. Whether these are to be regarded as themselves the remnants of worn-down themes, or as primitive phonetic elements, is a yet unsettled question, though for myself I incline to the latter opinion. The MS. I am quoting gives a long list of such significant particles, the most important of which are as follows:

a or *ha* indicates causative action on another; as *uranlec*, I eat; *auranlec*, I cause another to eat.

apa or *pa* denotes present action, as *nambilec*, I live; *nambiapalec*, I am now living.

ata or *anda* is a suffix denoting an interrogation.

cun, as an infix, denotes action about to take place.

ilala, as an infix, signifies that the action is of a permanent character.

imbo, as an infix, conveys a negative sense, and is often employed with the regular negative, *cola*.

itu, inserted before the termination of verbs, indicates that the action is done for another.

la, infixed, signifies that the action is for this one time only.

misan, infixed, conveys the sense that the action is shared by all present.

na, as a suffix, indicates habit, as *intulina*, he who is habitually in a bad temper.

nunda, infixed in the present tense, denotes that the action takes place at some other time ; as *notonundalec*, I do it (am accustomed to do it, but am not doing it now).

pa or *mba*, an affirmatory suffix.

qui, as an infix, denotes that the action takes place where the speaker is at the time.

ti is a frequent euphonic suffix, which does not alter the meaning.

van, as suffix or infix, denotes possession; as *huchavanlosa*, those who have sins.

vanan, like *itu*, signifies action for another ; as *muchavananamasu*, thou who asks for us.

ya or *nara*, as a prefix, intimates a wish or desire; as *palec*, I see ; *yapalec*, I wish to see.

yn, as a prefix, denotes reciprocal or mutual action ; as *yainmali*, they desire to take each other (in marriage).

Verbs.

The verbs have but two tenses, the present and the future. Occasionally the adverb *epa*, now, is prefixed to define the present, and *nuca*, pl. *naupa*, to denote a past time.

The formation of the future is frequently irregular, but the following examples will show its usual forms. It alone appears to present a dual number.

	Present. Singular.	Future. Singular.	Future. Dual.	Future. Plural.
I do,	*notolec,*	*notetic,*	*notoa,*	*notoaua.*
I take,	*malec,*	*matic,*	*maa,*	*mauua.*
I love,	*tandeñlec,*	*tandeñetic,*	*tandeña,*	*tandeñaua.*
I speak,	*laonlec,*	*laontic,*	*laona,*	*laonaua.*
I die,	*timinlec,*	*timintic,*	*timiantala,*	*timiantalua.*
I pray,	*malealec,*	*maleatic,*	*maleaa,*	*maleaua.*

The imperative is formed by the termination *qued*, often abbreviated to *q'r* ; as *tecalec*, I run ; *tecaqued*, run thou. Other terminations of an imperative character are *tan*, *aner*, *licaa* and *ma*.

The substantive verb is not found in the language, its place being supplied by terminations, especially the pronouns *cu* or *sucu*, etc., as *Pedrocu*, I am Pedro ; *Pedroquenma*, thou art Pedro ; *moim-*

bosucu, I am bad. In a similar sense the verb *nolec* or *nilec*, I do thus, I am thus, is often heard.

There is no trace of a true passive voice, its place being supplied by the sense of the verb or by particles.

At the conclusion of his MS. the author inserts two versions of the Lord's Prayer—the one "in the Xebera language, as it was spoken in the earliest times of the mission," the translation being that of Father Lucas de la Cueva (about 1655); the second in the language of the period of the writer, which I suppose to have been about one hundred and fifty years later.

Of the second or later of these I have ventured an interlinear translation, while the former I insert without a rendering.

Lord's Prayer in Jivaro—Later Version.

Papa mapoa, mosninanloquec napala; linlinpalin nomisansu muchai;
Father our, heaven in art thou; name thy holy become;
quenmaquinlosamasu cudaquec unadiai; loantamasu nomisansu notoi
thy kingdom us to come; desire thy holy be
maponsu mosninanloquec, nanaposu pilaasu lupaquec unda; uglilosa
as heaven in, earth in; daily
tandamapoa epala ugli encaodec; cudaqui huchabidöc anuladöc, maponsu
bread our now to-day give; our sins forgive, as
quenmoa unda alapila dape'dlosaqui huchanengna anulalidöc; anerata
we others their sins forgive;
quenmoa dentatutan, quenmoa cola Dios ayuaimbocaquec; nanamengtu
our our us
moimbosuöuegla atiegodac.
evil from deliver.

Lord's Prayer in Jivaro—Earlier Version.

Papa mapoa, mosenquec napalac linlinpalin ruchapalin; quenma quilosamasu cudaquec undiai. Loantacasu notetiuma mapolina mosninanloquec inosupila asumincenloquec unda. Uglilosa tanda epala ugli encaodöc nulaodöc cutaqui hudabidöc; dengquina cuda anulalidöc aubaqui hucha nengna; anerata apolata muchaquec amengdana; moimbocasuquegla atiego.

English-Jivaro Vocabulary.

Above, *mosenqûec.*
Ankle, *tula.*
Arm, *da'mpa.*
Arrow, *na'mu.*
Ashamed, to be, *dacotalec.*
Ask, to, *mucha.*
Bad, *moâimbosu, aperosu.*
Beard, *amucuiola noteri,*
Belly, *du', metpi, oquiulec.*
Below, *vilenquec.*

Bird, *ilans'r, tiperllu.*
Black, *catli, cadladasu.*
Blind, *dapina.*
Blood, *uogladec.*
Blue, *carcaso.*
Body, *loqueglo, timipi.*
Bone, *lansi.*
Born, to be, *oclilec.*
Boy, *vila.*
Branch, *taümec.*
Brave, *nan'tapi.*
Breast, *mudin, titoi.*
Brother, *yalli, yuyu'uc.*
Burn, to, *ügedalec.*
Buy, to, *ucolatolec.*
Calabash, *pabi.*
Call, to, *pöclolec.*
Child, *babi.*
Clothing, *capi.*
Come, to, *undialec.*
Cold *no'qûed, noq'r.*
Cotton, *piterlu, boûngpalo.*
Cover, to, *patantulec.*
Dance, to, *danzalec.*
Dawn, to, *ügliti.*
Day, *'ugli.*
Dead, *timiansu.*
Dear, *llada, nünilu.*
Death, *töminacasö.*
Deer, *boro'.*
Dog, *nini.*
Drink, a, *huasu, ülec.*
Drink, to, *upailacu.*
Drum, *tundo.*
Dwell, to, *nambilec.*
Ears, *bûec.*
Earth, land, *lu'pa.*
Eat, to, *calec, uranlec.*
Egg, *cado.*
Elbow, *quög'da.*
Enemy, *quegma.*
Enter, to, *da'lec.*
Eyes, *llada, da'pila.*
Face, *llada* (see *Eyes*).
Feather, *ambo'lu.*
Female, *cuaprⁿ.*
Field, *tiq'n ñaua.*
Finish, to, *tavantulec.*
Fire, *poung.*
Fish, *samer, lapisamed.*
Flesh, meat, *canan.*
Flint, *mosed.*
Flute, *pi'leaña.*
Flower, a, *dancu.*
Food, *ca'lo'.*
Foot, *la'ndec.*
Forehead, *teqûeda'.*
Forest, *tana.*
Girl, *vilalu.*
Give, to, *n'galec.*
Go, to, *palec.*
Gold, *uri.*
Good, *môa, moali.*
Grandfather, *papaiangu.*
Grandmother, *ami'.*
Great, *cuni, chi, halupi.*
Green, *canin'rtia.*
Grow, to, *zuzulec.*
Hair, *hintic.*
Hammock, *ta'la.*
Hand, *ötegla.*
Have, to, *nali, napali.*
Head, *uma.*
Hear, to, *la'oclec.*
Heart, *cangan.*
Heaven, *mosninanlo.*
Herb, *puma, daubad.*
High, *chi.*
Hill, *mutopi.*
House, *pi'dec.*
How? *mapoli.*
Hot, *ucasu.*
If, *aa, n'tati.*
In, *pa'lec.*
Indian, *muda, cuaprⁿ.*
Iron, *huana'.*
Kill, to, *atiminlec.*
Knee, *toto'pi.*
Knife, *scotic.*
Know, to (things), *nintitulec.*
(persons), *loatulec.*
Lake, *sangna.*

Last, *na'pi.*
Learn, to, *nintitanalec.*
Life, *nambiacasu.*
Light, a, *ugli, ocli.*
Light a fire, to, *atengtulec.*
Lightning, *yümerlec.*
Lip, *ü'tec.*
Live, to, *nambilec.*
Lizard, *tuda, lili.*
Love, to, *tan'deñlec.*
Maize, *tötrn, tötrlla.*
Man (vir), *queñmopineñ.*
Married man, *sadalec.*
Married woman, *sudalec.*
Medicine man, wizard, *pichotasu muda.*
Monkey, *duda, isolo, lolo.*
Moon, *ducat.*
More, *hapia.*
Most, *halupi, mointi.*
Mother, *auauc.*
Mouth, *lala'.*
Much, *cupi, bapo.*
Name, *linlin* or *lintin.*
Navel, *mumu'la.*
Near, *pa'ula.*
New, *na'lu.*
Night, *dogpili.*
No, *cola.*
Nose, *ne'tic.*
Now, *epala.*
Old, *tas'serpi.*
Old (man), *tas'pitosu.*
Old (woman), *tas'serllu.*
Open, to, *höquêrlec.*
People, *vapomuda.*
Pray, to, *malealec.*
Raft, *sudu'.*
Rain, to, *ölan, olanli.*
Rainbow, *podo'na.*
Red, *pip'rasu, togua.*
Road, *degaun.*
Root, *ötecnin.*
Run, to, *tecalec.*
Salt, *lamu'la.*
Say, to, *tulec.*
See, to, *lölec, löapalec.*
Semen, *miladöc.*
Send, to, *piuglec.*
Shade, shadow, *dachu'na.*
Sierra, *obituna.*
Sin, a, *hucha.*
Sing, to, *peclalec.*
Silver, *culiqued.*
Sister, *chayauc, cadecuc.*
Sleep, *bitilec.*
Small, *hamecha.*
Smoke, *cadlo* or *callo.*
Snake, *daua.*
Soul, *vada, timipi.*
Spaniard, *vadan.*
Speak, to, *laonlec, lalalec.*
Star, *tandola.*
Stick, *na'la, unguña.*
Strong, *nantapi.*
Sun, *quö'qui.*
Sweet, *yali.*
Take, to, *malec.*
Tame, *daiali.*
Tapir, *pahuala.*
Teach, to, *anintitulec.*
Throat, *unqued.*
Thumb, *intimutu.*
To, *qûec.*
Tobacco, *pinterlo, uhualec.*
Tongue, *ninegla.*
Tooth, *la'tec.*
Totem, clan, *patun.*
Town, *ninan'lo.*
Tree, *nala, squig'uinti.*
Turtle, *mado.*
Uncle, *aprcha.*
Valley, *sa'can.*
Virgin, *inilad.*
Wall, *lupa, patenpi.*
Water, *döc.*
White, *dadapua'su.*
Who, *deng.*
Wind, *tanlo'a.*
Within, *que'negla.*
Without, *a'dipi.*
Woman, *cuaprn, sada.*
Wood, *deboe.*
Yellow, *chapicaso.*

III.

THE CHOLONA LANGUAGE.

Nothing has heretofore been printed of the language of the Cholonas. This tribe dwells on the left bank of the upper Huallaga river, between 8°–9° 30′ South latitude. They were visited by Edward Pœppig in 1829, when he found them to number about 1000 souls, scattered in missions on the banks of the Monzon, Uchiza, Tocache and Pachiza, small streams flowing into the Huallaga. At the close of the last century they occupied a mission with the Hibitos or Xibitos, and together numbered about 5000.* Pœppig asserts that the Hibitos speak a wholly different tongue, but this is denied by my MS. authorities, who acknowledge only a dialectic difference; but the German traveler is correct in his statement that some of the wild Chunchos of the Sierra belong to the same stock.

My source of information in regard to this language is a MS. in the British Museum, entitled *Arte de la Lengua Cholona*. Its author was Fr. Pedro de la Mata, who wrote it in Truxillo in 1748, from which original the MS. in question is a copy made by Fr. Geronimo Clota, in San Buenaventura del Valle, in 1772. It is a small octavo of 132 folios and is complete. Fathers José de Araujo and Francisco Gutierrez wrote also *Artes* of these dialects, but I have not discovered their manuscripts. There is also a MS. *Arte de la Lengua Cholona*, apparently anonymous, mentioned by Ludewig, *Lit. of Amer. Aborig. Langs.*, p. 162.

The Cholona is a language extending over a small area, but it seems connected with no other, forming an independent stock. The only analogies worth mentioning which I have noted point towards dialects of the Arawak stock. For instance:

Sun, *muxac*. This seems = *kamu saache*, "the shining sun," of the Moxos.

Moon, *pel*; allowing for *r* = *l*, this is close to the *pueri* of the Jucuna dialect.

Eye, *nache*; reminds one of the *nuchii* of the Canamirim; the *nacuque* of the Uirina, etc.

Tooth, *alé*; again allowing *r* = *l*, this is the *ari* of the Goajiro.

Black, *saluch* or *chaluch*; *ghulek* in Araicu.

White, *chech*; *ghalik* in Araicu.

* See my *American Race*, p. 288.

Whether these analogies are sufficient to classify it with the Nu-Arawak groups of Von den Steinen is doubtful. The differences in the personal pronouns especially seem to isolate it from the dialects of that stem.

PHONETICS.

The letters *b*, *d*, *r* and *f* are lacking in the Cholona alphabet. The soft *ch* (as in "choose") alternates with the soft *th*; the latter is represented in the Spanish alphabet by *z*, so that in the *Arte*, *z* and *ch* are interchangeable. Initial *g* is hard before all vowels. The vowel represented by *o* is stated to be between *o* and *u*, and is probably the neutral vowel (as *u* in "but"). The initial *i* seems to represent a slight aspiration, as *iayu* or *hayu*, man. The elements *ñ* and *ñg* appear to be nasals.

The accent always falls on the last syllable, except in some verbal forms, where it is found on the penult. Pœppig says that the sound of the spoken tongue is disagreeable to the European ear.

NOUNS.

The relations of the nominal theme are indicated by suffixes, which may be arranged to appear like a declension, though not really such.

Nom.—iayu or *iayutup*, the man.
Gen.—iayuilou, of the man.
Dat.—iayuhe or *iayuge*, to the man.
Acc.—iayute or *iayutu*, the man.
Voc.—iayuey or *iayupey* (fem.), O man.
Abl.—iayute or *tep, pat, nic*, with or by the man.

The plural is formed by the insertion of the particle *loi*, before the case ending.

nunlol, the men.
nunlolloula, of the men.
nunlolge, to the men.
nunlolte, the men (accus.).
nunloltep, with or by the men.

The case endings are used only when required to render the meaning clear, as *Juantup Pedro ilami*, Juan killed Pedro, where the accusative termination is omitted, that of the nominative sufficiently indicating the relation. Certain particles also give a plural sense, in which case *lol* is omitted. These are *mec*, all; *pullem*, along with; *comec*, *incomec* and *pemec*, signifying quantity, and *manmiñ*, as many as. Whenever the plural is indicated by the form of the attached pronoun, other plural signs may be omitted.

There is no grammatical distinction of gender in nouns, difference of sex being indicated by the terms *nun*, male; *ila*, female, which may be either prefixed or suffixed, as:

Man, *nuniayu* or *iayunun*.
Woman, *ilaiayu* or *iayuila*.
Boy, *nunpullup*.
Girl, *ilapullup*.

A neuter or epicene gender can be denoted by a suffixed *ô*, as *nunô*, a person.

Various suffixes are added to nouns to modify their meaning, as:

nic, signifying excess or abundance.
zu, signifying absence or negation.
camayoc, indicating knowledge of a subject or practice in it. This word is borrowed from the Kechua.

Pronouns.

The pronouns possess the prominence in this tongue which they so frequently show in American languages. All parts of speech can be grammatically inflected by their agency, and they generally suffice to indicate the plural without the insertion of the plural sign, *lol*.

The primitive pronouns are:

I, *oc*.	We, *quija*.
Thou, *mi*.	You, *minaja*.
He, *sa*.	They, *chija*.

The separable or independent possessives are formed by adding to the primitives the particle *alou*, with slight euphonic changes:

Mine, *ocalou*.	Ours, *quihaguilou*.
Thine, *mimilou*.	Yours, *mimilouha*.
His, *sailou*.	Theirs, *chihaloula*.

The inseparable possessives are those prefixed to form the conjugation of verbs, and attached to certain classes of nouns. They are as follows:

My, *a-*.	Our, *qui-*.
Thy, *m-* (masc.), *p-* (fem.).	Your, *mi-* (both genders).
His (none).	Their, *chi-*.

In the transitions of verbs the pronouns are abbreviated and certain other forms used, as:

	SINGULAR.		PLURAL.
1st.	*a.*	1st.	*q, c.*
2d.	*m* (masc.), *p* (fem.).	2d.	*m.*
3d.	*y, c, v.*	3d.	*pa, po, mo, la.*

In adjective nouns the former class are used with euphonic changes, as:

pallou, good, a good thing.
amallou, my good or advantage.
mimallou, thy good or advantage.
quimallou, our good or advantage.
mimallouha, your good or advantage.
chimallou, their good or advantage.
amallouven, it is to my advantage.

The possessives, which form inseparable prefixes to nouns, are united by means of various ellipses and euphonic changes. Example:

Yuca, *el.*

My yuca, *anel.*	Our yuca, *quenel.*
Thy yuca, *menel.*	Your yuca, *menelha.*
His yuca, *nel.*	Their yuca, *enel.*

NUMERALS.

The numerals are employed with the addition of particles indicating the nature of the objects counted. The most usual of these particles appears to be *zel* or *chil.* The absolute forms, without these suffixes, are as follows:

1,	*an.*	20,	*ip-lec.*
2,	*ip.*	30,	*ix-lec.*
3,	*is.*	40,	*minip-lec.*
4,	*minip.*	50,	*quioc-lec.*
5,	*quioc.*	60,	*ipzoc-lec.*
6,	*ipzoc.*	70,	*quili-lec.*
7,	*quilip.*	80,	*pac-lec.*
8,	*pac.*	90,	*ocon-lec.*
9,	*ocon.*	100,	*apichac.*
10,	*alec.*		

These offer little resemblance to any other tongue, though the words for 8 and 9 remind one of the Chinchasuyu *pak* and *iskon.*

Verbs.

All active verbs are conjugated by transitions, formed by prefixing the pronoun of the person acting, and inserting immediately after it the pronoun of the person or thing acted upon. Example:

amcollan, I thee love.
mayian, thou me watchest.
payian, he me watches.
asac apuchihan, my food me they give.
misac mapuchilan, thy food thee they give (masc.).
pisac papuchilan, thy food thee they give (fem.).
sac hapuchilan, his food him they give.
ysac apahapuchan, their food them I give.

These are forms of the verb *apuchan*, to put before one, a derivative from *amchan*, to put, to place. Other examples:

amcolecte ameñan, I thee wish to love.
macolecte mimenan, thou me wishest to love.
Diosqui ñgolecte quimenan, we wish to love God.
Diostup iccolecte ymeñan, God wishes to love us.

The variation in the third person plural in the transitions appears to depend on the following conditions:

mo is used when the transition is from the third person singular to the third person plural, as in the expression, "he loves them."

po where the transition is from any of the other persons, singular or plural, to the third plural, as:

apocollan, I love them.
mipocollan, thou lovest them.
quipocollan, we love them.
mipocollan, you love them.
chipocollan, they love them.

pa where the verb implies another object besides the direct one, as:

ychac apahapuchan, I give them their food.

la is employed when the transition is from the third person plural to some other person than this, as:

micollilatan, they love thee.

chi is confined to transitions from third plurals to third plurals, as:

chipocollan, they love them.

Syntax.

The construction of phrases will be seen from the following examples:

Liman nê yayu yzip pusimpat añantumilā chectan.
Sierra in men their houses straw with covered are.
"The houses of the Indians in the Sierra are covered with straw."

The noun *zip* and the verb *anantuman* have their pronouns in the third person plural, so the plural particle *lol* is omitted.

The word *chectan* is an abbreviation of *chi actan*, the third person plural of the verb *actan*, I stand, I am in a place. This verb is much used to signify a usual action with reference to a noun, as *cot actan*, I bring water; *zip actan*, I fix or arrange my house; *ayllan àctan*, I make the bed, etc.

Ñanmac yayu izipte izoz pachacotan.
Each Indian his house in his idols keeps.
"Every Indian keeps idols in his house."

English-Cholona Vocabulary.

Armadillo, *xax, tacla.*
Bad, evil, *irivaj.*
Black, *zaluch* or *chal.*
Boy, *nun-pullup.*
Die, to, *colhac.*
Drink, a, *axitlam.*
Drink, to, *axcan.*
Each, every, *ñanmac.*
Eyes, *nache.*
Father, *pa.*
Flesh, body, *aycha* (K.).
Food, *apuchan.*
Fox, *sup.*
Girl, *ila-pullup.*
Give, to, *allan.*
Good, *pallou.*
Green, *llin.*
Hair, *pe.*
Hands, *nen.*
Head, *tech.*
House, *zip, chip.*
Husband, *muluch.*
Idols, *izoz, ichoch.*
Lance or dart, *ulluc.*
Louse, *cullâ.*
Love, to, *agollan.*
 my love, *agole.*
 my lover, *acoleuch.*
Maize, *cach.*
Man (homo), *iayu* or *hayu.*
 (male), *nun.*
 (married), *muluch.*
Moon, *pel.*
Mother, *pan.*
Mountain, sierra, *liman.*
Nose, *quexum.*
Not, nothing, *ma.*
Place, to, *amchan.*
Red, *llaca.*
River, *xocot.*
Road, path, *panâ.*
Rule, to, *capac* (Kechua).
Sick, *cama.*
Silver, *checho.*
Son, *pul.*
Soul, *zall* or *chall.*
Spittle, *ollê.*
Stars, *kenna.*

Straw, dry grass, *pusim.*
Sun, *muxac.*
Teeth, my, *alê.*
Tongue, *monzey.*
Town, *putam.*
Water, *cot.*
White, *chech.*
Wife, *zala.*
Will, wish, *men.*
my will, *amen.*
I wish, *ameñan.*
Woman (female), *ila.*
ilajayu.
(married), *zala.*
Word, *hil.*
Yuca, *el.*

IV.

THE LECA LANGUAGE.

The Lecos of the river Beni have been erroneously included in the Tacana stock by D'Orbigny and later writers (including myself). The only material I have anywhere found of their language is a short vocabulary given in Weddell's *Voyage dans le Nord de la Bolivia* (Paris, 1859); but this is sufficient not only to take them entirely out of the Tacana group, but probably to place them in an independent position by themselves. As Weddell's book is not to be found in many libraries, I shall translate and rearrange his list of words and precede it with some remarks on the tribe and its possible affinities.

The Lecos are stated by Weddell to have resided originally on the Rio Tipuani and its affluent, the Rio Isuaya, whence they removed to the banks of the Rio Mapiri.

On Arrowsmith's map (1809) the "Rio de Lecos" is located as a branch of the Rio Beni, between 13° and 14° South latitude, in a region assigned to the "Samachuanes," though I suspect these are the "Muchanes" of other writers, and who, according to Weddell, are Mozotenos.

The mission of Aten, in the valley of the Rio Beni, is distinctly stated by an official authority in the last century to have been peopled by the Lecos,* so we must include in them the "Atenianos," whom D'Orbigny classed with the Tacanas.

A somewhat extended comparison has not furnished me with positive grounds for including the Lecos in any known linguistic group. Most of the analogies I have noted are with the Carib stock, and some of them are striking, but scarcely decisive.

* "En Aten se hablan la Leca por ser este Pueblo de Indios Lecos." *Descripcion de las Misiones del Alto Peru*, 1771.

Leca Analogies.

Sun, *he'no;* compare *bue'no* (Opone, Carib stock).
Moon, *kurea;* comp. *kede, siregu* (Carib dialects).
Water, *dua;* perhaps from Carib *tuna.*
Arrow, *uela;* not far from Carib *boule'oua.*
Arm, *bepel;* close to Carib *yapoule, japali.*
Tooth, *bikiri;* nearly the same as the *kxier* and *yeri* of Caribs.
Heaven, *kaut;* almost identical with the Bakairi *kxau* and Carijona *cahoue,* both Carib dialects.
Legs, *boo'te;* comp. Carib *iebeti, beti.*

I think it is safe to infer from the above comparisons that there is an infusion of Carib elements in the tongue; but the material is too scanty to assign its true value.

According to a count made by the missionaries in 1832 there were about two thousand natives at the mission of Aten, all of whom we may assume were Lecos. Dr. Edwin R. Heath, who spent two years in the valley of the Beni about 1880, does not mention them, at least under this name, and gives no specimen of their language.

In personal appearance the Lecos are described (by Weddell) as of pleasant expression, with straight foreheads and horizontal eyes, the mouth of medium size. In temperament they were frank and cheerful. What is unusual, they seemed totally devoid of appreciation or care for music, and had no dances or songs of any kind.

The alphabet of the vocabulary is the Spanish; *ü* is the French *u; j* as *tscha* in German.

English-Leco Vocabulary.

Arm, *bepel.*
Arrow, *uela.*
Belly, *baùahobo.*
Bird, *katchu.*
Blood, *bile.*
Body, *bonotchco'ro.*
Bow, *tchava'ta.*
Child, *yatchpaik.*
Earth, *lal.*
Eyes, *bisiri.*
Feet, *besel.*
Fingers, *biui.*
Fire, *moa.*
Flower, *tutha.*
Forest, *kanda.*
Hand, *bueù.*
Head, *barua.*
Heaven, *kaut.*
House, *uan.*
Leaf, *uoià.*
Legs, *boo'te.*
Man, *yubasa.*
Milk, *buchuluro.*
Moon, *kurea.*
Mountain, *uotha.*
Mouth, *bokòrua.*

Nails (finger), *biuità.*
No, *nai.*
Nose, *bitchinua.*
Rain, *essa.*
River, *dua* (water).
Salt, *tij.*
Skin, *busutche.*
Sun, *he'no'.*
Teeth, *bikiri.*
Tree, *ba'ta.*
Village, *ue's.*
Water, *dua.*
Woman, *tchusuaya.*
Wood. *hamon.*
Yes, *o-o.*

NUMERALS.

1,	*ber.*
2,	*toi.*
3,	*tchai.*
4,	*didai*
5,	*ber-tcha.*
10,	*ber-bivque.*

V.

A TEXT IN THE MANAO DIALECT.

Two hundred years ago the Manaos occupied an extensive tract near where the Rio Negro empties its dark waters into the Amazon. They were, indeed, the most numerous accolents of the Black river on its lower course, and were estimated at something like ten thousand souls. Their large and shapely canoes and plastered conical dwelling houses bespoke a certain advancement in the arts, and their repute as daring warriors extended far among the Tupi tribes, who adjoined them on the Amazon.

They were not affined in blood or language to the Tupis, but belonged to what is now known as the Arawak or Nu-Arawak (or, as M. Adams prefers to call it, the Maipure) linguistic stock. In the early history of the country, their name is connected with the legend of El Dorado and the land of the Amazons. Later they willingly received religious instruction from the Carmelite missionaries, who gathered them in settlements. But the kidnapping Portuguese carried off many of the converts into slavery, and the remainder fled to the trackless forests, so that half a century ago scarcely a pure-blood representative of the tribe could be seen on the river.

Of their language there are but two specimens known to me; the one, a vocabulary of about 150 words, collected by the traveler, Dr. Spix, and published in Martius' *Glossaria Linguarum Brasiliensium;* the other, a short catechetical work, which forms the material of this study, and which has never been printed. The original is in the British Museum, Manuscript Department, and bears the title:

"*Doutrina christa'a pella Lingoa dos Manaos.*"

It has long been known to bibliographers, and is referred to by both Ludewig and Von Martius, but no one has copied or published any portion of it. Its authorship and precise date are unknown, but it has the appearance of a draft or copy of an older work, which it would seem was composed in 1740. The orthography of the Portuguese words is somewhat irregular, and there also seems to be an uncertainty in the spelling of various native terms. The extract which I give is about one-half of the whole, and is sufficient to show the character of the tongue.

A comparison of the words of the text with those collected by Spix about a century later shows little change in the dialect, especially when the difference in the method of transcription is allowed for, the writer of the text having employed the phonetics of the Portuguese tongue, while Spix followed that of the German. To illustrate this, and also to facilitate the examination of the text, I append a list of some of the words in the latter, the majority of which are also found in Spix's vocabulary; the latter I have placed in brackets and appended an S.

English-Manao Words.

All, *sabaque.*
Always, *lyxaöâri.*
Be, to, *sahi.*
Believe, to, *yaniqui.*
Belly, *tuba* (*tula*, S.).
Body, *cacadÿr* (*katy*, S.)
Day, *samaco* (*tzamâko*, S.).
Die, to, *mxtica* (*uamatika*, S.).
Earth, *etudeo* (*ete'e*, S.).
Father, *yracary* (*apakony*, S.).
God, *Tupa* (*mauary*, S.).
Heaven, *quinaucudeo* (*ghinauigota*, S.).
Hell, *caman latyma.*
Man, *herenary* (*yrinâly*, S.).
No, not, *mehe* (*me'e*, S.).
Our, us, *öëne* (*huene*, S.).
See, to, *öâbata* (*pipata*, S.).
Sins, *barâyda.*
Son, *bauri, dayri* (*tany*, S.).
Stone, *kÿá* (*ghüa*, S.).
Teach, to, *caÿna.*
Three, *piaduqui* (*pialuky*, S.).
True, *caura.*
Virgin, *sabyra.*
Where? *padeura.*
Why? *capeda.*

Most of these words are derived from roots extending through many Arawak dialects, and are the property of that stem. Others, however, are borrowed from the Tupi. This is especially so with the word for God, *Tupa,* which is still in use in the Brazilian "Lingoa Geral."

The personal pronouns as given by Spix are:

I, *no.*	We, *huene.*
Thou, *pi.*	You, *yna.*
He, *erouty.*	They, *nela.*

The possessives, however, which are also employed in the conjugations as inseparable prefixes, differ from these. Thus we have:

ŏê-mequer, our Lord.
oê-naca, like us.
oâ-yaniqui, we believe.
oâ-batar, we shall see.
p'yaniqùi, thou believest.
ba-batare, they shall see (him).

Doutrina christa'a pella Lingoa dos Manaos.

P. De q'. sorte se ha de haver o homem neste mundo querendosse livarsse do inferno, e querendo hir ao ceo?	P. Ca peda lyanaqui samaco anaqui çamanna tyma gotia, öáuûÿ-ÿápa que rey lÿüá kynaucuda diche lyoáÿá edaca ūêna?
R. Crendo em Deos, fasendosse baptizar, i goardando sua ley.	R. Tupā ÿâquer cayta ca lygara anaquyra.
P. Ha Deos?	P. Auûÿnâ ca Tupā?
R. Ha.	R. Auûÿnâca.
P. Credes em Deos?	P. Pyanŷqui Tupā?
R. Cremos.	R. Oâÿániqui.
P. Quem he Deos?	P. Capaçay Tupā?
R. O que fez todas as couzas.	R. Sabaqui bayqui tumaquer.
P. Com que fez todas essas couzas?	P. Capâ üÿna pura' Tupā tuma bayquê sabayque?
R. Com hua' sua so'palavra.	R. Lygâra üÿnapura.
P. Deos tem corpo como nos?	P. Cacadÿra oênâca Tupā?
R. Nam tem.	R. Mehê cacaliurÿ.
P. Deos teue antiguamente principio?	P. Catuquir ha quer rira bauynapu Tupā?
R. Nam teve principio.	R. Mehê catuquinhaqueri.
P. Sempre soy?	P. Lyxaöâri sahir?
R. Sempre.	R. Lyxaöâri.
P. Ha de ser para sempre?	P. Bayrichipâ sahi lideuri?
R. Para sempre.	R. Bayriche.

P. Aonde esta Deos?

R. No ceo, e na terra em todo o lugar aonde chamão por elle.

P. Pode o homem ver aqui a Deos?

R. Nam pode ver.

P. Porque?

R. Porque nam tem corpo.

P. Aonde o hemos de ver?

R. No ceo hindo nos la.

P. Eos que sorem ao Inferno nam o hao de ver?

R. Nam o hao de ver.

P. Por que rezam?

R. Em castigo desus culpas.

P. Padeura sahi Deos?

R. Quinancudeo, etedeo sabaqui panoquer deo, padeno oâcaŷta.

P. Sabÿra sahi oâbata caÿdêo Tupã?

R. Mehe sabi oâbatar.

P. Caÿpeda?

R. Mehe cacasÿr.

P. Padire öâbatar?

R. Guinacuda dixe guareda öâbatar.

P. Bamane camanhatyma diche gareda babatare?

R. Mehe babatare.

P. Capeda?

R. Mehe baÿaligara gata öéneÿninique.

Preguntas sobre a SS. Trinidade.

P. Quantos Deoses ha?

R. Hu sõ Deos verdadero.

P. Sendo pessoas quantas são?

R. Sam tres.

P. Como se chamao essas tres pessoas?

R. Deos Padre, Deos filho, Deos Espirito Santo.

P. Aelle se chama santissima Trinidade?

R. Aelle.

P. Porque rezam?

R. Porque em hu so Deos estam tres pessoas.

P. Esse Deos Padre, Deos Filho, Deos Espirito Santo he o mesmo Deos?

R. He hu so e o mesmo Deos.

P. Em quanto pessoas he a mesma pessoas?

R. Nao: em quanto pessoas Deos Padre he differente, Deos filho he differente, Deos Espiritu santo he differente.

P. Qual dessos pessoas antigamte

P. Paquiby Tupa?

R. Baûraÿma Tupa caúra.

P. Paquiby lideno paquibÿ.

R. Pyaduqui baduqui.

P. Capacapa mara qui-ÿo piaduqui baduqui-ÿú?

R. Tupan ÿracâry, Tupan bauri, Tupan Espirito Santo.

P. Lysciniqui oena ss. Trinde macûÿ?

R. Lyxiniqui.

P. Capeda?

R. Baûraÿma Tupa lyanaqui pyaduqui baduqui liûri.

P. Baûrayma liöari Tupa lÿ Tupa yracâry Tupa bayri Tupa Espirito Santo.

R. Baûraÿma Tupa öárÿ,

P. Baûraÿmara sahi lideo baura?

R. Maÿcadi; bauraymarara Tupa yracari, äÿúnaca Tupa bauri äúÿnaca, Tupa Espirito Santo äúÿnaca.

P. Padeuora lypa bauÿnapu lypa

soy prº, Deos Padre soy prº ou Deos filho ou Deos Espirito Santo?	Tupa yracary lypa oácaru Tupa bauri oácaru Tupa Espirito Santo?
R. Nao soy prₒ nen hum todos sempre foram.	R. Mehe lyaquyra quariry.
P. Qual dessos pessoas antiguamᵗᵉ foy a q. se fez homem como nos?	P. Capa bauynâpe qui-yo piaduquy baduqui di lixir; herenari cauraŷ eâanady oënâke?
R. O mesmo filho de Deos.	R. Tupan baÿri.
P. Como se chama o filho de Deos depoy de feyto homem?	P. Capaçay Tupa bauyri-y herenari caurarÿ tũminhâne garêde?
R. Nosso senhor Jesus Christo.	R. Oëmequer Jesus Christo.
P. Por isso he, que os Christãos tomaram este nome?	P. Lÿgâÿqui câÿta Christaos?
R. Por isso.	R. Lÿgâÿqui.
P. Que quer dizer Christaos?	P. Capaçây caytâca Christaosly?
R. O que he bapti zado, entre em Jesus Christo filho Deos.	R. Tupan bâÿri catÿâca Jesus Christo eÿáquêr.
P. Deyxou antigamente N. S. Jesus Christo outra pessoa em suo lugar antez de hir ao ceo?	P. Nemêda dipa baunâpe öémequer Jesus Christo baura öé cuniapâÿ quinaucuda lixyra gereda f gataÿa?
R. Deyxou s. Pedro e todos os Papas seos successores pª governarem a santa madre Igresia Catolica de Roma assim chamada.	R. Nemêda S. Pedro sabaque Paÿ abarepano mâr Simani caÿdixi santa madre Igreyja catholica mequêr-ey Papa de Roma öácâÿta.
P. Que couza he Santa Madre Igresja Catolica de Roma?	P. Capacay Santa Madre Igª Catholica de Roma?
R. Sao todos os que sao baptizados, e estao pela palavra do summo Pontifex Papa de Roma, e agvardao e creem em Jesus Christo.	R. Sabâque caÿtâca Jesus Christo eyaquer ligâra abarepano mar Papa de Roma gara anaguŷra.
P. Quem e nosso senhor Jesus Christo?	P. Capacay öémequêr Jesus Christo?
R. Verdadeyro Deos, e verdadeyro homem, como nos.	R. Tupan caura, herenari caura, äénâca.
P. Como he verdadeyro Deos?	P. Capeda Tupa caurâÿri?
R. Sendo verdadeyro filho de seo Padre.	R. Tupa ÿrâcari bâyrinÿo.
P. Como e verdadeyro homem.	P. Capeda herenari cauraÿri?
R. Sendo verdadeyro filho da sempre virgem Maria.	R. Santa Maria ababycagoereÿma dâyri caurayri.
P. Deos filho tem corpo como nos?	P. Cacadÿra öenaque Tupa dayri?
R. Tem corpo.	R. Cacadÿra.
P. Quem fez antigamente o corpo de nosso Senhor Jesus Christo?	P. Capabaüÿnapû öémequer Jesus Christo carytumaquer?

R. Nen huma pessoa, o fez por graça o por obra do Espirito santo foy feyto.

P. Aonde foy feyto?

R. No ventre de hua donzella chamada Santa Maria.

P. E essa Santa Maria ficou sem lezao assim como otra qualqer virgem que nunca parió?

R. Nem mais nem menos.

P. E depois de parir filou sem lezam?

R. Nao teve lezao ficou sempre virgem.

P. De que sorte se houue N. S. Jesus Christo neste mundo de nascer de sua santissima may?

R. Padeceo fo mecede e canpaço e todos os malles de pena por amor de nos f por nosso amor.

P. Ensinou antigamente N. S. Jesus Christo dando entendimento á gente?

R. Ensinou.

P. Ao depoiz morreo na cruz por nos, em paga de nossos peccados?

R. Morreo.

P. Por amor q.^{em} morreo?

R. Por amor de nos, por amor de nossos peccados, ou satyfuçum delles, p^{a}livarnos do Infierno, e levarnos ao ceo.

P. Por sua vontade?

R. Por sua vontade morreo.

P. Pois elle não hera Deos?

R. Hera Deos.

P. Pois esse morreo?

R. Náo: o corpo q^{e}tomou de sua santissima may he q^{e} morreo.

P. Não havia mos de hir ao ceo, se elle nam morrera?

R. Nao havia mos.

R. Mehe capâtomâr Tupan Espirito santo tuma quenda dêo letuminha f graça tumaquenda dêo letuminha.

P. Padêuora sâhi liâônâ?

R. Lÿmâque sabŷra Santa Maria caÿra ababycago erëÿma tubadêo.

P. Lydeu-o Santa Maria enidagareda sabyray ababŷ cagoerëyma mehê runida aguŷra sayro?

R. Lÿaquira öárÿ,

P. Lucâöánîquy pura lûy nidan gaıêda?

R. Mehê rupûta.

P. Capêda öémequer Jesus Christo ÿma samâco anaquŷa lÿracâro gatia lÿnidan gaıêda taÿâpa paÿni garêda?

R. Pöâtŷ ŷbûri metatŷr pe le ly poŷta sabâque bayque pura ly tâ ba ö ä cadŷ che.

P. C aÿna datîr baûÿnapû ö ë mequer Jesus Christo Lita ecatâya nitia herenari ÿchÿ?

R. Recaÿnâda.

P. Guayneÿpa remotîca cruza quadia ö ämâne barâyda öëneÿ?

R. Matîca.

P. Capeda rematîca?

R. Oágâyque ö á m â n e barâyda öënêÿ camânha tymagatîa o a u güŷ yâpaquer quÿnâudâ lixira eda câydây.

P. Pananêy?

R. Pananêyra rematica.

P. Mehê saÿhe Tupaly?

R. Tupá.

P. Lydêu-ora Tupã matîca?

R. Mehê; tupã matîca caca rŷra liracâro lyxîra ba çua lyöäri matîcadŷ.

P. Mehê öáma quynaucudâ diche mehe ö á mâtîca garêda?

R. Mehê öáma

P. Quantos dias estenne N. S. Jesus Christo debayxo da terra no teo sepulcro de pedra?	P. Paquÿby samâco ōemequêr Jesus Christo lideo rimaticâni garêda etê üÿn â pudēo kÿá anaquÿa.
R. Tres dias.	R. Pyaquîbaquî samāco.
P. Era depois como passou?	P. Guayney padeura?
R. Resuscitou.	R. Caydêu-o ocâry.
P. Depois de resuscitar como se houve?	P. Caydêu-o ocâry guaynèy padêury?
R. Subio ao ceo depois de 40 dias.	R. Lycuruca iquinaudadire 40 samâco buıûtiquêy.
P. De que sorte se ha, ou esta agourla?	P. Paquŷpa sahe cachadir lidêury?
R. Esta asentado à mao direyta de Deos Padre tao honrado e estimado como elle.	R. Tupan yrâcâr sabŷdi libaurây quidêu-o: subinha: aquidi câura ymöèta pyrama.

VI.

THE BONARI DIALECT OF THE CARIB STOCK.

The last of the Bonaris died about 1870. At one time they were a tribe of considerable strength, having their homes in the thick forests along the river Uatumã, which empties into the Amazon from the north, not far below the mouth of the Rio Negro. They were, therefore, neighbors to the Manaos, whose location I have already described.

They were a docile people, and readily collected around the mission Father Nuno Alvarez de Couto established at Sant' Anna do Atumå. There, however, they fell victims to various diseases brought by the whites, and when Canon Francisco Bernardino de Louza visited them, of all the tribe only one old woman survived who was able to give him the words of its speech. These he published in his book, *Para e Amazonas* (three parts, 8vo, Rio Janeiro, 1874–5), which is scarce outside of Brazil, and from which Dr. A. Ernst, of Caracas, obligingly copied for me the vocabulary which I subjoin.

The name of the tribe is taken from the Tupi language or Lingoa Geral of Brazil, and in its proper form *Boa-n-uara* means "snake-men" or "serpent-people." Other *boanari* or snake-men are mentioned, one band on the river Uaupes (Von Martius) and another on the river Içanna (Natterer). It was a term probably derived from the totemic sign, or perhaps from some accidental or fancied peculiarity, and has no ethnic significance.

Even a slight examination proves the Bonari a well-marked Carib dialect, and as such it is correctly assigned and located on Karl von den Steinen's linguistic map inserted in his work, *Durch Central Brasilien*. The only word, however, which he gives from their dialect, ***keri***, moon, is not quite correct, according to this vocabulary.

English-Bonari Vocabulary.

Air, *cabu.*
Arrow, *purena'.*
Black, *tapaiuna.*
Bow, *urapa'.*
Brother, *mimien.*
Cold, *tecominhoa'.*
Dance, *timiara.*
Ear, *panare'.*
Earth, *nono.*
Eye, *nurvba'.*
Fire, *uatu.*
Fish, *uutu.*
Girl, *meacaba'.*
God, *tupan.*
Grandfather, *tamunbā.*
Head, *iriopo'.*
Heat, *atupeua'.*
Heaven, *maica-paa.*
House, *abeno'.*
Husband, *unhô.*
Infant, *pitianhea.*
Light, *ataquice.*
Man, *uquere'.*
Moon, *quecê.*
Old, *tapoucu'.*
Old woman, *nafoucu'.*
Rain, *cunoba.*
River, *tuna'* (see *Water*).
Son, child, *meco'.*
String, *ubudiana.*
Sun, *usiu'.*
Thunder, *darara'.*
Tooth, *jorê.*
Uncle, *uemi.*
Water, *tuna.*
White, *tiada'.*
Wife, *upuiten*
Wind, *iriane'.*
Woman, *uauri.*

The influence of the neighboring Tupi tribes is seen in such words as ***tupan***, God; ***tamunhā***, grandfather; ***urapa'***, arrow (***urapa'ra***, Tupi); ***tiada***, white (***ti***, Tupi); ***tapaiuna***, black (***tapanhuna***, Tupi), and a few others more faintly. These are loan-words which do not affect the mass of the language.

VII.

THE HONGOTE LANGUAGE AND THE PATAGONIAN DIALECTS.

Among the manuscripts in the British Museum there is one in Spanish (Add. MSS., No. 17,631), which was obtained in 1848 from the Venezuelan explorer, Michelena y Rojas (author of the *Exploracion del America del Sur*, published in 1867). It contains several anonymous accounts, by different hands, of a voyage (or voyages) to the east coast of Patagonia, "desde Cabo Blanco hasta las Virgines," one of which is dated December, 1789. Neither the name of the ship nor that of the commander appears.

Among the material are two vocabularies of the Tsoneca or Tehuelhet dialect, comprising about sixty words and ten numerals. These correspond closely with the various other lists of terms collected by travelers. At the close of the MS., however, there is a short vocabulary of an entirely different linguistic stock, without name of collector, date or place, unless the last words, "á la Soleta," refer to some locality. Elsewhere the same numerals are given, and a few words, evidently from some dialect more closely akin to the Tsoneca, and the name *Hongote* is applied to the tongue. This may be a corruption of "Choonke," the name which Ramon Lista and other Spanish writers apply to the Tsoneca (Hongote = Chongote = Choonke = Tsōněca).

The list which I copy below, however, does not seem closely allied to the Tehuelhet nor to any other tongue with which I have compared it.

The MS. is generally legible, though to a few words I have placed an interrogation mark, indicating that the handwriting was uncertain. The sheet contains the following:

DESCRIPCION DEL INDIO.

Caveza,	*seyocup.*
Frente,	*eyssen.*
Ojos,	*can.*
Orejas,	*coana* (qy. *coaua*)
Narizes,	*bacsen.*
Cejas,	*suman.*
Boca,	*zuzin.*
Dientes,	*idis.*
Pescuezo,	*saislan.*
Brazos,	*cheslan.*
Manos,	*cupa'ches.*
Dedos,	*gadyocoye.*
Barriga,	*coaa'.*
Muslos,	*cava'.*
Pierna,	*cuxin.*
Pie,	*paxasen*
A las conchas,	*chavin* (?).
Cuchillos,	*chavi.*

1,	*pa.*
2,	*sa.*
3,	*chalas.*
4,	*bok.*
5,	*ciechs.*
6,	*tesan.*
7,	*zohs.*
8,	*tachs.*
9,	*teus* (?).
10,	*o'pen.*

No le he podido entender mas.

Canoa,	*tasabay.*
Canalete,	*asaup.*
Toda clase de botones,	*coyocuy.*
Abalorios,	*jamts* (?).

A la Soleta.

The above list I translate and arrange in alphabetical order as follows:

Arms, *cheslan.*
Beads, *jamts* (?).
Belly, *coya'.*
Buttons, *coyocuy.*
Canoe, *tasabay.*
Ears, *coana* (or *coaua*).
Eyebrows, *suman.*
Eyes, *can.*
Fingers, *gaayocoye.*
Foot, *paxasen.*
Forehead, *eyssen.*
Hands, *cupa'ches.*
Head, *seyocup.*
Knives, *chavi.*
Leg, *euxin.*
Mouth, *zuzin.*
Neck, *saislan.*
Nose, *bacsen.*
Paddle, *asaup.*
Teeth, *idis.*
Thighs, *cava* .

The other vocabulary, although it presents the same numerals, differs widely in some of the words. It gives:

Fire, *kanikerk.*
Water, *cuk-hin.*
Sun, *kekar.*
Woman, *becok.*
Eyes, *kavak.*
Ears, *kakuk.*
Mouth, *kakhe.*
Tongue, *kakshlüt.*

These are more closely akin to other Patagonian dialects than the words of the former vocabulary.

It must be acknowledged, however, that we are but poorly supplied with information about the tongues of Patagonia and Tierra del Fuego. In the latter country we have, indeed, sufficient material in the Yahgan, thanks to Brydges, Adam and others; but in the Onas tongue there is practically nothing and but little of the Alikuluf.

It is still uncertain whether the last mentioned is a branch of the Yakana-cunny, and whether these latter in turn differ from the true Patagonian or Tehuelhet.*

D'Orbigny insists that the Puelches, who have for a century and a half occupied the plains between the Rio Negro and the Rio Colorado (39° to 41° lat. South), are radically different in language both from their Aucanian neighbors to the north and the Patagonian tribes to the south.† For this reason they are called by the Araucanians *Quimnolu-che*, "People who cannot understand."‡ D'Orbigny's short comparative vocabulary of the "Patagon" and "Puelche" certainly reveals a wide difference, but a comparison of the few words of "southern Puelche" collected by Hale discloses unmistakable identities between the two idioms, as:

	S. Puelche.	Tehuel-het.
Star,	*sχalela,*	*tsōkalela.*
Tree,	*apa,*	*opuk.*
Bone,	*ohatsk,*	*ohit.*

Mr. Hale collected his vocabularies at Carmen, on the Rio Negro; and the influence of the northern tribes is distinctly visible in them. Especially the Guachi would seem to have percolated into them. The possessive pronoun of the first person singular, *ia* or *ya*, "my," is seen in both Hale's vocabularies and also in D'Orbigny's Puelche. It is common to the Tsoneca or Tehuelhet and the Guachi.

	Guachi.	Teh. or Puelche.
Nose,	*ia-note,*	*ia-nots.*
Water,	*euak,*	*yagup.*
Mouth *or* lips,	*ia-pé,*	*ia-pelk.*
Teeth,	*ia-va,*	*ia-hai.*
Mountain,	*tegec-loan,*	*atecq, yuilhuana.*

The Poyas or Pey-yus are stated in the *Informe* of General Pietas, above quoted, to have dwelt (in 1729) from the river Lauquen-leufu one hundred leagues southward and quite to the Atlantic. Twenty-five years ago Guinnard found the "Poyu-che," as he calls them, wandering along both banks of the Rio Negro from Pacheco Island

* The writers of the *Mission Scientifique au Cap Horn* identify the Onas with the Yakana-cunny, and assert that they speak a closely related dialect of Patagonian.

† *L'Homme Américain*, Tome II, p. 71.

‡ *Informe* of Don Geronimo Pietas, 1729, quoted by Dr. Darapsky in the *Bull. del Instituto Geographico Argentino*, Tomo x, p. 278.

to the Cordilleras.* The words he gives from their tongue—if they can be depended upon—prove it to be an Araucanian dialect.

Of the Chonos, who were a maritime people on the west coast, we have no linguistic material; nor can we define the relationship of the Calen and Taijatef, who resided on the shore south of 48° and spoke one tongue.

In the following table I present a comparison of a limited number of common words in Patagonian vocabularies, beginning with the earliest—that collected by Magellan on his first visit to the straits that bear his name, in 1520. It is interesting to note how little the language has changed in the nearly four centuries which have passed since that period. The list is found in Pigafetta's narration.

Dialect.	Author.	Man.	Woman.	Sun.	Moon.
1. Patagonian,	Pigafetta,			*calexchem,*	
2. "	MS. Br. Mus. I,	*nuken,*	*ache,*	*kora,*	*amania,*
3. "	MS. Br. Mus. II,	*nuken,*	*zunum,*	*kokaua,*	*amania,*
4. "	Martius,	*nuken,*	*zunum,*	*shuim,*	*amania,*
5. "	D'Orbigny,	*nuca,*	*nacuna,*	*chuina,*	*chuina,*
6. Tsoneca,	Hale,	*kina,*	*iamo-kanika,*	*apiuχk,*	
7. Choonke or Tehuelche, or	Musters,	*ahonican,*	*karken,*	*gengenko,*	*showan,*
8. Tehuelhet,	Lista,			*kenguenkin,*	*sheguenon,*
9. Puelche,	Hale,	*kine,*	*iamo-kanok,*	*tçiaχatoka,*	*apiχok,*
10. "	D'Orbigny,	*chia,*	*iam-kat,*	*apiucuc,*	*pioo,*
11. Hongote,	MS. Br. Mus I,				
12. "	MS. Br. Mus. II,		*becok,*	*kekar,*	
13. Tekennika (or Yahgan),	Brydges,	*won,*	*kepa,*	*lum,*	*hannuka,*
14. Alikuluf,		*ackinish.*	*ackhanash.*	*lum.*	*cuunequa.*

Dialect.	Author.	Fire.	Water.	Head.	Eye.	Ear.
1. Patagonian,	Pigafetta,	*gialeme,*	*holi,*	*her,*	*oter,*	*sané,*
2. "	MS. Br. Mus. I,		*jarra,*	*guil,*	*gosel,*	*jené,*
3. "	MS. Br. Mus. II,	*hamonaka,*	*karra,*	*guial,*	*gotel,*	*shené,*
4. "	Martius,	*hamonaka,*	*karra,*	*guil,*	*gottel,*	*shené,*
5. "	D'Orbigny,	*maja,*	*ara,*	*dil,*	*guter,*	*jené,*
6. Tsoneca,	Hale,	*hauakok,*	*iagup,*	*iagoha,*	*iatelk,*	
7. Choonke or Tehuelche, or	Musters,	*yaik,*	*lêy,*	*kittar,*	*ötl,*	
8. Tehuelhet,	Lista,	*yeike,*	*lehe,*		*otel,*	*shaa,*
9. Puelche,	Hale,	*auiχok,*	*iagop,*	*ia'oe,*	*iateteke,*	*iatsosk,*
10. "	D'Orbigny,	*aquacake,*	*iagup,*	*iaraa,*	*intitco,*	*iaxyexke,*
11. Hongote,	MS. Br. Mus. I,			*seyocup,*	*can,*	*coana,*
12. "	MS. Br. Mus. II,	*kauikok,*	*kukhin,*		*kavak,*	*kakuk,*
13. Tekennika (or Yahgan),	Brydges,	*pushaky,*	*shamea,*	*lukabe,*	*della,*	*ufkhea,*
14. Alikuluf.		*tĕtal.*	*chanash.*	*of'chocka.*	*telkh.*	*teldil.*

* A. Guinnard, *Three Years among the Patagonians*, p. 49 *et al.* (Eng. trans., London, 1871). The prayer he inserts in some dialect not clearly stated on p. 163 is almost pure Araucanian, as are the numerals on p. 261. It is doubtful if he was ever among the true Patagonians (the Tehuelhet).

Dialect.	Author.	Mouth.	Nose.	Tongue.	Tooth.
1. Patagonian,	Pigafetta,	*chian,*	*or,*	*scial,*	*for,*
2. "	MS. Br. Mus. I,			*deol,*	*jor, kor,*
3. "	MS. Br. Mus. II,		*ó,*	*del,*	*kurr,*
4. "	Martius,		*oo,*	*dal,*	*curr,*
5. "	D'Orbigny,	*ihum,*	*ho,*		*jor,*
6. Tsoneca,	Hale,	*iapulk,*	*ianots,*		*iaχaia,*
7. Choonke or Tehuelche, or	Musters,		*tchal,*	*tal,*	*oër,*
8. Tehuelhet,	Lista,	*shahan,*	*or,*		*orre,*
9. Puelche,	Hale,	*iapolk,*	*ianit,*	*iawonŏk,*	*ia hai,*
10. "	D'Orbigny,				
11. Hongote,	MS. Br. Mus. I,	*zuzin,*	*bacsen,*		*idis,*
12. "	MS Br. Mus. II,	*kakhe,*		*kakshlut,*	
13. Tekennika (or Yahgan),	Brydges,	*yeak,*	*cushush,*	*lŭn,*	*tu'un,*
14. Alikuluf.		*uffeare.*	*nohl.*	*luckin.*	*cauwash.*

Dialect.	Author.	Hand.	Foot.	House.	One.
1. Patagonian,	Pigafetta,	*chêné* (*cori,* fingers),			
2. "	MS. Br. Mus. I,	*jan,*	*kel,*	*cocha,*	*jauken,*
3. "	MS. Br. Mus. II,	*ore,*	*kel,*	*cocha,*	*cheuken,*
4. "	Martius,	*ore, fan,*	*keal,*	*cocha,*	*cheuquen,*
5. "	D'Orbigny,	*chêmé,*	*ti,*		
6. Tsoneca,	Hale,				*tçic,*
7. Choonke or Tehuelche, or	Musters,	*tsicc'r,*	*shankence,*	*kou,*	*chuche,*
8. Tehuelhet,	Lista,		*alj,*		*choche,*
9. Puelche,	Hale,	*ia sk'ep,*	*iapgil,*	*ahoike,*	*tçi,*
10. "	D'Orbigny,	*ia paye,*			
11. Hongote,	MS. Br. Mus. I,	*cupaches,*	*pasasen,*		*pa,*
12. "	MS. Br. Mus. II,				*pa,*
13. Tekennika (or Yahgan),	Brydges,	*jösch,*	*cŏeea,*	*ukkral,*	*ocoale,*
14. Alikuluf.		*yuccaba.*	*cutliculcul,*	*hŭt.*	*towquidow.*

Dialect.	Author.	Two.	Three.	Four.	Five.
1. Patagonian,	Pigafetta,				
2. "	MS. Br. Mus. I		*kear,*	*kekague,*	*kaszen,*
3. "	MS. Br. Mus. II,	*keukay,*	*keash,*	*kekagui,*	*keitzun,*
4. "	Martius,	*xeukay,*	*keash,*	*kekaguy,*	*kegtzun,*
5. "	D'Orbigny,				
6. Tsoneca,	Hale,	*pŏetçi,*	*gotsk,*	*mala,*	*tanka,*
7. Choonke or Tehuelche, or	Musters,	*houke,*	*aäs,*	*carge,*	*ktsin,*
8. Tehuelhet,	Lista,	*jauke,*	*kaash,*	*kague,*	*tzen,*
9. Puelche,	Hale,	*pe tçi,*	*gŏt,*	*mala,*	*tanke,*
10. "	D'Orbigny,				
11. Hongote,	MS. Br. Mus. I,	*sa,*	*chalas,*	*bok,*	*ciechs,*
12. "	MS. Br. Mus. II,	*sa,*	*chalas,*	*bot,*	*ciech,*
13. Tekennika (or Yahgan),	Brydges,	*combabc,*	*mutta,*	*carga,*	*cup'aspa.*
14. Alikuluf.		*telkeow.*	*cup'eb.*	*inadaba.*	

Notes on the Vocabulary.

Man.—The root in all the allied Tsoneca dialects is *ken, kin* or *kan,* which is the generic term for the species *homo.* It is seen with a feminine prefix in *iamo-kan-ok*, *kārken*, *ackhanash* (=*wa-kan-ash*). The English form of this root becomes *cunny*, found as a suffix to various tribal names.

Woman.—*Zunum* = woman, as *zunum nakon*, ugly woman; *zunum kekalun*, girl, young woman; *iama* or *yama* means properly "mother;" *ache* or *ysher* (Musters) is a woman of the same gens, the masculine form of which is *chen*, brother; *karken* is a married woman.

Sun and Moon.—The two prevailing roots are *kar* and *shuin*. They both appear in Pigafetta's *calexchem* (=*kare-shuin*). The vocabulary No. 2 translates *kora* as "sun, heaven, God." The generic term for both orbs is *shuin* (*chuina*), which seems allied to the Araucanian *cuyen* of the same meaning. The Hongote *ke-kar* shows the radical *kar*. Another radical for both orbs is the guttural sound variously represented by *kok*, *cuc*, *χok*, *keng*, *geng*, *sheg*. According to Brydges the Yahgans have two different words for sun, *lum* and *usteca*, and two for moon, *annuca* and *hunian*.

Fire.—The radical sound appears to be '*auaχ*, spelled variously *yaik*, *hauak*, *kauik*, etc. The first syllable is visible in *maja* = *ma-yaχ*.

Water.—The term *jarra* or *karra* means "drinking water," from *jara*, to drink; *iagop* is rain water (*ciagop*, rain, Hale); the *léy* and *lehe* of Musters and Lista appear to be an abbreviation of the *ho-li'* of Pigafetta.

Head.—Pigafetta's *her* = *hel*, which is a variant of *guil*, *dil*, etc. Another radical for the idea is a guttural, '*χa*, which is at the base of *ia'oe*, the Hongote *se-yocup*, Yahgan *luka-be*, etc. (comp. Araucanian *lonco*, head).

Eye.—All the words are clearly related except the Hongote.

Ear.—The term given by Pigafetta, *sané*, is repeated with slight variation in the various dialects including the Hongote, except the Puelche, where Hale and D'Orbigny give a different word. The verb *choinqué*, to hear, seems related to *shené*, ear.

Mouth.—Wide discrepancies appear in the terms for this organ. The words *chian*, *shahan* and *ihum* are probably forms of *shum*, which is the right word for mouth, while *ia pelk*, according to Hale, means "my lips."

Nose.—The general root is a modification of *ō*, Lista's *or* = *ob*, which reappears in *tochal*, *nōhl*, etc.

Tongue.—Pigafetta's *scial* reappears in Muster's *tal*, etc.

Tooth.—The prevailing radical *or* may be related to Araucanian *or*, bone.

Hand.—Two conceptions are conveyed by the words presented, *ché'mé, ché'né, jan, fan,* all forms of the same = upper extremity, arm and hand; while *or, cori, tsic-c'r, ya-s'k'cup* all refer to the fingers.

Foot.—The general root *kel* probably reappears in *'alj,* and even in *shan-kence* (= *chen-kels,* lower extremity), *cutli-kulkul,* etc.

House.—The root is generally *ko'a.*

Numerals.—These display considerable diversity. Several are merely borrowed from the Araucanian, in which we have: 1, *quiñe;* 2, *epu;* 3, *cula;* 4, *meli;* 5, *kechu.* From *kechu,* for instance, comes Hongote *ciech,* Tel. *keitzun, tzen,* etc. Hong. *chalas* probably = Tel. *ka-ash;* Hong. *sa* = Tel. *tçi,* etc.

The general conclusion to which these comparisons lead is that the Patagonian dialects are probably more closely related than has hitherto been assumed.

VIII.

THE DIALECTS AND AFFINITIES OF THE KECHUA LANGUAGE.

At the time of the discovery, and probably long before that date, the Kechua language was spoken along and near the Pacific coast from 3° North to 35° South latitude, that is from the Rio Ancasmayu in Ecuador to the Rio Maule in Chili.

Of course, in this long extent of nearly twenty-five hundred miles of mountains and deserts, there was considerable variety in its dialects; but, so far as I can learn, much less than might be expected at first sight. The Abbé Camaño, a learned Jesuit who traveled extensively in Peru about the middle of the last century, and whose *Elementi della Lingua Quichua* has never seen the light in print, classified the tongue under five dialects as follows:

1. The Chinchasuyo, spoken in the diocese of Lima.
2. The Lamaño, spoken about Lamas, in the diocese of Truxillo.
3. The Quiteño, current in and around the city of Quito.
4. The Calchaqui or Tucumaño or Catamareño, which prevailed west of the Cordillera in the province of Tucuman.
5. The Cuzcuaño, in and around Cuzco.

Of these the last mentioned is that which is considered the classical, and was adopted by the missionaries as representing the language in its purest and most ancient form. In it the drama of *Ollanta* was composed, which is justly regarded as one of the finest productions of American aboriginal literature.

The identification of the Calchaqui dialect of Tucuman with a patois of the Kechua would settle a vexed question in American ethnography and archæology. The language and the nation of the Calchaquis have long since disappeared; but their material relics, in the shape of well-constructed walls of dressed stones, tombs of the same material, ornaments and images in copper and gold, and handsomely decorated jars of earthenware, still remain in sufficient abundance to testify to a condition of culture among them rivaling that of the Kechuas of the western slope of the Cordilleras.*

The learned traveler, Von Tschudi, imagined that their tongue was the modern Atacameño, and that these sparse inhabitants of the desert were descendants of refugee Calchaquis.† But there is no actual evidence to this effect.

Florentine Ameghino, who has done so much for our knowledge of the Argentine Republic, claims the Calchaqui as a dialect of the Aymara tongue of Bolivia;‡ and the two latest writers on the subject, S. A. Lafone Quevedo and Dr. H. von Ihering, are equally at issue in their opinions. The latter insists that the Calchaquis spoke an idiom wholly different from either Kechua or Aymara;§ while the former argues that this extinct tongue was "not exactly Kechuan, but not altogether distinct" from it, and was a mongrel dialect made up of Kechuan, Abiponian and Guaranian elements.‖

When we turn to the old authorities the point is by no means cleared up. The first and best who states anything definite is the Jesuit missionary, Alonso de Bárzana (sometimes written Barcena), whose letter from "Asuncion del Paraguay," dated September 8, 1594, gives some pertinent particulars. He writes: "The most widely extended languages (in Tucuman) are the Caca, the Tonocote and the Sanavirona. The Caca is spoken by the Diaguitas and throughout the valley of Calchaqui, and that of Catamarca, and in most of the district of Nueva Rioja. Nearly all the towns

* See authorities quoted in my work, *The American Race*, pp. 319 *seq.*

† *Reisen in Süd-Amerika*, Vol. v, p. 81; *Organismus der Khetsua-Sprache*, p. 71.

‡ Ameghino, quoted by Ihering.

§ In *Das Ausland*, 1891, p. 944.

‖ "Notes in the Calchaqui Region," in the *American Anthropologist*, October, 1891, p. 358.

about Santiago use it, as well as the natives along the Rio de Estero, and many more who live in the mountains. I have prepared a grammar and vocabulary of this language."*

These statements assign a distribution of the language over an area about 450 miles from east to west, and 300 miles from north to south. It is highly unlikely that so widespread a tongue should utterly disappear while so many of the descendants of those who spoke it still survive. Yet the native population of Tucuman to-day speak only a corrupt Kechua dialect, when not Spanish. In fact, the name applied to the tongue by Bárzana, *kaka*, is the Kechua word for mountain, and signifies in this connection the dialect of the mountaineers.

The grammar and vocabulary he prepared are lost, and we have no monuments of the language remaining, except the geographical and other names mentioned in the early writers or preserved on old maps. In examining these one is at once struck with the numerous names of villages ending in *-gasta*. These are found from the Rio Salado to the Cordillera, and from about 26° 30′ to 31° 30′ South latitude; in other words, in just about the area assigned by Bárzana to the Caca tongue.

I quote some of them:

Ambargasta,	Guanagasta,
Amingasta,	Machigasta,
Auguagasta,	Paquilagasta,
Cahgasta,	Tinogasta,
Calingasta,	Tuquiligasta.
Chiquiligasta,	

I do not think there can be any doubt but that this *gasta* is a corrupted form of the Kechua *llacta*, town or village. In pure Kechua there is no *g* sound, and the *c* is a guttural (German *ch*); so that a rough equivalent in the Spanish alphabet would be close to *gasta*. Moreover, many of the syllables preceding the termination are evidently Kechua, as:

Cahgasta = *caja llacta*, cold town; an appropriate name, as it lies high up the Cordillera on the Rio de Limari.

Auguagasta = *aucca llacta*, enemies' town; occupied by hostile people.

Calingasta = *ccali llacta*, healthy town; probably from its salubrious site.

* Bárzana's letter is printed in the *Relaciones Geograficas de Indias, Peru*, Tomo II (Madrid, 1885).

Machigasta = *macchiy llacta*, washing town, place where large solid things are washed; quite suitable to the village of the name on the eastern end of Lake Andalgala.

The Kechua origin of these names is plain. But if the Caca or Catamareño, as it is sometimes called, was merely a dialect of the Kechua, why did Bárzana speak of it as a separate tongue? Possibly because the differences in sound were so great as to render it unintelligible to a person familiar only with the dialect of Cuzco.

For the present the evidence seems sufficient to consider the Calchaquis a more or less mixed branch of the Kechua family, and the supposition formerly advanced by myself and others that they constituted an independent stock seems unwarranted.

The Quiteño dialect was held by Von Tschudi to present features of higher antiquity than that of Cuzco. So far as I know, there are few published specimens of it.*

The Chinchasuyu or Chinchaya dialect, also one of the northern branches of the tongue, has been sufficiently analyzed by Von Tschudi in his work on the language, his materials being drawn from the Appendix to the second and third editions of Diego de Torres Rubio's *Arte de la lengua Quechua*, and from the manuscripts of the German engineer, Hermann Göhring.† He finds the pronunciation softer. Certain differences in the verbs appear, in part, to be neologisms. And there is a rather large number of words which are wholly diverse in the two dialects.

The Lamaño is said by Von Tschudi to be closely allied to the Quiteño, but he acknowledges that he was not personally familiar with it.

Whether the Incas, that is, the gens from whom the war and peace chiefs were selected, had a language or dialect peculiar to themselves, as asserted by Garcilasso de la Vega—and by nobody else—has been again brought up for discussion lately by Dr. E. W. Middendorf. He maintains that they had, and that this secret language was the Aymara.‡ This he does in the face of the fact that every one of the eleven words which Garcilasso quotes from this mysterious tongue turns out either to be pure Kechua or from a

* An *Arte*, printed at Lima in 1753, of this dialect, is mentioned by Ludewig, *Lit. of Amer. Aborig. Langs.*, p. 162.

† *Organismus der Ketchua Sprache*, Einleitung, p. 65.

‡ See the Introduction to his work, *Das Runa Simi oder der Keshua-Sprache* (Leipzig, 1890).

Kechua radical.* Dr. Middendorf holds his opinion not so much on the evidence, as to support his favorite theory that the Kechua civilization was derived from the Aymaras and that the Inca gens was of Aymara descent. Unfortunately, he has not acquainted himself with the real constitution of the Kechua social system. It has been ably and satisfactorily analyzed by Dr. Gustav Brühl † and later by Heinrich Cunow.‡

The precise relationship of the Aymara language to the Kechua has received considerable further elucidation through Dr. Middendorf's recent studies. He supplies a list of about five hundred and seventy words, which have approximately the same form and sense in the two tongues, and a second list of about one hundred words which are alike in form but with more or less variation in sense. There is also a strong phonetic likeness between the tongues, and their grammatical characteristics approach each other. His conclusion is that "Aymara and Kechua are sister languages, but are like children of mixed marriages; for while they agree in their essential nature (in ihrem Wesen) quite to the most trivial peculiarities, yet in external grammatical form, as well as in the larger part of their vocabulary, they are wholly asunder." §

This is substantially the conclusion reached by that master of linguistic science, Prof. H. Steinthal, who has ably explained the identities and diversities of these two tongues on principles of the general philosophy of language.||

It is probable that further light would be thrown on this question, so interesting for the information its settlement would yield on the origin of Peruvian civilization and the archæology of the region around Lake Titicaca, were the comparison instituted between the oldest, and therefore purest, forms of the two tongues; and it is partly to call attention to some rare or unpublished materials suitable for this purpose that I have introduced the subject.

* Von Tschudi, *Organismus der Khetsua-Sprache*, Einleitung, s. 65. Wilhelm von Humboldt was the first to identify the words adduced by Garcilasso as members of the Kechua.

† Gustav Brühl, *Die Culturvölker Alt-Amerikas* (Cincinnati, 1887).

‡ "Das peruanische Verwandtschaftssystem und die Geschlechtsverbände der Inka," in *Das Ausland*, 1891. As to the "secret language," Cunow says, after discussing what words of it we find in Garcilasso—"Man sieht, von einer Geheimsprache kann keine Rede sein."

§ See Dr. E. W. Middendorf, *Die Aimará-Sprache*, s. 285, *seq.* (Leipzig, 1891), and *Das Runa Simi oder der Keshua-Sprache*, s. 25 (Leipzig, 1890).

|| "Das Verhältniss zwischen dem Ketschua und Aimará," in the *Compte Rendu* of the Congrès des Américanistes, 7ème Session (1888), p. 465.

Assuming with most Kechuists that the trend of migration was from north to south, we should look towards the north for the oldest forms of the tongue. This, as I have said, Von Tschudi did; but both he and Dr. Middendorf state that they had not seen the work on the Quiteño dialect printed at Lima in 1753, nor apparently any MS. on the structure of the northernmost branches of the tongue.

A vocabulary is mentioned by Von Tschudi, dated in 1814, which gives words of the idiom as spoken in the dioceses of Maynas and Ucayali.

This could be supplemented by a later MS. in my library, containing a *Diccionario castellano-inga* (*y inga castellano*) *segun se habla en las montañas limitrofes del Ucayali* and a *Gramatica del idioma Inga acomodado al modo de hablar de los manoitas y Maynas*. It is dated 1868, and the author is given as Fr. Mariano Castellanzuelo; but it appears, in part at least, to be founded on some earlier work.

A comparison of this MS. with the grammars of Von Tschudi and Middendorf shows that the dialect of Maynas, the most eastern of all the Kechua dialects, is more closely akin to the Cuzceño than to the Quiteño, both in vocabulary and structure. It does not present the terminal *nga* to the verbal stem, common in the latter. In vocabulary it is nearer the classical Kechua than to the Chinchaya; for example:

	Maynas.	Kechua of Cuzco.	Chinchaya.
Town,	*llacta,*	*llacta,*	*marca.*
Head,	*uma,*	*uma,*	*peka.*
Water,	*yacu,*	*unu,*	*yacu.*
Small,	*uchuccla,*	*huchuccla,*	*ikchiccla.*
Cold,	*chire,*	*chiri,*	*cahcha.*

For the Aymara, the comparison should be made with its purest form. This was confessedly the Pacasa dialect and not the Lupaca, in which the *Arte* and *Diccionario* of Bertonio were composed. At present, although the distinction between the dialects has been in a measure erased by the facilities of modern intercourse, there remain extensive variations both in grammar and vocabulary.* The excellent work of Dr. Middendorf is founded on what purports to be the Pacasa; and in the Brown Library, at Providence, there is a modern folio MS. by D. B. de Merian, entitled *Historia D. N.*

* Dr. E. W. Middendorf, *Die Aymará-Sprache*, Einleitung (Leipzig, 1891).

J. C. in Linguâ Pacasâ. It contains the original and an interlinear translation in Latin. I quote the following passage as an example:

Text in the Pacasa Dialect of the Aymara Language.

Ancha hacha llaquisiñapana kerisiñapa vila humppiñapsa
Summæ afflictionis suæ agone suo, sanguineo sudore suoque finito

tacutatha collna Jesusa cinti carcta uraquetha
divinus Jesus valdé fatigatus de terra surgens,

sartussina yatichatanacparu cutinira.
ad discipulos suos rediit. Verum eos valdé dormientes

Maasca acanaca conti iquisquiri hacjatassina parajtayana
deprehendens, eos excitavit, dicens: "Surgite! Jam enim venit

sassina sartupjama niupilla puri aljirihaja
venditor meus: quomodo vos dormitis? non videtis

lamisaraqui humana cuja iquisipjiquita hanati
quomodo inimicus meus non dormit, sed Judæorum in manus

ulljapjta, camisa aucahaja hanihua iquiti,
suas ad tradendum me jam adest?" Verum, divine Jesus,

maasca Judiona cana amparanacparu catuyaña hattaqui
non solum de discipulis tuis conquerere, de hujus urbis incolis

niahua piori? Maasca collana Jesusay haniqui
etiam conquerere, qui in omnibus et singulis animas

yatichatanamatha quejasirati aca marca haquenacatha.
suas salvandi rebus semper dormitant, semper otiosi sunt.

(From the *Historia D. N. J. C. in Linguâ Pacasâ, diocesis urbis de la Paz. Descripsit D. B. de Merian.* MS. folio.)

IX.

AFFINITIES OF SOUTH AND NORTH AMERICAN LANGUAGES.

The first scientific attempt to show a connection between South and North American languages was that read by Dr. Max Uhle before the Congrés des Américanistes at Berlin in 1888, and published in the *Compte Rendu* of that association. It was confined to demonstrating a relationship between the Chibcha dialects of northwestern South America to the Costa Rican dialects, which have been so fruitfully studied by Gabb and Thiel.*

* I have summarized the evidence in *The American Race*, pp. 184–186. I do not overlook the Rev. William Herzog's article in the *Archiv für Anthrop.*, 1884, entitled, "Ueber die Verwandtschaftsbeziehungen der costaricensischen Indianer-Sprachen mit denen von Central- und Süd Amerika;" but it does not take up the subject in a scientific manner, and hence its results are unsatisfying.

Still more recently an effort has been made by Dr. A. Ernst, of Caracas, to establish a linguistic connection between the dialects of the Timote stock, who occupy the Cordillera in the district of Mérida (8° N. lat.), and the Costa Rican dialects, thus bringing the Timotes into the Chibcha stock, as he expressly claims. He goes yet further and seeks to discover verbal identities between the Timote and the Guatuso, spoken in Nicaragua on the Rio Frio. The latter is not supposed to be related to the Costa Rican dialects, which makes Dr. Ernst's theory the more important could it be substantiated. He has published a list of forty-five words in an article in the *Boletin del Ministerio de Obras Públicas* for April 8, 1891 (Caracas, Venezuela), on which he bases his claim. I translate and arrange these words, and shall examine the alleged analogies.

SUPPOSED AFFINITIES BETWEEN TIMOTE, COSTA RICAN AND GUATUSO WORDS.

	TIMOTE STOCK.	COSTA RICAN STOCK.	GUATUSO.
Man,	*caac*,	*caga, caca* (father).	
Woman,	*cursum*,	*ra cur*,	*curiza* (female).
Wife,	*carigura*,		*curijuri* (woman).
Mother,	*shugúe*,		*shu*.
Man, white,	*ticep*,	*suát*,	*otshapa* (señor).
Woman, white,	*ticiura*,	*soóra*.	
Child,	*timúa*,	*istamura* (little).	
Boy,	*sari*,	*hara, tshaasoroj*,	*araptshaura*.
Brother,	*cushis*,	*ayi, tshi*.	
Head,	*kitsham*,	*kotshen* (a point).	
Mouth,	*macabó*,		*macokica*.
Tongue,	*shikivú*,	*kerkuo*.	
Foot,	*cujú*,	*bukurú*.	
Fire,	*shirup*,	*yuc, iyuc, tshicra*.	
Water,	*shimpue*,	*divua* (a torrent).	
Stone,	*tituup*,	*i-úhu-wah*,	*capi* (hard).
Wood,	*tisep*,	*dshi-shiba*.	
Salt,	*shapi*,	*tsheba* (pepper).	
Meat,	*shoroc*,	*susturic* (deer).	
Flesh,			
Skin,	*mishu*,		*maiza*.
Animal,	*ticagüai*,	*oguá*.	
Dog,	*tisirki*,	*shiti*.	
Snake,	*sui*,	*shuah*.	
Flea,	*ikis*,	*shiike*.	

	Timote Stock.	Costa Rican Stock.	Guatuso.
Scorpion,	*ikiyut,*	*iküh.*	
Hawk,	*kuê,*		*zuë.*
Egg,	*shicapo,*	*cup, icup.*	
Pepper,	*sicas,*	*shiboh, tsheba.*	
Maize,	*shipyac,*	*cupac* (cornfield).	
Bread,	*suridipa,*	*ip* (maize).	
Town,	*musipuc,*	*coc* (place), *susi* (to dwell), *nicona puca* (to live).	
Night,	*kisi,*	*shki.*	
Thief,	*shisnugui,*	*nruoëh.*	
Morning,	*sik,*	*seék.*	
When,	*pena,*		*ping.*
Sweet,	*shiboh,*	*búuk.*	
To go,	*guateque,*	*ta toeh* (I go).	
It rains,	*oki moi,*	*tshoki.*	
One,	*cari,*	*krará.*	
Two,	*ca-bó,*	*buúk.*	

On looking over this list it is obvious that the Guatuso affinities are too slight to justify the assumption of a relationship. The syllable *cur* in the words for woman, and *shu* for mother, are the only elements that offer a real similarity, and this is too scanty a supply to work on.

In the Costa Rican analogies the sense is often too remote. It is scarcely fair to consider "father" and "man" as identical ideas; or "child" and "little;" "head" and "point;" "meat" and "deer;" "salt" and "pepper;" "maize" and "cornfield," etc. Selecting words so asunder in meaning and choosing, from several dialects on both sides, apparent analogies can always be found. Other words present, in fact, no resemblance, as *suát* to *ticep*, *divua* to *shimpue*, *i-uhu-wah* to *tituup*, etc. There remain a few actual similarities which may be linguistic identities; but these should probably be explained by the fact that the Timote tribes lived near those of Chibcha lineage, and doubtless borrowed from them a number of terms. Such loan words are found in the tongues of all nations who reside in close proximity for a few generations.

I conclude, therefore, that the Timote must still be regarded as an independent stock, and its connection with any in North America has not yet been demonstrated.

On crossing the mountain chain which separates Costa Rica from Nicaragua, we enter a territory which was at the discovery occupied by nations whose traditions and linguistic affinities pointed to the higher latitudes of North America. Such was the Nahuatl tribe, who occupied the islands and southern shores of Lake Nicaragua, and the Mangues, who peopled the borders of Lake Managua.

The latter were closely related to the Chapanecs of Chiapas, speaking the same tongue with slight dialectic variations. One band of the Mangues, about four hundred in number, was found by the early explorers among the Guaymis, one of the Costa Rican tribes whose language has marked affinities to the Chibcha idioms of New Granada. The close relations thus established between the two stocks reappear in the Mazatec language, spoken in the district of Teutitlan del Camino, State of Oaxaca.

Availing myself of a MS. vocabulary of this language, furnished me by M. A. Pinart, I have shown that it is essentially a Chapanecan dialect, but with a strong infusion of Costa Rican, and especially Guaymi, elements, and presents the most northern example of the influence of South American upon North American languages.* The following examples will illustrate the similarity:

	Mazatec.	Costa Rican.
Sun,	*sui,*	*chui* or *sua.*
Moon,	*sa,*	*só, sie* (or *za*).
Ear,	*schical,*	*quhyca, sehuke.*
Eye,	*scheu,*	*s'ócvo, ócua.*
Hair,	*coshé,*	*schá, quyhé.*
Man,	*chi,*	*he-chi-che.*
Woman,	*chu,*	*sue, gŭi.*
Rain,	*tzi,*	*siu.*
Sea,	*dachicu,*	*dechequ-in.*
Foot,	*tzoco,*	*tsuku.*
Head,	*tku,*	*θokua.*
Nose,	*nito,*	*nido-ñ.*

The Mazatecs were a people of considerable culture, celebrated for their religious fervor, and for the important temples and sanctuaries established in their country, prominent remains of which still exist.

* See a paper by me in the *Proceedings* of the American Philosophical Society, January, 1892, entitled "The Mazatec Language and its Affinities."

X.

ON THE DIALECTS OF THE BETOYAS AND TUCANOS.

The most recent writer on the Tucanos of the Rio Negro and Upper Amazon, Dr. Franz Pfaff, observes: "Ueber die Stammesverwandtschaft der Tucanos kann mit einiger Sicherheit nichts behauptet werden." * Von Martius believed them a horde of the Tapuya (Gēs, Botocudo) stock; † but their language betrays no such relationship except in a few, doubtless borrowed, words. They are equally far from the great Tupi, Arawack and Carib stocks. But I believe I can show by conclusive evidence that this hitherto unidentified people speak a language akin to that of the Betoyas and Tamas, whose home is located on the eastern slope of the Cordillera, between the head waters of the rivers Apure and Meta.

My further studies of the Betoya dialects have resulted in discovering for them a much wider extension than I assigned in *The American Race.* They can be traced through about ten degrees of latitude (from 3° South latitude northeastward to 7° North latitude) in a large number of tribes resident on the rivers Napo, Putumayo, Caqueta, Uaupes, Negro, Meta and Apure. The affinities of many of these tribes are asserted by the early missionaries, whose testimony on such points was based on a study of the languages. One of the most useful of these sources is the *Noticias Autenticas del Famoso Rio Marañon*, composed by an anonymous Jesuit missionary, and recently published for the first time under the competent editorship of Jimenez de la Espada by the Geographical Society of Madrid.

Another Jesuit, Father Padilla, in a letter to the Abbé Hervas, stated from personal knowledge that the *Siraras*, *Eles*, *Airicos* and *Situjas* all speak dialects of Betoya; while Gumilla names as other dialects the *Luculia*, *Jabua*, *Arauca* (probably for *Airica*), *Quilifay*, *Anabali*, *Lalaca* and *Atabaca*.

The town *Betoye* itself is situated on a small affluent of the Casanare, in 6° North latitude, at the foot of the mountain chain known as the "Paramo de Chisga," inhabited by a wild tribe of unknown affinities, the *Chitareros*.

The anonymous writer already referred to states that in 1730 the Jesuits had seven "reductions" among the Icaguates (Piojes) of

* *Verhandlungen der Berliner Gesell. für Anthrop.*, etc., 1890, s. 603.

† *Glossaria Linguarum Brasiliensium*, p. 283.

the Napo, and their missions extended north to the banks of the Putumayo, on which stream were the *Amaguages* and the *Ocoguages.* Below the latter, and occupying most of the district between the middle Putumayo on the north and the lower Napo and Amazon on the south, were a number of tribes collectively called *Zeonas* (*Seones*), comprising the *Cungies, Parianas, Cenceguages* and others. These spoke a tongue allied to that of the Icahuates (Piojes); while "the *Neguas, Seizos, Tamas, Acunejos* and *Atuaras* are all of one tongue." The editor, Jimenez de la Espada, speaking from personal knowledge gained on the spot, identifies the modern Piojes with the *Encabellados* of the Spanish writers and the *Icaguates* of the Jesuits.

It is greatly to be regretted that the ample material existing in manuscript for the study of the Zeona language has not been made accessible. Col. Joaquin Acosta had in his library a *Diccionario y Doctrina en lengua Zeona* of 416 pages and another MS. of 116 pages. He expected to present them to the public library of Bogota, but I have not been able to ascertain whether they are there.

From these materials I present the following list of tribes who should be classed in this linguistic family:

The Betoya Linguistic Stock.

Acanejos, a branch of the *Tamas*.
Aguaricos, a branch of the *Tamas*.
Airicos (Ayricos), adjoin *Betoyes* to the south.
Amaguages, on upper Caqueta.
Anibalis, on Rio Apure.
Atuaras, a branch of the *Tamas*.
Avijiras, on Rio Napo.
Becuaries, a branch of the *Icaguates*.
Betoyes, on and near R. Casanare.
Cenceguages, on upper Putumayo south of the *Correguages*.
Ceonas = *Zeonas*.
Cobeus, north of the *Tucanos*.
Correguages, on head waters of Caqueta and Putumayo.
Cungies (Kemgeioios), on R. Cungies, a branch of R. Putumayo.
Curetus (Coretus), west of the *Tucanos*.
Dacé = *Tucanos*.
Eles, north of *Betoyes*, on Rio Casanare.
Encabellados = *Piojes*.
Icahuates (*Icaguates, Icaguages*), former name of *Piojes*.
Jamas, on Rio Manacacia.
Jaunas, near River Uauper.

Jupuas, on Rio Apaporis.
Lolacos, a branch of the *Betoyas*.
Macaguages, on Rios Caucaya, Mecaya and Sensella.
Magueias, a branch of the *Icahuates*.
Malifilitos, a branch of the *Betoyas*.
Neguas, a branch of the *Tamas*.
Ocoguages, on R. Putumayo, near R. Pineya.
Pararies, a branch of the *Zeonas*.
Payaguas, a branch of the *Icahuates*.
Pequeyas, a branch of the *Piojes*.
Piojes, on Rios Putumayo, Napo and Cocaya.
Pouzevaries, a branch of the *Icahuates*.
Quiiifayes, on Rio Apure.
Seizos, a branch of the *Tamas*.
Seones = *Zeonas*.
Situfas (or *Situjas*), on Rio Casanare.
Tamas, on Rio Yari and R. Cagua.
Tucanos, on the Rio Uaupes.
Uaupes, on R. Uaupes.
Yapuas, a branch of the *Piojes*.
Yehebos, a branch of the *Icahuates*.
Yetes, a branch of the *Piojes*.
Zenseies, a branch of the *Zeonas*.
Zeonas, between lower Napo and Patumayo rivers.

Several of these names are synonyms, or merely the same word with varying orthography. The specific termination of *nomina gentilia* in the Betoya dialects would seem to be *guage*, which is perhaps the *guce*, house, household, people, of the Correguage. Thus, *Oco-guage* = water people, this tribe, according to Markham, being remarkably skillful canoemen. *Yete* is the Corr. for "hands." "*Pioje*" is the negative "no," with which these natives reply to all inquiries addressed them by travelers. Other of the names belong to the Lingoa Geral; as, *Payagua* = enemies; *Pararie* (*paraiuara*), parti-colored, *i. e.*, painted men; *Atuara* = the basket (making) men; *Jupua* in the Jauna dialect means "tree" or "wood" men, while *Jauna* means, in the *lingoa geral*, "watermen." *Dacé* is the name of the Toucan bird in the Tucano dialect. "Curetu" in the *lingoa geral* is an opprobrious epithet, "rascals." It was applied to several tribes. Balbi, in his *Atlas Ethnographique*, gives a short vocabulary of one of these "rascal" tribes, who lived at Ega on the Amazon. It has no connection with the Curetu of the Rio Apaporis.

The Jupua and Curetu dialects are properly one and the same, the difference which appears in their vocabularies arising simply from inequality in the ears and the orthographies of observers. This is evident by the following comparison of the vocabularies of Martius (German orthography) and Wallace (English orthography):

	Jupua (Martius).	Curetu (Wallace).
Blood,	*thik,*	*dü.*
Bow,	*patopai,*	*patueipei.*
Earth,	*thitta,*	*ditta.*
Flesh,	*ga'hi',*	*se'hea'.*
Finger,	*moh-asoing,*	*mu-etshu.*
Fire,	*pieri,*	*piure.*
Flower,	*pagari,*	*bagaria.*
Foot,	*göaphæ,*	*giapa.*
Hair,	*poa,*	*phoa.*
Hand,	*moho,*	*muhu.*
Head,	*co'ëre,*	*cuilri.*
House,	*wu'i,*	*wee.*
Mouth,	*thischüh,*	*dishi.*
Sun,	*hauvä,*	*aoué.*
Tongue,	*toro,*	*dolo.*
Tooth,	*gobâckaa',*	*gophpecuh.*
Water,	*thäco,*	*deco.*
Woman,	*nomöa,*	*nomi.*

These two, the Jupua and Curetu, together with the Jauna and Cobeu, form with the Tucano a group of dialects closely related among themselves; and they are a branch of the same mother tongue as the Betoya, Tama, Pioje and Correguage, which, in turn, present also merely dialectic differences between each other.*

In spite of the imperfect materials yet available to study this extended family, the relationship of its scattered members is demonstrable. To illustrate it, I submit the following:

Comparative Vocabulary of the Betoya and Tucano Dialectic Groups.

Betoya Group: B. = Betoi; C. = Correguage; P. = Pioje; T. = Tama.
Tucano Group: Cob. = Cobeu; Cur. = Curetu; Jup. = Jupua; Tuc. = Tucano.

* Dr. Pfaff (u. s. p. 603) has compared five words of the Tucano, Coretu and Cobeu, presenting similarities; and Dr. Ernst (*Zeitschrift für Ethnol.*, 1891) has shown similarities of six words in Tamas and Tucano; but a general survey of the stock has not heretofore been offered.

Man,	*umasoi*, B. ; *emiud*, C.;	*eum*^{a}, *imea*, Tuc.; *ermeu*, Cob., Cur.
Woman,	*domi*, C.; *romeo*, T.;	*nomi*, Cur.; *nomio*, Tuc.
Fire,	*to'a*, P., T.; *fu-tui*, B.;	*toua*, Cob.
Water,	*oco*, B., C., P., T.;	*oco*, Tuc.; *hóggoa*, Jup.
Rain,	*oco-raime*, C.;	*oco-ro*, Tuc.
Tongue,	*chimenu*, P.;	*chemeno*, Tuc.; *erimendo*, Cob.
Hand,	*r'umocoso* (my hand),	*umoca*, Tuc.
Foot,	*coapi*, C.;	*göaphae*, Jup.; *gi*^{a}*pa*, Cur.
Teeth,	*cojini*, C.;	*coping*, Cob.
Nose,	*j'inkepiu* (thy), C.;	*enkenha*, Tuc.
Forehead,	*siapue*, C.; *jopue*, T.;	*dipua*, *righpoah* (head), Tuc.
Breast (mamma),	*oχecho*, C.;	*oχ-penno*, Tuc.
Meat,	*guai*, C.;	*ga'hi*, Jup.
Maize,	*huka*, P.;	*o-hoka*, Tuc.
Jaguar,	*ia'i*, P.; *chai*, C.;	*jih*, Jup.
Parrot,	*gueco*, C.;	*weχki*, Tuc.
Deer,	*ñama*, C.;	*ikama*, Jup.
Egg,	*tsia*, C.;	*dia*, Cur.
Fowl,	*cura*, C.;	*caru-hin*, Cob.
Monkey,	*tangue*, C.;	*aχke*, Tuc.
Stone,	*cata*, C.;	*iχtana* (=*i-cata-na*), Tuc.
Star,	*manioco*, C.;	*jocheo'*, Jup.; *ambiocowa*, Cor.; *ua'coa*, Tuc.
Banana,	*ohoh*, P., C.;	*ohoh*, Tuc.
Son,	*sii*, C.;	*si-mugi*, Cur.
Sky,	*quen-eme*, C.;	*imina*, J.; *imi-se*, Tuc.
Canoe,	*choque*, C.;	*yuki*, Tuc.
Devil,	*guatò*, C.;	*ouatin*, Tuc.
Enemy,	*pai-name*, C.;	*ua-pai*, Tuc.
Farewell,	*sayé*, P.;	*uâyé*, Tuc.

In other words, although the identity of the radicals exists, it is not visible in the forms presented. Thus, in Wallace's vocabulary both "sun" and "moon" are rendered by *uipo*, which is the Betoya *ubo*, sky, heaven.

Domi, *nomio*, "woman," is really a compound of the Betoya feminine *ro*, female, and *emi*, or *uma*, "man" (homo), as is easily seen in the Tama *ro-meo*.

Very few analogies are visible to the Tapuya (Gēs) dialects, to which the Tucano has usually been assigned. The only one of importance is the word for fire, *pekhămi* (Tuc.), *păhgă* (Jauna), which appears to be the Botocudo *pĕk*.

The conception of number is very slightly developed in this stock, and even the dialects most closely related show wide variations; for example:

	Betoya.	Tama.	Pioje.
1,	*edoyoyoi,*	*teyo,*	*moño* (finger).
2,	*edoi,*	*ca'yapa,*	*tsamun-cua.*
3,	*ibutu,*	*cho-teyo* (2+1),	*tsamun-huente-cua.*
4,	*ibutu-edoyoyoi* (3 + 1),	*ca'yapa-ria* (2 again),	*tajeseca.*
5,	*ru-mocoso* (hand),	*cia-jente* (hand),	*teserapin.*

In the vocabularies both *moko* and *jente* (*jete*) are given for hand, and both are used in the words for "five."

In the Tucano group the dialect which has retained the strongest affinities is the Curetu:

	Curetu
One,	*tchudyu* (= Betoya *ĕdyuyu*).
Two,	*ap-adyu* (= " *ĕdyu*).
Three,	*arayu.*
Four,	*apaedyái* (= 2 + 2).
Five,	*tchumupa.*

I believe the evidence here briefly presented will be adequate to prove the extended affinities of this stock, and to vindicate its importance in South American ethnography. How far its analogies may be traced north and west I have not sufficient materials to determine. In *The American Race*, p. 275, I pointed out a few similarities between Betoya and Choco roots; and I would particularly mention that the words for "man" and "woman," *uma* and *ira*, reported by early explorers (in 1515) as in use along the northern shore of Venezuela and the Isthmus of Panama, certainly belong to the Betoya language.*

* "En toda esta tierra llaman à los hombres *omes*, y à las mugeres *iras*." See J. Acosta, *Historia de Nueva Granada*, p. 453. The tract referred to is from the Gulf of Uraba to the Punto del Nombre de Dios, along the shore of the Isthmus of Panama.

Stated Meeting, January 15, 1892.

Present, 47 members.

President, Mr. FRALEY, in the Chair.

Correspondence was submitted as follows:

A circular from the Observatoire National Astronomique et Météorologique d'Athènes, asking exchanges, which was agreed to.

A circular from M. Julio N. Rosas, announcing his appointment as Director Général de Statistique de la Provincia de Buenos Aires, La Plata.

A circular from the Royal Geographical Society, on the orthography of geographical names.

Letters of envoy from the Observatory, Adelaide, S. Australia; Biblioteca N. C. di Firenze; Musée Guimet, Paris; Meteorological Office, Zoölogical Society, London, Eng.

Letters of acknowledgment from the Royal Geographical Society of Australasia, Melbourne, Victoria (131–134); Tokyo Library (135); Prof. Dr. Ludwig Rütimeyer, Basel, Switzerland (135); Direccion General de Estadistica de la Provincia de Buenos Aires, La Plata (131, 132, 133, 134).

Accessions to the Library were reported from the Observatory, Adelaide, Australia; Count R. d'Hulst, Alexandria, Egypt; Anthropological Society, Tokyo; Société Imp. des Naturalestes, Moscow; Physical Central-Observatoriums, Bibliotheque Geologique de la Russie, St. Petersburg; Academie R. de Belgique, Bruxelles; K. Nordiske Oldskrift Selskab, Copenhagen; Physiologische Gesellschaft, Berlin; R. Ministero della Instruzione Publica, Firenze; R. Istituto Lombardo, Milan; Société des Antiquaires de Picardie, Amiens, France; Société Historique, Littéraire, etc., Du Cher, Bourges; Société de Borda, Dax; Société des Sciences Naturelles, etc., de la Creuse, Guéret; Société des Sciences Naturelles, La Rochelle; École des Mines, Musée Guimet, Société Zoologique de France, Société D'Anthropologie, Société N. des Antiquaires de France, Paris; Société de Géographie, Toulouse; Académie N. des Sciences, etc., Bordeaux; Société des Antiquaires de la Morinie, Saint Omer; Zoölogical Society, London; Geological Society, Manchester; Natural History Society, Montreal; Historical and Scientific Society of Manitoba, Winnepeg; Harvard University, Cambridge, Mass.; Travelers' Insurance Co., Hartford, Conn.; Editors of the "American Journal of Science," Agricultural Experiment Station, New Haven, Conn.; Agricultural Experiment Station, Storrs, Conn.; Mathematical Society, New York; Engineers' Club, College of Pharmacy, Franklin Institute, Hydrographic Office, Dr. Charles A. Oliver, Philadelphia; State Board of Health, Nashville; Experiment Station of Florida, Lake City; Editor of "Journal of Comparative Neurology," Cincinnati, O.; Sociedad Cientifica "Antonio Alzate," Mexico.

The decease of the following members was announced:

General Montgomery C. Meigs, Washington, D. C.; born May 3, 1816; died January 2, 1892.

Mr. Addison May, West Chester, Pa.; died January 8, 1892, æt. 80.

Mr. Edward Penington, Philadelphia; died December, 1891.

Prof. Jean Louis Armand de Quatrefages, at Paris, January 12, 1892, æt. 82.

This being the evening for the selection of the Standing Committees of the Society, for the ensuing year, on motion the President was authorized to appoint the same, which he subsequently did as follows:

Finance.

William B. Rogers, Philip C. Garrett, Charles S. Wurts.

Hall.

J. Sergeant Price, William A. Ingham, Charles A. Oliver.

Publication.

Daniel G. Brinton, George H. Horn, Samuel Wagner, Patterson Du Bois, Horace Jayne.

Library.

Edwin J. Houston, William John Potts, Jesse Y. Burk,
William H. Greene, William S. Baker.

Michaux Legacy.

Thomas Meehan, J. Sergeant Price, William M. Tilghman,
Isaac Burk, Isaac C. Martindale.

Henry M. Phillips' Prize Essay Fund.

Richard Vaux, Henry Phillips, Jr., William V. McKean,
Furman Sheppard, Joseph C. Fraley,
The President and the Treasurer of the Society, *ex officio.*

This being the evening for the election of Librarian, a ballot was held and the tellers reported that Mr. Henry Phillips, Jr., had received 28 votes and Mr. Benjamin Smith Lyman had received 12 votes; whereupon Mr. Phillips was declared duly elected Librarian for the ensuing year.

[Secretary Phillips present and not voting.]

Pending nominations Nos. 1232 and 1233, and new nominations Nos. 1234, 1235, 1236, 1237, 1238, 1239 and 1240 were read.

The Committee appointed to examine the paper of Prof. Cope, offered at the last meeting for the Transactions, reported progress and was continued.

Dr. Brinton presented the following papers for the Proceedings: "On the Mazatecan Language of Mexico, and its Affinities," and "Observations on the Chinantec Language of Mexico."

The Committee on the Michaux Legacy presented a paper on "The Temperate and Alpine Floras of the Giant Volcanoes of Mexico," by Prof. Angelo Heilprin, which was ordered to be printed as a part of its report.

The report of the Committee, on the Publications of the Society, appointed December, 1890, was then taken up.

The report was then read, signed by the Chairman and three other members of the Committee, the Chairman stating in answer to inquiry that the signature of the other member was withheld on account of his not approving the second resolution. The resolutions were then read as follows:

Resolved, 1. That the Proceedings of the American Philosophical Society be issued quarterly, and also at more frequent periods whenever an amount of matter is ready for press, which will make sixty-four pages of text, but so as not to interfere with the regularity of the quarterly issue.

Resolved, 2. That in order to permit estimates of the cost of illustrations, authors shall submit either completed drawings or the specimens to be drawn; and that the Secretaries shall accept either as sufficient basis for the publication of articles otherwise unobjectionable.

On motion of Dr. Frazer, the Society proceeded to the consideration of report of the first resolution. A debate took place thereon, participated in by Messrs. Price, Morris, Houston, Cope, Frazer, Barker, Vaux, Martindale and Horn.

Mr. Martindale moved to strike out all after the word "quarterly" and to insert thereafter the words "provided sufficient material shall be furnished for that purpose."

The amendment being put to a vote was carried and a vote being taken on the resolution as amended it was adopted.

The question then arising on the adoption of the second resolution, Dr. Brinton stated his reasons for declining to recommend the same, and offered as an amendment the substitution of the word "may" for "shall" in the third line, to read "the Secretaries may, etc."

The amendment was carried and the resolution as amended was adopted.

On motion of Mr. Dudley, the Society adjourned.

Stated Meeting, February 5, 1892.

Present, 8 members.

Dr. MORRIS in the Chair.

The following correspondence was submitted :

A letter from Commander F. M. Green, U. S. A., giving sufficient reasons for declining the membership in the Society to which he had been elected.

A circular from the Manchester Geographical Society, announcing the decease of its President, the Duke of Devonshire.

A letter from Gustav Fock, bookseller in Leipzig, offering for sale the library of the late Prof. Zarnke for 45,000 marks.

Accessions to the Library were announced from the Royal Society of South Australia, Prof. H. Y. L. Brown, Adelaide; Linnean Society of N. S. Wales, Sydney; Prof. H. H. Risley, Calcutta; Section für Naturkunde O. T. C., Vienna; K. danske Geografiske Selskab, Copenhagen; Gesellschaft für Erdkunde, Deutsche Geologische Gesellschaft, Horticultur-Gesellschaft, Messrs. Friedländer & Sons, Berlin; K. Sächsische Meteorologische Institut, Chemnitz; Société des Sciences Naturelles, Fribourg; Verein für Erdkunde, Halle a. S.; Verein für Thüringische Geschichte und Altertumskunde, Jena; K. Sächsische Gesellschaft der Wissenschaften, Leipzig; K. B. Akademie der Wissenschaften, Munich; R. Societatas Scientiarum, Upsal; État Indépendant du Congo, Bruxelles; Société Vaudoise des Sciences Naturelles, Lausanne; Société de Géographie, Lille; Université de Lyon; Société de L'Enseignement Supérieur, Marquis de Nadaillac, Paris; R. Academia de la Historia, R. Academia de Ciencias, etc., Madrid; Meteorological Council, R. Statistical Society, Society of Arts, Royal Society, Editors of the "Geological Magazine," Mr. Frederick Arthur Crisp, London; Agricultural Experiment Stations at Bangor, Me., Amherst, Mass., Kingston, R. I., Auburn, Ala., College Station, Tex., Corvallis, Oreg., Laramie, Wyo.; National Civil Service Reform League, Boston;

Hon. Robert C. Winthrop, Prof. Eben Norton Horsford, Harvard University, Cambridge; Essex Institute, Salem; Brown University, Providence, R. I.; Prof. E. North, Clinton, N. Y.; Free Public Library, Jersey City; Bureau of Statistics of New Jersey, Trenton; American Pharmaceutical Association, Drexel Institute, Drs. J. E. Ives, D. Jayne, J. C. Ayer, Mr. Henry Phillips, Jr., Philadelphia; American Chemical Society, Baltimore; Anthropological Society, Bureau of Navigation, Mr. Lester F. Ward, Washington, D. C.; Oberlin College, Oberlin, O.; Colorado Scientific Society, Denver; Observatoire Météorologique Central, Observatorio Astronómico Nacional de Tacubaya, Mexico; Observatorio Nacional Argentino, Buenos Aires; Museo de La Plata; Prof. Ladisláu Netto, Rio de Janeiro.

The Committee on Dr. Cope's Paper for the Transactions reported the same to be worthy of publication and was discharged.

Photographs of the following members were presented for the Society's Album:

Dr. Thomas Chase, Providence, R. I.

Dr. J. L. Campbell, Crawfordsville, Ind.

Dr. W. G. A. Bonwill, Philadelphia.

Mr. Charles Truscott presented a photograph from the portrait of Franklin owned by the Society.

Miss Emily Phillips presented a locket containing hair of General Andrew Jackson.

The following announcements of the deaths of members were made:

Paul Hunfalvy, Budapesth, December, 1891.

Andrew C. Ramsay, London, December, 1891.

Thomas Jefferson Lee, Baltimore, December, 1891.

Rev. Joseph F. Garrison, Camden, N. J., January, 1892, æt. 70.

The President appointed Mr. William John Potts to prepare the obituary notice of Dr. Garrison.

Prof. Cope offered for the Transactions a paper by himself on "The Homologies of the Posterior Cranial Arches in the

Reptilia," which was referred to a Committee to be appointed by the President.*

Dr. Cope offered for the Proceedings "A Contribution to the Vertebrate Palæontology of Texas."

Dr. Brinton presented for the Proceedings "Studies in the South American Native Languages," which was ordered to be printed.

The paper by Dr. Bonwill, "Geometry and Mechanics Deny Evolution," was made the special order for March 4, 1892.

Pending nominations 1232 to 1240 (inclusive) were read.

On motion of Dr. Brinton, it was resolved that a Committee of three should be appointed by the President to consider the advisability of taking concerted action in connection with other learned societies for the celebration of the four-hundredth anniversary of the discovery of America.†

And the Society was adjourned.

Stated Meeting, February 19, 1892.

Present, 12 members.

President, Mr. Fraley, in the Chair.

Correspondence was submitted as follows:

Acknowledgments (136) were received from the Geological Survey, Ottawa; Canadian Institute, Toronto; N. S. Institute of Science, Halifax; Society of Natural History, Maine Historical Society, Portland, Me.; Agricultural Experiment Station, Amherst; Prof. C. H. Hitchcock, Hanover, N. H.; Vermont Historical Society, Montpelier; State Library of Massachusetts, Historical Society, Boston Public Library, Society of Natural History, Mr. Robert C. Winthrop, Boston;

*The President subsequently appointed as such Committee, Drs. Ryder, Jayne and Sharp.

† The President subsequently appointed as such Committee, Drs. Brinton, Cope and Fraser.

Museum of Comparative Zoölogy, Profs. A. Agassiz, Charles W. Eliot, Robert N. Toppan, Cambridge, Mass.; Dr. Pliny Earle, Northampton, Mass.; Essex Institute, Salem; American Antiquarian Society, Worcester; Brown University, R. I. Historical Society, Providence; Mr. George F. Dunning, Farmington, Conn.; Historical Society, Theological Seminary, Hartford; Yale University, N. H. Colony Historical Society, Profs. O. C. Marsh, H. A. Newton, W. D. Whitney, New Haven; Prof. James Hall, Albany; Society of Natural Sciences, Buffalo Library, Buffalo, N. Y.; Prof. E. North, Clinton, N. Y.; Profs. J. M. Hart, J. E. Oliver, Ithaca, N. Y.; American Museum of Natural History, Mathematical Society, Meteorological Observatory, New York Historical Society, Hospital Library, University of the City of New York, General Henry L. Abbot, Mr. Joel A. Allen, Prof. J. J. Stevenson, New York; Vassar Brothers Institute, Poughkeepsie; Oneida Historical Society, Utica; U. S. Military Academy, West Point; Prof. Henry M. Baird, Yonkers; Mr. Isaac C. Martindale, Camden, N. J.; Profs. W. H. Green, C. A. Young, Princeton; Dr. Robert H. Allison, Ardmore, Pa.; Mr. Burnet Landreth, Bristol; Prof. Robert W. Rogers, Carlisle; Prof. Martin H. Boyè, Coopersburg; Hon. Eckley B. Coxe, Drifton; Rev. Thomas C. Porter, Prof. J. W. Moore, Dr. Traill Green, Easton; Prof. Lyman B. Hall, Haverford College P. O.; Mr. Ario Pardee, Hazleton; Mr. John Fulton, Johnstown; Academy of Natural Sciences, Engineers' Club, Wagner Free Institute, Numismatic and Antiquarian Society, Philadelphia Library, Drs. W. G. A. Bonwill, H. C. Chapman, George Friebis, W. W. Keene, George R. Morehouse, Isaac Norris, Charles A. Oliver, C. N. Peirce, W. S. W. Ruschenberger, H. Clay Trumbull, Profs. John Ashhurst, Jr., F. A. Genth, Jr., H. D. Gregory, J. P. Lesley, John Marshall, Samuel P. Sadtler, H. W Spangler, Messrs. Henry Carey Baird, William S. Baker S. Castner, Jr., Thomas M. Cleemann, Patterson Du Bois, J. S. Harris, William A. Ingham, W. W. Jefferis, G. de B. Keim, James T. Mitchell, C. Stuart Patterson, Henry Phillips, Jr., Franklin Platt, Theodore D. Rand, Samuel Wagner, Talcott Williams, Admiral E. Y. Macauley, Philadelphia; Mr. Heber S. Thompson, Pottsville; Rev. G. W. Anderson, Rosemont, Pa.; Philosophical Society, Messrs. William Butler, Philip P. Sharpless, W. Townsend, West Chester; Maryland Institute, Baltimore; Agricultural Experiment Station, College Park; Leander McCormick Observatory, University of Virginia, Prof. J. W. Mallet, Charlottesville, Va.; Agricultural Experiment Station, Prof. I. C. White, Morgantown, W. Va.; N. C. Agricultural Experiment Station, Raleigh; University of Alabama, University P. O.; Agricultural Experiment Station, College Station, Tex.; Prof. E. W. Claypole, Akron, O.; Cincinnati Observatory; Editor of the "Journal of Comp. Neurology," Granville, O.; Columbia Athenæum, Tenn.; Prof. J. L. Campbell, Crawfordsville, Ind.; Experiment Station, La Fayette, Ind.; Historical Society, Chicago; Academy of Science, St. Louis; Geological Survey of Missouri, Jefferson City; General William F. Reynolds, Detroit, Mich.; Kansas Academy of Science, Topeka; State Historical Society, Madison, Wis.; University of California, Berkeley; Prof. George Davidson, San Francisco, Cal.

Letters of acknowledgment were received from the Tokyo Anthropological Society (135); Société de Geographie, Bucarest, Roumania (135); University Library, St. Petersburg (135); Société de Géographie de Finlande, Helsingfors (131–135); Société R. des Sciences, Upsal, Sweden (134); Maatschappij de Nederlandsche Letterkunde, Leiden (135); Société Neuchateloise de Geographie, Neuchatel (135); Redaction der "Naturwissenschaftlichen Wochenschrift," Berlin (135); Naturforschende Gesellschaft in Emden (135); Oberhess. Gesellschaft f. Natur. u. Heilkunde, Giessen; M. Otto Böhtlingk, Leipzig (135); Société des Sciences Naturelles, etc., Guéret, France (135); Prof. Léon de Rosny, Paris (134, 135); Société des Antiquaires de la Morinie, St. Omer (131–134); R. Istituto di Studi Superiori, Florence, Italy (135); Bowdoin College, Brunswick, Me. (96–130, 132–136, and Catalogue, Parts i–iv); Mr. George F. Dunning, Farmington, Conn. (135);

Free Public Library, Jersey City (96–130, 136, and Catalogue, Parts i–iv).

Letters of envoy were received from the Société de Géographie de Finlande, Societas pro Fauna et Flora Fennica, Helsingfors; Naturwissenschaftliche Verein für Schleswig-Holstein, Kiel, Prussia; K. Sächsische Gesellschaft der Wissenschaften, Leipzig; Société Royale des Sciences, Upsal, Sweden; R. Academia de Ciencias y Artes, Barcelona, Spain; Royal Statistical Society, Lowdon; Boudoin College, Brunswick, Me.; Messrs. J. C. Ayer & Co., Lowell, Mass.; Observatoire Météorologique Central de Mexico.

Accessions to the Library were reported from the Geological Survey of India, Calcutta; Magyar Tudományas Akadémia, Société Hongroise de Géographie, Budapesth; Société de Geographie de Finlande, Societas pro Fauna et Flora Fennica, Helsingfors; Société Royale de Geographie, Antwerp; Gesellschaft für Anthropologie, Ethnologie, etc., Berlin; Naturwissenschaftlicher Verein für Schleswig-Holstein, Kiel; Publishers of the "Revue Universetaire," Paris; R. Academia de Ciencias y Artes, Barcelona, Spain; Royal Society, Royal Geological Society, London; Royal Society, Edinburgh; Philosophical Society, Cambridge, Eng.; Bowdoin College, Brunswick, Me.; Harvard College, Cambridge, Mass.; Prof. William Dwight Whitney, New Haven; Astor Library, Academy of Sciences, American Museum of Natural History, Dr. T. Sterry Hunt, New York; Hon. Thomas H. Dudley, Camden; Mr. Albert S. Gatschet, Washington, D. C.; Public Library, Cincinnati; State Historical Society, Iowa City; Wyoming Agricultural College, Laramie; Missouri Geological Survey, Jefferson City; Dr. John C. Branner, Little Rock, Ark.; Academy of Science, Tacoma, Wash.; Prof. J. de Mendizábel Tamborrel, Mexico.

The Committee appointed at last meeting to examine Prof. Cope's paper for the Transactions, reported it worthy of publication, and was discharged.

The deaths of Theodore Mommsen (February 3, 1892, æt. 75) and T. Sterry Hunt (February 12, 1892, æt. 66) were announced.

On motion, the Society appointed Mr. James Douglass, of New York city, to prepare the usual obituary notice of Dr. Hunt.

The proceedings of the Board of Officers and Council were submitted.

This being the stated evening for balloting for candidates for membership, pending nominations Nos. 1232, 1233, 1234, 1235, 1236, 1237, 1238, 1239 and 1240 were read, spoken to and voted upon.

Prof. Cope made an oral communication on "The Geology of the Staked Plains of Texas."

The Committee on Extended Accommodations presented a final report, and stated that the total cost of alterations to the building had amounted to $41,449.72.

On motion of Dr. Brinton, the report was accepted and the Committee discharged, with the hearty thanks of the Society for its long, arduous and faithful labors.

The Library Committee reported the following minute:

STATED MEETING, FEBRUARY 12, 1892.

The Librarian reported that owing to the advanced condition of the Library he had been able to dispense with the services of the assistants hitherto employed by the Committee, and pursuant to authority granted him by the Chairman he had discharged them.

The action of the Librarian was approved.

The Librarian was directed to purchase the New Century Dictionary, the Supplement to Allibone's Dictionary, and U. S. wall map.

Dr. Morris, on behalf of the Curators, reported that the Peale collection of relics of the Stone Age had been placed in the Society's museum, and that all expenses connected with the transfer of the same had been borne by Mr. Robert Patterson, to whom the thanks of the Society were tendered.

The thanks of the Society were tendered to Miss Emily Phillips for a gift of a locket containing the hair of General Andrew Jackson, presented at the last meeting of the Society.

All other business having been transacted, the tellers reported to the President the result of the ballot, who thereupon declared the following to have been duly elected members of the Society:

2199. Hon. George William Curtis, New York city, N. Y.

2200. Anthony J. Drexel, Esq., Philadelphia.

2201. Prof. Edward A. Leech, Ph.D., Director U. S. Mint, Washington, D. C.

2202. Hon. Seth Low, LL.D., President Columbia College, New York city, N. Y.

Dr. E. D. Cope offered the following amendment to Chapter ix, Section 1, of the Laws:

The ordinary meetings of the Society shall be on the first and third Fridays of every month, from September to the third Friday in June inclusive, at eight o'clock in the evening.

And the Society was adjourned by the President.

Stated Meeting, March 4, 1892.

Present, 27 members.

President, Mr. Fraley, in the Chair.

Correspondence was submitted as follows:

Acceptances of membership were read as follows:

Mr. Anthony J. Drexel, Philadelphia.

Hon. Seth Low, New York city, N. Y.

Hon. George William Curtis, West New Brighton, Staten Island, N. Y.

A circular was received from the Linnean Society of New South Wales, announcing the death of its President, Sir William Macleay.

A letter from P. Steiner (Darmstadt) in reference to his language, *Pasilengua*.

Letters of acknowledgment were received from the Institut

Egyptien, Cairo (135); Académie R. Danoise des Sciences, etc., Copenhagen (135); K. Bibliothek, Berlin (135); Deutsche Seewarte, Hamburg (135); Verein für Erdkunde, Netz (135); R. Accademia di Scienze, etc., Padova (135); Natural History Society, Montreal (136); Mr. Hamilton A. Hill, Boston (136); Free Public Library, New Bedford, Mass. (136); Prof. Burt G. Wilder, Ithaca, N. Y. (136); American Museum of Natural History, New York city (97, 99, 100, 101, 127–135); New Jersey Historical Society, Newark (136); Messrs. Cadwalader Biddle, Samuel Dickson, Philadelphia (136); Maryland Historical Society, Baltimore (136); U. S. Naval Observatory, U. S. Coast and Geodetic Survey, Anthropological Society, Patent Office, War Department (136), Department of Agriculture (136), Dr. W. J. Hoffman, Rt. Rev. J. J. Keane, Capt. Thomas Jefferson Lee, Messrs. Charles A. Schott, William B. Taylor, Washington, D. C. (136); University of Tennessee, Knoxville (136); Georgia Historical Society, Savannah (136); University of Cincinnati (99–130, and Catalogue, Parts i–iv); Colonel William Ludlow, Detroit, Mich. (136); Indiana Society of Civil Engineers, Remington (136); Lick Observatory, Mount Hamilton, Cal. (96–130, 136, and Catalogue, Parts i–iv); Sociedad Cientifica "Antonio Alzate," Mexico (136); Academy of Science, Tacoma, Wash. (96–130, 136, and Catalogue, Parts i–iv); Wyoming University Experiment Station, Laramie (136).

Accessions to the Library were reported from the K. N. F. Universitetel, Christiania, Norway; Statistika Central Byrån, Stockholm, Sweden; Académie R. Danoise des Sciences, etc., Copenhagen; Prof. P. Steiner, Darmstadt, Germany; Prof. Léon Douay, Nice, France; Academy of Arts, San Fernando, Spain; Société de Geographie, Lisbon, Portugal; Sir J. D. Hooker, London, Eng.; Theological Seminary, Andover, Mass.; Harvard College, Cambridge, Mass.; John M. Berry, Worcester, Mass.; Rochester Academy of Science; Free Public Library, Jersey City; Mr. W. J. Potts, Camden; Historical Society of Pennsylvania, Academy of Natural Sciences, Dr. Persifor Frazer, Messrs. MacCalla & Co., Dr.

Charles A. Oliver, Philadelphia; U. S. Naval Observatory, War Department, Treasury Department, Washington, D. C.; Agricultural Experiment Stations, Virginia, Mississippi, Arkansas; Denison University, Granville, O.; State Historical Society of Wisconsin.

The amendment to the Laws of the Society (Chap. ix, § 1) came up for action. Due proof of advertisement and notice of same having been first submitted, and a constitutional quorum being present, the Society then proceeded to consider the same.

Dr. Cope moved that it be adopted.

Mr. Vaux moved as an amendment that it be indefinitely postponed.

A vote being taken, Mr. Vaux's motion was carried, and the consideration of the amendment was indefinitely postponed.

The Publication Committee reported that the papers by Dr. Cope had been placed in the printers' hands, and that the illustrations to accompany them had been ordered to be prepared; and that Vol. xvii, Part i, had been ordered to be closed and distributed when printed.

Dr. Bonwill read a paper entitled "Geometry and Mechanics Deny Evolution," which he illustrated with diagrams and specimens.

Dr. Cope spoke against some of the propositions set forth by Dr. Bonwill, and exhibited specimens of early dentition from Spuj, Belgium.

Dr. Cope offered for the Proceedings a paper on "Tiaporus, a New Genus of Teiidæ."

Mr. Price, Chairman of the Hall Committee, presented the following report:

To the American Philosophical Society:

The Hall Committee respectfully reports that they have carefully considered the matter of a fireproof in the new building to preserve the valuable books, papers and documents belonging to the Society, which was referred by it to them. They have called in consultation with them Messrs. Wilson & Bros., the architects of the building, who have prepared detailed drawings for the construction of a fireproof 4 feet by 14 feet in the clear inside and reaching from the floor to the ceiling, and situate in the southeast corner of the northern room on second floor, which will afford ample room for many years to come for the protection from fire of valuable books, papers and documents and articles of various kinds, which may need such care and preservation. They have also received an estimate from Messrs. Stacy Reeves & Sons to construct and complete the same for the sum of $278. They therefore submit the following resolution :

Resolved, That the report of the Committee be accepted, and they are directed to have said fireproof constructed under the direction of the architect, in accordance with the plans prepared by them.

All of which is respectfully submitted.

J. SERGEANT PRICE, *Chairman.*

On motion of Mr. Price, the report was accepted, and the resolution contained therein was adopted by the Society.

Mr. Williams offered the following resolution, which after discussion was adopted by the Society:

Resolved, That a Committee of three be appointed by the President, to consider and report to the Society upon the advisability of an annual grant for the purpose of aiding the publication or assuming the entire cost of publishing transcripts of the Babylonian tablets, on deposit in the Museum of the University of Pennsylvania.*

And the Society was adjourned by the President.

Stated Meeting, March 18, 1892.

Present, 9 members.

Mr. WOOD in the Chair.

Correspondence was submitted as follows:

Letters of envoy were received from the Société de Litteraire Finnoise, Helsingfors; K. Sächsische Gesellschaft der Wissenschaften, Leipzig; Meteorological Office, London; Museum of Comparative Zoölogy, Cambridge, Mass.; Department of State, Washington, D. C.

* The President subsequently appointed Messrs. Williams, Du Bois and Price as such Committee.

Letters of acknowledgment were received from Marquis Antonio de Gregorio, Palermo, Sicily (135); Sir J. W. Dawson, Montreal, Canada (136); Agricultural Experiment Station, Geneva, N. Y. (135, 136); Geological Society of America, Rochester, N. Y. (136); Prof. Henry Morton, Hoboken, N.J. (136); Dr. Charles B. Dudley, Altoona, Pa. (136); Mr. R. Meade Bache, Hon. Henry Reed, Philadelphia (136); Prof. Charles V. Riley, Washington, D. C. (136); State Experiment Station, Baton Rouge, La. (135, 136); Washburn College, Kansas State Historical Society, Topeka, (136); Colorado Scientific Society, Denver, (136); Museo Oaxaqueño, Oaxaca, Mex. (136); Observatorio Astronómico Nacional, Mexicano, Tacubaya (136); Bishop Crescencio Carillo, Merida, Mex. (136).

Accessions to the Library were reported from the Société Litteraire Finnoise, Helsingfors; Colonial Museum, Harlem, Holland; Académie des Sciences, Cracow, Austria; Zoologisch-Botanische Gesellschaft, K. Geologische Reichsanstalt, Anthropologische Gesellschaft, Vienna, Austria; Instituto y Osservatorio de Marina, San Fernando, Spain; Rousdon Observatory, Lyme Regis, Eng; Society of Antiquaries, Meteorological Council, London; Editors of the Journal of Philology, Cambridge; American Institute of Electrical Engineers, Prof. J. A. Allen, New York; Mr. William John Potts, Camden; College of Physicians, Mercantile Library, Superintendent of City Trusts, Mr. Henry Phillips, Jr., Philadelphia; Chief of Engineers U. S. Army, Lighthouse Board, Bureau of Ethnology, Washington, D. C.; Mr. William Harden, Savannah, Ga.; Agricultural Experiment Stations, Burlington, Vt., Geneva, N. Y., State College, Centre County, Pa., Baton Rouge, La.

The decease of the following members was announced:

John Couch Adams, Cambridge, England, January 21, 1892, æt. 73.

Dr. Hermann Kopp, Heidelberg, February 20, 1892, æt. 75.

Thomas Hockley, Philadelphia, March 12, 1892, æt. 54.

Dr. Cope presented some additional matter for his paper in the Transactions, which was ordered to be printed.

Mr. Phillips presented "A Second Contribution to the Study of the Folk-Lore of Philadelphia and its Vicinity."

Pending nomination No. 1233 was read.

The Library Committee reported a minute of its last meeting.

Mr. Bache offered the following resolution:

Resolved, That, if the funds of the Society permit, this room be now put in charge of a Committee, for the purpose of receiving such treatment to its walls, ceiling, and columns as accord with the character of the Society, and that the Society instruct the Curators to exclude from the cases everything but such printed matter as is desirable for ready reference, and from the floor any articles which are not conducive to the primary purpose in this room of convenience of the members of the Society."

After some debate, the consideration of the resolution was postponed until the next stated meeting of the Society.

Dr. Morris moved that the Secretaries be requested to ask from the Academy of Natural Sciences, the Numismatic and Antiquarian Society and the Historical Society the return of all the articles belonging to this Society that are now deposited with them. After discussion, on motion of Mr. Price, as an amendment, it was resolved to refer the resolution to the Curators for the purpose of ascertaining and reporting to the Society exactly what these deposits consist of, where they are and the amount of space that will be required for their proper display in the building.

Mr. Williams offered the following resolution:

Resolved, That the busts of Lafayette and Franklin, by Houdon, in the possession of this Society, be loaned to the University Lecture Association for its loan exhibition of French art, at the Academy of Fine Arts, provided that they be returned on or before April 1, under the usual stipulation by the Curators.

And the Society was adjourned by the presiding member.

A Contribution to the Vertebrate Paleontology of Texas.

By E. D. Cope.

(Read before the American Philosophical Society, February 5, 1892.)

I. Fayette Formation.

In the First Annual Report of the Geological Survey of Texas (p. 47), Mr. R. A. F. Penrose, Jr., describes this formation as it occurs in South and East Texas. He places it at the summit of the Tertiary series and below the "Posttertiary;" that is, at the summit of the Neocene, just prior to the advent of the Plistocene. This location is justified by the only vertebrate fossils definitely traceable to these beds, which have been sent me for identification by Dr. E. T. Dumble, State Geologist of Texas. One of these consists of a well-preserved left ramus with symphysis and nearly complete dentition of the mandible of the large lama, *Holomeniscus hesternus* Leidy. This species is characteristic of the Equus beds of Oregon, California and Mexico, and indicates satisfactorily the age of the formation in which it occurs. It confirms fully the position assigned to the Fayette beds by Mr. Penrose. The only other identifiable fossil from this formation is several teeth of the *Equus major* Dekay. This species is most abundant in the Eastern States, where the Equus beds have not been certainly identified; but it occurs also in the Equus bed of Nueces county, Texas, with other characteristic species of that epoch. The specimens of the two species named came from Wharton county. This is the first exact determination of the age of the Fayette formation from paleontological data, and is therefore of much interest, as it enables us to correlate a definite horizon of the East with the Equus bed of the Pacific region. The determination of King and myself that the Equus bed is upper Pliocene is confirmed; since besides Penrose, Chamberlin assures us that the Fayette formation (Appomattox or Orange sand) is pre-glacial.

II. Upper Cenozoic of the Staked Plains.

In some remains of vertebrata, obtained by Mr. W. T. Cummins, from Crosby county, Texas, and sent me for determination by Dr. E. T. Dumble, State Geologist, three genera may be identified, and several others are indicated. The three genera are Equus, Mastodon and Testudo. They are enclosed in a white siliceous friable chalk, which Mr. Louis Woolman finds on examination to be highly diatomaceous. Prof. C. Henry Kain had identified the following species: *Compylodiscus bicostatus* W. Smith; *Epithemia gibba* Ehr.; *E. zebra* Ehr.; *E. gibberula* var. *producta* Ehr.; *Navicula major* Ehr.; *N. viridis* Ehr.; *N. rostrata* Ehr.; *N. elliptica* var. *minutissima* Green; *Gomphonem clavatum* Ehr.; *Cymbella cistula*, Hemp.; *Fragillaria virescens* Raffs var. The formation has been named the Blanco Canyon bed by Mr. Cummins (First Annual Report of the Geol. Survey of Texas, 1890, p. 190) without exact determination of its position in the Cenozoics.

The Mastodon is of the *M. angustidens* type, as indicated by the teeth, but there are not enough fragments preserved to render it clear whether they pertain to this species or to some allied one. The Equus is allied to the *E. occidentalis* of Leidy, but the enamel plates are more simple than in that species, being the most simple known in the genus. I regard it as an undescribed species, and describe it below under the name of *Equus simplicidens*. A second species of horse is indicated, but an exact determination cannot be made without additional material. The tortoise is a terrestrial form. A water bird of which a tarcometatarse is contained in the collection, is kindly determined for me by Dr. Shufeldt as allied to the rails.

EQUUS SIMPLICIDENS sp. nov.

This species is represented by one nearly entire superior molar of an adult, and one of a young animal, with characteristic fragments of two other superior molars, and several fragments of inferior molars. The size of the teeth is about that of the *E occidentalis* and *E. caballus*. The internal column is of moderate anteroposterior extent, its posterior border marking the anterior third of the posterior lake. Its long diameter is considerably less than half that of the crown. A peculiarity found in two of the superior molars, but not in two others, is that the median dentinal connection between the external and median crescents is interrupted by the continuity of the enamel plates bordering the lakes from the one to the other. This arrangement is frequently seen in the large pm. 3, in the species of Equus, but does not occur in the other premolars and molars. It is a reversion to the condition seen in Anchitherium. A principal character of the species is seen in the extreme simplicity of the enamel borders of the lakes. They are without inflection, except the usual loop on the posterior inner border of the anterior lake, and this is simple and widely open at the base. At the point of junction of the median crescents (meta- and paraconules), the usual loop of the internal enamel border is seen. The external median rib is narrowed and not flattened; the anterior rib is more flattened, especially at the present grinding face.

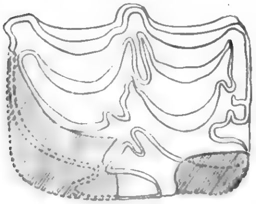


FIG. 1. *Equus simplicidens* Cope; crown of true molar of left side; natural size.

The species with which it is necessary to compare this species is the *Equus occidentalis* of Leidy. The enamel plates bordering the lakes in that species are always more complex, although they are simpler in it than in the other extinct species of North America. Even in the simplest forms (*e. g.*, that figured by Leidy in Vol. i, Report U. S. Geol. Surv. Tens., 1873, Pl. xxxiii, Figs. 1, 2) the lakes have anterior and posterior emarginations on the inner border, which are wanting in the present species.*

The species is probably the oldest member of the genus Equus known from North American beds. It is the only species which was contemporary with a Mastodon with the *M. angustidens* type of molars. The simplicity of the enamel foldings is appropriate to this primitive period, as it approximates to the condition seen in many of the three-toed horses and the supposed one-toed *Hippidium spectans* Cope.† The size of the molars is about that of the modern horse, *E. caballus* L.

Observations.—The contemporaneity of this species of Equus with the Mastodon with molars of the *M. angustidens* type has considerable significance. The latter is characteristic of the Loup Fork horizon in North America, in which the genus Equus does not occur. The Equus beds, so named from the abundance of individuals of four species of Equus which they contain, have never produced a specimen of Mastodon allied to *M. angustidens* in North America.‡ The fact that the Equus of the Staked Plains is different from those of the Equus beds, adds to the indication furnished by the Mastodon that these beds do not belong to the Equus horizon; but the presence of the genus Equus is equally conclusive that they do not pertain to the Loup Fork. It is probable that the age of the beds is intermediate. They thus offer an interesting field for further research.

CRECCOIDES OSBORNII, Shufeldt, gen. et sp. nov.

Char. gen.—Only a fragment of a left tarso-metatarsus represents this new genus and species of bird. It evidently belonged to some wader of about the proportions of a medium-sized heron, or to a form rather larger than the Floridan crane-like rail Aramus.

The specimen consists of about the superior moiety of the tarso-metatarsus, and, in so far as it goes, appears to be perfect, with the exception of slight marginal abrasions of the summit of the bone and the almost complete fracturing off of the hypotarsial process. Superiorly, the intercondyloid prominence or tubercle is rounded and not especially conspicuous; the inner condyloid depression is more extensive than the outer one, and occupies a higher plane. In front the shaft is longitudinally excavated only above, the excavation gradually but soon disappearing as we pass down towards the distal extremity; and at the midpart of its

* The horse found in Florida by Mr. Wilcox, which Dr. Leidy identified as his *Equus fraternus* (Transac. Wagner Free Inst. Science, Philadelphia, 1889, p. 16), must be referred to a genus distinct from Equus, on account of the absence of cups of the incisors, by the loss of the internal wall. This is seen in both unworn and worn specimens. In some cases an internal cingulum remains to indicate its position. It appears to be a case of degeneracy. I have named the genus Tomolabis.

† *American Naturalist*, 1887, p. 1072.

‡ It is probable that the *Dibelodon shepardii* Leidy, which has molars of this type, occurs in the Equus beds of the valley of Mexico. Cfr. Cope, Proceed. Amer. Philos. Soc., 1884, May.

continuity it is subcylindrical upon section. A short distance below the head of the bone are seen the usual anteroposterior perforating foramina, here three in number, two being lateral and below, with a mid one just above them. Immediately below these is a single, somewhat prominent tubercle for the insertion of the tendon of the *tibialis anticus* muscle. It occupies nearly a median position upon the shaft. So far as can be ascertained from the imperfect hypotarsial process it would appear that it possessed originally a large, single, inner groove for tendons, with a plate-like projection to its outer side.

Char. specif.—Proximally, the tarso-metatarsus is considerably excavated to the inner side of the hypotarsus at a point just below the summit. The outer muscular line is single and commences at the middle point of the margin of the outer condylar depression, passing from thence down the back of the shaft. The inner muscular line bifurcates proximally, then passes more obliquely backwards than the outer line, to finally pass parallel with the latter also down the back of the shaft.

Measurements.

	MM.
Greatest transverse width of proximal end..................	15
Greatest anteroposterior diameter of prox. end, not including hypotarsus..	11
Distance from apex of intercondyloid tubercle to the tubercle for tib. ant. muscle....................................	10
Vertical depth of hypotarsus..................................	10
Transverse diameter of shaft near its middle................	6

Remarks.—This fragment has been compared with the corresponding part of the skeleton in a great many kinds of birds. It was found to differ entirely from all larine, gallinaceous and raptorial types, while on the other hand it seemed to combine the characters of several various species of existing waders and allied groups. The writer compared it with numerous species of the genera Guara, Plegadis, Aramus, Rallus, Crex, Porzana, Ajaja, Tantalus, Botaurus, Ardea, Nycticorax, Grus and the Gallinules, Storks, etc.

For a skeleton of *Crex pratensis* I am indebted to Mr. F. E. Beddard, prosector of the Zoölogical Society of London, and for the loan of other material to the United States National Museum, as well as to Mr. F. A. Lucas, of that institution, for placing the same at my disposal. In the specimen under consideration, the Ralline characters appear to predominate, while more remotely we may see Ibis in its general form and outline. Apart from the question of size it, however, distinctly differs from the tarso-metatarsus in such a form as *Aramus giganteus* in that the shaft was more cylindrical as it approached its midportion, and, as has been said above, did not show the anterolongitudinal excavation in that part. Moreover, in Aramus the hypotarsus exhibits *two* grooves for the passage of tendons, and the tubercle for the insertion of the *tibialis anticus* muscle is double. Essentially, it agrees with Aramus in the *general form* of its hypotarsus and in the direction of its lateral muscular ridges. In other particulars it exhibited both some minor differences and agreements with the corresponding bone in the skeletons of Crex and Rallus. Upon the whole the specimen would appear to have belonged to some large rail-like wader, now extinct.

The name of the genus I create to contain this form is composed of the two Greek words, *κρέξ*, a crake, and *ειδος*, resemblance. Its specific name is given it in honor of Prof. Henry F. Osborn, of Columbia College, New York, in recognition of his excellent work in paleontology for a number of years past.

The specimen was collected by Mr. W. T. Cummins, and is at present in the possession of Prof. E. D. Cope, to whom the writer is indebted for the honor of having been permitted to describe it.—*R. W. Shufeldt.*

TESTUDO TURGIDA sp. nov.

This species is represented by the greater part of a chelonite of about the size of the *Xerobates agassizii* of Arizona. It is remarkable for the remarkable depth of the dermal sutures and sculpture lines, and for the swollen character of the interspaces which separate both. The general shape is a short, wide oval, with steep to vertical margins.

The plastron is widely emarginate posteriorly, and the anal-femoral dermal sutures form a deep notch in the border. The anal scuta are oblique rhomboids, with equal and nearly parallel sides. The median longitudinal dermal suture is deep and wide, cutting half through the thickness of the plastron. It sends off a branch on each side bounding the gular plates in front. The part of the plastron enclosed in the latter forms two flattened cones appressed together, whose vertical diameter exceeds the transverse, and whose subconic apices are separated by a deep notch. The interclavicular bone is very large and is wide diamond-shaped, the anterior angle being larger than the posterior. The transverse humeropectoral suture is very deep, and is similar to the median longitudinal. The borders of the anterior lobe are strongly convex, with a chord only twice as long as the lateral border of the gular plates.

The nuchal bone has a strongly concave-emarginate border. On the posterior vertebral bones is a seat-like concavity, which is surrounded by a ridge which forms the greater part of a circle. The costal bones are unequally divided by the costal dermal sutures, which are very deep. Each costal scutum is divided into two areas, one of which is marked with ribs parallel to the vertebral axis at one extremity and a seat-shaped plane with a bordering ridge at the other, which is in some of the costals smaller and more swollen. The other half or part of the costal scutal area is swollen in the longitudinal direction, but not for its entire length. The marginal bones are massive and have a subacute border between the bridge and the median points. They are much deeper than long, and are deeply divided by the sutures which separate the dermal marginals. These grooves cut the margin into deep notches at some points and into shallower ones at others. The areas between these sutures are all swollen in the same way as the alternate parts of the costal plates.

Measurements.

		MM.
Length of plastron anterior to posterior angle of interclavicle		80
Width of plastron anterior to posterior angle of interclavicle		112
Length of interclavicle		40
Width of interclavicle		58
Thickness of interclavicle		11
Length of free lateral margin of gular plate		29
Width of base of both gular plates		45
Length of xiphiplastral bone		32
Width of xiphiplastral bone on anterior suture		53
Width of emargination of posterior lobe of plastron		50
Diameters of free marginal near bridge	anteroposterior	20
	vertical	34
	transverse below	25
Diameters of marginal of bridge	anteroposterior	29
	vertical	44
	transverse below	21
Diameters of penultimate vertebral bones	anteroposterior	17
	transverse	30

The American tortoise, which has produced gular areas somewhat like those of this species, is the *Testudo cultratus* Cope of the White River Neocene of Colorado. That species is, however, totally different in the dermal sutures of the usual character, flat marginals, etc., and the gular processes are not conic, but trihedral in form.

The specimen above described comes from Espuella near Dockum, from the same horizon as that of Crosby county, or the Blanco Canyon bed of Cummins.

III. On a Mesozoic Pycnodont.

Microdus dumblii sp. nov.

This species is represented by a splenial bone of the left side, which supports four and a half rows of teeth. The external two rows include small teeth with crowns, which are either round or slightly transversely oval. The teeth of the third row are larger and the crowns are all transversely oval. The teeth of the fourth row are of unequal sizes, commencing anteriorly of about the same size as those of the third row. The third tooth from the front, as preserved, is much larger, but it is exceeded by the fourth; while the fifth is half as large again as the fourth. The sixth and last is a little smaller than the fifth. The teeth of the fifth row are as small as those of the first and second rows, and extend posteriorly to the anterior part of the fourth of the fourth row, and not beyond. The crowns of the teeth are perfectly smooth and without keel or depression.

		MM.
Length of tooth series		17
Six teeth of external row		10
Six teeth of third row		11.5
Six teeth of fourth row		16.5
Diameters of fifth of fourth row	anteroposterior	3
	transverse	7

The horizon of this species is not exactly known, but it is probably Lower Cretaceous. It gives me much pleasure to dedicate it to Dr. E. T. Dumble, Director of the Geological Survey of Texas.

IV. Triassic or Bokum Beds.

The fossils from these beds present a general similarity to those obtained elsewhere in the Trias. Fragments of large Stegocephali are abundant, and Crocodilians of the Parasuchian group are still more so. Teeth like those of the Eastern Clepsysaurus and Zatomus also occur. The number of identifiable species is small, and the best preserved of these is a new representative of the genus Episcoposaurus Cope, already described from the Triassic bed of New Mexico.*

Episcoposaurus haplocerus sp. nov.

I refer to this species the following pieces which were found together by Mr. W. T. Cummins. A dorsal and probably two caudal vertebræ; a scapula of the right side; a few fragments of ribs, and about thirty dermal bones. The generic characters and those of higher value may be first described.

The single dorsal vertebra is from the posterior part of the series. Its articular surfaces are shallowly concave. The neural arch is not entirely coössified, part of the sutural surface being visible in the fracture, from which the neurapophysis has been broken. There is a rib-facet at each end. The smaller, which is longer than deep, is continuous at an open angle with the tubercular articulation of the short diapophysis. The other is longer than deep, lenticular in outline, and terminates acutely above. The scapula is massive, and the inferior extremity is thinned below and turned obliquely inwards. No proscapula. The coracoid facet is not large, and is separated by an angle from the glenoid cavity. The ribs are flat, not very wide, and have one subacute edge. The head of one is attached to the dorsal vertebra, above described. The capitular and articular surfaces are subequal and are separated by an angle. The dermal bones are thick and are united by suture, so as to form transverse bands across the body; but are not united in the anteroposterior direction. Some

*Proceedings Amer. Philos. Soc., 1887, p. 213.

of them have median tuberosities, which are developed in others into horn-like spines. These form rows on the opposite sides of the middle line, as they are unilaterally symmetrical.

Char. specif.—The dorsal vertebra above referred to has the centrum slightly wider than deep. Its inferior surface is contracted on each side, and is slightly concave on the middle line. The surface is smooth. The diapophysis is robust, subtriangular in section, and it does not project freely beyond the centrum. The centrum of a caudal vertebra with chevron facets, is deeper than wide, and has robust diapophyses, which spring principally from the centrum. The outline of the articular face is a hexagon elongate vertically. This is partly due to the broad truncation of the inferior face. Concavity of centrum slight.

Measurements of Vertebræ and Ribs.

		MM.
Diameters of dorsal	anteroposterior	66
	vertical	64
	transverse	75
Diameters of caudal	anteroposterior	52
	vertical	59
	transverse.	51
Vertical diameter of head of rib attached to dorsal, above mentioned		46
Transverse diameter of capitulum of do.		26
Transverse diameter of shaft of another rib		40
Thickness of shaft of another rib		15

The section of the scapula is everywhere lenticular. It is robust, rather short, without much constriction at the base, and but a moderate expansion above. A distinct clavicular facet is not preserved. The incurvature of the inferior surface is most abrupt anteriorly, the angle there amounting almost to a tuberosity.

Measurements of Scapula.

		MM.
Length on external face from superior border to line of superior edge of glenoid cavity		141
Diameters at narrowest part	anteroposterior	60
	transverse	32
Diameters glenoid cavity....	vertical	52
	transverse	40

The *dermal bones* are subquadrate in form, and have sutures on two opposite sides and thin edges on the other opposite sides. The inferior surface is more or less concave from one sutural border to the other. They are all coarsely pitted, but the pits are reduced in size towards the edges in some of the plates. In many of the plates there is a prominent obtusely conic tuberosity placed unsymmetrically near the centre or edge of the plate. This tuberosity is in some of the plates developed into a prominent spine or horn, which has an anteroposteriorly oval section. The surfaces of the tuberosities are punctate. These horns are placed on the sides, and probably not far from the median line, since they form with the adjacent tuber-bearing plates a strong angle, such as would be necessary to enclose the neural spines of the vertebral column. It is also not certain whether these spines were on the dorsal, cervical or caudal regions, or whether they were on all of them. The plates adjacent to those bearing spines are the most robust. The spines are gently curved, probably backwards.

Measurements of Dermal Plates.

		MM.
Diameters of plate without knob	anteroposterior	90
	transverse	78
	vertical at suture	18
Diameters of plate with knob	anteroposterior	100
	transverse	70
	vertical at suture	37
Diameters of plate with spine	anteroposterior	115
	transverse (chord)	65
	vertical at suture	35
Elevation of spine of plate last, measured from base (apex restored)		190
Diameters of spine at base	anteroposterior	95
	transverse	65
Diameters of spine 45 mm. below apex	anteroposterior	30
	transverse	20
Diameter of pits on flat bone		5
Diameter of pits on knobbed bone		9

In *comparison* with the only species of the genus known thus far, the *E. horridus*, from the Triassic bed of New Mexico, the present species has the tuberosities and horns of a different shape. In that species the former are compressed and keel-like, and the horns are also compressed, having an edge in front and a triangular section. The individual which served as the basis of the description of the *E. horridus* is also of rather smaller size than the present one.

On Tiaporus, a New Genus of Teiidæ.

By E. D. Cope.

(Read before the American Philosophical Society, March 4, 1892.)

Tiaporus fuliginosus, gen. et sp. nov.

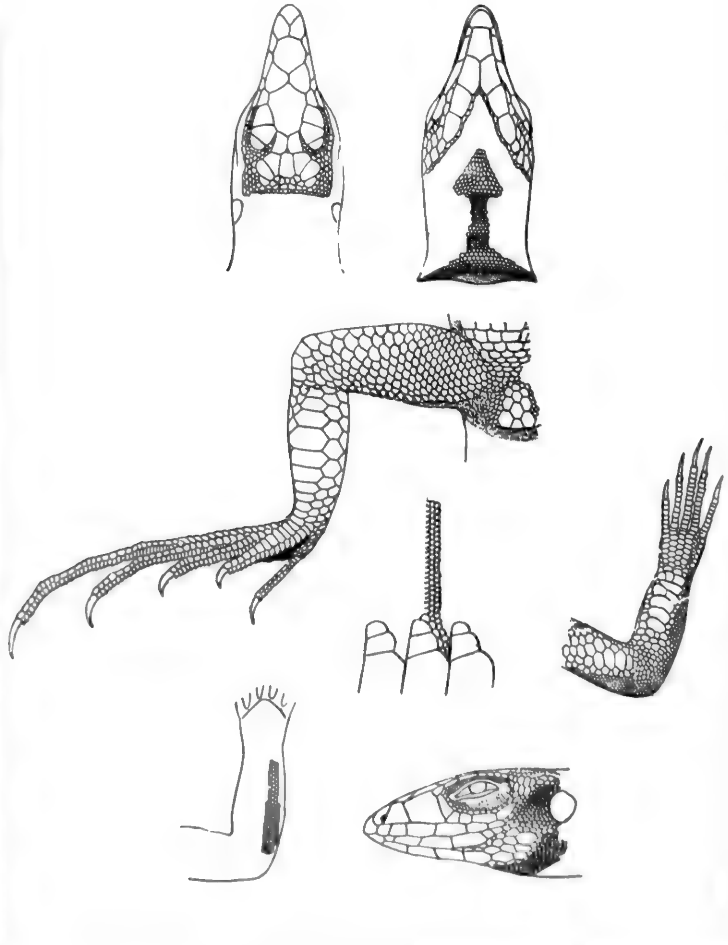
Char. gen.—Tongue cylindric and sheathed at the base; no femoral pores; abdominal scales smooth; a cervical collar fold; tail cylindric. Digits 5–5.

This form is identical with Amiva, except in the absence of femoral pores. Monoplocus Gthr. has no femoral pores, but the tongue is not sheathed, and the abdominal scales are keeled.

Char. specif.—The squamous surface of the tongue is ovate posteriorly and not notched. The apex of the tongue is deeply bifurcate. The teeth of the maxillary bone are compressed, and have a principal compressed apex, and one or two denticles of the edges near the base. The rosettes of scales, which in other genera surround the femoral pores, are present, but the pores are absent.

The animal is about the size of the *Amiva corvina* Cope. The dorsal scales are minute, measuring .02 mm. The abdominal plates are in twelve longitudinal and thirty-two transverse rows. They are smooth, and those of the external row are smaller than the others. The nostril is on the suture between the nasal plates. The pariëtals are divided into two and sometimes into three plates, the internal of which is wider than the interpariëtal. The latter is smaller than each frontopariëtal. Supraorbitals, four; supraciliaries, six; no frenoorbital. Head rather elongate and acuminate; labials $\frac{6}{6}$; infralabials, three large and two small, separated from labials by two rows of large scales. A few rows of scales on the middle of the mesoptychium equal those of the gular region, which are a little larger than those of the neck, which are equal to those on the posterior part and edge of the gular fold. The brachial scales are not large, and are in three or four rows, separated by small scales from a few small postbrachial scales near the elbow. The antebrachial scales are not continuous with the brachials, and are in one large external and two or three smaller internal rows. No postantebrachials. Femorals in 13–14 rows; the third from the front large; the posterior six rows not imbricate. Tibial scales in five rows, the external much larger. Anal plates with five or six large marginals, and five in front of them, four arranged round a small central one. Caudal scales narrow, numerous, not oblique, keeled, but not uncinate. No spurs.

Color above brown, sometimes with a lead-colored shade. Below lead color, with an olive tinge, to nearly black. A black band from temporal region to above femur present in all the specimens. In three specimens there are traces of one or two brown bands on the middle dorsal region



Tiaporus fuliginosus Cope.

anteriorly; in one of these also an interrupted black lateral band below the one already described. Below this there are in the same specimen two rows of blackish spots on the sides, the inferior on the lateral ventral scales. In a ♀ there is a row of small pale spots above and below the superior lateral black band.

Total length, 310 mm.; length to angle of mandible, 30 mm.; do. to collar, 38 mm.; do. to axilla, 45 mm.; do. to vent, 108 mm.; do. of fore-leg, 40 mm.; do. of forefoot, 17 mm.; do. of hind leg, 83 mm.; do. of hind foot, 47 mm.

This remarkable species has no particular resemblance to any known species of Amiva or Cnemidophorus. Four specimens, No. 14,710 U. S. National Museum Register, from Swan Island in the Caribbean Sea Collected by Charles Townsend.

Swan Island is off the northeastern coast of Honduras, at a distance of about two degrees of latitude. It is about five degrees west by south of Jamaica. It was visited by the U. S. Fish Commission steamer *Albatross*, and Mr. Townsend, the naturalist of the expedition, obtained this species with several others. The present form is related to Amiva as Monoplocus is to Centropyx.

Explanation of Plate.

Fig. 1. Head profile: *a*, from above; *b*, from below; fig. 2, anterior limb from above; *b*, forearm from below; fig. 3, hinder limb with anal region from below; fig. 4, portion of side of body.

PROCEEDINGS

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A Sketch of the Life of Joseph Leidy, M.D., LL.D.

By W. S. W. Ruschenberger, M.D.

(Read before the American Philosophical Society, April 1, 1892.)

The Academy of Natural Sciences, of Philadelphia, devoted the stated meeting of May 12, 1891, to commemorate its President, Dr. Joseph Leidy, who died April 30. The meeting was very large and impressive. Drs. William Hunt, Harrison Allen, Henry C. Chapman, James Darrach, Edward J. Nolan, Prof. Angelo Heilprin and Mr. Joseph Wilcox, by appointment, delivered appropriate addresses ; and the Rev. Dr. H. C. McCook, Mr. Isaac C. Martindale, Dr. James J. Levick and others eulogized the dead President.

A more affectionate tribute has seldom been paid in this city to the memory of a votary of science. Ample testimony was adduced that Dr. Leidy had attained distinction among scientific men at home and abroad, and that he had the warm sympathy and respectful regard of all those members of the Society with whom he had been in any degree associated.

In the first hours, while a great bereavement is still fresh, love and admiration so obstruct perception that the extent of the loss sustained may be sometimes overstated. But let whoever may conjecture that in this instance some of the addresses were too fervid, consult the cold records of the Academy in which are faithfully set down his works since he entered the Society, and he will find that they justify the encomiums pronounced.

Loyalty to truth and ingenuousness were shining features of Dr. Leidy's nature.

The first paragraphs of Dr. William Hunt's opening address on Dr. Leidy's personal history are cited here in illustration :

"It is fitting that we imagine the beloved subject of our discourses this evening to be with us in spirit, as he doubtless is in influence, and to let him introduce himself as I heard him do in Association Hall some years ago when he was about to give a popular lecture. I was unexpectedly called upon to introduce him. 'What !' said I. 'Who is to introduce the introducer? Here's a man more widely known to the city and to the world than any of us.' Dr. Leidy, hearing the conversation, said: 'Oh! Dr. Hunt, keep your seat; I don't wish to be introduced; I'll introduce myself.' And, stepping to the rostrum, he spoke in this way:

"'My name is Joseph Leidy, Doctor of Medicine. I was born in this city on the 9th of September, 1823, and I have lived here ever since. My father was Philip Leidy, the hatter, on Third street above Vine. My mother was Catherine Mellick, but she died a few months after my birth. My father married her sister,* Christiana Mellick, and she was the mother I have known, who was all in all to me, the one to whom I owe all that I am. At an early age I took great delight in natural history and in noticing all natural objects. I have reason to think that I know a little of natural history, and a little of that little I propose to teach you to-night.'"

Dr. Leidy's ingenuous introduction of himself suggests that a fuller account of his ancestors may be acceptable.

Carl Leidy, the forefather of the American-born Leidys, came to America from Rhenish Germany in the early part of the eighteenth century (about 1724), and settled in that part of Penn's province which now includes Montgomery and Bucks counties, Pa.†

**Erroneous.*—His mother died May 28, 1825 (soon after her son Thomas was born), twenty months after the Doctor's birth. His father's second wife was a cousin and not a sister of Dr. Leidy's mother, as stated. See, The Story of an Old Farm, or Life in New Jersey in eighteenth century. By Andrew D. Mellick, Jr., Somerville, New Jersey, 1889.

†*Genealogical Notes.*—Carl Leidy's son, Carl Ludwig, b. Dec. 30, 1729, and his wife, Ursula Elizabeth, b. Feb. 8, 1734, had issue: (1) John Jacob, b. Nov. 7, 1753; (2) George Heinrich, b. Oct. 19, 1755; (3) Margaretta, b. Nov. 15, 1757; (4) Eva Christina, b. Dec. 25, 1759; (5) Anna, b. Oct. 1, 1761; (6) Magdalena, b. Dec. 18, 1763; (7) Carl, b. Aug. 20, 1765; (8) Anna Maria Elizabeth, b. Feb. 24, 1768; (9) George Ludwig, b. July 1, 1770; (10) Maria Catherine, b. May, 1772. Both parents and children were natives of Hilltown township, Bucks county, Pa.

John Jacob Leidy, the first-born of this family, m. April 18, 1777, Catherine, b. March 16, 1757, a daughter of Christian Comfort. They had issue: (1) Charles Ludwig, b. Jan. 7, 1778; (2) Henry, b. Jan. 12, 1779; (3) Catherine, b. May 16, 1780; (4) Maria Margaretta, b. March 1, 1781; (5) Jacob, b. Jan. 10, 1782; (6) Christian, b. Jan. 3, 1784; (7) George, b. Oct. 7, 1786; (8) Conrad, b. Nov. 25, 1788; (9) Philip, b. Dec. 5, 1791, d. Oct. 9, 1862; (10) Emanuel, b. Dec. 22, 1794; (11) Frances Fanny, b. March 6, 1798. All were natives of Hilltown township, Bucks county, Pa.

Philip Leidy, the ninth child of the preceding family, m. Oct. 6, 1818 (he was then settled in Philadelphia), Catherine, a daughter of Peter and Rachel Mellick. She was born in Bloom township, Columbia county, Pa., Jan. 27, 1790, and died in Philadelphia, May 28, 1825. They had issue: (1) Peter, b. Dec. 28, 1819, d. Aug. 29, 1820; (2) Catherine, b. Aug. 7, 1821, d. Nov. 20, 1822; (3) Joseph, b. Sept. 9, 1823, d. April 30, 1891; (4) Thomas, b. May 21, 1825, d. April 20, 1870.

Philip Leidy m., May 25, 1826, Christiana Taliana, a cousin of his first wife. She was born in Philadelphia, July 29, 1797, and died Jan. 6, 1881. They had issue: (1) Christiana T., b. Feb. 22, 1827, m. June 4, 1839, James Cyrus Umberger, d. Oct. 24, 1878; (2) Francis, b. Dec. 14, 1828, d. June 3, 1856; (3) Asher, b. July 30, 1830, d. July 6, 1878; (4) Helen, b. Sept. 30, 1833, d. Dec. 3, 1839; (5) Catherine Mellick, b. March 28, 1837, d. Aug. 12, 1839; (6) Philip, b. Dec. 29, 1838, d. April 29, 1891. All born in Philadelphia.

Peter, the forefather of the Mellick family, came to America from Rhenish Germany about the close of the sixteenth century (1695).

German and English, it may be said, were vernacular languages to the members of the Leidy and Mellick families generally—the German came to them as a birthright, and English from their environment.

The name first appears in the City Directory for 1809—"Leidy, Jacob, shoemaker, 9 Summers' Court." Prior to that year the Leidys probably lived either in Bucks or Montgomery county. All of them who exchanged a country for a city residence were of the class called "plain people," composed of well-to-do and respectable workers—men whose individual energies when united constitute the national strength and are almost exclusively the progenitors, in aftermaths, of millionaires, consequently of aristocratoid or "first families" and gentry, often more boastful of ancestry than of creditable achievement. The name of Philip Leidy, hatter, the father of our subject, first appears in the City Directory for 1817, and that of his brother, Conrad, bootmaker, in 1820. At those dates they were established in business. During several years before that time they resided in the city. Both volunteered in the War of 1812–15 against Great Britain and served with those at Camp Du Pont. The Leidys named in the City Directories for 1809 and for several years thereafter were mostly mechanics, makers of hats, boots, chairs, etc., and probably had been apprentices and learned their trades in the city. One of their contemporaries, now an influential citizen advanced in years, remembers that "all the Leidys were smart."

Philip Leidy, who was born in Montgomery county, Pa., December 5, 1791, is spoken of as a powerful man whose stature was rather more than six feet and in every way well proportioned. Though not conspicuous for mental force he was naturally endowed with practical good sense. His educational acquirements were limited ; but his industry, honesty and frank deportment secured him confidence and respect wherever he was known. He made and sold hats, did a good business, and had many customers from the adjoining counties as well as in the city. He was a member of the German Lutheran Church in New street, and with his family habitually attended its services.

Dr. Leidy said in his self-introduction, every word in a halo of grateful love, my stepmother "was the only mother I have known, who was all and all to me, the one to whom I owe all that I am."

Besides being notable in the management of domestic affairs, she possessed a large share of tact and of good womanly qualities. She was intellectually the superior of the family, had literary taste, wrote verses sometimes, was ambitious, and desired that her children should be well educated and that her sons should study the professions.

Through her influence Joseph, at the age of about ten years, was sent to the Classical Academy, a private day-school conducted by the Rev. William Mann, a Methodist clergyman. There he studied English and read Latin—Historia Sacra, Viri Romæ and Virgil—the principal being scrupulously careful that his pupils should understand the grammar. Probably he began Greek also.

Minerals and plants interested him at an early age. Mr. Mann encouraged the cultivation of this taste. One day an itinerant lecturer from the so-called "Universal Lyceum" visited the school, and, by permission, discoursed about mineralogy, illustrating his lesson with specimens. Young Leidy was so much interested that soon after he procured books on mineralogy and botany and diligently studied them. At length he became so fascinated in the pursuit that he often absented himself from school without leave to seek specimens in the rural districts near the city. Parental chidings for delinquencies of this kind did not always restrain him. His self-will and eagerness to hunt for minerals and plants often caused him to forget those admonitions and follow the inclination of the hour.

The conduct of the boy, his spontaneous ways, are in many instances forecasts, in outline, of the characteristic features of the man he will become; and therefore it is interesting to observe those surroundings which may influence their development.

At the time Joseph entered the academy, Mrs. Burris, a respectable colored woman, a widow, lived near and did laundry work for support. Her son, Cyrus, a bright youth a few years older than Joseph, was errand boy in the hatter's shop. His chief duty was to deliver hats at the homes of their purchasers, and for each errand of the kind he received six or twelve cents, according to the distance he had to walk.

There were then three schools at no great distance apart. Mr. Collom and Mr. Livensetter charged three dollars a quarter for each pupil and Mr. Mann twelve dollars. The boys of the two schools were at war with those of the academy, and they had a fight whenever they met in the street.

Apprehensive that her son might be assaulted by some of those "rowdy boys," Mrs. Leidy engaged Cyrus to accompany him to school. These two became intimate friends and often went together botanizing.

Cyrus Burris is now a well-preserved man, of pleasant deportment, and of more than seventy-five years of age. He is intelligent and has a retentive memory.

In answer to questions, Cyrus related substantially that Mr. Leidy once took all his family for a picnic out where Fortieth and Baring streets are now, and he went with them to carry things and be useful. At that time plenty of weeds grew on the side of the hill. They at once attracted the young professor, who found that he did not know any of them. But Cyrus, who had been brought up in the country, near Burlington, N. J., had there learned to know and name the herbs and weeds in his neighborhood, was able to tell him the names of many of them. This show of superior information pleased him so much that afterwards Cyrus was his chosen companion on botanical excursions.

His favorite hunting ground was along the banks of the Schuylkill and Wissahickon. On the way, on one of their early walks, they strolled into Mr. Henry Pratt's famous grounds at Lemon Hill. The late Mr. Robert Kilvington, a practical and proficient botanist, then had charge of the hothouses and garden. He noticed Leidy, and kindly answered his questions, regarding him as a poor, intelligent boy who was striving to instruct himself. This was the beginning of an enduring friendship. In a short time Mr. Kilvington cheerfully assumed to be his systematic instructor, and, after his pupil had become distinguished, complacently mentioned to friends that he had been Leidy's botanical preceptor.

On one occasion Cyrus and the young professor spent a whole day in Bartram's garden, near Gray's Ferry, and did not reach home till night.

"The professor," as Cyrus styled him, "used to say that the valley of the Wissahickon was the best place in the neighborhood to find plants. He very soon knew more about them than I did. Sometimes we went all day with nothing to eat but raw turnips we got out of the fields, for the old man was stingy of spending-money to his boys, though he was always a bountiful provider of the very best things in the market for them at home. Once we went into Jersey, and that was the only time I ever cheated the professor. We saw in a thick bush a big snake, four or five feet long, with a white spot under his throat. The professor wanted to catch him, so he gave me a carpet bag to hold open on one side of the bush for the snake to run into, while he frightened him out from the other. The snake came hissing along towards me. I jumped aside—I couldn't help it—and let him get away, but I never let on that I was scared."

In the course of his schooldays the young naturalist, besides gathering stones and plants, caught butterflies and bugs, which he pinned in a box prepared for the purpose, to be arranged in his cabinets at home.

Cyrus stated, among other things, that he sometimes acted as caterer and waiter for the lads on special occasions; and that whenever the boys came into the hatter's shop, their father always talked to them in German. He also said that Dr. Leidy had taught him a great deal about plants and their medicinal uses, adding, "Through what I learned from him, I have been able through many years to make a decent living."

The offspring of almost constant companionship during their boyish days, at home or in the fields, was a personal sympathy, a friendship which, to the credit of both, was life-long, notwithstanding the extreme difference and distance between the social places each occupied in adult age. The professor gave him, at different times, several books on medicine, and among them his *Elementary Treatise on Anatomy*, in which is written, "To Cyrus Burris, from his old friend, the author." These are Cyrus' treasures. He quietly but, no doubt, proudly shows them to a favored few.

The future professor did not own shinny or hockey stick, kite, skates nor ball; never played marbles, nor whistled nor hummed a tune at any time.

He was a good boy in school, always neat and tidy, and never joined his schoolmates in their out-of-door sports during the hour of daily "recess," but sat the while at his desk, pencil in hand, portraying some natural object, as a snail shell, carefully and beautifully shading it, or drawing caricatures suggested by acts of his fellow-pupils.

He had no teaching to develop this talent. The high artistic skill which he acquired was exclusively due to self-cultivation. A small book of his portraits of shells, dated February, 1833, has been preserved, which show his skill with a pencil in his tenth year.

According to his school champion, who, the boy always declared was the best Greek scholar in the academy, "Joseph Leidy never sized up to the other boys."

His schooldays ended in his sixteenth year, probably about the last of July, 1839.

His worldly condition required that he should now be taught some art by which to earn a livelihood. As he had manifested at an early age uncommon aptitude in draughting and drawing, his father conjectured that he would best succeed as a sign painter. But the son, who had passed much of his leisure in the wholesale drug store of his cousin, Napoleon B. Leidy, M.D., "physician and druggist," as the City Directory styled him, fancied that he would rather be an apothecary.

In compliance with his preference he was placed with an apothecary and in the course of a few months acquired such a degree of knowledge of drugs and the method of compounding them, that he was considered qualified to be left in temporary charge of the retail business.

His loving stepmother, however, was not satisfied. She seemed sure that there was in him the making of a successful physician. Her arguments at last prevailed. With the consent of his father, rather reluctantly given, it was agreed that he should study medicine.

In the autumn of 1840, he became a pupil of Dr. James McClintock, then a private teacher of anatomy in College avenue. His father's proposition to pay the preceptor's fee in hats was accepted, but the settlements provoked dispute and at last estrangement of the parties.

Parts of 1840 and 1841, more than a year, were devoted to practical anatomy under the able instruction of Dr. McClintock. During the first half of 1841 he parted from Dr. McClintock, who, having accepted the office of Professor of Anatomy in the Castleton Medical College, in Vermont, removed from Philadelphia in 1842.

Leidy matriculated at the University, October 26, 1841, and was under the instruction of Dr. Paul B. Goddard, then Demonstrator of Anatomy in the University and Prof. Horner's prosector. He was a promising surgeon, a man of bright qualities. In conjunction with Mr. Robert Cornelius he was the first in Philadelphia to make a daguerreotype. He devoted his leisure evenings in his office, with a few intimate friends, to microscopic studies, and there young Leidy received his first lessons in the use of the microscope.

Having attended three courses of lectures and submitted a thesis on *The comparative anatomy of the eye of vertebrated animals*, the degree of Doctor of Medicine was conferred upon him, April 4, 1844, by the University of Pennsylvania.

In the year after graduation, he was an assistant in the laboratory of Dr.

Robert Hare, Professor of Chemistry, during six weeks, and then entered that of Dr. James B. Rogers, lecturer on Chemistry in the Medical Institute of Philadelphia, from 1841, and remained there through the summer course. On the retirement of Dr. Hare, in 1847, Dr. Rogers succeeded him in the University.*

He was now prepared to begin the practice of any branch of medicine he might prefer, but he had yet to learn how to make the profession of commercial value to himself. No plan of proceeding was immediately formed. In August, 1844, on foot with several companions, he visited Harvey's lake, Bethlehem, Mauch Chunk; also the Beaver Meadow and Hazleton coal mines. In a letter to a sister he wrote: "Pedestrianated to Wilkesbarre and arrived at Berwick yesterday, August 28, having walked from the lake to this place, thirty-five miles, the longest distance I have ever walked in one day."

In the autumn he opened an office, No. 211 North Sixth street, hoping to obtain employment as a general practitioner. But the business which came to him during two years' trial did not promise a satisfactory living, and therefore he determined to devote himself exclusively to teaching. Possibly his failure to obtain practice was ascribable in some degree to lack of due attention to patients. Years after this time, to show how intently attractive comparative anatomy was to him, he related to his private class that on one occasion he was so absorbed in his office studying the anatomy of a worm that he totally forgot that he had been called to an obstetric case which he had engaged to attend. Later in life he would have felt that unbridled eagerness to learn the structure of a worm is an inadequate plea for forgetting a professional or other engagement.

An unhappy experience, which occurred shortly after he began the practice, tended to disgust him with it and may have been one reason among others why he abandoned it. Ten years afterwards he narrated substantially that, called to a child suffering "with all the symptoms of tubercular meningitis," he informed the parents that medicine in such a case is inefficacious. Nevertheless, they requested him to visit it. At the end of a week a much older practitioner was called, and attended the child till it died. He then "informed the parents that he could have saved the life of the patient had he been called at the time of Dr. Leidy's first visit." †

In 1845, on the resignation of Dr. Goddard and the appointment of Dr. John Neill, Demonstrator, in his place, the Professor of Anatomy,

* Biographical Notice of Joseph Leidy, M.D. By the Editor. "The New Jersey Medical Reporter and Transactions of the New Jersey Medical Society." Edited by Joseph Parrish, M.D., Burlington, N. J. Published by S. W. Butler, M.D. Ninth month, September 30, 1853, Vol. vi, No. 2. It is understood that this notice had the approval of Dr. Leidy.

† See p. 16, Valedictory Address to the class of medical graduates of the University of Pennsylvania, delivered at the public commencement, March 27, 1858. By Joseph Leidy, M.D., Professor of Anatomy. Published by the Graduating Class. Collins, Printer, Philadelphia, 1858.

Dr. Horner, appointed Dr. Leidy his prosector. In 1846 he was chosen Demonstrator of Anatomy in the Franklin Medical College, but resigned the office at the close of the session, in 1847, resumed his position with Dr. Horner and delivered to his students a private course of lectures on Human Anatomy.

He indulged himself with a short vacation in July, 1846, and visited his friends, Messrs. Haldemann, at Chickies, Pa.

While his kinsman, Dr. N. B. Leidy, was Coroner of the County of Philadelphia (1845–48), he acted as Coroner's Physician and received fees for the autopsies he made.

In the spring of 1848, impaired health induced Prof. Horner to visit Europe. He invited his friend, Dr. Leidy, to be his traveling companion. They sailed in April and returned in September. In England, Germany and France they "visited hospitals and anatomical museums, and sought out eminent anatomists and surgeons." Dr. Leidy witnessed in Paris, June 20, some vivisection experiments by Magendie, in his physiological laboratory, which interested him. They "were in Vienna while the revolutionary movements were in progress:" and "were also in Paris during the fierce conflicts from 23d to 26th of June; and during several days afterwards they "witnessed in the hospitals, filled with wounded, every variety of gunshot wound and the modes of treatment pursued."*

On his return from Europe, in the autumn, Dr. Leidy delivered a course of lectures on Microscopic Anatomy; and in the spring of 1849 began a course on Physiology in the Medical Institute of Philadelphia, which the condition of his health required him to abandon.†

He edited *Quain's Human Anatomy*, which was published June, 1849, by Lea & Blanchard.

An interesting event enabled Dr. Leidy to go abroad again under very favorable circumstances. Dr. George B. Wood, who was elected May, 1850, Professor of the Practice of Medicine in place of Dr. Nathaniel Chapman, resigned, desired to collect in Europe models, casts, preparations, etc., suitable for objective illustration of his future courses of instruction. Aware of the artistic judgment of Dr. Leidy, and of his recently acquired knowledge of localities in which objects adapted to his purpose could be purchased, Dr. Wood easily persuaded him to be his companion and assistant in hunting and selecting desirable specimens.

Dr. Wood had proved, while Professor of Materia Medica from October, 1835, till May, 1850, that placing before his class appropriate objects illustrative of his subject is superior, more successful than the purely oral and

* A discourse commemorative of William E. Horner, M.D., Professor of Anatomy, delivered before the Faculty and students of the University of Pennsylvania, October 10, 1853. By Samuel Jackson, M.D., Professor of the Institutes of Medicine. Published by the Class, Philadelphia, 1853.

† Sketch of Joseph Leidy. By Edward J. Nolan. *The Popular Science Monthly*, September, 1880. This sketch was read and approved by Dr. Leidy.

didactic method of instruction. For this reason he was confident that it would be equally useful, though perhaps more difficult to accomplish, in teaching that to which materia medica is merely subservient. With special reference to his intended system of instruction, he visited the most celebrated schools in Europe, and at a cost of many thousands of dollars, purchased models, castings and drawings of many pathological specimens. "These formed a cabinet of morbid representations unique in this country, and supplied material for a course of medical tuition which was as instructive and satisfactory as it was interesting and novel."*

Dr. Wood was the first to teach the practice of medicine in a series of "object lessons," by placing before his class models, casts, etc., appropriate to the illustration of each lecture.

At the end of his holidays in Europe, Dr. Leidy resumed his routine work in the University. He was elected a Fellow of the College of Physicians of Philadelphia, August, 1851. He seemed to be not much interested in the pursuits of the Society; seldom attended its meetings, and was not a contributor to its Transactions.† He was Secretary of the Committee on Lectures, under the Mütter Trust, from January, 1864, and kept a neat record of its proceedings. In November, 1883, "on account of his scientific achievements," the College exempted him from future payment of annual contributions.

He lectured on Physiology in the Medical Institute of Philadelphia in the summer courses of 1851 and 1852.

He was appointed in 1852 Pathologist to St. Joseph's Hospital, a purely nominal position.

Failing health had disabled Prof. Horner. With approval of the Trustees and the Medical Faculty of the University, Dr. Leidy, as his substitute, delivered the course of lectures on Anatomy for 1852–53.

Dr. Horner died March 13, 1853, and in May Dr. Leidy was elected Professor of Anatomy.

He was yet in the thirtieth year of his age. His educational opportunities and collateral advantages may have been less than those of his predecessor and friend, but from the hour he resolved to be a teacher he probably hoped some day to fill a Professor's Chair. The unremitting exercise of his natural abilities, his ever eager quest of knowledge enabled him to publish, prior to this time, many works which won for him praise

* Memoir of George B. Wood, M.D., LL.D. By S. Littell, M.D. (read October 1, 1879). Transactions of the College of Physicians of Philadelphia, Vol. xii, 1881.

† At a meeting of the College, May 5, 1886, he related that he had recently examined three nematoid worms, found in the intestines of young cats, sent to him from Chicago, and read a letter from Durango, Mexico, reporting the great prevalence of scorpions in that district. He also exhibited "photographs of trichinæ in the flesh of the pig." In answer to a remark by a Fellow of the College that it had been repeatedly stated in Berlin that the trichinæ had been found there in the pig, prior to the time when Dr. Leidy announced his discovery of it, he said: "I believe mine was the first notice of the parasite occurring in the pig." *Transactions of the College of Physicians of Philadelphia*, third series, Vol. viii, 1886, pp. 41–43.

and a name, and proved him to be an eligible candidate, and, after an unusual trial of his aptitude for the office, fairly secured his preferment.

A brief notice of his predecessors in the same Chair is submitted to show in what respects he resembled them.

The medical department of the University of Pennsylvania has always been happy in selecting men of marked ability and acquirements to fill its professorships. At the start the Trustees elected (September, 1765) two professors. Dr. John Morgan, to whom the credit of founding the Medical School of the University belongs, was appointed Professor of Medicine, which embraced the practice of physic, materia medica and pharmaceutical chemistry, and Dr. William Shippen, Jr., Professor of Anatomy and Surgery, when he was twenty-nine years of age. He also taught midwifery. Their first courses of lectures began in November, 1765. He was an eminent general practitioner of medicine and a surgeon of the Pennsylvania Hospital during nearly twelve years.

Dr. Caspar Wistar, at the age of thirty-one years, was appointed, January, 1792, adjunct, and after the death of Dr. Shippen, July 11, 1808, Professor of Anatomy.

Desirous to improve the method of teaching anatomy, Dr. Wistar had made gigantic models, exactly proportioned, of several minute and intricate structures—of the internal ear, for instance—which he used as objective illustrations of his lectures.

His collection of numerous models and anatomical preparations was presented, after his death, by his family to the University, and by resolution of the Trustees, styled "The Wistar Museum."

Dr. Wistar published, in 1811, *A System of Anatomy*, which was a text-book during many years. He was versed in botany, mineralogy and chemistry. He was a surgeon of the Pennsylvania Hospital more than sixteen years, and always among the most eminent and beloved practitioners of medicine in the community.

On the death of Dr. Wistar, January 22, 1818, Dr. John Syng Dorsey was appointed, but died November 13, 1818, a week after the delivery of his introductory lecture. The course on anatomy for 1818–19 was completed by Dr. Physick, with the assistance of Dr. William E. Horner.

Dr. Philip Syng Physick, an eminent surgeon, who had been Professor of Surgery from June 4, 1805, was elected Professor of Anatomy July 13, 1819, and resigned in 1831. He was a surgeon of the Pennsylvania Hospital for twenty-two years, and rendered important services to the public during the epidemics of yellow fever in 1793 and 1798.

Dr. William E. Horner was elected adjunct in 1820 and Professor of Anatomy in 1831. He, a native of Virginia, had been a surgeon's mate in the Army of the United States from 1813 to March, 1815, and served on the Niagara frontier in the war of that period.

Dr. Wistar appointed him, March, 1816, his prosector, at an annual salary of $500.

From 1820 he was a surgeon of the Philadelphia Almshouse during twenty-four years. His private practice was large. In 1823 he published *A Treatise on Practical Anatomy;* in 1826, *A Treatise on the Special Anatomy of the Human Body,* in two octavo volumes, which passed through eight editions, and at different times contributed valuable papers to the medical journals.

The numerous pathological and anatomical preparations made by himself, which were appraised at $10,000, he bequeathed to the Wistar Museum. In acknowledgment of this valuable bequest, the Trustees of the University decreed that it should be named thenceforward the Wistar and Horner Museum.

The anatomical chair, under the lustre shed upon it by the professional skill and eminence of its occupants, had become notably conspicuous. They resembled each other so much in their works and ways that it seems not difficult to imagine that a kind of composite portrait of Shippen, Wistar, Physick and Horner may ever mark the Chair which they in succession so admirably filled from 1765 to 1853, about eighty-seven years, before Dr. Leidy was installed.

The University of Pennsylvania appointed Dr. Leidy its delegate to the American Medical Association in 1854 at St. Louis, Mo., and in 1872 at Philadelphia, but he did not directly contribute to its Transactions at either meeting. The Committees of the Association on Medical Literature and on Medical Science cited with encomium his papers, *On the Comparative Structure of the Liver; On the Intimate Structure and History of the Articular Cartilages; On the Intermaxillary Bone in the Embryo of the Human Subject,* published in the "American Journal of the Medical Sciences," for 1848 and 1849, and *On Parasitic Life,* printed in the Proceedings of the Academy of Natural Sciences of Philadelphia.

Dr. Leidy was on the list of permanent members of the Association from 1854 to 1876. At the St. Louis meeting he was appointed Chairman of a Committee on Diseases of Parasitic Origin, and member of a Committee on Prize Essays, but no report from either has been recorded.

In 1861 he published *An Elementary Treatise on Human Anatomy,* and in 1889, the work having been out of print many years, a second edition, rewritten and enlarged. The illustrations are largely from his own drawings of many recent dissections made by him in connection with this work. A peculiar feature of the volume is that English names of the parts are given in the text, and their old Latin names in footnotes, under a belief that the subject thus presented would be more readily understood by students.

Philip Leidy, the father of the professor, died October 9, 1862, in the sixty-seventh year of his age.

In 1862, when the "Satterlee," a U. S. Army Hospital, was established in West Philadelphia, Surgeon I. I. Hayes, U. S. V., in charge, a number of leading teachers and medical practitioners of Philadelphia volunteered their services as ward physicians, and received contracts as acting assistant surgeons. To Dr. Leidy was assigned the task of conducting the autopsies and reporting them, from time to time, to the Surgeon-General of the Army. A number of pathological specimens prepared by him accompanied his reports. They have been preserved in the Army Medical Museum in Washington. He made about sixty autopsies, of which his reports are published in "The Medical and Surgical History of the War of the Rebellion."* In this capacity he served from 1862 to 1865.

His brother, Dr. Philip Leidy, was assistant surgeon of the 106th Pennsylvania Infantry from November 1, 1861, till September, 1862, when he was appointed surgeon of the 119th Regiment of Infantry, and served in the field till he was honorably discharged, June 19, 1865. He was present in nearly all the battles of the Army of the Potomac, evincing courage and devotion to his duties "with the rare qualities of a gifted man." His official reports to the Surgeon-General are published in the history above named.

Dr. Joseph Leidy was appointed a member of the Sanitary Commission Association, April 3, 1862; and September 11, "The State of Pennsylvania, Executive Office of the Military Department at Harrisburg," appointed him Chief Surgeon within the old limits of the city of Philadelphia.

August, 1864, he married Anna, a daughter of Robert Harden, of Louisville, Ky. To compensate for the sterility of this union, they some years afterwards adopted the infant daughter of a deceased friend. Dr. Leidy told the writer that had this dear child been his own he could not have loved her more. He was fond of children. The crying or hilarious romping of the playmates of his young daughter in the study did not in the least degree disturb or divert him from his work.

Since his reports to the Surgeon-General of the Army the only paper connected with the science of medicine from his pen found in print is an essay on Intestinal Worms, included in *A System of Practical Medicine by American Authors*, edited by William Pepper, M.D., LL.D., etc., assisted by Louis Starr, M.D., etc., published by Lea, Brothers & Co., Philadelphia, 1888. This essay—largely derived from foreign publications—occupies thirty-five pages of the second volume. At the close of this paper, Dr. Leidy states that for much of his information he is indebted to the articles on "Intestinal Parasites" and "Diseases from Migratory Parasites," in Ziemssen's *Encyclopædia of the Practice of Medicine*.

After he relinquished practice to devote himself exclusively to teaching, no branch of the healing art attracted or practically engaged his attention. From this circumstance his father, who unwillingly consented that he might study medicine, was probably led to say that "a first-class sign-painter had been spoiled to make a poor doctor."

Dr. Leidy delivered courses of lectures on comparative anatomy in the University, and on pure human anatomy as part of the medical curriculum,

* Vol. I, Part I, and Vol. II, Parts I and II.

seldom adverting to its useful applications in surgery or the practice of medicine, but not merely for the sake of imparting knowledge of his subject. He carefully taught human anatomy as a means of self-maintenance. And within his domain he zealously wrought to promote the welfare of the medical department of the University, the principal source of his livelihood. This was his serious occupation, his work, which to all concerned was always acceptably done, during thirty-eight years. In all that period he was absent from his post through indisposition in the aggregate only five days.

His pastime, while not engaged in his appointed task, was somewhat different though not less laborious. To increase knowledge of natural things, animate or inanimate, gigantic or microscopic, seemed to be a ruling passion; and, like a true huntsman, he cared less for the capture than for the pleasure of pursuing his game.

It may be truly said that Dr. Leidy was born to be a naturalist. To his innate ability to perceive the minutest variations in the forms and color of things was united artistic aptitude of a high order. These natural faculties, in continuous exercise almost from his infantile days, and his love of accuracy, enabled him to detect minute differences and resemblances of all objects, and to correctly describe and portray them. Besides, nothing, however small, that came within the scope of his vision, while walking or riding, escaped his notice.

He says (p. 294) of his work on *Fresh Water Rhizopods*, 1879: "The study of natural history in the leisure of my life, since I was fourteen years of age, has been to me a constant source of happiness, and my experience of it is such that, independently of its higher merits, I warmly recommend it, than which, I believe, no other can excel it. At the same time, observing the modes of life of those around me, it has been a matter of unceasing regret that so few, so very few people give attention to intellectual pursuits of any kind."

His first important work in natural history was begun in the winter of 1844, at the instance of Mr. Amos Binney, President of the Boston Society of Natural History. It is entitled, *Special Anatomy of the Terrestrial Gasteropoda of the United States.* By Joseph Leidy, M.D., of Philadelphia. Quarto, pp. 169; illustrated by 16 plates, containing 120 figures.

This admirable essay is included in the first of the three handsome volumes of Mr. Binney's work.* In the Preface Mr. Binney says: "The author is gratified in announcing that the anatomical details of the species, together with the dissections and drawings, are exclusively due to the labors of Joseph Leidy, M.D., of Philadelphia. They constitute the most novel and important accessions to science contained in the work, and are

* *The Terrestrial Air-breathing Mollusks of the United States and the Adjacent Territories of North America;* described and illustrated. By Amos Binney. Edited by Augustus A. Gould. Charles C. Little and James Brown, Boston, 1851. Quarto, Vol. i, pp. 366, 16 plates; Vol. ii, pp. 362, 74 plates; Vol. iii, pp. 183, 57 plates.

Mr. Binney died February 18, 1847.

an honorable evidence of a skill and industry which entitle him to a high rank among philosophical zoölogists."

Dr. Leidy, in 1845, contributed three papers—anatomical descriptions of mollusks named—to the Boston Society of Natural History, which were published in its Journal and Proceedings.

On nomination by Dr. Samuel George Morton and Messrs. John S. Phillips and John Cassin, Dr. Leidy was elected a member of the Academy of Natural Sciences of Philadelphia, July 29, 1845, then at the northwest corner of Broad and Sansom streets.

At that period natural history interested comparatively few persons in the community, and by those few was regarded chiefly as a rational pastime.

A brief retrospect of the subject, which is nearly associated with Dr. Leidy's career, may be permitted to recall its ancient standing and progress in public estimation.

John Hyacinth de Magellan, of London, in 1786, gave to the American Philosophical Society (of which he was chosen a member January, 1784) two hundred guineas, to be a permanent fund, the interest thereof to be annually awarded by the Society in premiums "to the author of the best discovery or the most useful invention, relating to navigation, astronomy or natural philosophy (*mere natural history only excepted*)."*

This exception, though seemingly contemptuous, was wise. Had naturalists been eligible to receive those premiums, Dr. Leidy alone, who almost annually discovered many genera and species, might have earned the whole income of the fund. Magellan's opinion, which was probably common in his day, seems to have been that to discover and describe natural species of any kind is comparatively so easy, requires so little inventive aptitude and intellectual force, and the discovery itself imports so little to the good of mankind that such work needs no encouragement. A century's experience has modified this notion in many respects.

Natural history attracted very little attention in Philadelphia during the first quarter of the present century. There were some botanists, but very few were interested in other branches of natural science.

A half dozen gentlemen who, at chance meetings, often discussed questions connected with the subject, formally assembled, January, 1812, at the residence of one of them, to form a natural history society. They styled themselves "Friends of science and rational disposal of leisure moments." After due consideration at several meetings they founded, March 21, 1812, "The Academy of Natural Sciences of Philadelphia."

* John Hyacinth de Magellan, a Portuguese physicist, was born in Lisbon in 1723. He claimed that Magellan, the first circumnavigator, was one of his ancestral kinsmen.

He long sojourned in the convents of St. Augustin, of which he assumed the habit, and removed to England about 1764, to devote himself to the study of physical science, and died at Islington, near London, January 7, 1790.

He was elected a member of the Royal Society of London, 1774, and was also a member of the Academies of Paris, Madrid and St. Petersburg. *Nouvelle Biographie general depuis les temps les plus recules jusque nos jours. Firmin Didôt, Freres, Paris*, 1860.

To rationally dispose of leisure moments; to foster peaceful study of natural things, as a wholesome diversion of the mind from the mental weariness and waste incident to idlers, quite as harmless, and more useful than contending at a game of chess; and to communicate freely to each other, as well as to the world, the results of their studies and spontaneous investigations were the chief motives which led its members to institute the Society and promote its progress.

Many books of reference, to tell students what had been already ascertained, and collections of numerous natural objects, to compare with those supposed to be new, are indispensable implements of a naturalist, but no individual was able to obtain them. Immediately after founding the Society the members saw this urgent need, and together began to form a library and a museum for their common use.

Looking forward to a time when the members of the Society would be numerous, and possibly might include zealous supporters of different religious creeds and rival political parties, the founders were somewhat apprehensive that a source of discord might arise in meetings of men holding conflicting opinions on these subjects, and for such reason agreed from the outset that, on entering the premises of the Society, every member should leave his religion and politics behind him at the door, and that debate of religious or political questions should be always out of order. This unwritten By-Law, solely designed to preserve harmony, though well understood by the members, was misconstrued outside of the Society.

Educated people, generally, then regarded the study of natural history to be in some vague way antagonistic to religion, and erroneously supposed that its votaries must be atheists or at best deists, and, therefore, to be avoided. The above unwritten By-Law, which, according to vulgar rumor, required members on joining the Society to give up religion, sustained the popular error.

During the first quarter of a century of the Academy's existence, natural history was not a part of the curriculum in any school or college in our country, because its economic value was not generally understood. Most of the Society's members were self-taught. They met in the evening once a week and before the meeting was called to order, passed some time harmoniously conversing about their studies. Their aim was to encourage spontaneous investigations and to make the Academy a practical school of natural history. No one then imagined that knowledge of it would ever become, as it is now, marketable knowledge, a part of the stock in trade of the teacher's beneficent vocation. At that time the chief incentive to the study was pure love of it, without hope of renown or emolument.

When Dr. Leidy joined the Society its library contained about 12,000 volumes, and its museum representative collections of thousands of specimens in all departments of natural history, besides chemical and other apparatus. He had at once use of all these resources, and the encouragement which flows from the fellow-feeling of many comrades working on the same line. He often said in after years that, without the facilities found in the Academy, he could not have succeeded in many of his original researches.

Dr. Leidy was elected Librarian December, 1845. He resigned at the end of the year, and the Academy voted him thanks for his efficient service. In December, 1846, he was elected a Curator, and was continuously Chairman of the Board till he died—more than forty-four years.

During all that time he virtually directed and managed the affairs of the museum. To him it was a congenial occupation—helped him in the line of his pursuits.

At the weekly stated meetings of the Academy the Chairman of the Curators usually invited attention to any notable addition to the museum. In this connection his verbal communications, which are recorded in the Proceedings, are very numerous, and were always seemingly delivered and heard with pleasure. An examplary specimen of them is, as follows :

At a stated meeting of the Academy, October 6, 1846, Dr. Leidy announced substantially that he had lately detected an entozoon in the thigh of a hog, which "is a minute, coiled worm contained in a cyst. The cysts are numerous, white, oval in shape, of a gritty nature, and between the thirtieth and fortieth of an inch in length." He *supposed* it "to be the *Trichina spiralis* heretofore considered as peculiar to the human species. He could perceive no distinction between it and the specimens of *T. spiralis* which he had met with in several human subjects in the dissecting rooms, where it had been observed by others, since the attention of the scientific public had been directed to it by Mr. Hilton and Prof. Owen."*

In an address, delivered May 1, 1886, he said : "I recall to mind an occasion upwards of forty years ago, while I was a student assisting my preceptor, Dr. Goddard, the Demonstrator of Anatomy in the University and Prosector to Prof. Horner. We were making preparations for a lecture on the muscles when Dr. Goddard, who was endowed with quick perception and sharp vision, observed an appearance in the flesh which led him to examine it with the microscope. In it he found a number of minute coiled worms to which he called the attention of Prof. Horner. The parasite had been discovered a short time previously by the English surgeon, Sir James Paget, and was described by Prof. Owen with the name *Trichina spiralis*. Several years later I found the same parasite in pork."†

It appears that the existence of trichinæ in the human subject was first noticed in England in 1832.

On the 22d of January, 1833, Mr. John Hilton read a paper before the Medico-Chirurgical Society of London, entitled, "Notes on a peculiar

* *Proc. Acad. Nat. Sc. of Phila.*, Vol. III, pp. 107–8, 1846.

† "An Address on Evolution and the Pathological Importance of the Lower Forms of Life." By Prof. Joseph Leidy. Delivered before the graduating class of the Medical Department of the University of Pennsylvania, May 1, 1886. Reprinted from the *Therapeutic Gazette* for June 15, 1886. George S. Davis, Detroit, Mich., 1886.

appearance observed in human muscles, probably depending upon the formation of very small cysticerci. By John Hilton, Demonstrator of Anatomy at Guy's Hospital."

He states substantially that Procter, aged seventy, was admitted into the hospital for a cancer, and died three months after. "Between the [muscular] fibres, and having their long axis parallel to them, are situate several oval bodies, transparent in the middle and opaque at either end, altogether about one-twenty-fifth of an inch in length. No organization could be discovered with the aid of a microscope."*

At a meeting of the Zoölogical Society of London, February 24, 1835, Mr. Owen read a description of a microscopic *Entozoon*, infesting the muscles of the human body.†

In the *Transactions of the Zoölogical Society of London*, Vol. i, pp. 315–23, is the same paper, "By Richard Owen, Assistant Conservator of the Royal College of Surgeons in London," with a plate. In that paper Mr. Owen states in substance that Mr. Paget, an intelligent student at St. Bartholomew's Hospital, observed that muscles of the body of an Italian barometer-maker, who died January 29, 1835, aged fifty, were beset with minute whitish specs," and that Mr. Paget, aided by Mr. Brown and Mr. John Bennet, at the British Museum, at the same time satisfactorily determined the existence of the entozoon.

Mr. Wormald, Demonstrator of Anatomy at St. Bartholomew's Hospital, stated that he had noticed more than once the same condition during previous anatomical seasons, and at the request of Mr. Owen, soon furnished him ample materials for microscopic examination from the subject above mentioned. Mr. Owen at once described the entozoon, which he named *Trichina spiralis*, and reported the result of his investigation to the Zoölogical Society.

Dr. Henry J. Bowditch, of Boston, was the first American who noticed the *Trichina spiralis*.‡

No one had ever suggested a source of or how this parasite found its way into the human subject until Dr. Leidy, while eating a piece of ham at his own breakfast table, discovered its existence in the hog. In announcing his discovery, with his usual caution, he said that he *supposed* it to be the *Trichina spiralis* described by Owen. This may be a reason why it was not generally recognized at the time. The publication of it in the Proceedings of the Academy was copied in full in the *Annals and Magazine of Natural History*, Vol. xix, p. 358, London, 1847; and Drs. F. Küchenmeister and F. A. Zürn state, in their work on the *Parasites of Men*, that "Leidy found, in 1847, the parasite in the muscle of pigs."§

* *The London Medical Gazette* for February 2, 1833, Vol. xi, p. 605.

† See Proceedings Zoöl. Soc.

‡ His observations are published in the *Boston Med. and Surg. Jour.* for 1842 and 1844.

§ Dr. T. Spencer Cobbold, a chief English authority on the subject, in his work on Entozoa, published in 1864, cites Dr. Leidy in his bibliography, but does not mention him in his text in reference to *Trichinæ*.

The discovery that *Trichina spiralis* infests the hog is, in its economic relations, among the most important observations Dr. Leidy ever made.

Very soon after Dr. Leidy's discovery became generally known in Europe, the importation of American pork by Austria-Hungary, Germany, etc , was arrested, under a belief that American hogs are very often infested by this parasite. Recently, however, relying upon the system of inspection established by American authority, American pork is no longer excluded from European countries in which immense quantities of pork are consumed in the form of smoked meat, imperfectly cooked. Whether the Germans suppose, as has been asserted, that one pound of raw pork contains as much nourishment as a pound and a quarter well cooked, or prefer the taste of it simply smoked, is an open question. Be this as it may, it is now known that thorough cooking renders trichinous pork harmless.

Though the most ancient of lawgivers declared swine to be "unclean," unwholesome food, it does not seem supposable that he anticipated Leidy and knew that the pigs of his time were infested by this microscopic parasite.

Trichinæ found now in man, it is believed, are derived from the hog, but whence the hog receives the parasite has not been demonstrated.

Dr. Leidy was chosen a member of the American Philosophical Society October 19, 1849. Though not frequently present at its meetings, he contributed several papers to its Transactions and Proceedings.

Need of very much more space to properly accommodate the rapidly growing library and museum of the Academy had been apparent for some time, and had become so pressing that, early in 1866, measures were adopted to supply the want. Forty members were appointed a committee to solicit citizens generally to contribute to a Building Fund. Dr. Leidy was one of them, but it is believed that his modesty prevented him from actively participating in the work. A trust was created. The contributors were to elect thirteen members of the Academy Trustees of the Building Fund, with authority to purchase a site and erect thereon a suitable edifice. They represented the contributors, to whose bounty alone the Academy would be indebted for the proposed new building. When the subscriptions amounted to $100,000, the fund was placed in the custody of the Trustees.

This method of procedure was designed to remove the subject from the meetings of the Academy, and to avoid delays in construction, which, it was conjectured, might arise from officious meddling of non-contributing members, if the work were confided to a Committee of the Society.

Dr. Leidy was elected a member of the first Board of Trustees of the

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See, *On Poisoning by Diseased Pork*, being an essay on trichinosis or flesh-worm disease, its prevention and cure. By Julius Althaus, M.D., M.R.C.P., London, Physician to the Royal Infirmary for Diseases of the Chest, 8vo., pp. 34. John Churchill & Sons, London, 1864.

Also, *Animal Parasites and Messmates*. By P. J. Beneden, Professor at the University of Louvain; correspondent of the Institute of France, with 83 illustrations. D. Appleton & Co., New York, 1876.

Building Fund, January, 1867, and was regularly reëlected till the close of his life. The work of the Board was not in harmony with his previous experience or taste. For this reason, perhaps, and because he unreservedly confided in the business ability of his colleagues rather than on his own, he did not warmly participate in it, though none was more desirous of its satisfactory achievement.

During his student days, and for years after graduation, Dr. Leidy was generally held to be poor; but he had already acquired a local reputation on account of his knowledge of natural history, and was regarded to be a young scientist of unusual promise. He attracted the attention of some prominent citizens, among them Dr. James Rush, to whose beneficence the city is indebted for the Ridgeway branch of the Philadelphia Library. Mrs. Rush was frequently pleased to make him a lion at her evening parties. At that time many persons were pleased to believe that he strongly resembled the conventional likeness of our Saviour. Both Dr. and Mrs. Rush were his friends and admirers during their lives.

Mrs. Rush died October 23, 1857. After that event Dr. Leidy often dined *tête-à-tête* with Dr. Rush.

Dr. Rush died May 26, 1869. Dr. Leidy was invited to be a pallbearer at the funeral, and at the same time received an intimation that he should not fail to be present. He accepted the invitation.

A few days afterwards he was greatly surprised by the receipt of a bank cheque for $500. He learned that Dr. Rush had named those friends whom he desired to be his pallbearers, and that he had instructed the executor of his estate to give $500 to each of those who served in that capacity at his funeral.

At its summer commencement of 1869, the Franklin and Marshall College, Lancaster, Pa., conferred upon him the honorary degree of *Legum Doctor*—LL.D.

In the spring of 1871 he was appointed Professor of Natural History in Swarthmore College, eleven miles from the city, in Delaware county, and lectured there at 10 o'clock A.M., at first once in the week and subsequently twice. He resigned the office in June, 1885, but continued his connection with the institution as emeritus or retired professor.

The Secretary of War invited him, May 6, 1873, to be the senior member of the scientific corps during an exploration of the route of the Pacific Railroad. This invitation was declined.

In December, 1874, he was offered the Hersey Professorship of Anatomy in the University of Harvard, at an annual salary of $4000.

He passed the summer of 1875 in Europe, visiting museums in London, Paris, Berlin, and mingling socially with renowned professors and distinguished votaries of natural science wherever he halted.

He spent the greater part of two seasons exploring the country around Fort Bridger, the Uinta mountains and Saltlake basin in search of materials for his treatise on *Fresh Water Rhizopods of North America*, under the auspices of the U. S. Geological and Geographical Survey of the Territories, then directed by Dr. F. V. Hayden. The work was published in 1879. Dr. Leidy states, January 1, in his introduction to it, that during four years he had studied these Rhizopods as they occur in all the fresh waters of the country from the Atlantic border to an altitude of 10,000 feet in the Rocky mountains, and gratefully refers to the generous hospitality and aid received from Dr. J. Van A. Carter, formerly of Fort Bridger, who conducted his expeditions to the Uinta mountains and defrayed their expenses. Various railroad companies granted him entirely free transportation, or at half fare, so that to the Survey the expenses of this admirable work, besides the charges incident to its publication, amounted to about $222.

His friend, Mr. Joseph Wilcox, relates that while they were visiting the "bad lands" of Wyoming, he asked Dr. Leidy, "What beauties do you see in this forbidding territory?" In reply he said, "This is a most interesting place to see, where no living animal or plant exists. I enjoy the novelty of this anomalous locality. You will all agree with the man who appropriately compared this place to the infernal regions after the fires had been put out."

During many years Dr. Leidy habitually visited the Twelfth Street Market in search of specimens, and became quite intimate with Mr. R. M. Holbrook, who is a large dealer in fresh fish, etc., and is also Treasurer of the Market Company.

Speaking of Dr. Leidy, Mr. Holbrook said, "He was a man of such simplicity of manner that he drew all classes of persons to him, even children would stop and listen to him.

"At one time a few years ago he got from me a specimen of some kind of fish and wrote an article about it, in which he gave me the credit of furnishing the specimen. The article was copied in a London journal, but by mistake gave my name as the author. As soon as he saw it Dr. Leidy came and asked me whether I had written much for the papers. He then told me of the mistake, laughed heartily, and seemed to enjoy it very much.*

"And he told me about the publication of his book on Rhizopods. And on my expressing a hope that he was well paid for his work, he said that all he got for his labor was twenty copies of it and that he was satisfied.

"At another time he told me that he had just received an unexpected remittance from Boston; that he had written a paper for the Walker prize the year before and had not received anything, but this year in consideration that his papers were good both years the committee had awarded him a double prize. His childlike manner in telling me about it, without reference to the sum of money he had received, and without the least tinge of egotism or conceit, showed that he wished me to enjoy his success with him.

* At a stated meeting of the Academy, May 10, 1870, Dr. Leidy "called attention to errors in published reprints of the Academy's Proceedings in foreign journals."

"He usually came to market about six o'clock in the morning before the crowd began, and sat behind the stall a half hour or more talking and watching the men while they were cleaning fish. He was always pleased to carefully examine whatever might be found in the stomachs or intestines of the larger varieties. The entrails of very big ones were sometimes sent to his house that he might inspect them at his leisure. And if anything strange came along—for whatever comes into the fisherman's net is fish—it was sent to him. Sometimes he wrote the Latin name of an uncommon kind on a scrap of paper, which my men copied in large letters and, sticking it on the specimen, displayed it on the stall. For example, on one scrap he wrote, 'Horse Crevalle—Caraux hippus. Cape Cod to the West Indies. Belongs to the Pilot-fish family and related to the Mackerels;' on another, 'Pensacola black grouper—Trisopteris microlepis;' and on a third, 'The Massachusetts Tile Fish—Monacanthus Massachusettensis.'"

The Boston Society of Natural History, January 22, 1880, "Voted that the Walker Grand Honorary Prize for 1879 be awarded to Prof. Joseph Leidy for his prolonged investigations and discoveries in zoölogy and paleontology, and in consideration of their extraordinary merit the sum awarded be $1000.*

In August, 1880, an invitation to lecture and supervise the scientific studies of the postgraduates of Princeton College, N. J., was declined.

In December, 1881, he was elected without competition President of the Academy of Natural Sciences of Philadelphia, and continuously held the office till he died.

About the year 1866 it was suggested that natural history should be taught in the University. The proposition was entertained and discussed from time to time, and lingered on without action. In 1882, under the propulsive and successful administration of Dr. William Pepper, the distinguished Provost of the University of Pennsylvania (whose policy apparently is to enlarge the institution and foster within it every branch of

* Dr. William J. Walker, a generous friend of science, who died at Newport, R. I., April 2, 1865, placed in trust of the Boston Society of Natural History means of awarding prizes for the best memoirs, written in English, on subjects proposed by a committee, appointed by the Council of the Society. The first and second prizes to be awarded annually, and the third once in five years, beginning 1870.

First.—For the best memoir presented a prize of $60 may be awarded, which sum, at the discretion of the Committee, may be increased to $100, if the memoir be of marked merit.

Second.—For the next best memoir a prize of not exceeding $50 may be awarded, provided it be of adequate merit in the opinion of the Committee.

Third.—Grand Honorary Prize. The Council of the Society may award the sum of $500 for such scientific investigation or discovery in natural history as may be deserving thereof in its judgment, provided such investigation or discovery shall have first been made known and published in the United States of America; and at the time of said award shall have been made known and published at least one year. "If in consequence of the extraordinary merit of such investigation or discovery, the Council of the Society should see fit, they may award therefor the sum of $1000." *Proc. Boston Soc. Nat. Hist.*, Vol. x, p. 146, 1866.

human knowledge which may be profitably taught), a school of natural history was devised and instituted under the modern style of Department of Biology, and Dr. Leidy was appointed, for the current academic year, Professor of Biology (Zoölogy) in the Faculty of Philosophy.

In 1884 the department was organized by the appointment of a Faculty of seven professors, including Dr. Leidy as Professor of Zoölogy and Comparative Anatomy, and he was elected, May 6, Director of the Biological Department.*

It was proposed, March 16, 1885, that his salary should be $6000, on condition that he should resign his position in Swarthmore College, which he did, and give his time exclusively to the University.

A laboratory, an herbarium and an appropriate museum were started. To the latter Dr. Leidy contributed many of his skillfully made preparations, and bequeathed to it an herbarium of about 1400 species of plants, collected by himself.

In this connection the University Marine Biological Association has been founded, with laboratories and aquaria located at Sea Isle City, N. J.

The Geological Society—Burlington House, London, January 5, 1884—awarded to Dr. Leidy the Lyell Medal, with its accompanying purse of £25, in recognition of his important services to paleontology.

About the close of the year 1883 the attention of Dr. Leidy was invited to a subject which he had not previously considered.

Mr. Henry Seybert, a firm believer in modern spiritualism, who died March 3, 1883, aged eighty-two years, not long before his death gave to the University of Pennsylvania a sum of money sufficient to found a Professorship of Philosophy, on condition that the University should appoint a commission to investigate "all systems of morals, religion or philosophy, which assume to represent the truth, and particularly of modern spiritualism."

Ten gentlemen, most of them members of Faculties or of the Board of Trustees of the University, were constituted a commission to investigate modern spiritualism. Dr. Leidy, with one or more members of the commission, attended twelve sittings with reputed spiritualist mediums, from March, 1884, to April, 1887. The commission submitted a preliminary report of its proceedings May, 1887.†

The Trustees of the Wagner Free Institute of Science elected him, July 27, 1885, President of the Faculty and Professor of Biology, at an annual salary of $500. From that date the Trustees obtained his views before deciding any question relating to the scientific policy of the Institute, and appointed members of the Faculty subject to his approval. He lectured two or three times every season, and always attracted a large audience. In the spring of 1890, lectureships superseded the Faculty system, and

* University of Pennsylvania. Handbook of Information, concerning the School of Biology. Philadelphia, 1889.

† Preliminary Report of the Commission appointed by the University of Pennsylvania to Investigate Modern Spiritualism, in accordance with the Request of the late Henry Seybert. 12mo, pp. 160. J. B. Lippincott Company, Philadelphia, 1887.

Dr. Leidy was elected Director of the Museum June 3, 1890, and spent some of his last days in planning a synoptical arrangement of it.

He was authorized by the Trustees to expend $3000, while in Europe in 1889, in the purchase of specimens for the museum, and on his return $1000 more were placed in his hands to be spent in the United States for objects of the same kind. His interest in the growth of the museum and library was constant. He presented many books and specimens collected by himself.

At its summer commencement of 1886, Harvard University conferred upon him its honorary degree of *Legum Doctor*—LL.D.; and the Institute of France awarded to him, December 18, 1888, the Cuvier prize medal.

He had now reached the sixty-fifth year of his age. Unremitting routine and other labors, and the enjoyment of many social meetings with friends, had somewhat abated both his physical and mental energies. Rest was desirable. Accompanied by his wife and daughter he visited Europe in the summer of 1889, but his first letters from London indicate that the sojourn there was much less cheering to him than it ever had been. And then the serious illness of Mrs. Leidy, soon after reaching England, greatly augmented his depression, although the sympathy and attention of his English friends were unstinted. After her recovery the projected tour was completed, and in September all returned in better health and spirits than when they started on their trip to Europe.

Soon after reaching home a rumor from the University was a source of much distress to Dr. Leidy. It was said that the professorships were to be rearranged, and to realize the plan he would be asked to relinquish the Chair of Anatomy and retain his position in the Biological Department. A city newspaper reported substantially that Dr. Leidy had been requested to resign. The statement was at once authoritatively contradicted. Nevertheless, subsequently he, who was pronounced by one of the Faculty to be the "most consummate teacher that ever held the Chair of Anatomy," was requested to relinquish it, but he declined.

During the year 1890, in compliance with the wish of a valued friend, he visited several times the establishment of Mr. Keely, who claims that he had long ago discovered a new motor of extraordinary force. Diligent study during many years has failed to ascertain a practical method of applying this power to any use. With this aim Mr. Keely has constructed costly and ingenious machinery which is set in motion by this occult power. Many prominent scientists, engineers and others have been invited at different times to inspect it, hoping probably that their opinions would encourage his continuous research. It seems, however—if the public be rightly informed in the premises—that, in their judgment, the nature of this new force, whatever it may be in fact, is not yet apparent. But Dr. Leidy wrote, December 18, on his card to a friend, "Keely appeared to me to have command of some power previously unknown."

This statement is not even presumptive testimony that a previously unknown natural force is now under command. Unsurpassed ability to ascertain the structure of organisms of every kind, as Dr. Leidy had, is not in itself sufficient to guarantee that the witness may not be deceived as to the motive force that operates complicated machinery, especially one who has never been interested in or studied any branch of physics. The judgment of a backwoodsman on the sea-worthiness and fighting qualities of the first battleship he ever visited would be as respectable.

His membership in many societies at home and abroad is significant of his widespread reputation. A list of them is appended.

Prof. Henry C. Chapman, of Jefferson Medical College, in his Memoir, printed in the Proceedings of the Academy of Natural Sciences of Philadelphia, for 1891, has noticed in a summary but admirable manner each of Dr. Leidy's leading publications. Lists of all of them may be found in the Appendix.

The general character of all his works is anatomical. They consist almost entirely of technical descriptions of genera and species of existing or extinct animals. Though highly creditable to their author, they interest very few persons besides votaries of natural history, because they are not applicable to any apparent industrial use. Such writing does not bring pecuniary reward. With the exception of his books on Anatomy and reports to the Surgeon-General of the Army, he received no substantial compensation for any of his numerous essays.

Inasmuch as botany and mineralogy were greatly preferred to other branches of natural history in his early life, it is notable that he published little, if anything of importance, in connection with either.

Prof. Thomas C. Porter, of Lafayette College, among the foremost of our botanists, who was his intimate friend during many years, wrote in reply to inquiries: "To your other question I can give a definite answer. Of course, as a master of biology, he had a comprehensive knowledge of structural and physiological botany, but his interest in the plant world was only a side-interest. He had a fair acquaintance with our native flora, and his wonderful powers of observation were sometimes of great service to his friends who were engaged in its study. Had he turned his mind from animals to plants he would, no doubt, have done the same kind of valuable work amongst the latter as he had done amongst the former. But I know of no thorough investigations of the sort made or published by him. Looking over his species of Panicum one day, he remarked to me that, if he could devote the time to it, he should like to produce a monograph of that difficult genus. He had a herbarium composed chiefly of specimens of his own collection. It is not large, but like everything else which passed through his hands, in excellent condition."

In his charming personal history of Dr. Leidy, Dr. William Hunt says: "I remember walking with him along the grassy path by the seaside at Bar Harbor one summer day. We were on our way to visit a Philadelphia lady who was herself an amateur botanist, and particularly well acquainted with the region about us. Suddenly Dr. Leidy said, raising his hands, 'Dear me! there is a plant which Gray says only grows high on the mountains, and here it is by the sea.' He gathered a portion of it with great care and put it in his pocket. When he got to the house he spoke of his find, and showed Mrs. —— the specimen. 'Why, Doctor,' she said, 'that is *Empetrum*.' The doctor looked carefully at it and said, 'Why, so it is; I thought it was *Loiseleuria*,' and laughed heartily, receiving the correction as though it had come from Gray himself."*

His deep interest in mineralogy was continuous from boyhood till the close of his life. To him it was a kind of Sunday afternoon or holiday recreation to visit friends who had cabinets, examine their newly acquired specimens, and talk about them in connection with those in rival collections. Always seeking to obtain rare specimens, especially of gems, he bought and sold and exchanged minerals with his friends whenever opportunity occurred. About the year 1870 he purchased a collection, said to be the finest ever brought from Europe to this country, and a year or two after sold it to a party in Boston for $2000, because he said he could not afford to keep it. He continually added to and improved his cabinet, which, at his death, was sold to the National Museum at Washington, D. C., for $2800.

He was not practically interested in the chemical analysis of minerals. But through his life-long habit of examining, comparing and exchanging specimens, as well as of buying and selling them, he acquired the skill of an average lapidary in recognizing mineral forms, especially of gems, and among his friends became an authority for their market value. Yet more than once he mistook an artificial for a real stone, submitted to his inspection by a dealer to test his knowledge.

Dr. Leidy had a broad chest and strong limbs, was about five feet ten or eleven inches in height and 200 pounds in weight. Relatively to his stature, slightly stooping at the shoulders, his head was rather small; and it was ascertained after death that his brain weighed forty-five and a half ounces—somewhat less than the average. But deficiency of brain tissue was probably compensated for by the sustaining power of good blood-circulating and digestive apparatus, upon the normal functions of which mental activity in a degree depends. It is commonly known that a drink of tea or of any stimulant temporarily augments the activity of the mental machinery when it is moving slowly from fatigue or other cause. It is generally supposed, however, that intellectual energy is in proportion to the size of the brain, the prevailing weight of which in adult man is from forty-six to fifty-three ounces, according to an English authority,† and from forty-five to fifty-five ounces among our own people, and among all races from two to four pounds, according to an American authority.‡

* In Memoriam. Dr. Joseph Leidy, b. Sept. 9, 1823, d. April 30, 1891. Personal History. By William Hunt, M.D. Read at the Academy of Natural Sciences, May 12, 1891.

† *Anatomy, Descriptive and Surgical*. By Henry Gray, F.R.S.

‡ *An Elementary Treatise on Human Anatomy*. By Joseph Leidy, M.D., LL.D., etc. Second edition, 1889.

"A little man with the same size of head as a big man will (other things being equal) possess more energy. In weight of brain, again, considerable differences exist among men of acknowledged power. The average weight of the male brain in civilized races is about 49 ounces. Cuvier's brain weighed 64 ounces; Abercrombie's and Schiller's, 63; De Morgan and Gauss, the mathematicians, $52\frac{3}{4}$ and 52 respectively. But Grote, the historian, had a brain only three-quarters of an ounce above the average, while the brains of Tiedemann, the anatomist, and Hausmann, the mineralogist, fell 5 and 6 ounces below it. * * *

"The heaviest known human brain belonged to a Sussex bricklayer, who died of consumption in University College Hospital in 1849. It exceeded 67 ounces and was well proportioned; while in physical size its owner was not greatly above the average, being 5 feet 9 inches in height and of robust frame. But the man could not read or write, though he was said to have a good memory and to be fond of politics."*

According to these data size or weight of brain is not a measure of mental capability.

Dr. Leidy had a handsome forehead, though it was not remarkably high nor broad. Compared with the head, his face was perhaps large. Nearly horizontal, straight brows slightly overhung tranquilly pensive blue eyes, which were not widely separated by a full-sized, well-formed nose. His mouth, slightly drooping at the corners, contained a set of fine teeth. The lips were well proportioned and his chin was broad. He wore a full beard and was well crowned with fine hair. While conversing with friends the expression of his face was truly significant of his very amiable disposition. His utterance was distinct and the tone of his voice pursuasive and pleasant, though slightly nasal. A natural and very modest demeanor made him welcome wherever he was. He loved the company of his friends. No member of either the Old Contributorship, of which he was a Director, or of the Biological Club, of which he was President, enjoyed more their stated dinners; on those occasions his cheerful and instructive conversation, almost always mentioning some fact new to them, gratified his companions.†

To him controversy and conflict were always repugnant. He preferred to yield at once, rather than contend. For him it was a task to say, No. This feature of his nature at times lessened his administrative efficiency in

He says, p. 713: "All other conditions being equal, it is observed also to hold a relation in size to the degree of mental development; hence the more civilized races and more cultivated and intelligent people are distinguished by a larger and heavier brain, while the opposite condition exists in the barbarous races and the least cultivated persons."

* *The Insanity of Genius and the General Inequality of the Human Faculty, Physiologically Considered.* By J. F. Nisbet, author of *Marriage and Heredity.* Ward & Downey, 12 York street, Covent Garden, London, 1891.

† The Biological Club, as a token of its appreciation of Dr. Leidy, had painted a very satisfactory portrait of him, which is in the library of Academy of Natural Sciences.

The College of Physicians of Philadelphia has in its library a portrait, which is a lugubrious likeness, though artistically well painted.

the opinion of some of his warmest friends, and caused them on occasions to jocosely say: "Oh! he is an invertebrate."

While he was a bachelor his manner of living was properly economical, and his savings at different times amounted to considerable sums; but his financiering ability or forecast seemed to be limited to this kind of hoarding. At the time when speculation in petroleum was imagined to be a sure road to fortune, he listened to a friend supposed to be knowing in the field, invested in a petroleum company and lost $4000. On another occasion he was lured by promises to invest in a silver mine and lost about twice as much. Next he purchased stock of a certain railroad which from that day never made a dividend, and sold it for about half its cost.

During the first half of his life or more his attention was exclusively given to anatomical and natural history pursuits. General literature or popular diversions did not interest him in any considerable degree. His diary kept while in Europe in 1848 mentions that he once attended the Haymarket Theatre in London, and that he passed one evening in Paris at the Theatre du Palais Royal. But galleries of paintings and sculpture attracted his attention. To a friend who presented him a poem years ago he said: "I never read poetry. It seems to me such a round-abound way of expressing ideas." And to another he said he did not understand how anybody could read "rhyming stuff." But in the last decade of life, when age and experience had tamed his energies, and egoism was less exacting, his tastes changed. He read with pleasure certain poetic compositions, which friends commended, and now and then a novel. Theatrical amusement often attracted him, and he was sometimes pleased to hear the music of his daughter's piano in the parlor while he was engaged in his study. He daily read newspapers, and, as a good citizen, voted at elections of city, State and United States officers.

In some respects he resembled Charles Darwin. Matthew Arnold says: "Mr. Darwin once owned to a friend that, for his part, he did not experience the necessity of two things, which most men find so necessary to them—religion and poetry; science and the domestic affections he thought were enough."*

In his autobiography Mr. Darwin says: "For many years I cannot endure to read a line of poetry; I have tried lately to read Shakespeare, and have found it so intolerably dull that it nauseated me. I have almost lost my taste for pictures and music. * * * My mind seems to have become a kind of machine for grinding general laws out of a large collection of facts."

Dr. Leidy, however, sought chiefly to ascertain facts; he did not attempt to deduce general laws from them.

He accepted, without reserve, all the theories of evolution, etc., of Mr. Darwin, with whom he had correspondence, but their religious views were very different.

* *Discourses in America.* By Matthew Arnold. Macmillan & Co., London, 1885, p. 113.

In a letter, dated February 28, 1879, addressed to his friend, the Rev. Dr. Henry C. McCook, he said: "I mark what you say in reference to quoting from the *Cosmic Philosophy* of Prof. Fiske, instead of expressing my opinions in my own language. I preferred doing so because my religious views so fully accord with those he so clearly presents to the reader. I have always had an antipathy to enter into a discussion of religious opinions, and when persons, curious to know mine, have questioned me, to avoid discussion, I have the last few years referred them to the admirable work of John Fiske.

"While I am disposed to avoid public notice, I feel some recompense in your having read my note to your audience, as it may tend to remove the reproach of atheism, which you know is so unreasonably and freely imputed to all naturalists and philosophers.

"Through life I have been conscious of having been a devoted worshiper (again to quote Mr. Fiske) 'of an ever-present God, without whom not a sparrow falls to the ground;' and I have often felt annoyed at the implied reproach of infidelity from the self-sufficient who consider that they fulfill all religious duty in lip-service to the same Deity."

Though not a regular attendant of any church, he was pleased to listen occasionally to sermons of the Rev. Drs. Phillips Brooks (Episcopalian), Ed. R. Beadle (Presbyterian) and William H. Furness (Unitarian). The teaching of the last was in accordance with his own religious views.

The genius of Dr. Leidy—an innate force that seems to dominate the exercise of the natural aptitudes or talents—a force none of his ancestors possessed, and is therefore not ascribable to heredity—impelled him to investigate natural objects and portray those which had not been previously described. His strong egoism was more gratified in this occupation than in any other. Some of his contemporaries, who wrought in the same field, possibly may have done more, but in the accuracy of their work none surpassed him.

Prof. Cesare Lombroso, of Turin, forcibly argues that genius of every kind is always associated with abnormal conditions of the organism, and for such reason its presence is significant of some degree or kind of degeneration.* Dr. Leidy was, as geniuses generally are said to be, precocious and sterile; also, emotional and so far, neuropathic. During his visits to Europe, too long and too eager quest of whatever he sought was sometimes followed by a feverish state and an unpleasant degree of nervous depression; but perfect rest for a day, as his diaries show, enabled him to resume his pursuits.

Dr. Leidy had a rare experience of living nearly sixty-eight years without provoking personal hostility, without making an enemy. Troops of friends encouraged his pursuits, and among them some were ever ready to give him, when needed, substantial help to publish his works. No votary of natural history was helped more or more favored or more popular.

* *The Man of Genius.* By Cesare Lombroso, Professor of Legal Medicine at the University of Turin; with Illustrations. Walter Scott, 24 Warwick Lane, London, and Charles Scribner's Sons, New York, 1891.

Announcement of his death brought expressions of regret for the loss sustained and of admiration of his character from many citizens. Newspapers published sketches of his career and praised his works and ways.

The Alumni Society of the Medical Department of the University of Pennsylvania held its annual meeting in the evening of the same day. The President, Dr. Alfred Stillé, officially announced that Dr. Leidy had died in the morning, and said, among other things, that by the death of Dr. Leidy the University "looses the profoundest and most consummate teacher that ever held the Chair of Anatomy, and whose fame as a comparative anatomist, paleontologist, geologist, zoölogist and botanist was not bounded by his native city or country, but was coextensive with the civilized world.

"No man, who had such reason to be proud, was ever more humble. His simple and amiable manners attached to him the old as well as the young, and made him revered in the gravest circles of the learned and loved by the students, whom he inspired by his example and enriched by his knowledge."

The Wagner Free Institute of Science recorded its sense of loss in a minute, as follows:

"With feelings of deep sorrow we record the death of Dr. Joseph Leidy, who, for the past six years has stood at the head of the science work of our Institute as President of the Faculty and Director of the Museum.

"The death of this true and honest man, as gentle as he was strong, as humble as he was great, is to the whole civilized world, as it is to our own country, the loss of one of the most distinguished scientists of the day; while to Philadelphia, the city of his birth and life-long home, it is the loss, not only of one of her greatest men, but as well of a true and faithful son, who loyally spent his whole life in her service, and who died, as he lived, in entire devotion to duty, wholly forgetful of himself, and mindful of the welfare of others.

"To the Wagner Free Institute of Science the loss occasioned by his death is beyond repair. The place he has left vacant cannot be filled. To him, more than any other man, and to his good guidance more than anything else, is due whatever has been accomplished by the Institute since the death of its founder, in the organization and conduct of its work in the cause of science. It is impossible to express in words the debt of gratitude we owe to him; only by deeds can we give expression to it, by striving to carry out the work which he has planned for us with such consummate skill, that it may become a living memorial of his earnest labors, his broad intelligence and his commanding knowledge."

And in the first paragraph of his Valedictory Address to the graduating classes in medicine and dentistry of the University, delivered at the annual commencement, May 1, 1891, Prof. James Tyson said: "The ink was scarcely dry on my page when came the intelligence that Joseph Leidy was seriously ill, and close on this fact of his death. This most unexpected calamity has changed the present occasion from one of rejoicing to one of mourning—scarcely mitigated by the circumstance that Dr. Leidy died as he wished, after a short illness and with his shoulder, as it were, still at the wheel. For Dr. Leidy never ceased to work. His industry was only equaled by his intellect, and these by the sweet simplicity of his life. He loved science for science's sake, and neither poverty nor promise of riches, nor ambition, nor princely decoration could swerve him from his purpose. We are stupefied by the suddenness of our loss. And there is a fitness in the association of the end of your greatest teacher's life, and the new commencement of your own, which ought not to be without its effect in keeping green his precious memory, and in stimulating you to emulate his example."

The funeral services were at the First Unitarian Church, May 2. Members of the societies to which he belonged, the Faculties of the University, and prominent citizens in large numbers were present. The venerable and Rev. Dr. Furness officiated, and delivered an eloquent and touching tribute to his worth.

His remains, and at the same time those of his brother, Dr. Philip Leidy, who died April 29, were cremated, May 9.

Not long afterwards representatives of the University solicited contributions to an endowment of $50,000 to be raised at once and exclusively devoted to the use of his widow; and ultimately revert to the University, "to establish and endow the *Leidy Memorial Museum* as an independent part of the great museum" projected for the Institution. Dr. Leidy bequeathed a modest sufficiency for his family. For such reason, probably, the necessity of the proposed endowment was not generally regarded to be urgent. About the same time it was decided to obtain an endowment for the Chair of Anatomy, the sum to be counted in the General Endowment Fund of $250,000 for the Medical Department, which, to make Dr. Pepper's conditional subscription of $50,000 payable, "must be secured before June 1, 1892, and then designate this chair by "the illustrious name of Leidy, whose labors gave it imperishable fame." "No more fitting memorial," says the circular, "can be found for this great man and beloved teacher." And the other circular says, "No memorial of Joseph Leidy can be more fitting than a museum in which will be garnered the infinite variety of natural objects which formed the basis of his admirable studies."

Prof. J. P. Lesley, his personal and scientific friend, early in May published in the *Christian Register* a warm tribute to his worth and memory. He said among other statements: "The eulogy of the dead runs easily into exaggeration. In this case that cannot happen. Rare men are so rare—a few in a generation, here and there one whose excellence is above degrees, the perfect man, the ideal man. He is like a statue set up in the public park of the metropolis, veiled until the day of showing comes. Death drops the veil, and the splendid apparition smites the heart of the community with a strange astonishment."

He also said, in substance, that while Cope and Marsh were working the fossiliferous field into which Dr. Leidy had entered long before, and by his labor made, in a sense, his own, they fell into disputes over priority of dates of different names of genera and species found in the later strata of a Western Territory, in which contention Leidy, the friend of both, refused to take any part. And, it seems proper to add, so dominant was his repugnance to controversy of every kind that he left his friends, freed from his participation, to compete with each other, and for a considerable period engaged in an entirely different field of investigation, to return long afterwards to his beloved paleontology.

The Trustees of the Building Fund of the Academy of Natural Sciences ordered, May 15, 1891, a memorial notice to be preserved with the record of their proceedings, in which it is stated that "his modest, amiable deportment at all times, his abiding interest in the welfare of the Academy and in the progress of the natural sciences, won for him the unreserved confidence and respect of his colleagues on the Board, and made his presence at its meetings always welcome. But his connection with the Trustees and his many official positions in the Academy could not add to the high estimation in which he was held in the community. His accurate and extensive knowledge of natural history in all its departments, his writings, his most acceptable teachings as Professor of Natural History in Swarthmore College, and as Professor of Human Anatomy in the University of Pennsylvania during more than a third of a century, from May, 1853, obtained for him a deserved reputation and fame among the friends of the Natural Sciences at home and abroad."

In his *Address to the Graduating Class of 1891, at Swarthmore College,* June 16, the President of the Board of Managers, Mr. Joseph Wharton, said: "And since nothing more potently aids us in the struggle to become wiser and better than observation of those who stand above us, and study of their methods, I can do nothing more fitting this occasion than endeavor to show you how this great man came to be so eminent, so trusted and so beloved.

"Joseph Leidy inherited excellent constitution of mind and body; he was transparently sincere and absolutely devoted to truth; he was remarkably devoid of selfishness in any form; he had persistent and lifelong diligence; he was systematic in his expenditure and careful in his economy of time; he held firmly to whatever task he undertook; his temper was cheerfully equable and his disposition affectionate."

Commenting on each of these characteristics successively, in a lucid style, Mr. Wharton thus happily concludes his pleasing address: "If now I have succeeded in showing you that every part of Dr. Leidy's great eminence grew out of the cultivation of such natural powers as your own, and out of the constant practice of such simple virtues as should also be yours, that, in a word, you may hope to scale such heights, to breathe such lofty air, to serve so well your kind, and to attain such universal respect and affection, without possessing other genius than that which has been defined as 'an infinite capacity for taking pains;' and if in showing this I have stirred in you a secret resolution to make your lives bear some resemblance to his clean and fruitful life, my aim has been reached."

The tribute delivered at the opening session of the Congress of American Physicians, assembled at Washington, D. C., September 21, 1891, is the last. Dr. Pepper, the distinguished Provost of the University of Pennsylvania, said: "In the death of Joseph Leidy, which occurred April 30, 1891, at the age of sixty-eight years, the medical profession in America lost its most loved and honored member, and American science its most illustrious representative.* It makes a difference to the world when such a man passes away. At his birth Nature gave him her accolade, and all his life long he was loyal to the holy quest of truth, which is the vow imposed on those whom she invests as her chosen knights. Who can say how much of the marvelous and inexhaustible knowledge of nature this great man possessed came from the singleness of his life and the purity of his heart," etc., etc.

Leidy's life sustains rather Arthur Schopenhaur's opinion, that "thinkers and men of genius are those who have gone straight to the book of Nature; it is they who have enlightened the world and carried humanity further on its way."†

Postscript.—In the preparation of the preceding sketch, the writer has earnestly endeavored to avoid errors and hopes that he may have fairly succeeded. Incidents connected with the career of Dr. Leidy, though some of them may be unimportant or even trivial, have been narrated under an impression that they may assist in conveying a true representation of him.

The degree of usefulness to the world of his life-long work, according to the opinion that may be formed of it in the future, will be the criterion of its worth as well as the measure of the duration of his reputation.

* Knowing that Dr. Leidy had entirely ceased to practise medicine more than forty years before, a witty friend of the Provost, after reading his graceful eulogy, remarked in substance that it was like telling an assembly, representative of all the tanners of the United States that, in the death of General Grant, they had lost the most beloved member of the trade.

† November 17, 1891, Dr. William Hunt delivered an address on his University career before the alumni and students of the Medical Department of the University of Pennsylvania.

APPENDIX.

Societies at Home and Abroad of which Dr. Joseph Leidy was a Member.

Boston Society of Natural History, 1845.
Academy of Natural Sciences of Philadelphia, July 29, 1845.
Naturhistorischer Verein für das Grossherzogthum Hesse und Umgebung, 1848.
American Academy of Arts and Sciences, 1849.
American Philosophical Society, Oct., 1849.
Fellow of the College of Physicians of Philadelphia, 1851.
Philadelphia County Medical Society.
Société de Biologie, Paris, 1851.
Medical Society of Virginia, 1852.
Linnean Society of Pennsylvania College, Gettysburg, 1853.
Société Imperiale de Naturalistes de Moscow, 1853.
Logan Institute, Virginia, 1853.
Zoösophical Society of the University of Pennsylvania, 1853.
Philomathian Society of the University of Pennsylvania, 1854.
Société des Sciénces des Arts et des Lettres de Hainault, 1853.
Dallas Historical Society, 1855.
Iowa Lyceum, Des Moines, 1855.
Natural History Society of Charleston, S. C., 1855.
American Medical Association, 1856.
Academy of Sciences, St. Louis, Mo., 1856.
K. Leopoldinisch Carolinische Deutsche Akademie der Naturforscher, 1857.
Zoölogical Society of London, 1857.
K. Bairische Akademie der Wissenschaften, 1858.
Dublin University Zoölogical and Botanical Association, 1859.
Burlington County [N. J.] Lyceum of History and Natural Science, 1859.
K. Bömische Gesellschaft der Wissenschaften, 1860.
R. Academia economicoagraria dei Georafili di Firenze, 1861.
K. K. Zoologisch-botanischer Verein, Wien, 1861.
Geological Society of London, 1861.
Dublin Natural History Society, 1863.
National Academy of Sciences [an original member], 1863.
Minnesota Historical Society, 1863.
Entomological Society of Pennsylvania, 1864.
College of Physicians and Surgeons, Reading, 1870.
Alumni Society of the Medical Department of the University of Pennsylvania, 1871.
Anthropological Society of London, 1872.
Linnean Society of London, 1872.
Minnesota Academy of Natural Science, 1873.
Société Nationale des Sciénces Naturelles de Strasbourg, 1873.
Sociedad Mexicana de Historia Natural, 1874.
Zoölogical Society of Philadelphia, 1876.
Literary and Philosophical Society of Liverpool, 1877.
Historical Society of Pennsylvania, 1884.
Biological Society of Washington, D. C., 1884.
New York Microscopical Society, 1884.
K. Danske Videnskabernes Selskab, 1886.
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Dr. Leidy's Medical Papers and Books.

The Medical Journal of the Medical Sciences:

On Several Important Points in the Anatomy of the Human Larynx. Vol. 12, pp. 141–43, 1846.

Researches into the Comparative Structure of the Liver. Vol. 15, pp. 13–25, 3 plates, Jan., 1848.

On the Intimate Structure and History of the Articular Cartilages. Vol. 17, pp. 277–91, 2 plates, April, 1849.

Intermaxillary Bone in the Embryo of the Human Subject. Vol. 17, p. 577, 1849. Also reported Jan. 9, 1849, in Proc. Acad. Nat. Sci., Vol. 4, pp. 145–47.

Notice of Certain Bodies observed in the Human Subject. Vol. 20, pp. 89-91, 1850.

Human Anatomy. By James Quain, M.D. Edited by Richard Quain, F.R.S., and William Sharpey, M.D., F.R.S., Professor of Anatomy and Physiology in University College, London. First American from the Fifth London Edition. Edited by Joseph Leidy, M.D. In 2 Vols., with over 500 illustrations. Lea & Blanchard, Philadelphia, 1849.

Atlas of Pathological Histology. By Gottlieb Gluge, Professor of Physiology and Pathological Anatomy in the University of Bruxelles; Member of the Royal Academy of Bruxelles. Translated from the German by Joseph Leidy, M.D., Pathologist to St. Joseph's Hospital, Philadelphia; Fellow of the College of Physicians of Philadelphia; Honorary Fellow of the Medical Society of Virginia; Corresponding Member of the Biological Society of Paris, etc. With 320 figures, plain and colored, on 12 copperplate engravings. Folio, pp. 100. Blanchard & Lea, Philadelphia, 1853.

The Medical and Surgical History of the War of the Rebellion. Quarto. Part i, Vol. 2, 1870. *Surgical History:*

Report of Case of Gunshot Wound of the Cervical Vertebræ, with Autopsy and Specimen. p. 431, 1863.

Gunshot Wound of Rib, with Autopsy and Specimen. p. 569.

Part ii, Vol. 2, 1876. *Surgical History:*

Gunshot Flesh Wound, with Autopsy. p. 439.

Excision of Humerus necrosed after Gunshot Wound, with Autopsy. p. 596.

Gunshot Wound of Forearm, with Autopsy and Specimen. p. 927.

Specimen of Ulna successfully excised on Account of Gunshot Wound, with Report of the Case. p. 962.

Part ii, Vol. 1, 1879. *Medical History:*

Reports of Cases and Autopsies made from July 30, 1862, to Oct. 25, 1864. pp. 109–122; and subsequently p. 300, p. 518 and p. 581.

Note.—Dr. J. Leidy's official communications to Surgeon-General Barnes embrace reports of more than sixty autopsies and cases.

An Elementary Treatise on Human Anatomy. By Joseph Leidy, M.D., Professor of Anatomy in the University of Pennsylvania; Curator of the Academy of Natural Sciences; Member of the American Philosophical Society, American Academy of Arts and Sciences, Natural History Society, Boston, Lyceum of Natural History, New York, Elliot Natural History Society, Charleston, S. C., Medical Society of Virginia, Academy of Sciences of St. Louis, Imperial Society of Moscow, Royal Academy of Sciences, Munich, Imperial Leopold Carol. Academy of Sciences of Jena, Biological Society of Paris, Society of Arts and Sciences, Mons, Zoölogical Society, London, United Zoölogical and Botanical Association, Berlin, etc. With 392 illustrations. J. B. Lippincott & Co., Philadelphia, 1861.

Intestinal Worms. 8vo, pp. 930-951 incl., in Vol. 2 of A System of Practical Medicine. By American Authors. Edited by William Pepper, M.D., LL.D., etc.; assisted by Louis Starr, M.D., etc. Lea, Brothers & Co., Philadelphia, 1888.

An Elementary Treatise on Human Anatomy. By Joseph Leidy, M.D., LL.D., Professor of Human and Comparative Anatomy and Zoölogy in the University of Pennsylvania; President of the Academy of Natural Sciences, and of the Faculty of the Wagner Free Institute of Science. Second Edition, rewritten, with 495 illustrations. 8vo, pp. 950. J. B. Lippincott Company, Philadelphia, 1889.

Dr. Leidy's Books and Papers on Natural History.

Anatomical Description of the Animal of Littorina angulifera. Illustrated. [Presented July 16, 1845.] Boston Journal of Natural History, Vol. 5, pp. 314–17. Boston, 1847.

On the Anatomy of the Animal of Helix albolabris, Say. Illustrated. Proceedings of the Boston Soc. Nat. Hist., Vol. 2, p. 57, 1845.

On the Sack of the Dart, and of the Dart in Several Species of American Pneumobranchiate Mollusks. Proc. Boston Soc. Nat. Hist., Vol. 2, pp. 59–60, 1845.

A Notice of Helix lithophaga, p. 207, Official Report of the United States Expedition to Explore the Dead Sea and River Jordan. By Lieut. W. F. Lynch, U.S.N. Published at the National Observatory, Washington. Quarto, printed in Baltimore, 1852.

Dr. Leidy's Papers Published in the Proceedings of the Amer. Philos. Soc. Octavo.

Verbal Remarks, March 4, 1859, on the Geology of the Headwaters of the Missouri. Vol. 7, p. 10.

A Biographical Notice of Isaac Lea, LL.D. Read Nov. 18, 1887. Vol. 14, pp. 400–3.

Dr. Leidy's Papers Published in the Transactions of the Amer. Philos. Soc.

Vol. 10, New Series, Quarto, Published 1853:

On the Organization of the Genus Gregarina of Dufour. Read Jan. 3, 1851, pp. 233–40, 2 plates.

Some Observations on Nematoidea imperfecta, and Description of Three Parasitic Infusoria. pp. 241–44, 1 plate.

Description of an Extinct Species of American Lion. Read May 7, 1852, pp. 319–24, 1 plate.

A Memoir on the Extinct Dicotylina of North America. Read May 21, 1852, pp. 323–43, 4 plates.

In Vol. 11, New Series, Quarto, 1860:

Notice of the Remains of the Walrus discovered on the Coast of the United States. pp. 83–86.

Descriptions of the Remains of Fishes from the Carboniferous Limestone of Illinois and Missouri. Read July 15, 1856, pp. 87–90.

Saurocephalus and its Allies. Read Nov. 21, 1856, pp. 90–95.

Observations on the Extinct Peccary of North America; being a Sequel to a Memoir on the Extinct Dicotylinæ of America. Read Nov. 21, 1856, pp. 96–105.

Extinct Vertebrata from Judith River and Great Lignite Formations of Nebraska. pp. 139–54, plate.

United States Geological Survey of the Territories.

Description of the Remains of Extinct Mammalia and Chelonia from Nebraska Territory, collected during the Geological Survey under the Direction of Dr. David Dale Owen. By Joseph Leidy, M.D., of Philadelphia. Quarto. Pp. 540–72 of the Report of the Geological Survey of Wisconsin, Iowa and Minnesota. By D. D. Owen, under instructions of the U. S. Treasury Department. Lippincott, Grambo & Co., Philadelphia, 1852.

Contributions to the Extinct Vertebrate Fauna of the Western Territories. By Prof. Joseph Leidy. Quarto, pp. 358, 37 plates. Being Vol. 1 of the Report of the United States Geological Survey of the Territories. By F. V. Hayden, United States Geologist in Charge. In Five Volumes. Government Printing Press, Washington, 1873.

Freshwater Rhizopods of North America. By Joseph Leidy, M.D., Professor of Anatomy in the University of Pennsylvania, and of Natural History in Swarthmore College, Pennsylvania. Government Printing Office, Washington, 1879. Quarto, pp. 324+48 =372. Illustrated by six figures intercalated in the text, and 48 plates which contain 1180 figures of 31 genera and 84 species, of which Dr. Leidy originally described 52 species. All the figures were first drawn and colored by Dr. Leidy, to be copied by artists.

Journal of the Academy of Natural Sciences of Philadelphia.
Second Series. Quarto.

1. History and Anatomy of the Hemipterous Genus Belostoma. 2. Miscellanea Zoölogica. Vol. 1, pp. 5.–67 and 67–70, 1 plate, 1847.

Descriptions of two species of Distoma, with the partial history of one of them. Vol. 1, pp. 301–309, 1 plate, 1850.

Descriptions of Some American Annelida abranchia. Vol. 2, pp. 43–50, 1 plate, 1850.

Description of a New Species of Crocodile from the Miocene of Virginia. Vol. 2, pp. 135–8, 1 plate, printed Dec. 1851.

On the Osteology of the Head of Hippopotamus, and a Description of the Osteological Characters of a New Genus of Hippopotamidæ. Vol. 2, pp. 207–24, 1 plate, 1853.

On Bathygnathus borealis, an Extinct Saurian of the New Red Sandstone of Prince Edward's Island. Vol. 2, pp. 327–30, 1 plate, 1854.

Contributions towards a Knowledge of the Marine Invertebrate Fauna of the Coasts of Rhode Island and New Jersey. Vol. 3, pp. 135–152, 2 plates, 1855.

Descriptions of Some Remains of Fishes from the Carboniferous and Devonian Formations of the United States. Vol. 3, pp. 159–65, 1 plate, 1856.

Descriptions of Some Extinct Mammalia. Vol. 3, pp. 166–71, 2 plates, 1856.

The Extinct Mammalian Fauna of Dakota and Nebraska. Including an Account of Some Allied Forms from Other Localities, together with a Synopsis of the Mammalian Remains of North America. Illustrated with 30 plates. Preceded with an Introduction on the Geology of the Tertiary Formations of Dakota and Nebraska, accompanied with a Map. By F. V. Hayden, M.D., Professor of Mineralogy and Geology in the Univ. of Pa., U. S. Geologist, etc., etc. Vol. 7, pp. 472, 1869.

Note.—The authors of the above-named work were enabled to execute it chiefly through the generosity of Messrs. Joseph Jeanes and William P. Wilstach, to whom, as well as to some others, they acknowledge indebtedness.

Description of Vertebrate Remains chiefly from the Phosphate Beds of South Carolina. Vol. 8, pp. 209–61, 5 plates, 1874–81.

Parasites of the Termites. Vol. 8, pp. 425–47, 2 plates, 1874–81.

Remarks on Bathygnathus borealis. Vol. 8, pp. 449–51.

Urnatella gracilis, a Fresh-water Polyzoan. Vol. 9, pp. 5–16, 1 plate, 1884.

Smithsonian Contributions to Knowledge.
Quarto.

A Flora and Fauna within Living Animals. (Accepted for publication 1851.) Vol. 5, pp. 68, 10 plates, 1853.

Memoir on the Extinct Species of Fossil Ox. (Accepted for publication 1852.) Vol. 5, pp. 20, 5 plates, 1853.

The Ancient Fauna of Nebraska; or a Description of Extinct Mammalia and Chelonia from the Mauvaises terres of Nebraska. (Accepted for publication 1852.) Vol. 6, pp. 126, 25 plates, 1854.

A Memoir on the Extinct Sloth Tribe of North America. (Accepted for publication Dec., 1853; published June, 1855.) Vol. 7, 1855, pp. 70, 16 plates.

Cretaceous Reptiles of the United States. (Accepted for publication Dec., 1864.) Vol. 14, 1865, pp. 140, 20 plates.

ANNUAL REPORTS OF THE BOARD OF REGENTS OF THE SMITHSONIAN INSTITUTION.

Brief Review of a Memoir on the Cretaceous Reptiles of the United States, published in the Fourteenth Volume of the Smithsonian Contributions to Knowledge. By the Author, Joseph Leidy, M.D. 8vo, pp. 66–73. For the year 1864. Washington, D. C., 1865.

WRITTEN AND VERBAL COMMUNICATIONS BY DR. JOSEPH LEIDY PUBLISHED IN THE PROCEEDINGS OF THE ACADEMY OF NATURAL SCIENCES OF PHILADELPHIA.

1845.

Notes taken on a Visit to White Pond, Warren Co., N. J., and a List of Ten Species of Fossil Shells collected there. Vol. 2, p. 279.

Verbal, Nov. 18, That his microscopic observation of a portion of a vertebra of the Fossil Zeuglodon shows that it has all the characteristics of recent bone. Vol. 2, p. 292.

1846.

Remarks on the Anatomy of the Abdominal Viscera of the Sloth, Bradypus tridactylis. Vol. 3, pp. 72–4, 2 figures.

On the Anatomy of Spectrum femoratum, Say. Vol. 3, pp. 80–4. Illustrated by 18 figures on 2 plates.

On the mechanism which closes the membranous wings of the genus Locusta. Vol. 3, p. 104, 1 fig.

Descriptions of a new genus and species of Entozoön, Cryptobia helicis. Vol. 3, p. 100, 1 fig. [Finding that this name, Cryptobia, had been previously appropriated he changed it, August, 1847, to Cryptoicus.]

Verbal, Oct. 6, notice that he had lately detected an Entozoön [*Trichina spiralis*] in the superficial part of the extensor muscle of the thigh of a hog. Vol. 3, pp. 107–8.

On the Situation of the Olfactory Sense in the Terrestrial Tribe of Gasteropodous Mollusca. Vol. 3, pp. 136–7.

Verbal, April 15, remarks on the great fecundity of the Cryptogamia indicated in a specimen Puffball. Vol. 3, p. 195.

1847.

Verbal, May 4, statement that he has observed numerous octagonal crystals, supposed to be oxalate of lime, in the cellular structure of several species of Parmelia. Vol. 3, p. 210.

Verbal, June 8, notice of the remains of sutures of the incisive bone distinctly traceable in the cranium of a New Hollander, then exhibited. Vol. 3, p. 217.

Verbal, June 22, description of Distoma helicis, an Entozoön found in the pericardium of Helix alternata. Vol. 3, p. 220.

Verbal, Aug. 24, remarks on the teeth of the specimen of Squatina Dumerli exhibited. Vol. 3, p. 247.

Description and Anatomy of a New and Curious Subgenus Planaria. Vol. 3, pp. 248–51.

Description of two new species of Planaria. Vol. 3, pp. 251–2.

On the Fossil Horse of America. Vol. 3, p. 262, 1 plate, 6 figs.

Verbal, Nov. 9, remarks on the slow destructibility of Animal Tissues in certain states. Vol. 3, p. 313.

On a new genus and species of Ruminantia, Poebrotherium Wilsonii. Vol. 3, pp. 322–6, 1 plate, 6 figs.

Verbal, Dec. 14, observations, in addition, on the Fossil Horse. Vol. 3, p. 328.

1848.

Verbal, Jan. 11, notice that he had found an eye in Balanus rugosus, heretofore admitted to exist only in the larva or imperfect stage of the Cirrhopoda. Vol. 4, p. 1.

Verbal, Feb. 15, notice of the Hair of a Hottentot boy. Vol. 4, p. 7.

On some Peculiar Bodies in the Boa constrictor, resembling Pacinian Bodies. Vol. 4, pp. 27–8, 4 figs.

A new fossil genus and species of ruminatoid pachydermata, Merycoidodon Culbertsonii. Vol. 4, pp. 47–50, 5 figs.

Verbal, Dec. 5, remarks on the development of the Purkenjean Corpuscle in bone; the intimate structure of cartilage, and on the arrangement of the areolar sheath of muscular fasciculi and its relations to the tendon. Vol. 4, pp. 116–20.

1849.

Verbal, Jan. 9, remarks on the existence of the intermaxillary bone in the embryo of the human subject. Vol. 4, pp. 145–7, 2 figs.

Remarks on fragments of the fossil Tapir deposited in the Academy. Vol. 4, pp. 180–2.

Remarks on species of Confervaceæ; on a new genus of Enterobrus elegans; Cladophytum; a new genus of Entophyta; Cladophytum somatum; Anthromitus (a second new genus); new Genera of Entozoa. Vol. 4, pp. 225–33.

On the Existence of Entophyta in Healthy Animals, as a Natural Condition. Vol. 4, pp. 225–33.

Observations on the Character and Intimate Structure of the Odoriferous Glands of the Invertebrata. Vol. 4, p. 234–6, 3 figs.

New genus and species of Entophyta. Vol. 4, pp. 249–50.

1850.

Remarks on Entophyta. Vol. 5, pp. 7–8.

Verbal, April 9, that he had observed in the stomach of the larva of Arctia isabella that the nucleus of every epithelial cell contained an octahedral crystal, the axis of which measured about 1.3750th of an inch, etc., etc. Vol. 5, p. 32.

On Crystalline Bodies in the tissues of plants. Vol. 5, pp. 32–3.

On Rhinoceros occidentalis. Vol. 5, p. 119.

Descriptions of new Entophyta growing within Animals. Vol. 5, p. 35.

Eucrotaphus Jacksoni, and Archæotherium Mortoni, from Fragments of Crania found in Cumberland Co., Pa. Vol. 5, pp. 92–3.

Contributions to Helminthology. Vol. 5, pp. 96–8.

Notes on the Development of the Gordius aquaticus. Vol. 5, pp. 98–100.

Two New Species of Infusorial Entozoa. Vol. 5, p. 100.

Descriptions of some Nematoid Entozoa infesting Insects. Vol. 5, pp. 190–202.

Descriptions of Three Filaria. Vol. 5, pp. 117–8.

Remarks on the Nettling Organs of the Hydra. Vol. 5, pp. 119–121.

On some fossil mammalian remains: Rhinoceros Nebraskensis; Palæotherium Bairdii; Merycoidodon Culbertsonii and Agriochœrus antiquus. Vol. 5, pp. 121–2.

Descriptions of New Genera of Vermes. Vol. 5, pp. 124–6.

1851.

Descriptions of New Species of Entozoa. Vol. 5, p. 155.

On Some Fragments of Palæotherium Proutii. Vol. 5, pp. 170–1.

Fossil Tortoise, Stylemys Nebrascensis. Vol. 5, p. 172.

Testudo lata—Emys hemispherica. Vol. 5, p. 173.

On the Fungus Disease of Cicada septemdecem. Vol. 5, p. 235.

Verbal, May 6, on transplanting cancer. Vol. 5, p. 201.

Verbal, May 16, that he had found a dead Mole Cricket (Grillo talpa Americana), perfect in all its parts, the body of which was everywhere filled with a parasitic fungus, the elliptical or globular sporules of which averaged 1.2333d of an inch in diameter. Vol. 5, p. 201.

Contributions to Helminthology. Vol. 5, pp. 205–9.

Helminthological Contributions, No. 2. Vol. 5, pp. 221–7.

Remarks on Fragments of fossil ruminant ungulates. Vol. 5, p. 237–9.

Helminthological Contributions, No. 3. Vol. 5, p. 239–41.

Plumatella diffusa, a branching fresh-water ciliated Polyp. Vol. 5, pp. 261–2.

Description of Cristatella magnifica. Vol. 5, p. 265.

Description of Spongilla fragilis. Vol. 5, p. 278.

Corrections and additions to former papers on Helminthology. Vol. 5, pp. 281–90.

Verbal, Nov. 4, that he had examined the fossil saurian bones presented by Mr. Nash, and found that they belong to a new species of Crocodile which he had named Crocodilus antiquus. Vol. 5, p 307.

Descriptions of Balæna palæatlantica and Balæna prisca, Leidy, based on fragments of fossil bones from the Miocene formation of Virginia. Vol. 5, pp. 308–9.

On some American fresh-water Polyzoa. Vol. 5, pp. 320–2, 1 plate with 5 figs.

Verbal, on fossil reptilian and mammalian remains found in the green sand of New Jersey: Cimoliasaurus magnus; Discosaurus vetustus; Priscodelphinus Harlani; Priscodelphinus grandævus; Crocodilus fastigiatus; Emys Oweni, all Leidy. Vol. 5, p. 325–8.

Fossils from the Green Sand of New Jersey, named Chelonia grandæva; Trionyx priscus; Machairodus primævus, Leidy. Vol. 5, pp. 329–30.

Contributions to Helminthology. Vol. 5, pp. 349–51.

1852.

Verbal, Jan. 6, remarks on Rhinoceros Americanus, named from fragments of fossil bones collected in Nebraska. Vol. 6, p. 2.

Verbal, Jan. 13, that the Cetacean remains, which he had named Priscodelphinus, are the first relics of mammals found in the Cretaceous group. Vol. 6, p. 3.

Verbal, Feb. 10, on Emys Culbertsonii, a new species. Vol. 6, p. 34.

Verbal, Feb. 17, on Delphinus Conradi, and a new genus and species, Thoracosaurus grandinis. Vol. 6, p. 35.

Verbal, March 2, on Pontogeneus priscus. Vol. 6, p. 52.

Verbal, March 16, Pointing out that heads of the Hippopotamus from N. W. Africa differ from those from Southern Africa. Vol. 6, p. 53.

Verbal, March 28, on a fine skeleton of Troglodytes Gorilla, presented by Dr. Henry A. Ford of Liberia. Vol 6, p. 53.

On Fossil Tortoises from Nebraska. Vol. 6, p. 59.

Verbal, May 4, notice of an extinct species of Ox, and Bootherium. Vol. 6, p. 71.

On the Red Snow of the Arctic Regions. Vol. 6, p. 59.

On the Honey Ant of Mexico. Vol. 6, p. 72.

Remarks on various fossil teeth. Vol. 6, p. 241.

On some fossil fragments from Natches. Vol. 6, p. 303.

Verbal, July 6, remarks on Bison latifrons (Leidy) and B. antiquus Leidy; and on several species of Megalonyx (3 Leidy). Vol. 6, p. 117.

1853.

Verbal, March 8, notice of three species of fossil Ursus. Vol. 6, p. 303.

Verbal, Aug. 2, remarks on Cetacean fossil bones in the green sand of N. J.; and on Cetacean fossils from other localities. Vol. 6, p. 377.

Verbal, Nov. 1, notice of fishes being infested with a parasitic worm of the genus Distoma. Vol. 6, p. 433.

Remarks on a collection of fossil mammalia and chelonia from the Mauvaises Terres of Nebraska. Vol. 6, pp. 392–4.

1854.

Verbal, May 23, account of fossil vertebræ of extinct saurians, which he named Breinosaurus grandis and Cimoliasaurus magnus, illustrated by 6 figs. on a plate. Vol. 7, p. 72.

Verbal, June 6, on Bison latifrons, Arctodus pristinus, Hippodon speciosus and Merycodus necatus. Vol. 7, pp. 89–90.

Synopsis of Extinct Mammalia from Nebraska. Vol. 7, pp. 156–7.

On Denictis felina. Vol. 7, p. 127.

On Hydrachma. Vol. 7, p. 202.

Description of a fossil apparently Indicating an extinct Species of the Camel Tribe. Vol. 7, pp. 172–3.

On Urnatella gracilis and a New Species of Plumatella. Vol. 7, pp. 191–2.

Notice of some Fossil Bones Discovered by Mr. Francis A. Lincke in the Banks of the Ohio River. Vol. 7, pp. 199-201.

Remarks on the question of the identity of Bootherium cavifrons with Ovibos moschatus, or O. maximus. Vol. 7, pp. 209-10.

1855.

On a so-called Fossil Man. Vol. 7, p. 34.

Indications of twelve species of Fossil Fishes. Vol. 7, pp. 395–7.

Indications of five species with two new genera of Extinct Fishes. Vol. 7, p. 414.

Notices of some Tape Worms. Vol. 7, pp. 443–4.

1856.

Verbal, Jan. 15, on Filaria canis cordis filling the right auricle and right ventricle of the heart of a dog, which was exhibited. Vol. 8, p. 2.

Description of two Ichthyodorulites. Vol. 8, pp. 11–2.

Synopsis of Entozoa and some of their Ecto-congeners, observed by the Author. Vol. 8, pp. 42–58.

Notices of some Remains of Extinct Mammalia recently discovered by Dr. F. V. Hayden in the Bad Lands of Nebraska. Vol. 8, p. 59.

Notices of Extinct Reptiles and Fishes, discovered by Dr. F. V. Hayden in the Bad Lands of Judith River, Nebraska Territory. Vol. 8, pp. 72–6.

Notices of Remains of Extinct Mammalia, discovered by Dr. F. V. Hayden in Nebraska Territory. Vol. 8, pp. 90–1.

Notice of the Remains of a species of Seal from the postpliocene deposit of the Ottowa River. Vol. 8, pp. 90–1, with a plate.

Notices of several genera of Extinct Mammalia previously less perfectly characterized. Vol. 8, pp. 91–2.

Verbal, Sept. 16, in reference to the color of the eyes of Platyphyllum concerum (Katydid) being greenish by day and cherry red at night. Vol. 8, p. 162.

Verbal, Sept. 16, that oyster and clam shells are perforated by a sponge of the genus Cliona. Vol. 8, p. 162–3.

Notice of some remains of Extinct Vertebrated Animals. Vol. 8, pp. 163–5.

Notices of remains of extinct vertebrated animals of New Jersey, collected by Prof. Cook of the State Geological Survey, under the direction of Dr. W. Kitchell. Vol. 8, pp. 220–1.

Notices of remains of extinct vertebrated animals discovered by Proj. E. Emmons. Vol. 8, pp. 255–6.

Notice of some Remains of Fishes discovered by Dr. John E. Evans. Vol. 8, pp. 256–7.

Notice of Remains of two species of Seal. Vol. 8, p. 265.

Remarks on certain extinct species of Fishes. Vol. 8, pp. 301–2.

Notices of remains of extinct turtles of New Jersey, collected by Prof. Cook, of the State Geological Survey, under the direction of Dr. W. Kitchell. Vol. 8, pp. 303–4.

Notices of Extinct Vertebrata discovered by Dr. F. V. Hayden during the Expedition to the Sioux Country under the Command of Lieut. G. K. Warren. Vol. 8, pp. 311–2.

1857.

List of Extinct Vertebrata, the Remains of which have been discovered in the Region of the Missouri River; with Remarks on their Geological Age. Vol. 9, pp. 89–91.

Notices of some Remains of Extinct Fishes. Vol. 9, pp. 167–8.

Rectification of the References of certain of the extinct mammalian genera of Nebraska. Vol. 9, p. 175.

Verbal, Dec. 1, on a large species of Gordius and a larva of Ostrea. Vol. 9, p. 204.

Verbal, Feb. 17, observations on Entozoa found in the Naiades. Vol. 9, p. 18.

Verbal, June 2, on Coprolites and Shales with Posodiniæ. Vol. 9, p. 149.

Verbal, June 16, on the new red sandstone fossils from the Gwynned tunnel North Pa. R. R. Vol. 9, p. 150.

Verbal, Sept. 1, on the dentition of Mososaurus; also on Oecanthus. Vol. 9, pp. 176–7

Verbal, Dec. 22, on a curious animalcule found on stones and dead plants in the Schuylkill and Delaware rivers. Vol. 9, p. 204.

Verbal, Dec. 22, observations on the introduction of camel into North America. Vol. 9, p. 210.

1858.

Verbal, Jan. 12, that the stomachs of Urnatella gracilis contained voluntary moving bodies, which might prove to be generative bodies. Vol. 10, p. 1.

Verbal, Jan. 19, that the extinct camel seemed to be about two-thirds the size of the recent species. Vol. 10, p. 2.

Verbal, Feb. 2, that the fossil remains from the Niobrara river belong to some twenty or more species which are distinct from those found in the Miocene of the Mauvaises Terres, as well as from those of a subsequent age. Vol. 10, p. 7.

Verbal, March 2, that with the collection of fossils received from the vicinity of Kansas river, were several masses of a yellowish magnesian limestone containing numerous casts of a very peculiar group of fossils; that among the specimens found in the valley of the Niobrara river, Nebraska, is the lower jaw of a new species of Mastodon. Vol. 10, p. 10.

Verbal, March 9, that after inspecting numerous equine remains from Niobrara, he inclines to believe that the remains of the horse found in the Postpliocene deposits of the United States indicate two species. Vol. 10, p. 11.

Notices of remains of Extinct Vertebrata from the valley of the Niobrara River, collected during the Exploring Expedition of 1857, in Nebraska, under the command of Lieut. C. K. Warren, U. S. Top. Eng., by Dr. F. V. Hayden, Geologist to the Expedition. Vol. 10, pp. 20-9.

Verbal, April 6, that in the collection from Niobrara two additional species of the ancient camel are indicated: Procamelus robustus and P. gracilis. He mentioned that fractured fossils are best mended by saturating them with melted beeswax. Vol. 10, p. 89.

Verbal, April 13, that he had named a fresh-water worm which lives in tubes of mud Manayunkia speciosa. Vol. 10, p. 90.

Contributions to Helminthology. Vol. 10, pp. 110-2.

Verbal, June 29, that one-half of the chrysalides of the canker-worm were infected by two species of Ichneumon. Vol. 10, p. 137.

Verbal, Nov. 2, that he and Dr. Bridges, in Lily pond, near Newport, R. I., had found a species of Cristatella. Vol. 10, pp. 188-90.

Verbal, Dec. 14, that the fossil bones obtained from Haddonfield, N. J., and given to him by Mr. Foulke for description, belonged to a huge extinct herbivorous Saurian, which he named Hadrosaurus Foulkii. Vol. 10, pp. 215-8.

1859.

Verbal, Jan. 11, that he had found the Manayunkia speciosa (a curious fresh-water worm, a drawing of which he exhibited) in great abundance at the foot of the cliffs washed by the ocean near Newport, R. I. Vol. 11, p. 2.

Verbal, Jan. 18, that from fossil remains of cartilaginous fishes, found in the carboniferous formations of Kansas, he had made three species. Vol. 11, p. 3.

Verbal, March 22, remarks on a Mastodon tooth from Tambla, Honduras; and teeth and fragments of teeth of Mososaurus from the green sand of New Jersey. Vol. 11, p. 91.

Verbal, April 12, in reference to ferruginous rock containing remains of fishes. Vol. 11, p. 110.

Verbal, April 19, in reference to fossil bones contained in so-called guano from Sombrero, W. I., which were exhibited. Vol. 11, p. 111.

Verbal, May 17, on specimens of Patæobrochus from subsilurian strata which he considered fossil, though its organic nature had been denied. Vol. 11, p. 150.

Verbal, Aug. 23, remarks on an antler of a reindeer, and on an animalcule, a drawing of which was submitted, found at Newport, R. I., named Freyia Americana. Vol. 11, p. 194.

1860.

Verbal, Feb. 11, that Albertite is a product from the distillation of bituminous coals or shales, and is perfectly amorphous. Vol. 12, p. 54.

Verbal, March 13, on Hyalomena from Japan. Vol. 12, p. 85.

Verbal, April 3, that experiments with Trichina spiralis, by Prof. Leuckart, of Giessen, imply that the animal finds its way into the human body through food or drink. Vol. 12, p. 96.

Verbal, July 24, notice of a specimen of Hyla. Vol. 12, p. 305.

Verbal, Oct. 9, that the specimens of fossil bones from Washington Co., Texas, indicated a new equine genus, and a species of Hippotherium. Vol. 12, p. 416.

Verbal, Oct. 16, notice of an extinct Peccary. Vol. 12, p. 416.

1861.

Verbal, April 16, that lignite had been discovered at the border of the new red sandstone on Plymouth creek, near Norristown, Pa. Vol. 13, p. 77.

1862.

Verbal, Nov. 18, that he had noticed a boulder, apparently of Potsdam sandstone, at the corner of Thirty-seventh and Market streets, exposed by digging gravel, which is the largest transported block he had observed in our vicinity. Vol. 14, p. 307.

1863.

Verbal, Sept. 15, that he had found a Phalangopsis rolled in a leaf of a spice bush. Vol. 15, p. 212.

Verbal, Nov. 3, on specimens of Nostoc pruneiforme. Vol. 15, p. 281.

1865.

Verbal, May 23, that a boring sponge existed during the Cretaceous period. Vol. 17, p. 77.

Verbal, June 6, that fossil remains of horses had been found throughout the length and breadth of the North American continent. Vol. 17, p. 94.

Verbal, June 20, that he had found at Cape Henlopen, in a kitchen refuse heap, a clay pipe. Vol. 17, p. 95.

Verbal, Sept. 5, remarks on a fœtal dog-shark. Vol. 17, p. 175.

Verbal, Sept. 19, in reference to fossil bones of Rhinoceros. Vol. 17, p. 176.

Verbal, Oct. 10, remarks on specimens of oölitic phosphates of lime and alumina; also on human bones from a guano deposit on the Island Orchilla, W. I. Vol. 17, p. 181.

1866.

Verbal, Jan. 2, on part of a human skull of the so-called pigmy race, from near the mouth of Stone river, Tennessee. Vol. 18, p. 1.

Verbal, March 20, on a large phalanx of an extinct reptile; and stated that he was the first to discover the Trichina spiralis in the hog (while eating a slice of pork, he noticed some minute specks which recalled to mind the Trichina spots seen in the muscles of a human subject only a few days previously). Vol. 18, p. 9.

Verbal, May 22, that in the salt mine of the Island of Petite Anse, La., were grains of precious garnet, olivine, bones of the elephant, etc. Vol. 18, p. 109.

Verbal, June 5, in reference to a small collection of fossils from Bangor, Maine. Vol. 18, p. 237.

Verbal, Oct. 23, in reference to molar teeth of Mastodon ohioticus. Vol. 18, p. 290.

Verbal, Dec. 4, in reference to Drepanodon or Machairodus occidentalis, fragments of bones of which were shown. Vol. 18, p. 345.

1867.

Verbal, June 25, in reference to Bison antiquus. Vol. 19, p. 85.

Verbal, Sept. 10, on a fossil skull of Geomys bursarius. Vol. 19, p. 97.

Verbal, Sept. 17, on a fossil skull of Castoroides ohioensis. Vol. 19, p. 97.

Verbal, Oct. 1, in reference to specimens of black hornstone exhibited. Vol. 19, p. 125.

1868.

Verbal, June 2, that some Sombrero guano contains ninety per cent. of phosphate of lime. Vol. 20, p. 156.

Notice of some Vertebrate Remains from Harden County, Texas. Vol. 20, pp. 174–6.

Indications of an Elotherium in California. Vol. 20, p. 177.

Notice of some Reptilian Remains from Nevada. Vol. 20, pp. 177–8.

Notice of some Vertebrate Remains from the West Indian Islands. Vol. 20, pp. 178–80.

Notice of some Remains of Horses. Vol. 20, p. 195.

Notice of some Extinct Cetaceans. Vol. 20, pp. 196–7.

Remarks on a Jaw fragment of Megalosaurus. Vol. 20, pp. 197–200.

Remarks on Conosaurus of Gibbes. Vol. 20, pp. 200–2.

Notice of American species Ptychodus. Vol. 20, pp. 205–8.

Verbal, Oct. 20, that he found the stomach of a shad full of small fishes. Vol. 20, p. 228.

Notice of some American Leeches. Vol. 20, 229–30.

Notice of the remains of extinct Pachyderms. Vol. 20, pp. 230–2.

Verbal, Nov. 3, in reference to specimens seemingly of coprolites from the Huronian slates. Vol. 20, pp. 302–3.

Verbal, Nov. 3, that iridescence in opals is caused by striæ, 6000 to the inch. Vol. 20, p. 303.

Verbal, Dec. 1, on asterism in mica. Vol. 20, p. 313.

Notice of some remains of extinct Insectivora. Vol. 20, p. 315.

1869.

Notice of some extinct vertebrates from Wyoming and Dakota. Vol. 21, pp. 63–7.

1870.

Verbal, Jan. 4, description of Megacerops Coloradensis. Vol. 22. pp. 1, 2.

Verbal, Jan. 11, remarks on Poicilopleuron and other fossils submitted for examination by Prof. Hayden. Vol. 22, pp. 3–5.

Verbal, March 1, remarks on the right humerus of one of the extinct giant Sloths resembling Mylodon robustus, and on Dromotherium sylvestre, submitted for examination by the Smithsonian Institution. Vol. 22, pp. 8, 9.

Verbal, March 8, remarks on reptilian remains from the Cretaceous formation near Fort Wallace, Kansas, described by Prof. Cope under the name of Elasmosaurus platyurus. Vol. 22, p. 9.

Verbal, March 22, observations on ichthyodorulites, of which specimens were shown; on a metacarpal bone of Megalonyx Jeffersoni, and on a last lower grinder of Bison antiquus. Vol. 22, pp. 12–3.

Verbal, April 5, remarks on Discosaurus and its allies. Vol. 22, pp. 18–22.

Verbal, May 3, description of the internal generative organs of a hog, which were exhibited. Vol. 22, p. 65.

Verbal, May 17, remarks on some fossil bones from the Pliocene formation in the Mauvaises Terres of Dakota, which were shown. Vol. 22, pp. 65–6.

Verbal, June 14, observations on mammalian fossil remains, submitted for examination, from Idaho, from Utah, and from Oregon; also, on Hadrosaurus and its allies. Vol. 22, pp. 66–9.

Verbal, June 21, notice of two fossil fragments belonging to Bison americanus and Elephas americanus. Vol. 22, pp. 69–71.

Verbal, July 5, remarks on differences between animals of the same species inhabiting Europe and America. Vol. 22, p. 72.

Verbal, July 12, remarks on a mutilated portion of the lower jaw of a large ruminant supposed to belong to Ovibos cavifrons. Vol. 22, p. 73.

Verbal, July 19, observations on a fossil, which he exhibited and named Nothosaurus occiduus. Vol. 22, p. 74.

Verbal, Aug. 2, description of Nephelis punctata, a new leech. Vol. 22, pp. 89–90.

Verbal, Sept. 20, account of a fossil crocodile, which he named Crocodilus Elliotti ; remarks on Urnatella and Manayunkia. Vol. 22, pp. 100–2.
Verbal, Oct. 4, reference to a small collection of fossils from Wyoming, most of which pertain to Merycochœrus. Vol. 22, pp. 109–10.
Verbal, Oct. 18, remarks on some fossil remains which belong to Oreodon. Vol. 22, pp. 111–3.
Verbal, Oct. 25, observations in reference to several boxes of fossils from Fort Bridger, among which were Microsus cuspidatus and Notharctus tenebrosus, etc. Vol. 22, p. 113.
Verbal, Nov. 1, notice of Graphiodon vincarius. Vol. 22, p. 122.
Verbal, Nov. 8, descriptions of fossil species: Emys Jeanesi, Emys Haydeni, Baena arenosa, Saniwa ensidens. Vol. 22, pp. 123–4.
Verbal, Nov. 15, observations on fossils submitted for examination by Prof. J. D. Whitney, among which are fragments representative of the llama, camel, Hipparion and Protohippus. Vol. 22, pp. 125–7.

1871.

Verbal, Feb. 6, remarks on fossil bones from California. Vol. 23, p. 50.
Verbal, March 21, notice of Tænia canallata. Vol. 23, p. 53.
Verbal, April 18, observations on extinct turtles from Wyoming. Vol. 23, p. 102.
Verbal, May 9, remarks on polydactylism in a horse. Vol. 23, p. 112.
Verbal, May 16, observations on some fossil remains of Mastodon and horse in North Carolina; and of mammals from Wyoming. Vol. 23, pp. 113–6.
Verbal, June 5, on fossil Testudo of Wyoming; on supposed fossil turtle eggs; and on garnets from Green's creek, Delaware Co., Pa. Vol. 23, pp. 154–5.
Verbal, July 4, on some fossils from Fort Bridger. Vol. 23, p. 197.
Verbal, Aug. 1, on Mastodon remains from California; on Anchitherium. Vol. 23, pp. 198–9.
Verbal, Aug. 8, on fossil vertebrates from Wyoming. Vol. 23, pp. 228–9.
Verbal, Aug. 29, on extinct Rodents. Vol. 23, pp. 130–2.
Verbal, Oct. 10, on the minerals of Mount Mica. Vol. 23, pp. 245–7.
Verbal, Oct. 17, on fossils from Oregon. Vol. 23, pp. 247–8.
Verbal, Nov. 21, on the communication of contagion by flies. Vol. 23, p. 297.
Verbal, Dec. 12, on several worms. Vol. 23, pp. 305–7.

1872.

Verbal, Jan. 2, that Dr. C. S. Turnbull had found a mite on the membrana tympani of an ox. Vol. 24, p. 9. Named Gamasus auris, p. 138.
Verbal, Feb. 4, notices of Corundum, and of fossils from Wyoming. Vol. 24, pp. 19–21.
Verbal, April 2, in reference to extinct mammals from the Tertiary of Wyoming. Vol. 24, p. 37.
Verbal, April 9, in reference to fossils from Niobrara river. Vol. 24, p. 38.
Verbal, June 11, in reference to a Mastodon of New Mexico. Vol. 24, p. 142.
Verbal, July 2, on the genus Chisternon and some Cretaceous fishes. Vol. 24, pp. 162–3.
Verbal, July 9, on Artemia Salina from Salt Lake, Utah; and on fossil shark-teeth. Vol. 24, pp. 164–6.
Letter dated Fort Bridger, Uinta Co., Wyoming, July 24, 1872, from Dr. Leidy to Mr. G. W. Tryon, Jr., in reference to fossil mammals found there. Vol. 24, pp. 167–9.*
Verbal, Sept. 3, in reference to ants observed at Fort Bridger. Vol. 24, p. 218.
Verbal, Sept. 10, about mineral springs in Wyoming and Utah. Vol. 24, pp. 218–20.
Verbal, Oct. 1, in reference to a recently opened corundum mine in Chester Co., Pa. Vol. 24, pp. 238–9.

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* Dr. Leidy sent a copy of this letter to The American Jour. of Science and Arts, because in it he referred to Elasmosaurus platyurus, Cope.

Verbal, Oct. 15, in reference to Uintatherium and other fossil remains; to chipped stones; a stone implement; and to the action of sand and wind on rocks of Wyoming. Vol. 24, pp. 240–3.
Verbal, Nov. 5, notice of fossils from Wyoming. Vol. 24, pp. 267–8.
Verbal, Dec. 10, notices of fossils from Wyoming. Vol. 24, pp. 277–8.

1873.

Verbal, Jan. 21, notice of fossil vertebrates from Virginia. Vol. 25, p. 15.
Verbal, Feb. 4, notice of remains of fishes in the Bridger Tertiary formation. Vol. 25, pp. 97–9.
Verbal, March 18, notice of an extinct hog found in the Pliocene sands of Niobrara river. Vol. 25, p. 207.
Verbal, April 1, notices of bituminous coal from Westmoreland, Pa.; of a black rat; and of a specimen of iron ore. Vol. 25, p. 257.
Verbal, April 15, notices of extinct mammals of California. Vol. 25, pp. 259–60.
Verbal, April 22, notice of a fungus parasite on a mouse. Vol. 25, p. 260.
Verbal, Oct. 14, notice of Distoma hepaticum. Vol. 25, p. 364.
Verbal, Dec. 9, notice of Lingula found in the stomach of a fish taken in the Susquehanna river. Vol. 25, p. 215.
Verbal, Dec. 16, notice of fossil elephant teeth. Vol. 25, pp. 216–7.
Verbal, Dec. 23, notice of intercellular circulation in plants, as in Vaucheria. Vol. 25, p. 420.

1874.

Verbal, Jan. 13, notice of Hydra, Vol. 26, p. 10.
Verbal, Feb. 3, notice of Protozoa. Vol. 26, pp. 13–5.
Verbal, Feb. 17, on the mode of growth of Desmids. Vol. 26, p. 15.
Verbal, March 24, on Actinophrys. Vol. 26, pp. 23–4.
Verbal, April 21, on the enemies of Difflugia; and on a supposed compound derived from leather. Vol. 26, p. 75.
Verbal, May 12, notice of some new fresh-water Rhizopods. Vol. 26, pp. 77–9.
Verbal, June 16, observations on some fresh-water and terrestrial Rhizopods. Vol. 26, pp. 86–9.
Verbal, Aug. 25, observations on Pectinatella magnifica; on a parasitic worm which infests the house-fly; and on some fresh-water Infusoria. Vol. 26, pp. 139–40.
Verbal, Sept. 8, notice of a remarkable Amœba; its process or mode of swallowing. Vol. 26, pp. 162–3.
Verbal, Sept. 15, on the motive power of Diatomes. Vol. 26, p. 143.
Verbal, Sept. 22, on sponges. Vol. 26, p. 144.
Verbal, Oct. 5, notice of some Rhizopods. Vol. 26, pp. 155–7.
Verbal, Oct. 20, notice of Dryocampa. Vol. 26, p. 160.
Verbal, Nov. 10, notices of remains of Titanotherium; on supposed spermaries in Amœba; and of Rhizopods. Vol. 26, pp. 165–8.
Verbal, Dec. 15, notice of some fossils presented. Vol. 26, p. 223.
Verbal, Dec. 22, observations on Rhizopods. Vol. 26, pp. 225-7.

1875.

Verbal, Jan. 19, report of a fungus in a Flamingo. Vol. 27, p. 11.
Verbal, Feb. 2, account of some parasitic worms. Vol. 27, pp. 14–5.
Verbal, Feb. 9, notices of some nematoid worms. Vol. 27, pp. 17–8.
Verbal, March 16, observations on marine Rhizopods. Vol. 27, pp. 73–6.
Verbal, April 6, observations on a coal fossil; on elephant remains; and on Stephanoceros. Vol. 27, pp. 120–2.
Verbal, April 20, observations on a curious Rhizopod; on Psorosperms in a mallard duck; on a mouthless fish; and on Ouramœba. Vol. 27, pp. 124–7.
Verbal, Sept. 7, on Mermis acuminata. Vol. 27, p. 400.

Verbal, Oct. 4, observations on Rhizopods, and on Quercus heterophylla. Vol. 27, pp. 413–5.

1876.

Verbal, Jan. 4, observation on Petalodus. Vol. 28, p. 9.
Verbal, March 21, notice of Mastodon andium. Vol. 28, p. 38.
Verbal, April 11, remarks on Arcella. Vol. 28, pp. 54–8.
Verbal, May 9, remarks on fossils from the Ashley phosphate beds. Vol. 28, pp. 80–1.
Verbal, June 20, observations on vertebrate fossils from South Carolina. Vol. 28, p. 114.
Verbal, June 27, remarks on the rhizopod genus Nebela. Vol. 28, pp. 115–9.
Verbal, Oct. 10, on the structure of precious opal; and on Rhizopods. Vol. 28, pp. 195–9.
Verbal, Dec. 5, remarks on Ozocerite and Hyraceum. Vol. 28, pp. 325–6.

1877.

Verbal, Jan. 30, on the present contamination of the drinking water; on Eozoön canadense; and an instance in which the dome of the human diaphragm was elevated to a level of the anterior extremity of the first rib. Vol. 29, p. 20.
Verbal, April 3, remarks on the yellow ant. Vol. 29, p. 145.
Verbal, May 15, remarks on gregarines. Vol. 29, pp. 196–8.
Verbal, May 29, in reference to flukes which infest common fresh-water mollusks. Vol. 29, pp. 200–2.
Verbal, June 12, on parasitic Infusoria. Vol. 29, pp. 259–60.
Verbal, June 19, remarks on seventeen-year locust, the Hessian fly and a Chelifer. Vol. 29, pp. 260–1.
Verbal, June 26, account of the birth of a Rhizopod. Vol. 29, pp. 261–5.
Verbal, Sept. 4, remarks on the bedbug and its allies. Vol. 29, p. 284.
Verbal, Oct. 2, account of the Dinamœba's mode of feeding. Vol. 29, pp. 288–90.
Verbal, Oct. 9, remarks on the discrimination of a Heliozoön in selecting food. Vol. 29, pp. 291–2.
Verbal, Oct. 23, remarks on Rhizopods, and on fossil fishes. Vol. 29, pp. 293–4.
Verbal, Nov. 13, remarks on ants. Vol. 29, p. 304.
Verbal, Nov. 27, remarks on the American species of Difflugia. Vol. 29, p. 306.
Verbal, Dec. 18, notice of Rhizopods in an apple tree. Vol. 29, p. 321.

1878.

Verbal, Feb. 19, remarks on citrine or yellow quartz. Vol. 30, p. 40.
Verbal, March 5, on the tusk of hippopotamus; and on Amœba. Vol. 30, p. 99.
Verbal, March 26, remarks on lice found on the pelican. Vol. 30, p. 100.
Verbal, May 14, about parasitic worms of the shad. Vol. 30, p. 171.
Verbal, Aug. 27, that he had found Foraminifera in the sand about Cape May, Atlantic City, etc. Vol. 30, p. 292.
Verbal, Sept. 3, remarks on the black mildew of walls. Vol. 30, p. 331.
Verbal, Oct. 1, on foraminiferous shells on the New Jersey coast. Vol. 30, p. 336.
Verbal, Oct. 8, remarks on Crustaceans of Cape May. Vol. 30, p. 336.
Verbal, Oct. 15, notice of Tetrarhynchus. Vol. 30, p. 340.
Verbal, Nov. 12, on Donax fossor. Vol. 30, p. 382.
Verbal, Nov. 19, notice of the Gordius in the cockroach and leech. Vol. 30, p. 383.
Verbal, Dec. 3, on Tænia mediocanallata. Vol. 30, p. 405.

1879.

Verbal, Jan. 28, on Gordius; and on parasites of the rat. Vol. 31, pp. 10–1.
Verbal, Feb. 4, remarks on fossil remains of a Caribou. Vol. 31, pp. 42–3.
Verbal, Feb. 18, remarks on Bothriocephalus latus. Vol. 31, p. 40.
Verbal, June 17, statement in reference to Rhizopods in Sphagnum. Vol. 31, pp. 162–3.

Verbal, July 8, notice of fossil foot-tracks in the anthracite coal measures. Vol. 31, pp. 164–5.

Verbal, July 22, account of the explosion of a diamond. Vol. 31, p. 195.

Verbal, Sept. 5, remarks about some small animals on the coast of New Jersey. Vol. 31, p. 198.

Verbal, Sept. 30, on Cristatella Idæ. Vol. 31, p. 203.

Verbal, Oct. 7, on the Amœba Blattæ. Vol. 31, pp. 204–5.

1880.

Verbal, Jan. 20, remarks on specimens of Filaria immitis of the dog. Vol. 32, pp. 10–2.

Verbal, March 2, remarks on a species of Filaria, alleged to have been drawn from a man. Vol. 32, pp. 130–1.

Verbal, April 13, notices of pond life near Woodbury, N. J. Vol. 32, pp. 156–8.

Rhizopods in the mosses of the summit of Roan mountain, North Carolina. Vol. 32, pp. 333–40.

Verbal, Sept. 21, account of a visit to a bone cave near Stroudsburg, Pa. Vol. 32, pp. 346–9.

1881.

Verbal, Jan. 4, notice that Rhizopods are eaten by young fishes. Vol. 33, pp. 9–10.

1882.

Verbal, Jan. 3, remarks on some rock specimens. Vol. 34, pp. 10–2.

Verbal, Feb. 7, notice of Filaria in black bass. Vol. 34, p. 69.

Verbal, Feb. 28, remarks on his collection of Tourmalines, which he exhibited. Vol. 34, pp. 71–3.

Verbal, March 7, notice of Balanoglossus aurantiacus; and of Scolithus. Vol. 34, p. 93.

Verbal, April 4, remarks on Sagitta. Vol. 34, p. 102.

Verbal, May 2, remarks on some Entozoa found in birds; also on a coprolite and a pebble resembling an Indian hammer. Vol. 34, pp. 109–10.

Verbal, May 23, remarks on Bacillus anthracis; on Enchytræus, Distichopus and their parasites. Vol. 34, pp. 145–8.

Verbal, May 30, notice of the yellow ant. Vol. 34, p. 148.

Verbal, Sept. 5, remarks on Balanus. Vol. 34, p. 224–5.

Verbal, Sept. 26, remarks on a collection of tobacco worms, which he exhibited. Vol. 24, pp. 237–8.

Verbal, Oct. 17, notice of a new species of Pyxicola. Vol. 34, pp. 252–3.

Verbal, Oct. 31, remarks on Actinosphærium Eichornii. Vol. 34, p. 260.

Verbal, Nov. 7, notice of topaz and biotite. Vol. 34, p. 261.

Verbal, Nov. 14, on Actinosphærium, and Tubularia crocea. Vol. 34, pp. 261–2.

Verbal, Dec. 12, remarks on fossil remains of horses. Vol. 34, pp. 290–1.

Verbal, Dec. 19, remarks on an extinct peccary. Vol. 34, pp. 301–2.

1883.

Verbal, Feb. 12, remarks on the reproduction of Anodonta fluviatilis and its parasites. [Vol. 35], pp. 44–6.

Verbal, April 24, remarks on a social Heliozoan. [Vol 35], pp. 95–6.

Manayunkia speciosa. [Vol. 35], pp. 204–12, 24 figures.

Verbal, Dec. 11, notice of a fungus infesting flies; and remarks on Manayunkia. [Vol. 35], p. 302.

1884.

Verbal, Jan. 1, notice of an ant infested by a fungus; and of Cassiterite from Dakota. [Vol. 36], p. 9.

Verbal, Jan. 16, account of the effects of the storm, Jan. 8, on marine animals of the New Jersey coast. [Vol. 36], pp. 12–3.
Verbal, Jan. 29, remarks on a collection of fossil bones from Louisiana; and on Foraminifera in the drift of Minnesota. [Vol. 35], p. 22.
Verbal, Feb. 26, notice of Distoma and Filaria. [Vol. 35], p. 47.
Verbal, March 4, reference to Dictyophora and Apsilus vorax. [Vol. 35], p. 50.
Verbal, March 18, notice of Eumeces chalcides. [Vol. 35], p. 66.
Verbal, April 22, remarks on vertebrate fossils from Florida. Vol. 35, pp. 118–9.
Verbal, May 6, account of a rare human tapeworm. [Vol. 35], p. 137.
Verbal, May 13, description of Pentastomum proboscideum. [Vol. 35], p. 140.
Verbal, Oct. 28, notice of living organisms found in ice. [Vol. 35], p. 260.

1885.

Verbal, Jan. 13, notice of parasitic worms found in birds. [Vol. 36], pp. 9–11.
Verbal, March 10, notice of fossil remains of Rhinoceros and Hypotherium from Florida. [Vol. 36], pp. 32–3.
Verbal, March 24, remarks on fossil Mylodon. [Vol. 36], pp. 49–51.
Verbal, May 19, notice of Bothriocephalus in a trout. [Vol. 36], pp. 122–3.
Verbal, Dec. 22, notice of living worms in ice; Lumbricus glacialis. [Vol. 36], p. 408.

1886.

Verbal, Jan. 19, remarks on fossil bones of Mastodon and Llama from Florida. [Vol. 36], p. 11.
Verbal, Feb. 23, description of an extinct boar from Florida; and notice of caries in the Mastodon. [Vol. 36], pp. 37–8.
Verbal, March 23, notice of Amia and its probable Tænia. [Vol. 36], pp. 62–3.
Verbal, June 1, notice of Toxodon and other remains from Nicaragua. [Vol. 36], pp. 275–7.
Notices of Nematoid worms. [Vol. 36], pp. 308–13.

1887.

Notice of some parasitic worms. [Vol. 37], pp. 20–1.
Verbal, Feb. 1, notice of a parasite of a bat. [Vol. 37], p. 38.
Verbal, May 31, notice of Asplanchna Ebbesbornii. [Vol. 37], p. 157.
Verbal, Oct. 11, remarks on fossil bones from Florida. [Vol. 37], pp. 309–10.
Verbal, Oct. 25, remarks on Hydra. Vol. 37, pp. 310–3.
Verbal, Dec. 13, remarks on the bot-larvæ of the terrapin. [Vol. 37], pp. 393–4.

1888.

Verbal, Jan. 10, remarks on a fossil of the Puma. [Vol. 38], pp. 9–10.
Verbal, Feb. 14, notice of Chætopterus from Florida. [Vol. 38], p. 73.
Verbal, Feb. 28, notice of Lepas fascicularis; and of a tapeworm in a cucumber. [Vol. 38], pp. 80–1.
Verbal, March 20, notice of the habit of Cirolana concharum; and remarks on parasites of the striped bass. [Vol. 38], pp. 124–5.
Verbal, March, 27, notice of the Trematodes of the muskrat; remarks on Entozoa of the terrapin. [Vol. 38], pp. 126–8.
Verbal, April 3, notice of a Crustacean parasite of the red snapper. [Vol. 38], p. 133.
Distinctive characters of Odontapsis littoralis. [Vol. 38], pp. 162–4.
Parasitic Crustacea. Vol. 38, p. 165.
Verbal, May 1, notice of parasites of the Rockfish; and of the louse of the Pelican. [Vol. 38], pp. 166–8.
Verbal, May 8, notice of the parasites of the Pickerel. [Vol. 38], p. 169.
Verbal, Oct. 2, notice of anomalies of the human skull. [Vol. 38], p. 273.

Verbal, Nov. 27, remarks on the fauna of Beach Haven, N. J. [Vol. 38], pp. 329–33.
Verbal, Dec. 11, notice of the food of barnacles. [Vol. 38], p. 431.

1889.

Verbal, Jan. 1, remarks, with illustrations, on several gregarines, and a singular mode of conjugation of one of them. [Vol. 39], pp. 9–11.
Verbal, Feb. 19, remarks on a fossil remnant of the sabre-tooth tiger from Florida. [Vol. 39], pp. 29–31.
Verbal. March 5, notice of Gonyleptes and Solpuga. [Vol. 39], p. 15.
The Boring Sponge, Cliona. [Vol. 39], pp. 70–5.
Verbal, April 16, notice of a parasitic Copepod. [Vol. 39], p. 95.
Verbal, April 23, remarks on fossil vertebrates from Florida. [Vol. 39], pp. 96–7.

1890.

Verbal, March 4, notice of Hypoderas in the Little Blue Heron; and of an ichneumon fly. [Vol. 39], p. 63.
Verbal, March 25, remarks on fossil vertebrates from Florida. [Vol. 39], p. 64.
Verbal, May 20, remarks on Hippotherium and Rhinoceros from Florida. [Vol. 39], pp. 182–3.
Verbal, May 27, remarks on Mastodon and Capybara of South Carolina. [Vol. 39], pp. 184–5.
Verbal, Sept. 23, remarks on Ticks. [Vol. 39], pp. 278–80.
Verbal, Sept. 30, notice of parasites of Mola rotunda. [Vol. 39], pp. 281–2.
Verbal, Oct. 7, notice of Beroe on the New Jersey coast. [Vol. 39], p. 311.
Notices of Entozoa. [Vol. 39], pp. 410–8.
Verbal, Nov. 11, notice of Velella. [Vol. 39], p. 408.

1891.

Verbal, Feb. 17, notice of the Boring Sponge of the Oyster. [Vol. 40], p. 122.
Notice of some Entozoa. [Vol. 40], pp. 234–6.
Dr. Leidy presided for the last time at the meeting of April 14.

Many of the above communications were copied by foreign and domestic periodicals, and many of them he included in elaborate essays on the same subjects.

Transactions of the Wagner Free Institute of Science of Philadelphia.
[Small Quarto.]

Notice of some fossil human bones. Vol. 2, pp. 9–12, 2 plates, Dec., 1889.
Description of Mammalian remains from a rock crevice in Florida. Vol. 2, pp. 15–7, 2 plates, Dec., 1889.
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On Platygonus, an extinct genus allied to the Peccaries. Vol. 2, pp. 41–50, Dec., 1889.
Remarks on the nature of Organic Species. Vol. 2, pp. 51–3.

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Notice of the formation of some crystalline bodies in Collodion. Amer. Jour. Pharmacy, Vol. 16, pp. 24–6, 1850.
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Addresses by Dr. Joseph Leidy.

A lecture introductory to the Course of Anatomy, delivered in the University of Pennsylvania, 1853. 8vo, pp. 22.

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In Memoriam. Dr. Joseph Leidy. Personal History. Read at the Academy of Natural Sciences, May 12, 1891. By William Hunt, M.D.

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The Osteology of the Lacertilia.

By E. D. Cope.

(Read before the American Philosophical Society, March 18, 1892.)

In the following pages is presented a review of the osteology of the Lacertilia with especial reference to the genera represented in the Nearctic fauna. It is based on the skeletons placed at my disposal by the U. S. National Museum, the Academy of Natural Sciences, and those contained in my private collection. It includes also the record of my observations and notes made in the principal European museums twenty-five years ago. The characters discovered by me at that time, which I found to be of the greatest taxonomic importance, I enumerated in a paper which is printed in the Proceedings of the Philadelphia Academy for 1864, p. 224. The use then made of those characters has been generally accepted by subsequent writers.* There are, however, many other characters whose value is of uncertain taxonomic value, which were not then mentioned, and which I now record.

The first description of the osteology of the Lacertilia is that of Cuvier, which is contained in his Ossemens Fossiles; (Vol. x, ed. 1836). This is an excellent one, but the many types discovered since his time render it necessary that a new survey of the subject should be made. In 1856 the Zootomie der Amphibien, by Stannius, appeared. The account of the osteology of lizards given in this work is more complete than that of Cuvier, but it is incomplete in many points, and is not up to the requirements of the present time. The present study is made with especial reference to the necessities of the paleontology of the order; therefore the description of characters is made as specific as possible. The principal novelty will be found in the references to North American Genera, and in the descriptions of the hyoid apparatus. The description of the scapular and pelvic arches in certain genera with the extremities degenerate or wanting, where they have not been previously described, is contained in a separate illustrated paper now in the hands of the editor of the *American Journal of Morphology* for publication.

Skull.—The premaxillary bone is single except in the Scincidæ, Acontiidæ, and some Gecconidæ (Phyllurus sp.). It is very small in the Iguanid genus Phrynosoma, and in the Agamidæ it is excluded from contact with the vomer by processes of the maxillaries which meet on the middle line. In the Chamæleonidæ the premaxillary is still smaller, the body being narrower than the superior spine, and supporting but one tooth. In the Anguidæ the premaxillary is bounded posteriorly on each side by a foramen which is sometimes large, which is wanting in other families, including the Helodermidæ. In Lepidosternum it is principally on the inferior

* See Boulenger, Ann. Magaz. Nat. History, 1884, p. 117; and Catalogue of Lizards in British Museum, i, 1885; ii, 1885; iii, 1887. This author has added osteological characters of the Eublepharidæ, Uroplatidæ, Pygopodidæ and Dibamidæ.

face of the muzzle. The nasal bones are generally distinct, but in the Varanidæ they are fused into a single narrow median element. In the Chamæleonidæ they do not attain the nasal border, being cut off by the junction of the prefrontal with the premaxillary and maxillary bones. In the genus Feylinia the nasal bones are fused into a broad plate. In Lepidosternum they are completely cut off from the nasal border by the maxillary, which is broadly in contact with the premaxillary spine. In Rhineüra the nasal bone reaches the nares as in Amphisbæna. The frontal bones are separate in the Varanidæ, Helodermidæ, Anguidæ, Scincidæ, Anelytropidæ, Anniellidæ and Amphisbænidæ, and in some Gecconidæ. They are coössified in some Gecconidæ; in the Iguanidæ, Agamidæ, Xenosauridæ, Eublepharidæ, Chamæleonidæ and Tiidæ. The parietals are generally fused, the only exception being the Gecconidæ, Uroplatidæ, and Xantusiidæ. Prefontals are always present, and in Anniellidæ, Helodermidæ and Chamæleonidæ they extend posteriorly to the postfrontals, excluding the frontal from the orbital border. Lachrymals are present, but they are fused with the prefrontal in the Scincidæ. The jugal is generally present, even when there is no postorbital arch, as in Gecconidæ, where it is a splint; but in the Amphisbænia, Annielloidea, and in Feylinia, the splint-like element attached to the maxillary extends to the pterygoid posteriorly and the prefrontal anteriorly, and may include the lachrymal. The jugal extends anteriorly as far as the lachrymal except in the Scincidæ. The postfrontal is wanting and in most cases is fused with the postorbital in the Varanidæ and Agamidæ; but in other families it is distinct, with sporadic cases of fusion, as in Cnemidophorus. Superciliary bones are present in Varanus, Phrynosoma and several genera of Agamidæ. They belong to the tegumentary system, and articulate, the anterior with the prefrontal, the posterior (absent in Varanus) with the postfrontorbital bone. The supraoccipital is undivided and forms the superior part of the edge of the foramen magnum. Its anterior border is generally loosely articulated with the parietal, joining it by a rudimental or developed median gomphosis with the process supraoccipital. It is generally overhung by the parietal, always so when the parietoquadrate arches are present. It is entirely overroofed by the parietal in the Xantusiidæ, the two elements being connected by a vertical laminiform septum. It is not overhung in the Annielloidea and Amphisbænia, and in these the articulation is a firm complete transverse union. The parietoquadrate arch consists proximally of a process of the parietal, which is directed outwards and posteriorly, which may represent the supramastoid element of the primitive Cotylosauria. Distally this process receives an ascending process of the paroccipital on its inferior aspect, sometimes anteriorly, sometimes posteriorly. This arch is shortened and depressed in the Anelytropidæ and is absent from the Anniellidæ and Amphisbænia. In the Chamæleonidæ it is differently composed, consisting of a superior posterior process of the supratemporal, which rises upwards and reaches the produced apex of the undivided parietal. The supratemporal is accompanied for a short distance above the quadrate by the ascending process of the paroccipital. The pineal foramen is present in the Chamæleonidæ, Agamidæ, Iguanidæ, Anolidæ, Xenosauridæ, Anguidæ, Lacertidæ, Varanidæ and Scincidæ. It is wanting in the Helodermidæ, Eublepharidæ, Tiidæ, Anniellidæ and in the Amphisbænia. It perforates the parietal bone clear of all sutures in most of the families, but it is near to or on the frontoparietal suture in Iguanidæ and Anolidæ, and is in the frontal in Dipsosaurus and the Chamæleonidæ. The occipital condyle is compound, consisting of portions of the exoccipitals and basioccipital. In many genera these segments become so thoroughly coössified at maturity as to be undistinguishable. In some of the Gecconidæ (as Gecco, Uroplates) the occipital segment is so reduced as to give the appearance of two condyles. In the Amphisbænia the condyle is transverse and concave at the center, leaving the lateral portions prominent.

The postorbital bone when present sends a process posteriorly to the supratemporal, forming the supratemporal arch. In the genera without this arch the postorbital may be wanting, as in Heloderma, or be rudimental as in Anniella. In the genera whose degeneration is advanced, the supratemporal bone is appressed to the parietal, enclosing no *foramen supratemporale*, as in Feylinia. In limbless genera of Anguidæ the supratemporal touches the parietal anterior to the paroccipital, thus reducing the supratemporal foramen. This occurs also in Gerrhonotus, Celestus, Xenosaurus and Xantusiidæ. In Heloderma the supratemporal is a rudiment on the external side of the base of the paroccipital.

The remarkable upward production of the supratemporal in Chamæleon has been mentioned. Here this process takes the place of the parietoquadrate arch. The exoccipitals are produced laterally, each embracing, with the petrosal in front, the small paroccipital. This sustains the superior extremity of the quadrate. In the snake-like genera, as Feylinia, Anniella and the Amphisbænia, this lateral elongation does not exist. The exoccipital is scale-like, and the quadrate is sessile on the side of the skull. The quadrate is generally convex at the upper part of its anterior face, and its external anterior border is produced outwards so as to embrace a longitudinal concavity or conch, with the vertical mass or column of the bone. This column is itself more or less concave, its upper extremity being produced a little backwards. In the Iguanidæ there is another concavity, internal to the column, similar to the external. This is much narrowed in the majority of the families, and in the Varanidæ and Helodermidæ, and in Phrynosoma, Eublapharis, and Celestus it is wanting. In Chamæleon, Anniella and the Amphisbænia there is no external conch, the quadrate being simply a rod ; while in Feylinia it is flattened in an anteroposterior plane. The mandibular articulation is more or less bilobate in all except Varanus, where it is plane. In Gecco the bilobation is strongly marked, as in the Permian Theriodonta. The pterygoid bones extend forwards from the quadrates, with which they are in contact in all forms except Chamæleon, towards the middle line. This portion is generally grooved, but in Xenosaurus it is a slender rod. They are received on the basipterygoid processes of the sphenoid, and then diverge and assume a longitudinal position without meeting on the middle line. They are produced in an angle or process towards the posterior extremity of the maxillary bone, from which they are separated by the ectopterygoid. The pterygoids then join the palatines. In a few genera they bear a few small teeth. The palatines are separate from each other and from the maxillaries, but send a process outwards and forwards to the latter. They join in front each its corresponding half of the vomer. The internal nares are situated each between the vomer and the maxillary, and it notches more or less deeply the palatine, which forms its posterior border. The vomers are separate in all forms excepting Chamæleon, and they have various forms. In Gecconidæ and Anolidæ they are flat and fit closely together, and they have the same character in many Agamidæ and Iguanidæ. In a few members of these families (Uromastix and Sauromalus), they are divided by a groove, which becomes a fissure posteriorly, which is the character in most other lizards. In the Varanidæ each vomer is produced posteriorly on each side this fissure to a greater distance than in other forms. The planes of the palate differ much in different families and groups. Thus the vomer is on a much higher plane than the palatines in Chamæleonidæ and Gecconidæ, the palatines curving downwards to meet the pterygoids. The latter are generally horizontal, but in Chamæleon they are in a subvertical plane, their free rounded extremities descending and fitting on the inner side of the mandible. They do not quite reach the quadrate. In the Agamidæ, Iguanidæ and Gecconidæ the internal extremity of the ectopterygoid is directed inferiorly, forming a downwardly directed angle on each side of the palate. In the Amphisbænia the structure of the palate is much more compact than in other lizards. The palatines are in contact on the middle line and there is no palatomaxillary foramen. That is, the palatine is in close contact with the maxillary, the ectopterygoid being tightly wedged in between them. The pterygoids are in contact throughout their length with the sphenoid, and the proximal end of each is tightly wedged between the latter and the quadrate.

The character of the petrosal must be attended to by any one who desires to understand the relations of the Lacertilia among themselves. In no member of the Lacertilia is the trigeminus foramen closed anteriorly by bony tissue, but it is enclosed by the membrane which forms the anterior wall of the brain case. The petrosal is divided into two parts by the deep notch whose fundus forms the posterior border of this foramen, which may be called the supra- and infraforaminal portions. The infraforaminal portion is divided in most of the families by a longitudinal, keel-like ridge, which forms the superior border of a groove whose inferior wall is formed by the sphenoid. This groove is not present in Heloderma and is very shallow in Xenosaurus. It is wanting in the Anniellidæ and Amphisbænia. In the Gecconidæ it does not exist, nor is the petrosal notched by the foramen, while the anterior border of the petrosal forms a free crest which extends from above downwards and backwards. In the Chamæleonidæ, Agamidæ, Iguanidæ and Anolidæ (families with papillose tongues), the supraforaminal part of the petrosal is short and is bounded by a convex anterior border which marks the position of the anterior semicircular canal. In the Nyctisaura, Thecaglossa, Diploglossa, Leptoglossa and Amphisbænia (families with smooth or squamous tongues, except Anniella, Diploglossa and Nyctisaura) the petrosal is produced beyond this curved border below the parietal. In many forms an outline of the semicircular canal, which forms the boundary in the other superfamilies, may be traced, whence I have termed this part of the petrosal posterior to it "the arched body" in my former system of the Lacertilia.* The petrosal is produced furthest beyond this arcade in the snakelike forms of the Anniella and Amphisbænia, reaching almost to the orbit in Lepidosternum. The relation to the parietal differs, the differences resulting from the greater or less reduction of the primitive supratemporal roof and the greater or less entrance of the parietal into the lateral wall of the brain case. In most of the families it is little or not decurved to meet the petrosal; and in the Iguania, where it is decurved, it does not come in contact with the petrosal owing to the shortness of the latter. In certain families where the petrosal is produced beyond the arcade, and the parietal is decurved, the two elements are in contact for a short distance, as in the Varanidæ. In the Tiidæ and Scincidæ the contact is mainly effected by a short descending process of the parietal. This process is especially elongate in the Scincidæ. The arcade is the anterior border of the petrosal in the Permian Theriodonta, and it marks the position of the anterior semicircular canal. The membranous wall of the brain case, anterior to the petrosal, contains an ossification which is of uncertain homology. It reaches or approaches by its superior extremity the frontal, and might hence be supposed to be the orbitosphenoid; but this homology is vitiated by the fact that its inferior portion passes behind the optic foramen. The latter position is that of the alisphenoid, and so the bone is named by Parker.† But there is another element, the epipterygoid, posterior to it and immediately anterior to the petrosal, which has been supposed to be the true alisphenoid. Leaving this question, and adopting for the bone in question the provisional name of postoptic, I remark that is typically triradiate, sending two branches upwards and one downwards. This is its character in Agamidæ, Varanidæ and Tiidæ. The posterior superior branch is much reduced in many Iguanidæ and Lacertidæ and in some Agamidæ (Megalochilus), and it is absolutely wanting in Gerrhosaurus and Chamæleon. There is nopostoptic in Heloderma. In the Rhynchocephalian genus Sphenodon these two elements coëxist with an orbitosphenoid, lying between the optic and tri-

* Proceeds. Academy Philadelphia, 1864, p. 224.

† Transac. Royal Society, 1879, p. 605, on the "Development of the Skull in Lacertilia."

geminal foramina. The two together may be homologous with the mammalian alisphenoid. The epipterygoid is present in all Lacertilia excepting the Chamæleonidæ and Annulati (Amphisbœnia). Its superior connections are quite characteristic of the different families. Inferiorly it rests on the pterygoid posterior to its ectopterygoid process, excepting in the Gecconidæ, where its point of attachment is opposite to that process. In the same family it does not reach the parietal, but the superior extremity rests on the apex of the supraforaminal part of the petrosal. In the remaining families there are three modes of superior attachment. In most of the Iguania and Acrodonta it reaches the parietal and does not touch the short petrosal. In the other superfamilies it is in contact with the petrosal. In the Varanidæ, Helodermidæ and most Anguidæ it reaches the parietal, which does not meet it with a conspicuous descending process. In Scincidæ and Tiidæ a conspicuous descending process meets it. In a certain number of genera of various families it does not quite reach the parietal. Such are Eublepharidæ, Gerrhosauridæ, Anguis, Lacerta, Phrynosoma (where it rests on the arcade of the petrosal), Iguana, Uromastix, Agama and Gonyocephalus (*subcristatus*). In Lyriocephalus and Phrynocephalus the epipterygoid is very short.

The *semicircular canals* perforate the supraoccipital, the exoccipital and the petrosal. The internal is in a subtransverse vertical plane, causing a convexity on the internal side of the supra- and exoccipitals, and in some types a visible rib on the superoexternal surface of the same. The external canal is in a horizontal plane and perforates the base of the exoccipitopetrosal suspensorium, causing a horizontal rib on the anterior face of the latter in some forms. The anterior is in a vertical anteroposterior plane, and perforates principally the petrosal, occupying its anterior border, which forms the "arcade" in most of the thick-tongued superorders, but crossing the bone much behind the anterior border in the slender-tongued superorders and the Diploglossa. The *fenestra ovale* is tightly closed by the disk of the stapes, which is continued externally as the rod-like columella. This rod is slender except in Anniella, where it is remarkably robust. In the other Amphisbænia its tympanic extremity is somewhat thickened. The columella is continued externally into a cartilage which is more or less expanded in the vertico-transverse plane, the distal portion always so, forming a vertical lamina in contact with the tympanic membrane. This is the epistapedial cartilage. It is frequently produced upwards beyond its point of attachment into a suprastapedial process. The plate thus formed is almost separate from the proximal axial part of the cartilage in Heloderma.* The axial portion has a descending process, the infrastapedial of Parker, in Lacerta, Heloderma, but not in Eublepharis, Thecadactylus and Phyllodactylus.

The rami of the *lower jaw* are united at the symphysis by ligament only. The angle is a prolongation of the articular bone ; it is elongate and simple,

* Memoirs U. S. Natl. Academy Sciences, 1884, Vol. III.

except in Anniella and Chamæleon, where it is absent. The angular bone never reaches the angle, and has an anterior position, being sometimes fused with the articular. The relations of the segments of the lower jaw are very characteristic in the divisions of the Lacertilia. The splenial bone is wanting in the Chamæleonidæ, and is very small in the Agamidæ; in other families it is well developed. The dentary extends posteriorly on the external face of the ramus, as the splenial diminishes, having the greatest posterior extent in the two families mentioned. The coronoid is differently extended in a similar ratio. Thus it is extended posteriorly on the external side of the ramus, and not anteriorly, in the Chamæleonidæ and Agamidæ; both forwards and backwards in the Gecconidæ; and forwards in the other families. The angular is absent (fused with the articular Boulenger) in the Gecconidæ, Anolidæ, Acontiidæ, Anelytropsidæ, Anniellidæ and the Annulata, and is distinct in all other families. The articular and surangular are fused in several genera of Iguanidæ; and there are but three bones in the ramus of Xantusia, q. v. The angular extends well anteriorly on the inferior border of the jaw in this order, but is differently developed on the inner and outer faces. The Chamæleonidæ and Agamidæ again show their similarity in having this element chiefly exposed on the interior side, while in other types the exposure is external. The Meckelian groove is open in the Chamæleonidæ, Agamidæ and Varanidæ, but is roofed over more or less completely in all other families.

The *hyoid system* is not connected with the skull except in Gecconidæ, Eublepharidæ and Lepidophyma, so far as I have examined them. Thus in Thecadactylus, Phyllodactylus and Eublepharis, the ceratohyal is continuous with a cartilage which projects from the paroccipital above the posterior part of the auditory meatus. In Lepidophyma the free epibranchial is attached to the inferior lateral angle of the basioccipital. In forty-two genera of other families enumerated below, this is not the case. In no genus have I discovered any connection with the stapedial cartilages. The hyoid system in lizards consists of a glossohyal which is continuous with a basihyal tract; a hypohyal often continuous with the basihyal tract; a ceratohyal; a first ceratobranchial, and a second ceratobranchial which is always continuous with the basihyal tract. There may be in addition an epibranchial, which belongs to the first ceratobranchial. In some genera, there is a free epibranchial, which may be then closely approximated to the ceratohyal (Eumeces, Oligosoma, Gerrhonotus), or to the second ceratobranchial (Lacerta, Xantusia, Lepidophyma). The only constantly ossified element is the first ceratobranchial. The genera and families differ in the presence or absence of the second ceratobranchials and epibranchials; and the proximity or separation of the former. In general the Varanidæ, Anguidæ, Zonuridæ, Gerrhosauridæ, Scincidæ, Lacertidæ and Xantusiidæ have epibranchials, while the thick-tongued and most degraded types are without them. In the Tiidæ the hypobranchials are much produced anteriorly beyond the bases of the ceratohyals, and there are no second ceratobranchials. In Anguidæ the hypobranchials are also greatly produced forwards, but carry the ceratohyals with them. Ceratobranchials of the second pair are also wanting in Varanidæ, Helodermidæ, Chamæleonidæ, Anguidæ, Anniellidæ and Rhineura; Phyllodactylus, Thecadactylus and Gecko, among Gecconidæ; and Egernia and Gongylus in Scincidæ. Ceratohyals are wanting in Chamæleon, Anguis, Anniella and Annulata generally. In both Agamidæ and Iguanidæ the second ceratobranchials are separated from each other in the depressed genera of terrestrial habits, and in close contact with each other in those of arboreal habits; but they are in close contact in Callisaurus and Crotophytus, both terrestrial genera. In Calotes, Iguana and Anolis they act as the rim on which the gular pouch or fan is stretched. The characters of Lacertilian hyoids may be tabulated as follows: Most of the genera referred to are figured in Plates iii to vi.

I. Ceratohyal present.	II. Ceratohyal absent.
A. A second ceratobranchial.	
a. Free epibranchials present.	
Scincidæ.	
Lacertidæ.	
Xantusiidæ.	
aa. No free epibranchials.	
(Scincidæ) *Mabuia agilis; Gongylus ocellatus.*	
Anolidæ.	
Iguanidæ.	
Agamidæ.	
Zonuridæ.	
Eublepharidæ.	Chirotidæ.
(Gecconidæ) Aristelliger.	Amphisbænidæ.
AA. No second ceratobranchial.	
a. No free epibranchials.	
Gecconidæ.	Rhineüra.
Varanidæ.	Chamæleonidæ.
Helodermidæ.	
	Anguis.
Tiidæ.	Anniellidæ.
Gerrhosauridæ.	
Anguidæ.	

2. Vertebral Column.—Except in the families of the Gecconidæ and Uroplatidæ, the vertebral centra are procœlous. In the families named, they are amphicœlous. The zygosphen articulation is present in the Tiidæ and the larger Iguanidæ, including a rudiment in Crotaphytus. In smaller Iguanidæ (Sceloporus Phrynosoma) and in Lacertilia generally this kind of articulation is wanting. In a good many families the caudal vertebræ are divided by a transverse fissure or suture in front of the middle, which

often splits the base and sometimes the length of the diapophysis. Such a structure is seen in Iguanidæ (Iguana Sauromalus Sceloporus Dipsosaurus); Anolidæ; Anguidæ (Celestus); Tiidæ (Tupinambis Cnemidophorus); Lacertidæ (Lacerta) and Scincidæ (Gongylus Eumeces). In Dipsosaurus, Anolis and Lacerta, the neural spines of the caudal vertebræ are double; in the other genera named, single. In Varanidæ, Helodermidæ, Gerrhonotus, Crotaphytus and Phrynosoma, the caudal centra are undivided, and the neural spines are single. In Ophisaurus the centra are undivided and the neural spines double. The centra are excessively thin in Ophisaurus, so that they break more readily than they disarticulate. There are two sacral vertebræ except in genera with the posterior limbs rudimental or absent. In some of these however, especially the degenerate genera of the Anguidæ, the rudimental ilium is attached to two diapophyses which join each other distally.

The first dorsal vertebra is that one which is first connected with the sternum by a hæmapophysis. In genera with a well-developed sternum, the number of vertebræ anterior to the first dorsal is eight, except in the *Varanus niloticus* (Cuvier) and *V. griseus*, where it is nine. In the extinct Dolichosauria of the Cretaceous period, the cervical vertebræ are stated by Owen to number seventeen.

The number of ribs attached to the sternum diminishes with the reduction of the limbs, from the normal number of four on each side to one, and total disconnection. A common hæmapophysis or "xiphoid rod," succeeds these on each side, which gives attachment to two separate hæmapophyses for ribs. The common hæmapophysis is a segmentation of the anterior part of the fifth hæmapophysis, and it is not distinct in some genera, as *e. g.*, Sauromalus. In Heloderma, the fifth hæmapophysis has no sternal segment or connection, and the sixth is wanting. In Varanus the fourth, fifth and sixth are wanting. In genera with the two appendicular hæmapophyses, they are closely appressed on the middle line in the majority of the genera, but in genera of depressed form, they are separated often widely. They are separated in *Stenodactylus guttatus*, in Phymaturus, Crotaphytus and Sceloporus. They are more widely separated in Dipsosaurus, and most widely in Sauromalus and Phrynoosma. Cervical ribs are present in varying numbers, and the posterior ones are generally quite elongate. In certain genera and families the ribs posterior to those attached to the sternum have their hæmapophyses fused on the middle line below, thus constituting a series of abdominal ribs. In the Iguanid genus Scartiscus there are two such ribs. In the Anolidæ there are four and five pairs; in the Polychroine Iguanidæ there are seven to ten. In the Chamæleonidæ and Gecconidæ there are several pairs. The ribs of Lepidosternum are remarkable for the presence of a capitular process, which has no distinct capitular articulation.

3. Scapular Arch.—The clavicle is present in all the families except the Chamæleonidæ, and in certain genera with degenerate fore limbs. In such genera it is the last portion of the scapular arch to remain, and it is

the only element present in Feylinia (Anelytropsidæ). It is always osseous. The form of its proximal extremity varies in the different families. It is simple in the Nyctisaura, Uroplatoidea, Acrodonta, Iguania, Diploglossa and Thecaglossa; and expanded and generally perforate in the other superfamilies where present, except in some degenerate genera where it is simple (see Plate ii, Fig. 2). In Trachysaurus and Cophias, its proximal end is dilated but not perforate. The scapula varies in form from elongate to short and wide. It presents a proscapular process in many families and genera. It is present in Iguania and Nyctisaura; in the last named often decurved and acuminate; and in Lophura, in Acrodonta. It is present among Leptoglossa in Cnemidophorus, and in some Amivæ, while in other Amivæ it is wanting. It is wanting generally in Acrodonta, Diploglossa, Thecaglossa and Leptoglossa, but it is present in *Celestus striatus*. It is wanting in Rhiptoglossa. The coracoid is extended anteriorly to the sternum, and it is generally deeply emarginate on its anterior interior border. These emarginations are closed by the procoracoid, which extends to the middle line, and is only partially or not at all ossified. There are two coracoid emarginations in most Iguania; exceptions being the terrestrial genera Urocentrum, Sceloporus and Phrynosoma, and the Anolidæ. There are also two in Varanidæ and Tiidæ. The Agamidæ generally have but one, but Uromastix is an exception. There is but one in Anguidæ and Scincidæ (two in Tiliqua); and none in Helodermidæ and Chamæleonidæ.

The interclavicle is a very characteristic element in the Lacertilia. It is wanting in Chamæleonidæ and in some genera with fore limbs rudimental or absent. It is a simple splint in Helodermidæ and some degenerate genera. In other families it has a transverse limb on each side, which may be anterior, producing the "anchor-shaped" form, or median, producing the "cruciform" type. It is anchor shaped in Acrodonta, Iguania, and Thecaglossa, and cruciform in Diploglossa and Leptoglossa. In Nyctisaura it is cruciform with the lateral processes wide at the base. The sternum is a broad subrhombic plate which articulates by its anterolateral borders with the procoracoid and coracoid, and by its posterolateral borders with the ribs. In genera with well-developed limbs its principal differences are seen in the nature of its fontanelles when present. In the Agamidæ there are two, and in most Iguanidæ there is one. Exceptions are the genera Polychrus, Sauromalus and Dipsosaurus, where there is no fontanelle. There is none in the Anolidæ. In Tiidæ and Lacertidæ it is present, but in Scincidæ it is mostly absent, exceptions being the North American species of Eumeces. The fontanelle is wanting in Gecconidæ, Diploglossa, Helodermatoidea, Thecaglossa and Leptoglossa, with the exceptions above noted. The single median fontanelle is frequently concealed by the median limb of the interclavicle. It is nearly divided in some species of Sceloporus.

4. The Pelvic Arch.—It is characteristic of the Lacertilia that the ilium is directed upwards and posteriorly, and that the obturator foramina

are well developed. The latter are only separated from each other by ligament or cartilage, which may sometimes contain some lime salt. It is produced posterior to the ischia in a triangular process, and less frequently into a similar one in front of the pubic symphysis. The pubic foramen is always present. The pectineal process is present except in Gecconidæ, but it is rudimental in some forms, as Phrynosoma. The following table shows the forms of the pubis in twenty-three genera of different families :

I. Pubes uniting at an acute angle.

1. Pectineal process anterior.......... .... *Chamæleon.*
2. Pectineal process median.............................. *Calotes, Draco, Iguana Dipsosaurus Anolis, Gerrhonotus, Tupinambis Cnemidophorus.*
3. Pectineal process near acetabulum .... *Scincus, Lacerta, Eumeces* (rudimental).
4. No pectineal process. .... *Gonyocephalus.*

II. Pubes uniting at an obtuse or very open angle.

1. Pectineal process median................*Iguana Cyclura Crotaphytus, Histiurus.*
2. Pectineal process near acetabulum.........................*Agama, Phrynosoma Sauromalus Sceloporus, Heloderma, Varanus.*
3. Pectineal process none...............*Gecko* (*Phrynosoma,* rudiment).

There is a tuber ischii in all of the genera which have come under my observation except Varanus. In Heloderma and some other forms it is small.

5. The Anterior Limb.—The humerus is much alike in all Lacertilia, Chamæleo only presenting peculiarities. The proximal end is expanded nearly in one plane, and the middle portion of the flattened extremity forms the oval head. This is not distinctly isolated, except by the presence of articular surface, from the greater and lesser tuberosities which occupy the angles of the expansion. The shaft betrays no twist. The distal end is chiefly occupied by the condyles ; but there are epicondyles, of which the internal is the more prominent, except in Chamæleon, where they are wanting. The condyles consist of an external rib and a medio-internal roller, which is generally bounded at the internal extremity by a tuberosity, which is, however, wanting in Chamæleon. The ulna articulates with the median roller, its external edge being beveled by the external rib. The head of the radius articulates with the external rib, having shifted from its primitive position on the inner side. It results from this that in pronation the radius crosses the ulna. There is a short ole-

cranon except in Chamæleon. The ulna and radius have about an equal share in the carpal articulation, sometimes the ulna a little the greater.

The constitution of the carpus is very uniform in Lacertilia with developed anterior limbs, the principal diversity being displayed by the Chamæleonidæ. In all, we have in the proximal row three distinct elements, the radiale, intermedium and ulnare (=pisiforme), the latter mainly external to the ulna and directed posteriorly. Distal to the radiale and intermedium, and between them and the carpalia of the second row, is a single small centrale. There are five carpalia, each corresponding to a metacarpal. I have failed to find in any of the genera at my disposal any of the carpalia fused together or wanting. In Chamæleon, on the contrary, Cuvier has shown that there is no ulnare, and that the centrale and carpalia are fused into a single round median piece, to which the metacarpals are articulated. In all the normal Lacertilia the tendons of the flexors of the digits are combined on the palm, and the point of junction is occupied by a large flat sesamoid bone. The number of phalanges is also remarkably uniform. They number in each digit, commencing with the pollex, 2-3-4-5-3. The sole exception in the genera with well-developed extremities is Chamæleon, where the numbers are 2-3-4-4-3. This genus differs also from other forms in the shapes of the metacarpals. Normally they are cylindric and subparallel in position and united in a common integument; but in Chamæleon they are flattened, with expanded extremities, and divided into two bundles by a fissure, three within and two without, enabling the three inner digits to oppose the two outer round a branch of a tree. The number of digits in Lacertilia is normally 5-5, but reductions take place presenting variations from 4-5 to 1-1, the posterior limb usually displaying a lesser degree of degeneracy than the anterior, although not always.

6. Posterior Limb.—The femur differs from the humerus in having a distinct head, which is marked off from a trochanter. The former is not hemispherical as in Mammalia, but is somewhat compressed, and is oval in section. The trochanter is on the inferior anterior side of the head, or in the position of the little trochanter of the Mammalian femur. There is no great trochanter, nor third trochanter. The condyles of the femur are not as well defined as in the Mammalia, and the patellar groove is represented by a shallow concavity without lateral ridges. Patella none, with some exceptional rudiments, as in Varanus, *e. g.* In Chamæleo all the prominent features of the femur are toned down; the trochanter being represented by a ridge. The fibula is more slender than the tibia, and is larger distally than proximally, the reverse of what obtains in the tibia. The latter has no crest.

Like the carpus, the tarsus is very uniform in the Lacertilia, the sole important modification being exhibited by the Chamæleonidæ. There are two fused proximal elements, which are probably tibiale-intermedium and fibulare. They are only distinct in Heloderma among North American genera, but a trace of the suture is seen in Varanus. In most Lacertilia there is then, but one bone of the proximal row, which is flat and wider than long. No centrale, and but two tarsalia, the third and fourth, the latter much the larger. The second metatarsal projects alongside of t. iii, so as to approximate the tibiale ; its head is figured by Cuvier as a distinct bone, but he does not describe it as such. In Chamæleon there is a single proximal tarsal element, which is not flattened as in other lizards, and this articulates with a single subglobular tarsale, from which the metatarsals radiate.* The phalanges number, like those of the anterior foot, 2–3–4–5–3, in ordinary Lacertilia, and 2–3–4–4–3 in Chamæleonidæ.

PHYLLODACTYLUS Gray.

In their osteology the species of this genus conform strictly to the Gecconid type as already described. I have before me the skeleton of *P. tuberculosus*, from which the following description is derived. The premaxillary is single and has a long superior spine; inferiorly it has the posterior border emarginate. Nasals elongate, distinct, emarginate posteriorly for the frontal. Frontal single, rather narrow, completely underarching olfactory lobes. Parietals distinct, wide, without pineal foramen, lying rather closely on supraoccipital, sending backwards the parietoquadrate arch, which encloses a small foramen with the exoccipital. Supraoccipital distinguished from exoccipital by suture. Prefrontal narrow, forming the preorbital border to the middle above ; no lachrymal ; jugal represented by a splint which extends from the prefrontal to the extremity of the maxillary on the superior surface of the latter. Postfrontal a rather wide V-shaped bone, its longest limb extending posteriorly more than half way to the base of the parietoquadrate arch. No postorbital. Quadrate with a single large, concave, external conch. Paroccipital in the usual position, splint-like.

Vomers in close contact throughout, with a common convex posterior border ; an external longitudinal convexity of the inferior surface, and a groove on each side of the median suture, which divides a keel. Palatines short and wide, and with a longer vomerine than maxillary process, and curving downwards below the level of the vomers. Nareal orifices fissure-like except posteriorly and anteriorly, the external border with a dentate process of the maxillary bone directed posteriorly near the middle. Pterygoids much expanded anteriorly, forming with the ectopterygoids and palatines a thin plate, which closes up the palatine foramen; contracting rather rapidly posteriorly to the subcylindric rod-like portion. Epipterygoid extending from the pterygoid at the basipterygoid process, and resting on the apex of the petrosal. Latter produced above

* Cuvier (Ossemens Fossiles, ed. 1836, p. 98) describes a distinct tibiale and fibulare in Chamæleo, and figures them (Plate 245, Fig. 52). These are not represented by Boulenger (Proc. Zoöl. Soc., London, 1891, p. 118). They are in fact not distinct tarsal elements, but are the epiphyses of the tibia and fibula such as exist also in Heloderma and other genera. The tibiale and fibulare are fused into a single element as in other Lacertilia.

anterior to semicircular canal; the anterior border continued into a crest which runs posteriorly above the trigeminal foramen. This terminates at the down-looking crest of the subforaminal portion, which bounds externally a wide down-looking groove. Basipterygoid processes long. Sphenoid distinct from basioccipital. Occipital condyle subequally divided into three parts, two prominent exoccipitals and a contracted basioccipital. The result is an apparently double condyle.

Mandible with the Meckelian groove closed, and with the splenial small and but little produced beyond the splenial foramen. Coronoid produced a little horizontally at the base. Angular not distinct; surangular and articular distinct. Angle simple, direct, spoon-shaped, with superior concavity. I have observed the following peculiarities in the otic and hyoid regions. There is no infrastapedial cartilage, and the suprastapedial and epistapedial cartilages are continuous. The hyoid system is characterized by the fact that the ceratohyal is attached to the paroccipital, which carries a cartilage on its extremity. There is a short second ceratobranchial, and no free epibranchial.

Vertebræ amphicœlous. Intercentra present throughout the vertebral column, continued into chevrons on the caudal region. Cervical ribs widened and truncate at extremities. In the specimen described the diapophyses of the second sacral vertebra are deeply longitudinally grooved on the inferior side so as to be nearly split. Diapophyses of anterior caudals elongate. Neural spines distinct but low throughout the column. In the scapular arch I note the following peculiarities. There is no proscapula, and the clavicle is much enlarged, and is perforate at the median extremity. The interclavicle is cruciform with the angles filled up so as to have concave borders. It is coössified with the clavicle in *P. tuberculatus*, and extends but a little way posteriorly on the sternum. The coracoid has one large foramen. The sternum has no fontanelle. There are four hæmapophyses attached to the sternum on each side; and two to each of the slender closely approximated xiphoid rods. There are several very slender abdominal ribs.

The ilium has no *angulus cristæ*, and the acetabulum is entire. The pubes join at a little less than a right angle, and the pectineal processes are short and a little posterior to the middle. Pubes uniting at less than a right angle below, with the tuberosities distal.

The most distinctive feature of the skeleton of this genus is the presence of intercentra throughout the vertebral column, a point in which it resembles the extinct Theromora of the Permian epoch.

EUBLEPHARIS Gray.*

Owing to the isolated position of this genus its osteology is worthy of especial attention. The premaxillary is undivided, and has a long superior spine but no inferior spine. The nasals are distinct. The frontals

* I include in this genus the Coleonyx of Gray, which does not differ generically from the other American species of the family.

are coössified and the interorbital space is very narrow. The parietals are coössified and there is no pineal foramen. The supraoccipital is loosely articulated anteriorly, but is coössified with the exoccipitals. No lachrymal bone; prefrontal large but not reaching far posteriorly over orbit. Postfrontal small, crescentic; no postorbital. No postorbital or supratemporal arches. Parietoquadrate arch depressed; paroccipital lying over the parietal at the inferior extremity. No jugal bone. No orbitosphenoid; the olfactory lobes enclosed below by the frontal bone. Petrosal produced beyond semicircular canal at the superior anterior angle, and without the oblique crest such as is characteristic of the Gecconidæ. A subforaminal projection and groove, the external wall of the groove as prominent downwards as the internal, so that the groove is open inferiorly. Vomers swollen, separated for most of their length by a deep groove. Palatines short and wide, sending a postnareal process to the maxillary. Pterygoids broad and flat in front, narrower posteriorly, with a short ectopterygoid without descending angle, enclosing a maxillopalatine foramen. Basipterygoids elongate. Sphenoid and basioccipital distinct; the latter distinct also from exoccipitals. Occipital condyle convex, without exoccipital portion. Epipterygoid oblique, articulating below posterior to ectopterygoid process of pterygoid and above with petrosal only. Quadrate straight, oblique, with a single conch, which is external to the rod-like axis; condyle emarginate. In the mandible the angular bone is small but distinct, and the coronoid is produced much further anteriorly than posteriorly on the external face of the ramus. The dentary extends to about opposite the middle of the coronoid on the external face of the ramus. The splenial extends posteriorly but not anteriorly. The Meckelian groove closed. In the hyoid apparatus all the elements are present, including a pair of elongate second ceratobranchials. There is a free process of the ceratohyal anterior to its junction with the hypohyal.

The scapular arch is much like that of the Gecconidæ. The clavicle is expanded and perforate proximally. The interclavicle is subcruciform with the limbs connected by laminate expansion. There is a small proscapula which is connected at its apex with the epicoracoid. Coracoid with one large emargination. Sternum without fontanelle, supporting three ribs and a ziphoid rod, which supports but one rib. No abdominal ribs.

Anolis Daudin.

The following osteological description is taken principally from the *A. carolinensis*, but other species which I have examined do not differ from it.

Premaxillary with long superior spine, and no inferior spine, but a notch. Nasals distinct, separated by premaxillary spine. Frontal and parietal bones each undivided, the pineal foramen on the coronal suture. Prefrontal large, not extending over orbit; lachrymal narrow, in contact with jugal. Postfrontal small, distinct; postorbital large. Supratemporal slender, forming the greater part of the supratemporal arch, its anterior extremity in contact with the postorbital and postorbital process of jugal bones. Paroccipital small; parietoquadrate arch well developed. Supraoccipital loosely attached, coössified with exoccipital.

The frontal bone is grooved on the median line below. The postoptics are within the epipterygoids, and are curved, enclosing a subcircular space, and have a short external branch. The epipterygoid leaves the pterygoid behind the ectopterygoid process, and articulates with the parietal, passing some distance in front of the petrosal. The petrosal is very short above; the subforaminal process is distinct, and the inferior groove looks outwards as well as downwards. Quadrate with wide external conch and no internal conch. Stapes not deeply sunk; columella slender. The vomers are flat and elongate, and are not separated by a groove. The palatines are broad and flat, and the maxillopalatine foramen is small. The pterygoids are broad and flat in front, and are then abruptly contracted from the outside to a narrow posterior part. This curves outwards from the long basipterygoid processes to the quadrate. The ectopterygoids are short and are deflected at the proximal extremity. Presphenoid long and rod-like. Occipital condyle convex, simple, without exoccipital divisions.

The mandible has marked peculiarities. The Meckelian groove is closed, and the splenial bone, if present, is minute. I do not detect it in the *A. carolinensis*. There is a fossa on the inside of the ramus at the base of the coronoid. The latter bone is developed much anterior to its apex on the external face, and not posteriorly. The dentary is produced far posterior to the coronoid. The angular and articular are fused, and the angle is rather short and has an internal angular projection (*Xiphocercus valenciennii, Anolis equestris, A. marmoratus, A. carolinensis*).

The hyoid apparatus has the extreme development seen in all the lizards with a gular compressed pouch or fan. That is, the ceratobranchials of the second pair are closely appressed and produced to a great length. First pair of ceratobranchials and ceratohyals simple, the latter attached to the extremities of the moderately developed hypohyals.

The scapular arch conforms to the Iguanid type. There is a proscapula well above the coracoid, and a single coracoid notch. The sternum has a small median fontanelle which is reached by the long posterior limb of the interclavicle. Two ribs attached to each side of sternum, and three to each of the slender, closely appressed xiphoid rods. There are five pairs of abdominal ribs in *Anolis carolinensis*, and four, five and six in other species.

The vertebræ have no zyosphen nor elongate diapophyses. There are eight cervical vertebræ, of which only the last four have ribs, all of which have simple heads, the last two being elongate and reaching to the plane of the sternum.

The caudal vertebræ have no supplementary dividing suture, and there is but one neural spine. The chevron bones are attached at the extremity of the centrum.

The pubes unite at an acute angle, and have well-developed pectineal process at the middle of their length. The ischia have a prominent tuber.

The premaxillary and anterior maxillary teeth are simple; the others are tricuspid.

Dipsosaurus Hallow.

The osteology of this genus presents a number of interesting peculiarities which constitute difference from Crotaphytus, to which its general appearance suggests affinity.

Premaxillary bone with elongate superior spine, and posterior emargination of inferior face. Nasals large, distinct, not shortened in front, since the nostrils open forwards. Frontal narrow, entire, grooved on the middle line below, its posterior region pierced by the pineal foramen which is entirely anterior to the coronal suture (*D. dorsalis*). Supraoccipital loosely articulated anteriorly, and not distinct from exoccipitals. Prefrontals large, not extending over orbit; lachrymal smaller, touched by jugal. Postfrontal small, distinct from the large postorbital. The latter articulates extensively with both the jugal and supratemporal. Paroccipital small. Parietoquadrate arch well elevated. The vomers together as broad as long, not produced posteriorly, with a median fossa. Palatine flat, with a short maxillary process; pterygoid flat in front, concave on the inner side behind for contact with the long basipterygoid process. Ectopterygoid decurved at its inner extremity. Quadrate with a narrow internal and a wide external conch. Postoptic an open sigmoid, reaching frontal above, with a median expansion with rudiment of posterior limb. Petrosal very short above; subforaminal portion prominent, with a wide inferior groove looking downwards. Epipterygoid leaving pterygoid behind ectopterygoid process, and reaching parietal without contact with petrosal. Presphenoid rudimental; sphenoid and basioccipital united, and with prominent lateral edges. Occipital condyle with exoccipital elements feebly distinguished.

In the mandible the Meckelian groove is completely curved. The coronoid has little horizontal extent, and that is principally anteriorly on the external side. The surangular and articular are fused together, and the splenial is small. The dentary extends as far posteriorly as the posterior border of the coronoid. The angle is prominent, flattened so as to be horizontal, and has an internal angle.

The scapula has a large proscapula directed upwards, and the coracoid has one emargination, which is large. The sternum has a narrow median fontanelle which is not covered by the interclavicle. There are four pairs of ribs articulated to the sternum, and two continue into the approximated xiphoid rods. The ribs reach the sacrum.

Vertebræ with a zygosphen articulation. Eight cervical vertebræ, the anterior with a compressed hypapophysis, which soon becomes a keel, which is absent on the eighth cervical and all following vertebræ. Four anterior vertebræ without ribs; seventh and eighth with long ribs. Diapophyses very short, except in the caudal region, where they are present for half its length, increasing in length to the base where they are quite elongate. Chevron bones intercentral. Neural spines of dorsal region low, of caudal region rather elevated, oblique, and preceded by a compressed vertical prominence or anterior neural spine. The centra are transversely segmented just in front of the diapophysis, except in the anterior part of the series.

The angle of junction of the pubes is nearly right, and the pectineal process is median, short and decurved. The ischia have a long common suture, and are deflected downwards, meeting at less than a right angle. Tuber a prominent angle. The ilium presents a short subacute angle representing the *crista*. There is a deep posterior notch of the acetabulum.

In *Dipsosaurus dorsalis* all the teeth on the maxillary bone are tricuspidate; these on the premaxillary are mostly simple, but one or two external ones show a rudimental lateral cusp.

CROTAPHYTUS Holbrook.

The skeletons of the two most abundant species are before me, viz., the *C. collaris* Holbr. and *C. wislicenii* B. & G. The following description includes both, and if any differences between the two exist, they are mentioned.

The premaxillary has a long spine above and a concave border behind on the palate, from which projects forwards a pair of juxtaposed processes which together form a button-like process which has an anterior free border. The nasals are wide and shortened by the removal of their anterior border on account of the large size and partly vertical direction of the nostrils. Frontal single, narrow; pineal foramen touching coronal suture, in the frontal bone in *C. collaris*, and in the parietal in *C. wislicenii*. Prefrontal large, with a prominent preocular boss, not extending posteriorly over the orbit. Lachrymal small in line with and touching the jugal. Postfrontal wanting; its place taken by a process of the frontal. Postorbital large, uniting exteriorly with jugal and supratemporal. Parietoquadrate arch elevated; supraoccipital bone loosely articulated, not distinct from exoccipital. Quadrate with rather flat conchs, the external the larger, and with straight external border. Postoptics not reaching frontal, curved, with short posterior branch. Petrosal with prominent subforaminal portion which has an open groove looking downwards. Vomers short and wide, not separated by a groove. Palatines flat, with short maxillary process. Pterygoids rather narrowed by the large palatine foramina; posterior part grooved and receiving basipterygoid processes. Ectopterygoids depressed internally. Epipterygoid originating behind ectopterygoid process, and reaching parietal without contact with petrosal. Presphenoid rudimental; sphenoid and basioccipital confluent. Occipital condyle plain, with exoccipital elements not distinct. The fenestra ovale and foramen of viii nerve sunk in deep fossæ.

In the mandible the terminal part of Meckel's cartilage is exposed. The coronoid has no extension on the external face, and extends a short distance forwards on the inner face. The splenial is rather elongate, and extends anterior to the splenial foramen. The dentary extends to the line of the posterior border of the coronoid above, and of its anterior border below. In old individuals the surangular and articular are fused. The angle is pinched, and sends inwards a horizontal process similar to its posterior process.

In the hyoid apparatus the ceratobranchials of the second pair are closely appressed, thus supporting a median gular angle. The hypohyals are moderately long, and they join by their extremities the ceratohyals, which have no expansions, and are of only moderate length.

The scapula has a well-developed proscapula, and there are two deep emarginations of the coracoid. The sternum has a narrow longitudinal median fontanelle in the *C. collaris*, and no fontanelle in *C. wislicenii* (one specimen of each examined). There are four ribs articulating directly with the sternum on each side, and two via each xiphoid rod. The latter are not closely appressed as in some, nor so widely separated as in other Iguanidæ.

Vertebræ without zygosphenal articulation, but the prezygapophyseal faces concave. Cervical vertebræ eight, the anterior five vertebræ with six free intercentra in *C. wislicenii*, and four vertebræ with five intercentra in *C. collaris*, anterior three vertebræ without ribs in both species. The neural spines are very low on the dorsal vertebræ, and are a little more elevated on the caudals. The latter have a projecting keel towards the anterior part in the *C wislicenii* (wanting in *C. collaris*), which represents the anterior neural spine of *Dipsosaurus dorsalis*. The centra in Crotaphytus are not segmented. Diapophyses are present, but are nowhere long. Short ribs extend to the sacrum.

The teeth are tricuspid, but in the two species examined the lateral cusps are rudimental. Anterolateral and incisor teeth simple, subequal.

The pubes unite at an exceedingly open angle, and the pectineal process is submedian. Tuber ischii prominent; a small angle or crista ilii. Acetabulum entire posteriorly.

The principal characters in which the skeleton of the Crotaphytus differs from Dipsosaurus are the following: Nasal bones shortened in front; no postfrontals; pineal foramen connected with coronal suture; Meckelian canal partly open; two notches of coracoid; xiphoid rods not appressed; no zygosphen; caudal centra not divided; acetabulum not deeply notched.

Sauromalus Duméril.

The following description of the osteology of this genus is based on a skeleton of the *S. ater*, belonging to the National Museum.

The premaxillary has a long spine above and a transverse posterior border below with the anteriorly directed button process. The nasals are well developed and distinct in spite of the large size of the nares. Frontal entire, rather narrow, grooved on the middle line below, and including pineal foramen, which touches the coronal suture. Parietals divided perhaps abnormally in specimen. Supraoccipital loosely attached, but fused with exoccipitals. Prefrontals large, not extending over orbits; lachrymals small, in contact with jugal. Postfrontal distinct, small. Apex of postorbital cartilaginous, inferior face in long contact with jugal and supratemporal. Paroccipital not large; parietoquadrate arch well separated from exoccipital. Postoptic not reaching frontal, superior extremity expanded backwards and forwards. Petrosal very short above, prolonged below, inferior groove looking laterally. *Fenestra ovale* and *foramen nervi octavi* sunk in deep fossæ. Vomers entirely separated from maxillaries, not produced, but separated by a groove behind. Palatines with a short maxillary process. Palatine foramen moderate; pterygoids divaricating from each other outwards. Ectopterygoid produced downwards at the posterointernal angle. Pterygoids grooved from basipterygoids backwards on internal side. Quadrate with two conchs, the internal one flat. The epistapedial cartilage is largely ossified.

Presphenoid a slender rod; sphenoid and basioccipital confluent. Occipital condyle with exoccipital elements slightly marked above.

In the mandible Meckel's cartilage is completely enclosed. The splenial is produced but little beyond the splenial foramen. Coronoid extended a little anteriorly at base on external face of ramus; and a little further on the inner side. Dentary extending as far back as coronoid. Articular and surangular distinct.

The premaxillary and anterior maxillary teeth are simple; the other maxillaries have two or three denticles anteriorly and one posteriorly. In the dentary bone the teeth (except in front) have two denticles on each edge.

The hyoid apparatus displays a pair of parallel but separate second ceratobranchials about half as long as the first ceratobranchials. Ceratohyals slightly expanded proximally, articulated at end of moderately long hypohyals.

The vertebræ display a zygosphenal articulation. Five cervicals display free intercentra, and four of them have no ribs. Ribs extending to sacrum. The two sacral centra and diapophyses are distinct, but the second diapophysis has a median longitudinal groove. Caudal centra of the distal half of the tail segmented, and possessed for the middle of the length of double diapophyses, between which the fissure passes. Diapophyses long on basal third of tail. Neural spines low everywhere; on the caudal vertebræ they stand at the posterior end, and send a keel to the anterior end, where it is elevated into a low anterior spine. Chevron bones intercentral. Four sternal ribs and two from the xiphoid rod.

Scapula very short, with a large superior proscapula. Coracoid with two notches. Sternum wide and emarginate posteriorly, spreading the xiphoid rods far apart. No fontanelle.

Pelvis with the pubis transverse and the pectineal process external. Ischia rather slender, with a short symphysis, and each with a long tuberosity.

This genus is remarkable for the combination of characters it displays. The zygosphenal articulation allies it to Dipsosaurus and the larger Iguanidæ, but the separated ceratobranchials, and the wide sternum are like that of the Phrynosomas, with the exception of the fontanelles. The transverse pubes have a similar significance.

SCELOPORUS Wiegmann.

As a basis for an examination of the osteology of this genus I have before me two skeletons of the *S. undulatus* and one of the *S. spinosus*, from the National Museum.

The premaxillary bone has a long superior spine, and is truncate on the palatal face, and has the button-like process. The nostrils are partially vertical so that the nasals are a little shortened in front. The latter are rather large and are distinct. The frontal is simple and narrow, and is strongly grooved on the middle line below. The parietal is short and wide, and is perforated by a large pineal foramen which touches the coronal suture. Parietoquadrate arch distinct. Supraoccipital broadly but loosely attached, confluent with exoccipitals. Prefrontals large, not reaching postfrontals above; lachrymal small and joining jugal. Postfrontal a small splint; postorbital large, extensively in contact with jugal and supratemporal. Paroccipital small. Vomers short, divaricate and separated by a deep notch behind. Palatine with the vomerine process longer than the maxillary; palatine foramen large. Palatines and pterygoids well separated from each other on the middle line; ectopterygoid deflected at its internal extremity. Basipterygoids developed. Quadrate with two conchs, the internal the narrower. Presphenoid rudimental; sphenoid and basioccipital coössified; descending lateral processes of the latter strongly developed. The supraforaminal part of the petrosal is very short; the infraforaminal portion is produced beyond it and is nearly horizontal in position. The *foramen nervi octavi* is at the bottom of a fossa. Epipterygoid resting on pterygoid much posterior to ectopterygoid and reaching parietal without touching petrosal. Occipital condyle not subdivided by grooves.

The hyoid system includes a pair of well-separated short second ceratobranchials, and rather long and slender first ceratobranchials and ceratohyals, which have no expansions. Hypobranchials moderate, supporting ceratohyals at extremities.

Mandible with Meckel's cartilage exposed at the distal part. Coronoid not horizontally produced on external face. Articular and surangular united. Splenial moderately elongate; dentary extending behind coronoid on external face and deeply notched. Angle short, horizontal, with short internal angle. Five cervicals with intercentra in *S. undulatus* and six in *S. spinosus;* three without ribs in both. Ribs extending to sacrum. Sacral centra not coössified. Sacral diapophyses coössified distally; the second with a posterior free angle distally. Caudal diapophyses well developed at base of tail. From about the eighth caudal the centra are segmented in front of the middle.

Scapula with proscapular process; coracoid with one notch. Sternum with a very large fontanelle. Two ribs join the sternal plate; one comes off the base of the xiphoid rod, and two articulate with the latter; total, five pairs. The ilium has a small *angulus cristæ*, and the acetabulum is not emarginate behind. The pubes are nearly transverse, and the pectineal angle is external. The ischia are rather slender, and the tuber is an angle.

The middle and posterior teeth are feebly tridentate; the others are simple.

Phrynosoma Wiegmann.

The following account of the osteology is derived from the skeletons of three species, the *P. douglassii*, *P. cornutum* and *P. coronatum.* The description applies equally to each of these species unless otherwise stated.

The premaxillary has a very short alveolar portion which does not bound the nostrils below (or very little *P. coronatum*). It has a superior spine and concave palatal border. The nasals are distinct and are excavated in front by the large nareal openings. The frontal is single, is much narrowed in front by the prefrontals, but extends transversely posterior to the orbits, where it sends forwards an acute process in the superciliary angle. The prefrontal is large and extends posteriorly to or beyond the middle of the supraorbital border. It sends posteriorly an acute superciliary process, which meets that of the frontal from behind, over the eye in *P. cornutum;* does not quite meet it in *P. coronatum*, and fails to meet it by a longer interval in *P. douglassii.* The lachrymal is small and is not reached by the anterior angle of the jugal. The parietal is broad and short, and the pineal foramen pierces it at the coronal suture. Its lateral border is very little decurved to meet the petrosal. Its strong parietoquadrate arch supports a horn or tuberosity, and in most of the species the middle of the posterior border supports the same. The occipital is broadly articulated with the parietal in *P. douglassii* and *P. coronatum;* in the former loosely, in the latter closely. In *P. cornutum* it affords a narrow but firm support for the parietal. Paroccipital small, visible from behind. The postfrontal is visible as a rudiment in *P. douglassii*, but it is apparently coössified in the two other species. The postorbital is slender, expanding below for union with jugal and supratemporal. The former bears two sharp tuberosities in *P. coronatum*, and the supratemporal two. In *P. cornutum* there is none on the jugal but there are three on the supratemporal; and in *P. douglassii* the arrangement is similar. Owing to the inferior position of the supratemporal, the quadrate is oblique forwards and downwards. It presents one conch, the external. The vomers are short, and are separated from each other for the posterior half or more of their length by a hiatus, which continues posteriorly of about equal width between the palatine and pterygoid pairs. The latter are short, wide and flat, and the palatine foramen is small; least and oval in *P. coronatum;* small and round in *P. cornutum;* larger and elongate in *P. douglassii.* The ectopterygoid is decurved at its inner extremity. The presphenoid is wanting, and the suture between the sphenoid and the basioccipital is persistent. The supraforaminal part of the petrosal is very short, and the infraforaminal part is not much produced, and has a wide inferior groove. The epipterygoid originates behind the ectopterygoid process, and has the peculiarity among Iguanidæ of not reaching the parietal, but of resting on the anterior border of the petrosal. The occipital condyle shows traces of its tripartite composition. The postoptic is curved and simple and does not reach the frontal bone. The latter is grooved on the middle line below.

The groove of Meckel's cartilage is open throughout in *P. cornutum* and *P. coronatum* and distally only in *P. douglassii.* The coronoid is not produced horizontally on the external face of the mandible, and the dentary is not produced beyond its posterior border. This element has a reflected inferior border in the *P. cornutum* which is acutely dentate posterior to the middle; characters absent from *P. coronatum* and *P. douglassii.* In *P. douglassii* the surangular is not coössified with the articular, while it is so united in the other two species. The angle is short, and is directed downwards and obliquely inwards.

The basihyal is wide and is ossified, and the second ceratobranchials are very short and widely separated. The hypohyals are short and carry the ceratohyals on their extremities. No expansions of lateral elements.

The vertebræ have no zygosphen articulation, but the prezygapophyseal facet is carried upon the side of the neurapophysis at an angle with the usual position. This furnishes the initial step in the production of a zygosphen. I find five cervical intercentra in *P. cornutum* and *P. coronatum,* and six in *P. douglassii,* exclusive of the intercentrum of the atlas, which has no hypapophysis. Ribs extend to the sacrum, and are attached to very short diapophyses. The two sacral diapophyses are separated by a wide fissure in the *P. coronatum* and *P. douglassii,* but are closely appressed in *P. cornutum.* On one side of the skeleton of *P. douglassii* the last lumbar vertebra carries, abnormally, a third sacral diapophysis which reaches the ilium. Proximal part of caudal vertebræ with long diapophyses. Caudal centra not segmented. Chevron bones intercentral, *not uniting distally.* Neural spines everywhere very low, those of the caudal vertebræ single.

The suprascapula is exceptionally elongate, and the scapula is of moderate length and has a proscapular process. The coracoid has one emargination. The interclavicle is remarkable for the shortness of its posterior limb, which is shorter than the transverse limb in *P. cornutum* and *P. douglassii*, and equal to it in *P. coronatum*. The sternum has a very large fontanelle which approaches the posterior border. In *P. coronatum* and *P. douglassii* three ribs articulate with the sternum, but in *P. cornutum* two only in my skeleton. The xiphoid rods are widely separated, and carry but one rib.

The ilium has a short *angulus cristæ*, and the acetabulum is entire. The pubis and ischium are slender and transverse in position, and approach nearly at their symphyses, which are connected by a short, narrow cartilage. The pectineal process is obsolete, while the tuber ischii is a prominent angle.

Two peculiarities especially distinguish this genus among Iguanidæ: first, the connection of the epipterygoid with the petrosal; and, second, the absence of symphysis of the chevron bones. The characters of the sternum are an extreme of what is seen in Sceloporus.

GERRHONOTUS Wiegm.

A skeleton of the *G. multicarinatus* from the U. S. National Museum, furnishes the material for an osteology of this genus.

The premaxillary has a well-developed spine and a truncate palatal border. Its alveolar border is short, and it forms but a small part of the inferior nareal border. Nasal bones not short in front, rather narrowed by the maxillary and prefontals on each side. Frontal narrow, single, partly enclosing olfactory lobes of the brain below, but the incurved lateral walls not touching. Parietal with small pineal foramen far behind coronal suture. Supraoccipital loosely articulated, and separated by suture from exoccipitals. Prefrontal not tuberiferous, produced posterior to middle of supraorbital border. Postfrontal crescentic equally united with frontal and parietal. Postorbital splint-shaped, with very slight contact with the jugal, and long contact with the supratemporal. Jugal slender, reaching anteriorly the small lachrymal. Paroccipital narrowly exposed posteriorly, well produced upwards on the distinct parieto-quadrate arch. Quadrate with one deeply excavated conch, which is external. Vomers in close apposition in front, separated by a fissure posteriorly; the anterior portion excavated medially. Palatines descending from the plane of the vomers, the vomerine and maxillary processes about equal; main plate rather narrow. Palatine foramen large. Pterygoid contracting gradually into posterior slender portion; basipterygoid well developed. Presphenoid wanting. Sphenoid and basioccipital separated by suture; descending tuberosities of the latter strong, compressed. Epipterygoid originating below opposite basipterygoid; above resting on anterior process of petrosal, and touching parietal just behind an obtuse descending angle of the decurved border of the same. Subforaminal portion of petrosal shorter than supraforaminal portion, enclosing a very narrow down-looking groove. Basioccipital and exoccipitals coössified; condyle small, simple.

Meckel's canal closed except distally, where it is open on the *under side* of the ramus. Coronoid developed anteriorly on external face of ramus, the dentary not reaching behind its anterior border. Splenial elongate, partly external; angular mostly external; surangular confluent with articular. Angle horizontal incurved with rounded border and concave superior surface.

Hyoid apparatus displays no second and rather short first ceratobranchials. Hypohyal rather long, the ceratohyal extending a little beyond its extremity, and widened at the posterior third. A free epibranchial which has a bifurcate anterior extremity at that of the ceratohyal, and extends posteriorly but little behind the ceratobranchial.

Five cervical intercentra, and two cervicals besides atlas without ribs. The odontoid is coössified with the axis. Ribs extend to sacrum. Sacral diapophyses distinct from each other. Dorsal vertebræ without zygosphen, prezygapophyseal facets not continued on neural arch. Caudal diapophyses present; centra of middle region segmented through them; chevron bones intercentral. Neural spines low, higher on caudal region.

Suprascapula much larger than scapula; no proscapula. One large coracoid notch. Sternum without fontanelle, with three ribs and two attached to xiphoid rod.

Ilium without prominent *angulus cristæ;* acetabulum entire; pubes uniting at an acute angle; pectineal angle medium. Ischia with prominent tuber.

CNEMIDOPHORUS Wiegmann.

For characters of the skeleton I have three individuals of the *C. tessellatus* from my own, and one of the *C. sexlineatus* from the National collection. The alveolar portion of the premaxillary is prominent, and is marked off from that of the maxillary bone by a shallow emargination on each side. The superior spine is long, and the palatal border is deeply emarginate to receive the narrow anterior production of the vomers. The nasals are distinct and rather elongate, although encroached on in front by the enlarged nostrils. The frontal is single and is rather narrow. The parietal is without pineal foramen in the adult. The parietoquadrate arch is well elevated, and is braced below by the small paroccipital. The supraoccipital is in close contact with the parietal by its middle portion, and it is distinct from the exoccipital by suture. The prefrontal does not extend above the orbit; the lachrymal is smaller, but rather large, and forms a suture with the jugal. The postfrontal is wanting, being fused with the postorbital. The latter is produced downwards and has a longer suture with the supratemporal than with the narrow jugal. The quadrate has an external conch only. The vomers are elongate and are in contact throughout, but each is swollen on the middle line so that they are divided by a groove along their common suture. The nareal fissure is long and narrow, and is contracted anteriorly, and then enlarged foramen-like at the anterior extremity. The vomerine branch of the palatines is longer than the maxillary branch; the pterygoid branch is not very wide, and the palatine foramen is of moderate size. The ectopterygoid is rather wide and has an anterior suture with the palatine bone as well as with the maxillary; it is deflected posteriorly. Pterygoid moderately expanded anteriorly and contracting gradually; the posterior portion but slightly grooved, and attached to the basipterygoid process by its entire width, and not by the groove only. Presphenoid rudimental; sphenoid distinguished from basioccipital by suture; the latter with descending compressed lateral processes. Petrosal with a short presemicircular process, and a long subforaminal process; the latter presenting an open groove downwards. Inferior face of frontal grooved; postoptic not reaching frontal, triradiate, the two superior limbs shorter than the inferior. Epipterygoid arising opposite ectopterygoid and in contact with a descending lateral process of the parietal and not touching petrosal.

The hyoid apparatus is distinguished, like that of other Tiidæ, by the great prolongation of the hypohyals anterior to the point of attachment of the ceratohyals. No second ceratobranchials or free epibranchials.

In the mandible the Meckelian groove is closed except at the distal portion. The coronoid is produced far anteriorly and not at all posteriorly on the external face, and the dentary does not extend much beyond the tooth line. Surangular distinct; angle horizontal, expanded, and forming an angle inwards. A distinct masseteric fossa, bounded below by the angular. Splenial elongate, extending far anterior to the splenial foramen.

Teeth with the crowns moderately compressed and unequally bicuspid; those of premaxillary and adjacent part of maxillary bone and corresponding part of mandible, simple.

Dorsal vertebræ with zygosphen. In both *C. tessellatus* and *C. sexlineatus* there are five cervical intercentra besides that of the atlas, and the first rib is on the third or fourth vertebra. Two sacral diapophyses, both robust. Neural spines distinct, moderate, highest in the caudal series; ribs extending to sacrum. Diapophyses very short except in caudal region, where they extend for a considerable part of the length, originating posterior to the middle of the centrum. On the distal part of the caudal series there is an additional short spine-like diapophysis in front of the normal one, and the centrum is segmented between the two. The segmentation disappears anteriorly with the disappearance of this prediapophysis. Chevrons intercentral.

The suprascapula is of moderate dimensions and extends to the summit of the neural spine. Scapula elongate, and with a large proscapula. Coracoid with two deep notches. Interclavicle with a very long median limb, which is wide at the base and which covers an elongate oval median fontanelle. Three sternal ribs, and two attached to the xiphoid rod.

Ilium with a prominent *angulus cristæ*. Acetabulum entire; pubis directed anteriorly at an acute angle, with median pectineal angle. Ischia directed vertically downwards, with *angulus tuberosus,* and pre- and post-ischiadic acuminate cartilages.

It is remarkable that in the large species of the allied genus Tupinambis the proscapular process is wanting.

Xantusiidæ.

In addition to the characters which I have previously given, Mr. Boulenger states (*Catal. Brit. Mus.*) that the sternum is without fontanelle. I find the hyoid apparatus has characters somewhat similar to those of the Lacertidæ. The ceratohyals and second ceratobranchials are both present and there is a well-developed free epibranchial. Its proximal end overlaps the distal end of the second ceratobranchial. It passes round the extremity of the first ceratobranchial and extends forwards. In Lepidophyma it has the peculiarity, which I have not seen in any other lizard, of being inserted on the lateral process of the basioccipital. In *Xantusia riversiana* (Plate vi, Fig. 41) it terminates before reaching this point. In Lepidophyma it displays a concave expansion as it passes the extremity of the first ceratobranchial, in which lies the helicoid cartilaginous extremity of the latter. In neither genus are the hypohyals prolonged with the ceratohyals, as in Anguidæ, nor beyond them as in the Tiidæ.

The stapedial disk in Lepidophyma is not sunk in a canal as in the Iguanidæ and some other Lacertilia. The columella is slender, and terminates in the interstapedial cartilage. This supports an oblique cartilaginous rod, one end of which (suprastapedial) is attached to the osseous wall above, and the other longer one (epistapedial) is in contact by a flat surface of its extremity with the membranum tympani (Plate v, Fig. 26).

The remarkable characters of the skull in Xantusia are described under the head of that genus. Bocourt (*Mission Sci. de Mexique,* Pl. xxg, Fig. 2), represents a probably similar structure in Lepidophyma.

Xantusia Baird.

My knowledge of the osteology of this genus is derived from the *X. riversiana,* specimens of which I owe to my friend, Dr. J. J. Rivers, of Oakland, Cal.

The *os premaxillare* has an elongate spine above and a nearly transverse posterior border below. Nasals well developed, distinct. Frontal single, grooved below. Parietal single, without pineal foramen, produced posteriorly so as to overhang the occipital bone and foramen magnum ; being connected with the former by a median keel which it sends downwards. The supraoccipital is subhorizontal and is not articulated in the usual way with the parietal, having only the median contact above mentioned. It is coössified with the exoccipitals. The prefrontal is small and is not produced far over the orbit. Lachrymal absent. Jugal with the superposterior limb expanded. Postfrontal and postorbital fused into a triangular bone which bounds the parietal externally, thus, with the supratemporal, roofing over the temporal fossa. Supratemporal in contact throughout with the parietal except where separated by the narrow splint of a paroccipital. Quadrate with one, a large external conch. Vomers closely juxtaposed throughout, coössified anteriorly, the median portion of the two elements with an excavation. Nareal orifices nearly closed except posteriorly, where the vomerine process of the palatine overarches them. The latter are in contact in front but soon spread apart. Maxillary processes rather shorter than vomerine, depressed below them. Pterygoids narrow throughout, not wider than palatines, their posterior part with a groove which looks upwards and inwards. Basipterygoids overlapping their entire internal face. Ectopterygoids wide, reducing the palatine foramen to a mere slit; with a considerable contact with the palatine, and a recurved portion in contact with the extremity of the maxillary; the internal extremity depressed. No presphenoid; sphenoid separated by suture from basioccipital, whose lateral processes are compressed and decurved. The postoptic bone seems to be wanting. The petrosal is well produced beyond the semicircular canal, and is equally produced below the trigeminal foramen, where it joins a backwards directed process of the basipterygoid. The groove below it is well defined and looks downwards. The epipterygoid rises at the basipterygoid and rests on the anterior border of the petrosal and the posterior border of the well-marked descending process of the parietal. Fenestra ovale not sunk in the fundus of a fossa.

The mandible is remarkable in having but three bones. The articular, angular and surangular are coössified, and the splenial and dentary. The coronoid has little horizontal production on the outside of the ramus, and the angle of the dentary extends considerably posterior to it. The Meckelian groove is entirely closed.

The hyoid apparatus is described under the head of the genus Xantusia.

There is no zygosphen. There are six cervical intercentra besides that of the atlas. The cervical ribs commence on the fourth vertebra. Four of these ribs are of peculiar form, being expanded and truncate at the extremity so as to be somewhat fan-shaped. Neural spines rather low on the cervical and caudal regions, and lower on the dorsal vertebræ. Caudal vertebræ segmented towards the anterior part, the fissure passing through the middle of the diapophyses. Neural spine single, oblique, posterior; chevron bones normal.

Suprascapula short and wide; scapula without proscapula. Coracoid with one notch; sternum without fontanelle. Interclavicle with moderate posterior limb. Sternal ribs three; xiphoid rods not juxtaposed, supporting two ribs. No abdominal ribs.

Pubes meeting at about a right angle; pectineal angles near the middle, decurved. Pubis with tuber exterior. Ilium without angulus cristæ; acetabulum entire.

The teeth have compressed tridentate crowns; those of the premaxillary bone are not conic, but have also compressed crowns, where traces of denticles are sometimes apparent.

The remarkable features in the osteology of this genus are (1) the peculiar relations between the parietal and supraoccipital bones, which resemble the structure seen in a sea-turtle; (2) the wide ectopterygoid; (3) the absence of lachrymal; (4) the presence of only three mandibular elements. The affinities are a mixture of those of the Lacertidæ and Scincidæ; the large postfrontal bones; the descending processes of the parietals, and the form of the pubes, resembling the corresponding parts in the latter family. The expanded cervical ribs resemble those of the Gecconid genus Phyllodactylus. The relations of the parietal and occipital bones are quite different from those found in the Lacertidæ and Anguidæ (Gerrhonotus, Celestus, Ophisaurus), where the temporal fossæ are also roofed over. In these forms the contact is normal, *i. e.*, by the elevated median portion of the anterior border of the occipital.

Eumeces Wiegmann.

For the determination of the skeletal characters of this genus I have skeletons of the *E. obsoletus* and *E. fasciatus*, from the National collection.

The premaxillary is split as in other Scincidæ, and the halves are in the closest contact. The common spine is rather elongate, while the palatal suture is simply emarginate. The nasals are not shortened, and are distinct. The frontal is double, and is simply grooved on the middle line below. The parietal is single, and is pierced by the pineal foramen at about its middle. The parietoquadrate arch is well elevated. The supraoccipital is loosely articulated, presenting a truncate median process towards, but not to, a median notch of the parietal. Exoccipital distinct by suture. Prefrontal rather large, not sending posteriorly a superciliary process, and not produced far above the orbit. Lachrymal small; not, or very little visible on external facial surface, and reached by a long internal process of the jugal. External surface of jugal separated widely from prefrontal, its postorbital portion much longer, slender, and rising to meet the postfrontal. The latter is large and unequally V-shaped, the posterior limb broad and covering the temporal fossa between the parietal and supratemporal bones, with more or less of a fissure next the parietal posteriorly. Postfrontal a splint separating the jugal and supratemporal from the postfrontal. Supratemporal well produced anteriorly, and in contact with the parietoquadrate arch for the posterior two-thirds the length of the latter. Quadrate with one, a deep external conch. The vomers are elongate, and also expanded laterally, passing above the prominent palatine laminæ of the maxillary bones. They are in close apposition on the median line, but are so swollen longitudinally as to leave a groove at the common suture. The longitudinal ribs terminate in a pair of appressed hooks which look downwards and backwards at the posterior extremities of the bones. The vomerine branch of the palatine is not quite as long as the maxillary branch, and is on a superior plane, being in close contact with its mate on the middle line, and forming with the maxillary plate a half tube opening inwards. Pterygoids not very wide, gradually narrowing to the posterior rod which is openly grooved on the inner side. The basipterygoid processes overlap the entire width of the internal face. Ectopterygoid reaching maxillary and jugal, but not palatine; little deflected posteriorly. Presphenoid not ossified; sphenoid distinguished from basioccipital by suture. Latter with subconic descending lateral processes, which enclose a deep fossa on the external side. Postoptic small, simple, crescentic. Petrosal extended well in advance of semicircular canal above; subforaminal portion still more produced bounding a down-looking open groove. Parietal sending downwards a rather elongate process in front of petrosal. Epipterygoid originating opposite basipterygoid below, and resting above on the descending process of the parietal and the anterior margin of the petrosal. Occipital condyle tripartite.

Meckel's cartilage exposed from the anteriorly placed splenial foramen. Coronoid a little produced anteriorly on external face of ramus, not at all posteriorly. Surangular and articular distinct; angle flat, rounded, not produced or angular inwards. Dentary produced as far posteriorly as coronoid; splenial rather elongate (forming the inferior border of Meckel's groove in *E. obsoletus*).

In the hyoid system, *E. fasciatus* presents a short second ceratobranchial. The first ceratobranchial has a cartilaginous terminal segment, as has also the ceratohyal. The latter is of moderate length, is without expansions, and is articulated with the extremity of the rather short hypobranchial. There is a large free epibranchial, which commences near the free extremity of the second ceratobranchial, and curving backwards, outwards and then forwards, terminates nearly opposite the middle of the ceratohyal.

The cervical intercentra in the *E. obsoletus* number four, and those of the *E. fasciatus* three, posterior to that of the atlas. There is no zygosphen. The caudal diapophyses are well developed at the base of the series, and are split lengthwise at the middle and distal part of the series by the segmentation of the vertebræ. Neural spine single at posterior extremity of neural arch.

The suprascapula is expanded anteroposteriorly, and the scapula is rather elongate. The latter has no proscapula, while the coronoid has one emargination. The sternum has a small fontanelle posteriorly placed. There are three costal articulations and a xiphoid rod with two ribs. The latter is in close apposition to its mate, and is expanded outwards at the junction of the first hæmapophysis.

The ilium has no *angulus cristæ*, and the acetabulum is entire. The pubes converge at a subacute angle, and the small pectineal process is nearer the proximal extremity, and is turned downwards. The ischia are subtransverse, and present a wide emargination posteriorly, since the *processus tuberosus* is near the acetabulum.

Besides the family characters, this genus is well distinguished among American lizards by the divided frontal; the overroofing the temporal fossa by the postfrontal and supratemporal; the descending process of the parietal; forms of the xiphoid rods, and forms of the pelvic bones.

ANNIELLA Gray.

My observations on this genus are based on specimens from San Diego, Cal., presented to me by my friend, James S. Lippincott.

The premaxillary has an elongate spine, and the palatal suture presents backwards two concavities separated by a median projection. The nasals are distinct and rather short and wide. The frontals are distinct and rather wide. The parietal is very large everyway, is single, and has no pineal foramen. The supraoccipital forms a close suture with it, sending forwards a median process for internal gomphosis, and an angle on each side of it. It is coössified with the exoccipital, and is expanded to accommodate the large circle of the superior semicircular canal. The facial plate of the maxillary is large. The prefrontal is above the eye, and is cut off from the postfrontal by an entrant angle only. The lachrymal is small, and is below and separated from the prefrontal. No jugal. Postfrontal crescentic, bounded by both frontal and parietal. Postorbital a caducous scale lying in contact with the posterior limb of the postfrontal. Petrosal with its superior border in close contact with the decurved lateral borders of the parietal, as in a snake. The latter do not, however, descend to the presphenoid, but leave a wide fissure below it which deeply notches the anterior border of the petrosal. Supraforaminal part of petrosal produced to an acute angle, terminating at the parietal border much in advance of the anterior semicircular canal. Body of petrosal perforated by a large foramen just in front of the superior part of the quadrate. No parietoquadrate arch, but a posteroexternal angle of the parietal extending near to the proximal extremity of the quadrate. No distinct supratemporal or paroccipital. Stapes with large disk and short stout columella, with thickened tympanic extremity. Vomers continuous anteriorly, slightly divergent posteriorly; excavated by a deep groove posteriorly, which terminates in a fossa medially. The external borders of the posterior apices are turned outwards so as to enclose partially the posterior nares below. The palatines are short, the groove separating the maxillary from the vomerine processes extending to the suture with the pterygoid, so that the maxillary process only appears as the inferior face of the bone. Pterygoids elongated anteriorly, reaching to beyond the middle of the palatine foramen. They extend directly back to the quadrates, being well separated on the middle line, and abruptly notched on the inner side to receive the short angular basipterygoids. They are separated from the sphenoid by a fissure, and are grooved on the inner side posterior to the basipterygoid. Ectopterygoids present, rather slender, enclosing rather large palatine foramina. No epipterygoid. Nareal fissure overhung by the free edge of the maxillary and palatine bones. Sphenoid and basioccipital and exoccipital coössified. Occipital condyle convex and perfectly simple.

The mandible has an open Meckelian groove, and the surangular and articular bones are coössified, while the angular and splenial bones are distinct. The latter extends well anteriorly. The coronoid extends a little forwards on the exterior face of the ramus, and in both directions on the inner face.

The hyoid apparatus is the most simple among lizards. It consists of a continuous cartilaginous glossobasihyal rod, which is bifurcated posteriorly; and a simple osseous first branchihyal, attached to each of the branches. Other elements wanting.

Ten cervical vertebræ with compressed inferior processes of the centra or hypapophyses. They are coössified with the centra, and are not intercentral in position, hence it is not evident that they are intercentra. No zygosphen. In the *Anniella pulchra* there are seventy-three rib-bearing vertebræ, and two cervicals without ribs. The sacral and proximal caudal vertebræ have diapophyses, those of the former little different from those of the latter. The fifth vertebra with a diapophysis supports a pair of parallel plates coössified with its inferior face like the chevron or double hypapophysis of a snake. In the succeeding vertebræ similar plates form the basis of a chevron, whose symphysis is turned rather abruptly posteriorly. The position of these chevrons is central and not intercentral. Caudal vertebræ not segmented.

Scapular elements and fore limb wanting. Pelvic arch represented by a pair of slender simple bones which lie near the extremities of the last ribs, one on each side of the vent. They are slightly curved, and are well separated in front. They are very similar to the bones which occupy the same position in the Amphisbænidæ, and are probably the iliopectineal bones of Fürbringer. Teeth simple, acutely conic.

The affinities of the Anniellidæ, as indicated by the above description, are interesting. When I first, in 1864,* pointed out the cranial peculiarities of the genus Anniella, I created for it a distinct family, which I associated with the Acontiidæ and Anelytropsidæ. Subsequently, in 1887,† I proposed for it a still more independent position, making it the type of a special superfamily, which I called the Anguisauri; a course which had been already adopted by Gill a short time previously,‡ who proposed for it the superfamily of the Annielloidea. The further knowledge of its structure above recorded brings out more clearly its true position. This is, I think, in the Annulati or Amphisbænia. The characters which indicate this reference are: (1) The continuity of the parietal with the petrosal and supraoccipital elements. (2) The absence of epipterygoid. (3) The absence of ceratohyal elements. (4) The hypopophyses of the

* Proceedings Academy Philada., 1864, p. 230.

† Bullet. U. S. Natl. Museum No. 32, p. 25, 1887.

‡ Smithsonian Report, 1886, The Progress of Zoölogy for 1885, p. 40.

cervical vertebræ which are continuous with the centra. (5) The partially open chevron bones, which are also continuous with the centra. (6) The sublongitudinal ileopectineal bone and absence of other pelvic elements.

There is agreement in various subordinate features, as the single premaxillary, double frontal, and single parietal; and the absence of supratemporal bone; also the fusion of the surangular and articular bones. There are some differences to be noted. Thus, in some of the Amphisbænia at least, there is apparently an orbitosphenoid bone, which is wanting in Anniella. The pterygoid is more closely adherent to the basis cranii in the Amphisbænia, and there is no palatine foramen, which is present in Anniella. The splenial is of full size in Anniella and the Meckelian groove is open. In the Amphisbænia the groove is closed and the splenial is much reduced.

The presence of scales, the papillose tongue and the distinct tegumentary eye fissure, with the characters above cited, define the Anniellidæ as a very distinct family of the Amphisbænia.

Rhineura Cope.

A specimen of the *R. floridana* Baird from Volusia, Fla., furnishes the characters of the skeleton.

The alveolar border of the premaxillary is very short, and supports only one, a median tooth. The spine is divided into two portions, that below the projecting angle of the muzzle and that above it. The former is contracted a little by a process of the maxillary which enters from the alveolar portion, separating it from the nostril, which is inferior in position. It then expands a little, to form on the upper side of the muzzle a terminal expansion twice as wide as long. The nasals are distinct, and extend to the border of the muzzle, overroofing the nostrils. Frontals wide, distinct, deeply emarginate posteriorly for the parietal. Prefrontal rather large, triangular, sending its apex posteriorly over the orbit and reaching the parietal. Its free border and a narrow band of the parietal form a *crista temporalis*, which do not unite on the middle line into a *crista sagittalis*. Parietal single, without pineal foramen, continuous laterally with the petrosal and alisphenoid, and posteriorly with the supraoccipital, from which it receives on the middle line a gomphosis. Supraoccipital bounding foramen magnum, of which it forms a rather narrow border. A small triangular bone at the extremity of the maxillary may be a jugal or a lachrymal. The alisphenoid and petrosal form the inferior part of the side walls of the brain case, and are separated from the pterygoids and presphenoid below them by a narrow fissure which is widest below the petrosal. The latter sends an angle upwards and backwards between the parietal and exoccipital. The exoccipital sends a prolongation (paroccipital ?) downwards and forwards, which gives articulation to the quadrate, bounding the fenestra ovale above. The latter is large and is closed by the large disk of the stapes. The quadrate has no posterior proximal process, and is oblique proximally, but is more nearly vertical distally. In its posterior angle rests the club-shaped head of the robust *columella auris.*

The vomer presents as its anterior extremity a process which separates a transverse process from each maxillary, and enters a notch in the posterior border of the premaxillary. The vomers are plane in front but become convex and separated by a fissure posteriorly, ending each in an acuminate apex lying on the presphenoid. The palatine is narrow and lies along the inner side of the ectopterygoid, consisting chiefly of its maxillary process; it is doubtful whether it possesses a vomerine process. Posteriorly it lies scale-like on the pterygoid, reaching nearly to the line of the quadrate (Pl. i, Fig. 5, B pl.). The nareal fissure is nearly closed anteriorly, except a foramen-like portion at the anterior extremity. The presphenoid, sphenoid and basioccipital are coössified. To these the pterygoid is closely appressed by the one side, while on the outer side the latter carries the narrow splint-like ectopterygoid as far as the maxillary. No palatine foramen. Occipital condyle simple, transverse, medially concave.

The mandible displays no Meckelian groove, and the splenial is small. The small angular is only visible on the internal side of the ramus. Surangular and articular confluent. Coronoid large, triangular, not concave below, and overlaid at base externally by anterior extremity of surangular; anteriorly not extended over dentary. Angle short, longer than wide, a little inflected, simple; its plane an angle of 45° to that of the ramus.

The hyoid apparatus is very simple. It consists of a glossobasihyal cartilage which is deeply bifurcate posteriorly. At the posterior extremity each posterior limb sends a process forwards, which is about half as long as the anterior elements, the hypohyal. No ceratohyal nor second ceratobranchial. A rather short and simple osseous first ceratobranchial on each side.

The vertebral column consists of many cervico-dorsals and a relatively small number of caudals. The second vertebra has a strong keel-like hypapophysis, which is also strong on the third, but which diminishes from that point so that on the sixth it is no longer perceptible. The first rib is short and is attached to the third vertebra. Diapophyses and neural spines very short. The ribs do not display a vertical process at the head as in *Lepidosternum octostegum.* Diapophyses very short and simple on caudal vertebræ. Caudal hypapophyses commencing on the anterior fourth of the caudal series, at first the halves widely separated. They soon converge downwards, and finally touch, but are never coössified to form a chevron. Position on the middle of the length of the centrum. Rib-bearing vertebræ without trace of zygosphen.

Scapular arch absent. Pelvic arch represented by a single curved rod on each side of and anterior to the vent, which is connected with the extremities of two ribs by ligament only. This is the ileopectineal bone of Furbringer. No trace of posterior limb.

Teeth simple, conic; situated on premaxillary, maxillary and dentary bones only. Premaxillary with but one, a median tooth.

The genus Lepidosternum, as typified by the *L. octostegum*, differs from Rhineura in that the nasal bones are excluded from the nareal borders by the maxillary, and from contact with each other by the prolonged spine of the premaxillary. In both of these points Rhineura agrees with Amphisbæna. In Lepidosternum also there is a Meckelian groove, and the angle is turned vertically downwards. In *Amphisbæna* (*fuliginosa*) there is a groove and no angle.

Plate II.

Figs. 1–3. *Feylinia currorii* Gray; × 2; from Gaboon, West Africa; specimen in Museum Academy Natl. Sciences, Philadelphia.

Fig. 1. Skull, three views; 2, skeleton of pectoral region; 3, skeleton of sacro-pelvic region.

Fig. 4. *Anniella pulchra* Gray; skull, × 3; from San Diego, California; from specimen in my private collection presented by Mr. James S. Lippincott.

Fig. 5. *Rhineura floridana* Baird; skull, × 3; from Volusia, Fla.; from specimen in my private collection from Mrs. A. D. Lungren.

The principal characters of the osteology of the Feylinia and Anniella are described in Proceeds. Academy Philadelphia, 1864, pp. 228–230; and the pelvic arch of the latter and of Rhineura in a paper now in press in the *American Journal of Morphology*. Additional characters of all the above forms are described in the preceding pages.

Lettering.—*Pmx.*, premaxillary; *N.*, Nasal; *F.*, frontal; *P.*, parietal; *So.*, supraoccipital; *Mx.*, Maxillary; *Pef.*, prefrontal; *L.*, lachrymal; *J.*, jugal; *Pof.*, postfrontal; *Pob.*, postorbital; *Pofb.*, postfrontoörbital; *St.*, supratemporal; *Pao.*, paroccipital; *Eo.*, exoccipital; *Os.*, orbitosphenoid; *Pop.*, postoptic; *Epg.*, epipterygoid; *Pe.*, petrosal; *Q.*, quadrate; *St.*, stapes; *V.*, vomer; *Pl.*, palatine; *Pg.*, pterygoid; *Ecp.*, ectopterygoid; *Sp.*, sphenoid; *Bo.*, basioccipital; *Art.*, articular; *Co.*, coronoid; *Ang.*, angular; *Spl.*, splenial; *D.*, dentary.

Plate III.

Hyoid bones of Lacertilia.

Fig. 1. *Sphenodon punctatum* Gray; nat. size; from specimen presented by Sir James Hector.

2 *Chamæleon* sp.; from Cuvier; nat. size.

3. *Gecko verticillatus* Laur.; nat. size; from Cuvier.

4. *Aristelliger præsignis* Hallow.; nat. size.; dissected and drawn by Dr. E. E. Galt.

Fig. 5. *Phyllodactylus tuberculatus* Wiegm ; × 2 ; dissected and drawn by Dr. E. E. Galt.

6. *Thecadactylus rapicaudus* Houtt.; × 2.
7. *Eublepharis elegans* Gray ; × 2 ; Dr. Galt.
8. *Eublepharis variegatus* Baird ; × 2.
9. *Calotes cristatellus* Kuhl ; nat. size.
10. *Phrynocephalus mystaceus* Pallas ; nat. size.
11. *Uromastix hardwickii* Gray ; nat. size ; from the Zoölogical Garden of Philadelphia.
12. *Holbrookia maculata* Gir.; × 2 ; from specimen from Otto Lerch, San Angelo, Tex.

Plate IV.

Fig. 13. *Phrynosoma coronatum* Blv.; × 3 ; Dr. Galt.

14. *Sceloporus undulatus* Daud.; × 2.
15. *Uta stansburiana* B. & G.; × $\frac{5}{2}$.
16. *Sauromalus ater* Dum.; nat. size.
17. *Crotaphytus wislicenii* B. & G.; × 2.
18. *Anolis carolinensis* D. & B.; × 2.
19. *Ctenosaura teres* Harl.; nat. size (not adult).
20. *Iguana tuberculata* Laur.; from Cuv.; nat. size.
21. *Anguis fragilis* L.; × 4 ; from Northern Italy.
22. *Dracæna guianensis* Daud. ; nat. size ; from specimen from Zoölogical Garden, Philadelphia.

Plate V.

Fig. 23. *Gerrhonotus multicarinatus* Blv.; × 2 ; Dr. Galt.

24. *Ophisaurus ventralis* Daud.; × 2 ; Dr. Galt.
25. *Heloderma suspectum* Cope ; nat. size ; Dr. Galt.
26. *Lepidophyma flavomaculatum* Dum.; three times nat. size.
27. *Varanus niloticus* Linn.; nat. size ; Dr. Galt.
28. *Scincus officinalis* Laur.; × 2 ; from Cuvier.
29. *Eumeces fasciatus* L.; × 3 ; Dr. Galt.
30. *Oligosoma laterale* Say; × 2 ; from Hidalgo, Mexico (*O. gemmingerii*).
31. *Gongylus ocellatus* Forsk.; $\frac{3}{2}$.
32. *Egernia cunninghamii* Gray ; nat. size ; the ends of the ceratobranchials are cut off in the specimen.

Plate VI.

Fig. 33. *Celestus striatus* Gray ; nat. size.

34. *Lacerta ocellata* Daud.; nat. size.
35. *Psammodromus algirus* Linn.; × 2.
36. *Zonurus cordylus* Linn.; × 2.
37. *Gerrohaurus nigrolineatus* Hallow.; × 2.

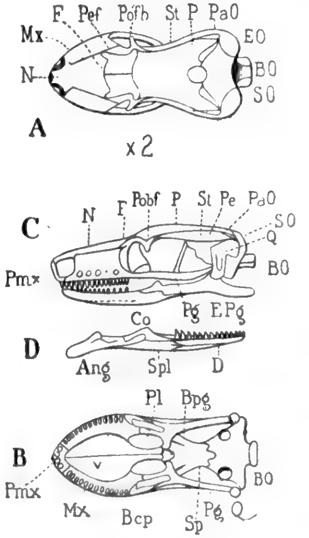


FIG. 1.

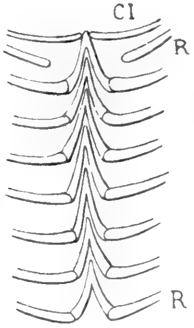


FIG 2

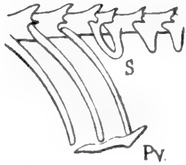


FIG. 3.

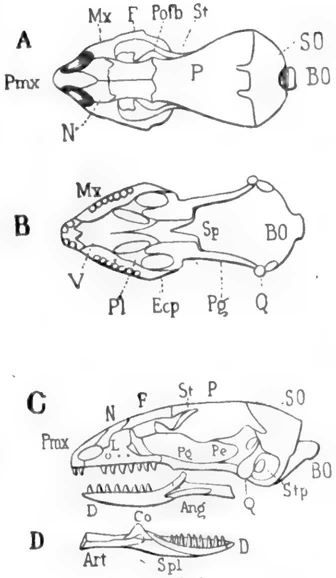


FIG 4.

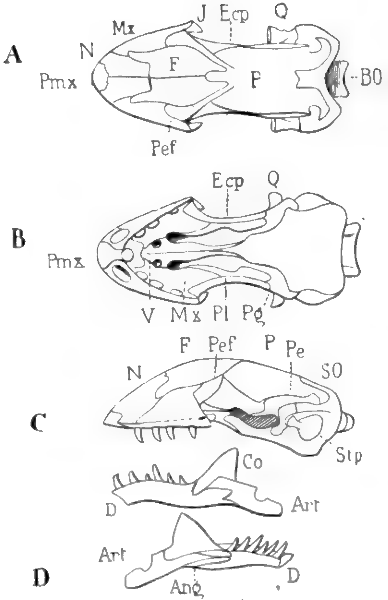
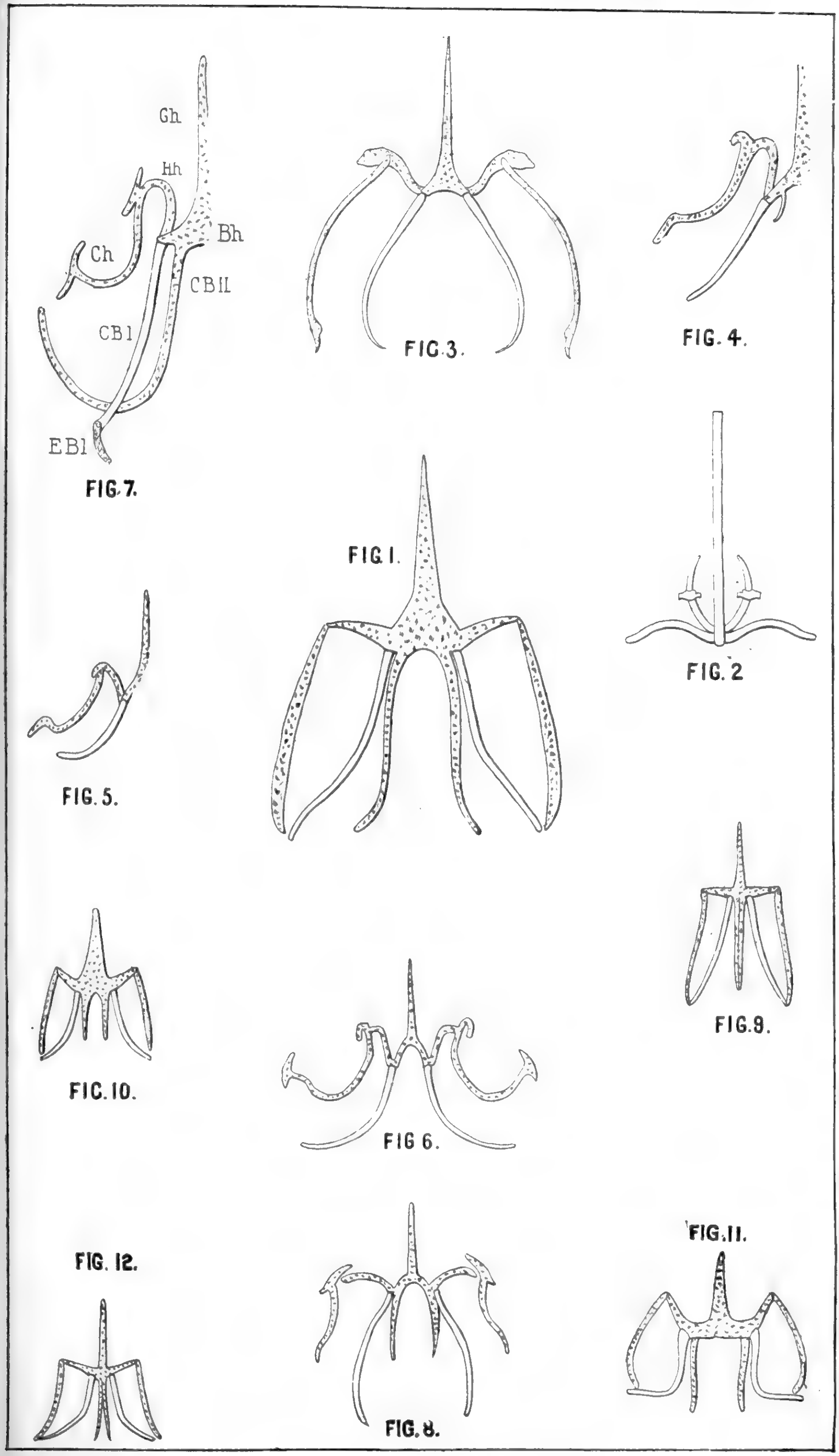
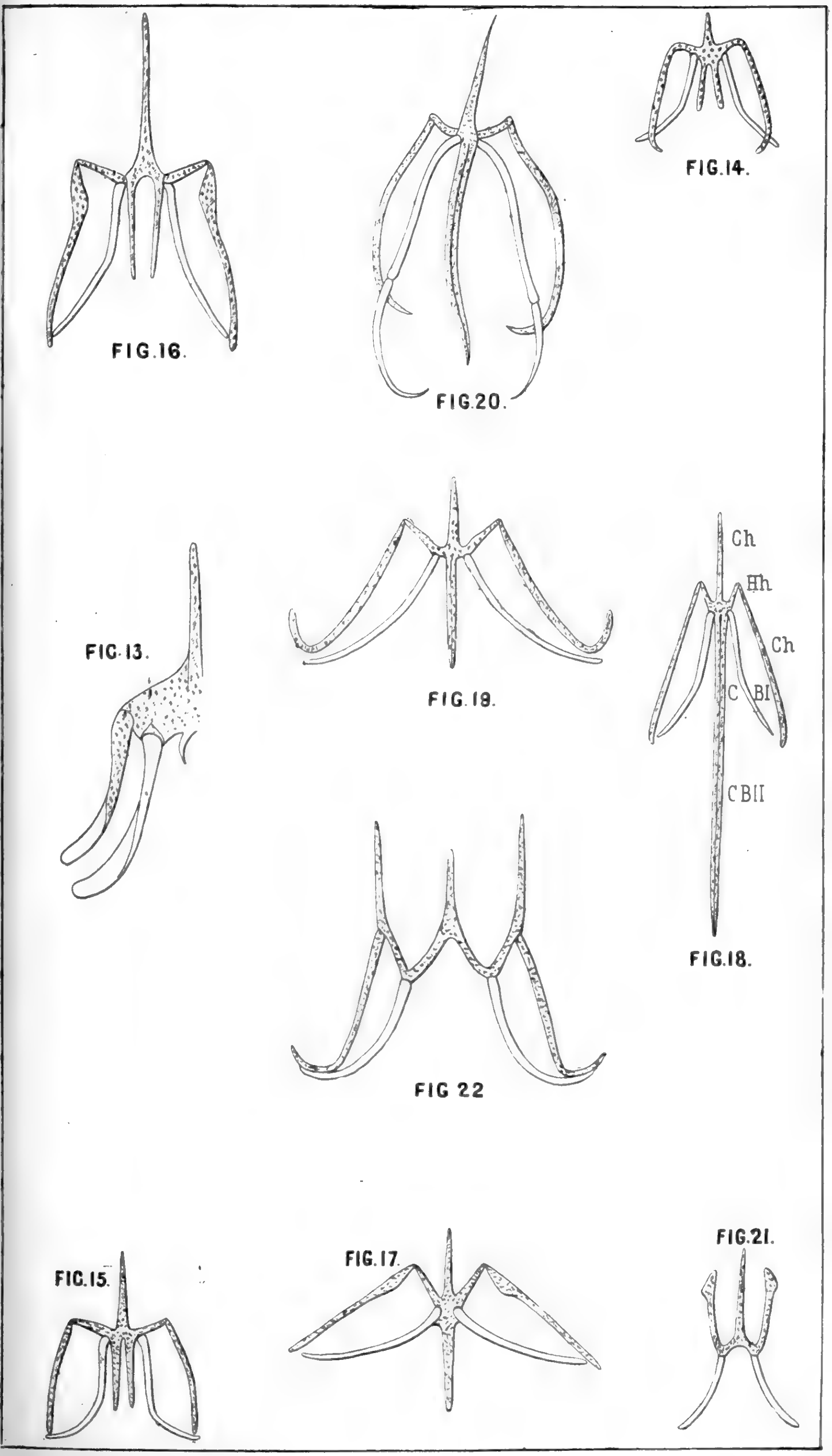


FIG 5

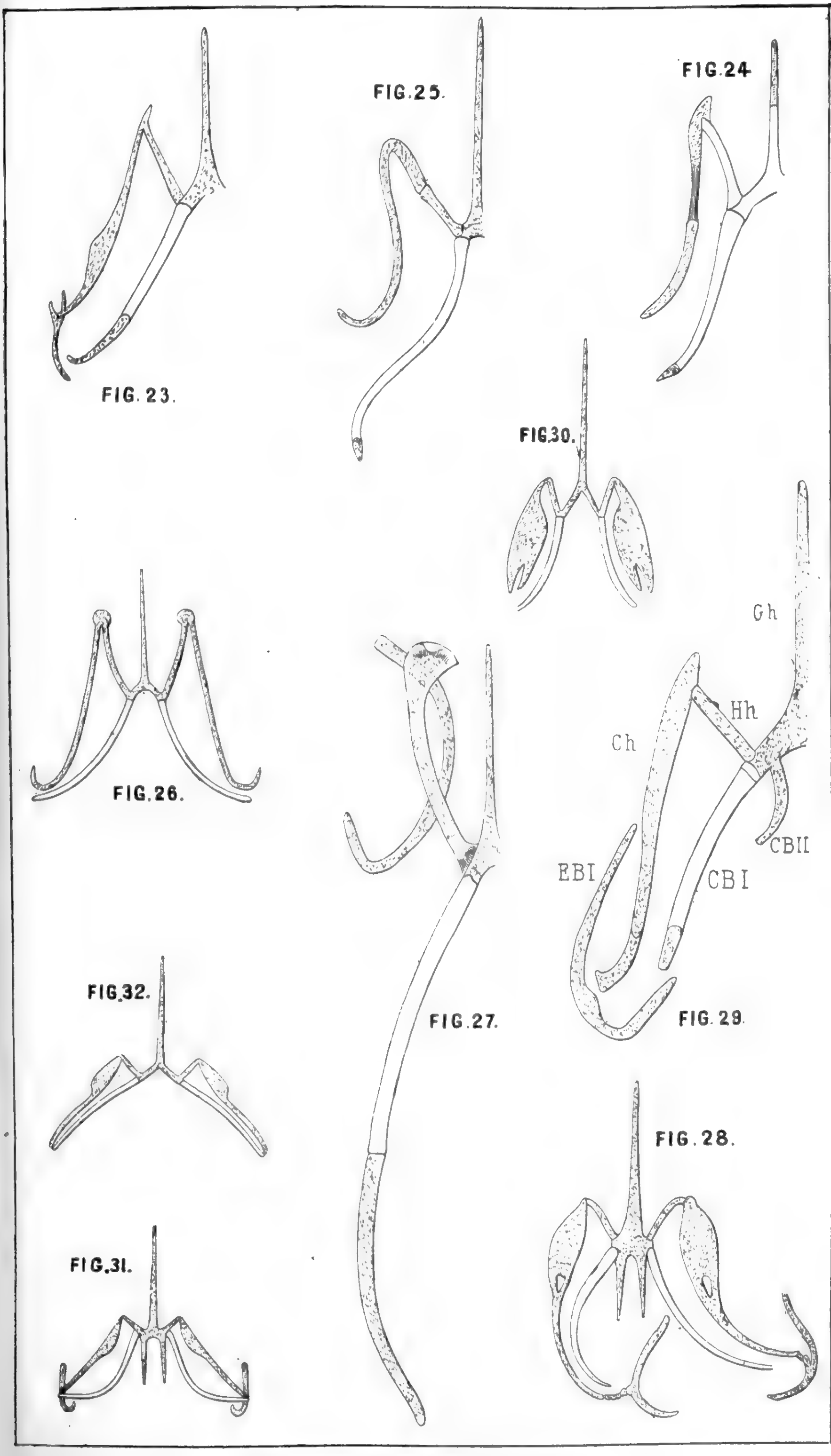
1–3, *Feylinia currorii*. 4, *Anniella pulchra*. 5, *Rhineüra floridana*.



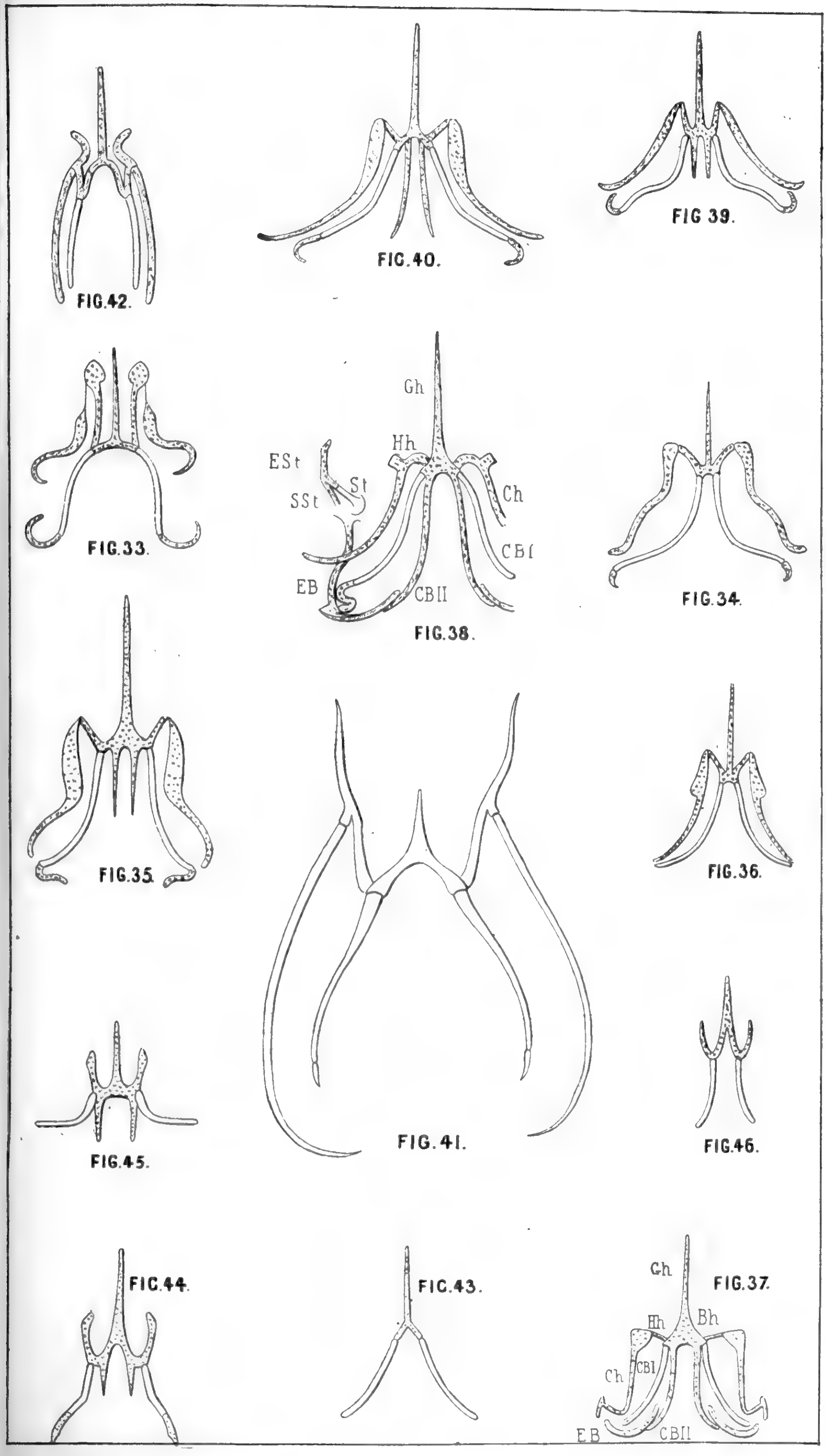
Rhiptoglossa Acrodonta Iguania.



Iguania. Diploglossa.



Diploglossa. Thecaglossa. Leptoglossa.



Leptoglossa Annulati.

Fig. 38. *Mancus macrolepis* Cope; × 3.
39. *Cnemidophorus tessellatus* Say ; × 2.
40. *Tupinambis teguexin* Daud.; nat. size ; from Cuvier.
41. *Xantusia riversiana* Cope ; $\frac{3}{2}$ nat. size.
42. *Anniella pulchra* Gray ; × 4; from specimen from James S. Lippincott.
43. *Chirotes canaliculatus* Bonn.; × 4.
44. *Amphisbæna alba* L.; $\frac{3}{5}$ nat. size.
45. *Rhineura floridana* Baird ; × 4.

Lettering.—Gh., glossohyal ; *Bh.*, basihyal ; *Hh.*, hypohyal ; *Ch.*, ceratohyal ; *CB. I*, first ceratobranchial ; *CB. II*, second ceratobranchial ; *Eh.*, epihyal.

On Some New and Little Known Paleozoic Vertebrates.

By E. D. Cope.

(Read before the American Philosophical Society, April 1, 1892.)

It has been long known that the Catskill-Chemung beds of Northern Pennsylvania contain a fish bed rich in specimens. This deposit has been traced from Warren, on the west, to Susquehanna county, inclusive, on the east. It is now known that at the close of the Chemung epoch, as at the close of the Devonian in Belgium and Scotland, land emergences took place, producing more or less continued brackish and fresh-water conditions. The latter received the deposits known as the Catskill in the Eastern United States, and these alternations with Chemung beds containing Chemung invertebrate fossils are now well established as facts of our geological history. A recent visit to Tioga and Bradford counties, in Pennsylvania, has recently afforded me the opportunity of inspecting some of the localities where vertebrate fossils occur. These have been already referred to by Prof. J. S. Newberry in his work on the Paleozoic fishes of North America. Guided by two geologists residing in the regions in question—Mr. Andrew Sherwin, of Mansfield, Tioga county, and Mr. A. T. Lilley, of Leroy, Bradford county—I had an excellent opportunity of observing the mode of occurrence of the fossils and of obtaining specimens. I wish here to express my particular indebtedness to these gentlemen for the aid they have rendered me.

The locality I visited, near Mansfield, is typical Catskill. The list of species obtained is not large. They are :

Bothriolepis nitidus Leidy.
Holonema rugosa Clayp.
Ganorhynchus oblongus, sp. nov.
Osteolepis or *Megalichthys*, fragments.

Holoptychius americanus Leidy.
Holoptychius giganteus Agass.

From Chemung beds near Leroy I obtained :

Holonema rugosa Clayp.
Holonema horrida, sp. nov.
Holoptychius filosus, sp. nov.

From another locality, probably Chemung, near Leroy :

Bothriolepis minor Newb.
Coccosteus macromus, sp. nov.
Osteolepis or *Megalichthys*, fragments.

At the last-named locality the specimens are very abundant, but mostly dissociated, so that it is rarely that two pieces of the same fish are found in their natural relations. The bed where they occur is in some places carbonaceous from the abundant organic matter deposited there. Fragments of the Osteolepid fish above referred to are abundant, but they are too scattered for identification.

To the species found in Pennsylvania, I add the description of a fine Megalichthys from the Carbonic of Kansas.

OSTRACOPHORI.

Holonema horrida, sp. nov.

This large species is represented by the nearly perfect mold of a plate whose position may be determined by the following considerations. It has almost exactly the form of the lateral plate of the specimen of the *Holonema rugosa* Clayp., to which I referred in describing the supposed pectoral spine of that species.* From the fact that the specimen referred to presents two median scuta, I have supposed that it is a part of the carapace. It is, however, true that the exposed surface of the long anterior median plate is acuminate in front, showing that the anterior lateral plates join anterior to it. This is not known to occur in the carapace, but is characteristic of the plastron. That this conclusion is correct is shown by the character of the median posterior scute of *H. rugosa*, shortly to be described. This being the case, it is necessary to admit that there are two median scuta, a character thus far unknown in the Antiarcha, and one which distinguishes the genus Holonema from Bothriolepis.

On this interpretation, the scute to be described is the posterior lateral of the left side of the plastron. It is about three-fifths the size of that of the *Holonema rugosa* and is considerably longer than that of the *Bothriolepis nitidus* Leidy. It differs from both species in its superficial sculpture. In the last-named species this is generally concentric to a non-central point. In the *Holonema rugosa* the sculpture radiates from a more or less central point. In the present species the pattern is longitudinal

* Proceedings U. S. Natl. Museum, 1891, p. 456.

from end to end of the plate. The anterior part of the external border of the plate is present in the rock mold, so that a cast of its surface was not obtained ; but, with this exception, the cast is nearly complete. On the middle of the plate, commencing at the anterior extremity, the ridges are least interrupted. Anteriorly they are oblique or slightly imbricate, looking outwards, and are connected at longer intervals ; near the inner border, but little connected. Posteriorly they are more direct and are more frequently joined by transverse connecting ridges. Near the middle of the external region the ridges so inosculate as to produce a non-linear arrangement of round pits. On the inner side of the plate the sculpture is finer and is longitudinally honeycombed.

	MM.
Total length of plate	120
Width at middle	60
Length of anterior internal border	90
Length of posterior internal border	47

In the roughness of its surface this species exceeds those that are known to belong to the Antiarcha.

Chemung bed, Bradford county, Pa., A. T. Lilley.

Holonema rugosa Clayp.

Newberry Paleozoic Fishes of N. Amer., 1889, p. 92.

Pterichthys rugosus Claypole, Proceeds. Amer. Philosophical Soc., 1883, p. 664.

Fragments of the exoskeleton of this species are common in the Chemung beds, and they are generally of large size, much exceeding that of any other species of the Bothriolepididæ. They are generally so much broken as to render their location difficult. I obtained from Mr. Lilley a number of fragments of such a plate, which, on reconstruction, proves to belong to the posterior median dorsal plate, enough of which remains to give a good idea of its form and sculpture. The anterior margin only is entirely wanting.

The plate is obtusely rounded at the median line, giving an obtusely roof-shaped form. It is relatively rather narrow anteriorly, and widens gradually to the posterior border, where it is also flatter. The edges (lateral and posterior) are rather thin, and the lateral are obscurely beveled below, as though to overlap the lateral posterior plates. The middle line below is openly grooved on the anterior half, while a longitudinal thickening marks the middle line of the posterior fourth below. The inferior surface is smooth, while the superior surface is sculptured with the parallel grooves characteristic of the species. These grooves extend to the lateral and posterior borders. The median ones are longitudinal and without interruption throughout the length of the fragment. Those on each side of the middle line diverge slightly and reach the margin, the lateral at an acute angle as far forward as the middle of the length of the fragment. From this point forward they diverge in a direction gradually approaching and thus reaching a right angle with the margin. The transverse grooves form a band which increases in width anteriorly until it is nearly one-third the width of the plate in front. The grooves are fine and are separated by interspaces wider than themselves. They become coarser anteriorly, the interspaces measuring 1.5 mm. ; posteriorly they measure 1 mm.

The middle line above shows some unsymmetrical low tuberosities which do not correspond to cavities on the inferior side. The plate is generally thin.

Measurements.

	MM.
Length of fragment	222
Width of plate at front of fragment	110
Thickness of plate at front of fragment	5
Width of plate at posterior border	120

This piece, together with the pectoral limb which I have already described, demonstrates the position of the genus to be with the Antiarcha, and not with the Arthrodira, as has been suspected by Mr. A. S. Woodward.

Chemung, Bradford county, Pa., A. T. Lilley.

Bothriolepis minor Newb.

Paleozoic Fishes of North America, 1889, p. 112 ; Pl. xx, Figs. 6–8.

Fragments of this species are exceedingly abundant in the Chemung rocks in Bradford county, but generally dissociated. The examination of a large number of these demonstrates the correctness of the generic references made by Prof. Newberry. The most abundant pieces are the lateral ventral plates, the anterior median dorsal plate, and the median occipital. The latter sometimes remains in conjunction with the plates on either side of it.

These specimens are unaccompanied by any trace of scales or fins, thus agreeing with other species of the genus. There is also but one median abdominal plate, showing that the *B. minor* is not to be referred to Holonema. One of the characters of the species is seen in the fact that the sensory grooves of the median occipital plate do not extend to the smooth articular border, but are separated from it by a band of sculpture. The premedian plate is crossed by a groove which presents an abrupt loop backwards at the middle. The species always remains much smaller than the *B. nitidus* Leidy (*B. leidyi* Newb.).

Leroy, Bradford county, Pa., A. T. Lilley.

DIPNOI.

GANORHYNCHUS OBLONGUS, sp. nov.

Established on what is either the symphyseal element of a mandible, or a median bone of the superior mouth-arch. It consists of an oblong trough-shaped plate with a thickened, somewhat revolute border, which is concave in two directions ; that is, in the direction of the concavity of the trough, and as a concavity of its free margin. This form indicates that it occupied an oblique position, like the elements mentioned, so that the thickened surface should fit closely the corresponding elements of the opposite jaw. There is no enamel covering the masticatory border, but this may have scaled off. There are no lateral denticles as in the Holodus of Pander. As compared with the *G. beecherii* of Newberry, this bone has the length relatively much greater as compared with the width. The width in that species exceeds the length several times, while in the *G. oblongus* the width but slightly exceeds the length. The concavity of the masticating border is greater ; the size is very much less. As compared with the *G. woodwardii* Traqu., this species is very much smaller ; there are no "nareal" notches ; and no tubercles on the edge.

The sides of the body of the bone are nearly parallel, and the posterior border is gently convex. Two layers are visible ; the interior one, like the external, has a coarsely punctate surface.

		MM.
Length	at middle	9
	at border	10.5
Width	at proximal extremity	8.5
	at masticatory extremity	13.5

From near Mansfield, Tioga county, Pa.; from the Catskill formation. From Andrew Sherwin.

TELEOSTOMATA.

COCCOSTEUS MACROMUS, sp. nov.

Fragments of this species are abundant in the Chemung rocks at Leroy, and I select as typical of it a pair of supraclavicular and adjacent pieces, which display its characters best. The supraclavicle has lost the condylar articulation. Both extremities display the unsculptured surface, and the usual groove extends obliquely across the sculptured portion at about two-fifths the length from one of the extremities. The sculpture consists of obtuse tubercles with delicate radiate-grooved bases, which are usually separated by spaces equal to their own diameters, sometimes by narrower spaces, but never by spaces which are wider. At some points they have a linear arrangement. This sculpture is coarser than in the *C. americanus* Newberry (see the Paleozoic Fishes of North America, by this author), but resembles that of the *C. decipiens* Agass. of Scotland. From this species the *C. macromus* differs in the elongate form of the supraclavicle, which is relatively short and wide in the *C. decipiens* (see Agassiz, in the Poissons de la Vieux Gres Rouge, and Zittel, Handbuch der Paleontologie).

	MM.
Length of supraclavicle......................................	35
Width just above condyle......................................	16

Associated and in contact with these pieces are two acuminate oval bones which may be opercula. Each is pierced by a groove. They display the inferior side, which is smooth.

MEGALICHTHYS MACROPOMUS, sp. nov.

Established on the greater part of an individual from the Carbonic system of Kansas. With the exception of a short interval just behind the head, the specimen is complete as to its length ; the pectoral and ventral fins are damaged, and the extremity of the anal is broken off. The scales of one side of the body only are visible in the present state of the specimen, and a good many of those of the abdominal region are lost.

The general characters may be enumerated as follows : The form is slender. The scales are large and rhombic, with rounded extremities. The supratemporal (cheek) bones and opercula are very large, and are much extended posteriorly. The enamel is present on the superior aspect of the skull in small and irregular patches only, but it covers the rest of the external surfaces. It is everywhere closely and minutely impressed-punctate. The bones of the skull are thin and light.

The elements of the skull are distinguishable for the most part, the sutures being obliterated on the nasal region. The pterotics (squamosals Traquair) are longer than the postfrontals, and the parietals are longer than the frontals. The supratemporals (cheek-bones Traqu.) are very large, extending posterior to the posterior border of the parietals. The intercalaria are large (supratemporals Traqu.). The opercula are very large, and in this specimen they are shoved upwards so as to overlap at the median line. Their length enters the total length of the skull, three and a half times, and is a little greater than that of the parietal bones. Their superior margin is leveled off from a low longitudinal thickening, from which some low wrinkles radiate downwards. Enamel is present on the superior surface of the skull, on the border of the frontal bone posterior to the orbit, and on the anterior part of the postfrontal bone. There are grains of enamel scattered on the parietals. On the supratemporals there are closely placed concentric interrupted lines on the superior part, and irregular patches of larger size on the inferior part. There are large patches of enamel on the opercula. The superior bones of the skull are everywhere roughened with minute tuberosities, which fuse into transverse ridges on each side of the sagittal suture. The maxillary bones are displayed partly on the superior, partly on the inferior faces of the specimen. They are rather slender, and their distal extremities are broken off.

There is a short pyriform symphyseal, entirely enclosed by the mandibular rami, and a median gular bone which joins the gulars with a concave suture. The gulars are large, and measure three times as long as wide at the middle. They are cut off obliquely on the inner side posteriorly, by the chevron-shaped arrangement of the pectoral scales. Several large external gulars. The posterior extremities of the mandibles are broken so that their proportions cannot be exactly ascertained, but the length preserved is six times the width opposite the anterior gular. The surface of their inferior portions is marked by coarse impressed punctures besides the usual minute ones. The former are not present on any other part of the fish.

The scales are large; between the bases of the pectoral and ventral fins can be counted about twenty-one rows, and between the ventral and the first dorsal immediately above, eight rows. The first dorsal fin is above the ventral, and the second dorsal above the anal. There are two large scales on each side which embrace the base of the first ray of the first dorsal and anal; the other fins are too imperfect at the base for description. The caudal fin is shortly heterocercal, and there are six broad fulcral scales protecting the side of its inferior border. In all the fins the rays are segmented. A half dozen rays near the border are coarse, but the remaining rays are finer. In all the fins the coarse rays are distally subdivided.

Measurements.

	MM.
Total length of specimen (20 mm. intercalated behind head)	950
Length to anterior border of orbits	45
Length to posterior border of parietals	143
Length to posterior border of operculum	230
Length to anterior base first dorsal fin	620
Width between orbits	33
Width of parietals + postfrontals anteriorly	38
Width of parietals and pterotics posteriorly	75
Length of symphyseal bone	15
Length of anterior gular	13
Length of gular	120
Length of first dorsal fin	110
Length of caudal from inferior base to superior free apex	135
Depth of body at first dorsal	85
Depth of body at second dorsal	50

This species is not nearly allied to the species from the Permian of Texas, the *M. nitidus* Cope, which is smaller and more robust in form. It has its scales and ganoine, generally, perfectly smooth, and there are but fourteen rows of scales between the pectoral and ventral fins. From the European species with punctate ganoine it differs in the longer gular bones and more elongate head, so far, at least, as concerns the *M. hibbertii* and *M. laticeps*. In *M. pygmæus* the scales are described as coarsely punctate by A. S. Woodward. Its dimensions are about equal to those of the *M. hibbertii*. The crescentic ganoine scales of the muzzle of that species and the *M. nitidus* are absent from the *M. macropoma*.

I owe the opportunity of examining the beautiful specimen which is described above to my friend, Mr. R. D. Lacoe, of Pittston, Pa., whose collection of Paleozoic fossils is so valuable, and has been of such utility to students of the subject.

(?) Holoptychius filosus, sp. nov.

Represented by a large scale which has a peculiar and characteristic sculpture. But a small part, if any, of the proximal border is smooth. There is an area of coarse tubercles whose centre marks the proximal fourth of the long diameter, and whose vertical diameter somewhat exceeds the longitudinal. From this area there radiate in all directions to the circumference, ridges, of which the proximal are very coarse, but which become finer to the posterior side of the central area. The longer and finer ridges divide dichotomously at various points as they approach the border, the division being most conspicuous in two lines above and two below the longitudinal middle line. The ridges are quite fine and are separated by spaces rather wider than their diameter, except proximal to the area, where the reverse is the case.

This species is represented by a mold from which a cast has been made. The distal border is evidently thin, and has been more or less broken, so that its outline is not certainly known. The following longitudinal measurement may, therefore, require revision at some future time.

		MM.
Diameters of scale	longitudinal	(?)63
	vertical	65
Diameters of tubercular area	longitudinal	10
	vertical	15
Width proximal to area		9
Five distal radii in		5

It will be observed that this is the equal in dimensions of the largest species of Holoptychius known. Its sculpture serves to connect the species of the *H. nobilissimus* type with those of the group Glyptolepis. The apparent absence of proximal smooth border may be due to accident, as the border is not complete ; but it is, in any case, narrower than in the known species.

From the Chemung beds of Leroy, Bradford county, A. T. Lilley, I have, like Prof. Newberry, obtained the *H. americanus* Leidy, and the *H. giganteus* Agass., from the Catskill beds of Bradford county, Pa., through Mr. Andrew Sherwin, to whom I am under many obligations.

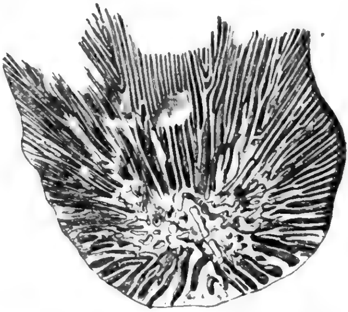


FIG 3

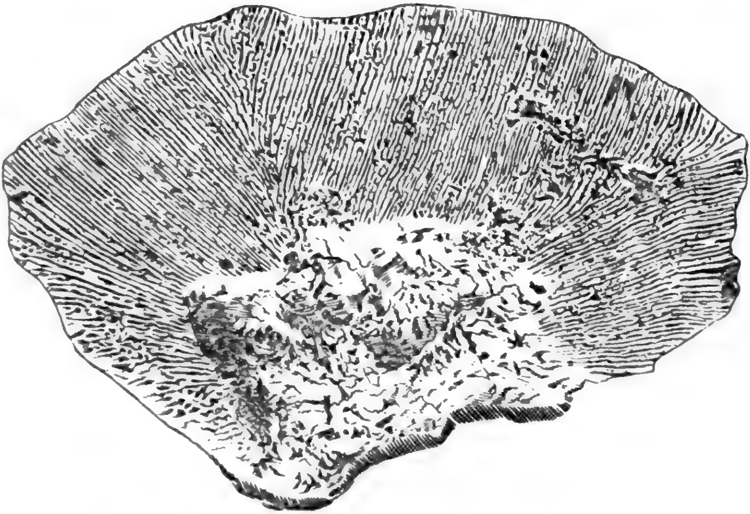


FIG. 2

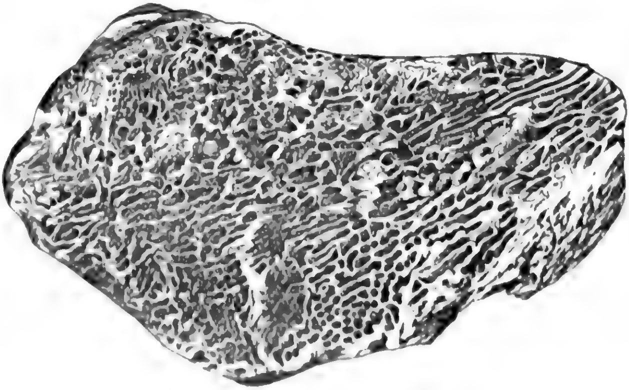
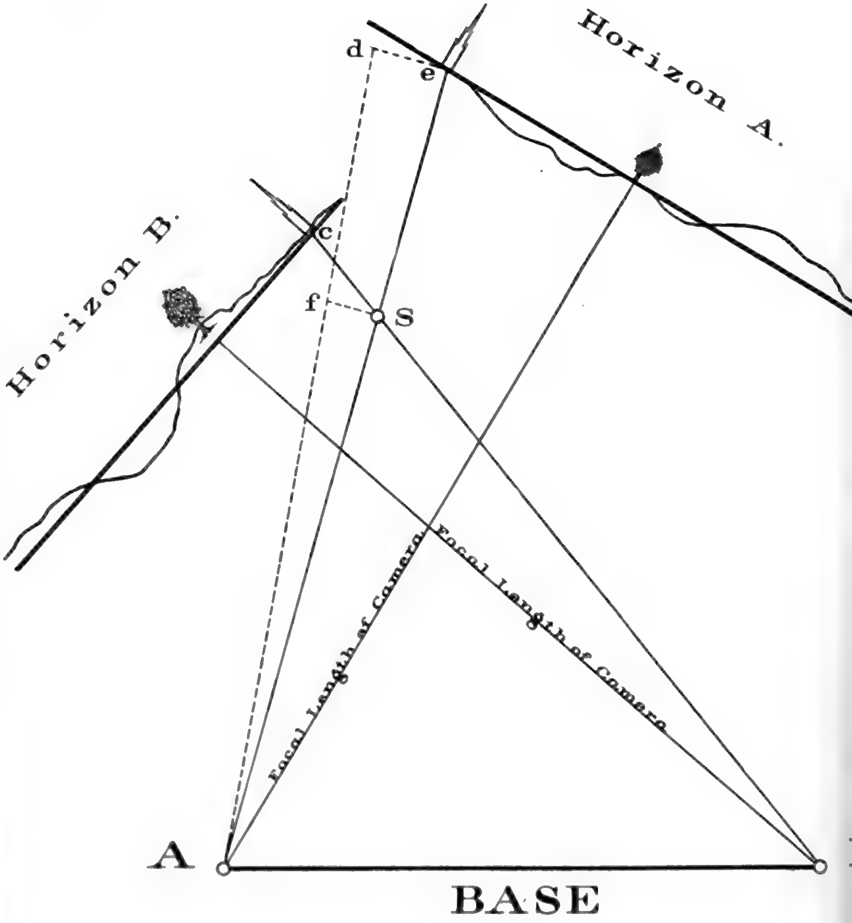


FIG I.

Megalichthys macropomus Cope.


Horizon A.
Horizon B.
d
e
c
f
S
Focal Length of Camera
Focal Length of Camera
A
BASE

Explanation of Plates.

Plate VII.

Fig. 1. *Holonema horrida* Cope ; lateral ventral plate ; two-thirds natural size.

Fig. 2. *Holonema rugosa* Claypole ; lateral ventral plate ; one-half natural size.

Fig. 3. *Holoptychius filosus* Cope ; scale ; two-thirds natural size.

Plate VIII.

Megalichthys macropomus Cope ; skull from above ; about three-fourths natural size ; from the collection of R. D. Lacoe.

Civil and Military Photogrammetry.

By R. Meade Bache.

(*Read before the American Philosophical Society, May 6, 1892.*)

Photogrammetry is recognized as a legitimate mode of surveying. It is, in fact, if practiced with due regard to the limitations involved through spherical aberration from object-glasses of too wide aperture, a mode of surveying of considerable accuracy, although not for a moment to be compared to other perfected modes of the present day. It can never rival these in their sphere, which is the sphere of extreme precision, but at the same time it must be admitted that, within its own, it is capable of doing good service.

The diagram on the blackboard has been made as simple as possible, to illustrate the mode of obtaining a single vertical and a single horizontal determination. It is evident, however, that the sectors of horizon and intervening landscape belonging to each picture, assumed to have been taken from the respective stations, *A* and *B*, might be filled with objects. Many of these, from the fact of their having been visible from both stations, would be determinable by this method of cartography.

AB is a base to serve for the determination of some of the details of a survey. The optical axis of the camera being set at each station respectively upon a prominent, distant object, say a lone tree, the angle at each station between the base and that object is taken.

The rays of light *eA* and *cB*, respectively, proceed from a steeple to the photographic points of view *A* and *B*. The intersection of these rays at *S* gives, according to the scale of the plotted base, the horizontal position by scale of the steeple with reference to those points of view.

In deference to a misunderstanding of which I heard lately, as to the relations of the horizons to each other, as represented in this diagram, I shall endeavor to preclude it now by calling attention to the fact that the horizons are here laid down as to direction, but in order to secure the utmost simplicity in the diagram, not as to their possibility of lateral extension. Objects, for instance, in the middle distance of the steeple, as seen in elevation on horizon *A*, from station *A*, would, at station *B*, fall to the left of the steeple, as seen in elevation on horizon *B*. Conversely, objects in the general direction, and in the background of the steeple, as seen in the elevation on horizon *A*, from station A, would fall to the right of the steeple, as seen in elevation on horizon *B*, from station *B*.

The chief method of photogrammetry in use at the present time is illustrated by this diagram, and is based on very simple principles. The angles and distances obtained in ordinary surveying are merely natural or artificial selections. They are merely arbitrary subdivisions of space, convenient selections from an infinite number of similar elements. But it is also true that, the relations of a few of those elements being judiciously selected and determined, all others secondarily deduced fall into harmony with them. The photographic camera, however, as compared with other surveying instruments, does not lend itself at first to selection, but giving all visible nature from various points of view, enables the employer of it finally to make his selection from the resulting pictures, as if from nature itself.

From all points of view, then, angles and distances exist in nature, and although they apparently change, as the observer changes place, the correspondences among them, as seen from all points of view, are perfect. Hence, if we delegate to the photographic camera the duty of making a permanent record of nature, as seen from two or more points of view, the intersection of the rays of light, reaching those points of view respectively from the same objects, as pictured in photographs properly placed, will, by their intersection on paper to become a map, give the positions of those objects relatively, as plotted, to the points of view and to one another.

Occupying with a photographic camera the points formed by the termini of a base line on the surface of the earth, having on its photographic plate imaginary vertical and horizontal lines, susceptible of being developed into real ones, the intersection of these lines corresponding with the centre of the prospective picture (the former enabling the operator to set the camera accurately to any horizontal direction, the latter giving, when the camera is leveled, the horizon for each picture), the camera is fixed in turn at the two stations upon some distant determinate object by its line of sight, its position being otherwise so adjusted that the objects to be determined in the landscape, within a given sector of the horizon, shall appear on the picture as taken from each of the two stations. The azimuth of the base line, and of the lines of sight from it, being determined by the theodolite, field transit, or compass, the survey for a particular sector of the horizon at the two stations lacks but one factor to make it complete, as soon as the pictures shall have been taken by the camera. The camera has given, by its occupation of the two stations at the ends of the base line of assumed length, only one portion of the data necessary to constituting a survey, namely, the angles subtended in nature by the various objects which come within the scope of both resulting pictures. A very simple addition, however, suffices to make the survey complete. To secure that, to introduce the element of scale, it is necessary to know the length of the base line. The scale to which the base line is plotted on paper becomes, then, through the acquisition of knowledge of the length of the base on the ground, the scale of the whole resultant map; which, it should be incidentally noted, must range by scale no further from each station than to a distance where rays of light to the two stations give good graphical intersection, the extent of the range by scale being conditioned upon the length of the rays by scale relatively to the length of the base line by scale.

Not only do rays proceeding from the same object, as introduced on two pictures properly placed, give by their intersection the horizontal position by scale of the object with reference to the base, but the angle subtended on any pictorial horizon by two objects, as seen from the properly plotted point of view of that horizon, represents on a map the actual visual angle as seen from that point of view in nature. In fact, the latter truth is that which is in nature the fundamental one in this connection. It is axiomatic that the visual angles in nature between all objects whatsoever, as projected on a given sector of the horizon, as seen by the eye of the observer, or that of the camera, from a given point of view, are the true angles between those objects, and that their sides, converged at the point of view, represent the true directions of the rays from those objects, corresponding with a base in nature with reference to which their angles are either directly or indirectly, in this case indirectly, known. Therefore it is because, in a *single* picture, the angles between different objects, in fact between all objects there, at the distance of the focal length of the camera, as seen in the picture from its plotted point of view, are the same as in nature from its point of view, that the intersection of rays from the same object, as seen on *different* pictures, placed in position corresponding with the way in which the landscape was photographed from nature, must represent by scale the horizontal position of the object as it stands in nature. That is to say, if what we see from one point of view in nature is true by angle, and also by angle true, although different, as seen from another point of view in nature, then the intersection of the individual rays, by means of which we have seen the objects in their angular positions with reference to each other, must represent their true horizontal positions with reference to the base which we have traversed between our respective points of view. And if this holds good with respect to nature, it must hold good with respect to corresponding pictures of nature, placed horizontally with relation to each other as nature had presented itself from those individual points of view from which the pictures were taken. The result, expressed as a surveyor would state the case, depends upon the fact that, if a point lies somewhere on a line, and also somewhere on a line intersecting the other, then the point will be at the intersection of the two lines. In this case the two lines are simply the visual rays, shown in the respective pictures, in the positions and with the angular effects as seen in nature, intersecting each other on their passage to the respective points of view.

In practice, a round of pictures, each taking in a certain sector of the horizon and intervening landscape, and slightly overlapping one another, is made to cover the tract of which it is contemplated to execute a survey, and the area comprised by them is pictorially duplicated from one or more stations. It is always desirable that the same objects shall be seen, if good intersection of rays can be secured from the different pictures, from three stations instead of two, because an error in one of the azimuths at the end of a single base, which of course gives only two lines for an intersection of rays, would vitiate a whole survey, whereas, with two bases, involving three points of view, and the intersection of three rays, accuracy throughout a survey receives a crucial test. The adoption of this plan, which is like that employed in ordinary triangulation, is also desirable on account of its securing accuracy of plotted results; because graphical differences in the positions, as given by the intersection of only two lines, are virtually eliminated by obtaining for intersections the mean positions as derived from three lines.

The survey, so far as the instrumental part of it is concerned, being complete, it only remains that the plotting of it shall be done. The base line being laid down to scale on paper, lines are drawn from its termini, at the angles with it represented by the azimuths of the lines of sight as determined there on the ground. On this representation on paper of the lines of sight, at the respective plotted stations, are placed, at right angles, printed on thin paper, the photographs taken at the two stations, in such manner that the individual plotted line of sight shall point on the photograph upon the representation of the object upon which the real line of sight was directed in nature, after that representation shall have been vertically projected on the horizon line of the photograph, and that the horizon line of the photograph shall be distant from the individual plotted station by the focal length of the particular camera that was used in taking the pictures. The eye then, placed in position over a plotted station, and looking at a photograph corresponding to the view taken from that station, sees, as already demonstrated, that view under precisely the same angular effect as the view is presented by nature on the ground. Consequently, as angles formed by rays of light with the base line are given truly in nature, are also given truly by the camera, and are now given truly as plotted on paper to become a map, the intersection on that paper of these rays, as proceeding from the pictorial representation of the objects from which they are derived in nature, after their pictorial source has been vertically projected on the horizon line of the photographs, will be the positions of the objects on the map, with due relation by scale and angles to the stations of the base line and to one another. The contemplated map will, in a word, be susceptible of being drawn throughout to scale. It is clear that a great number of objects may be thus plotted from two stations representing the ends of a base line, and that if we know the length and azimuth of a base line, and the azimuths of the lines of sight from its termini, the elements of scale and orientation will inhere in all the resulting work that goes to form a map. Used for the function described, the photographic camera is therefore very aptly called the camera-theodolite.

Adopting the same diagram to illustrate the mode of determining height by the camera-theodolite, we see the steeple, as observed upon from the point of view A, having the ray eA coming from the photographic position of the steeple as projected on the horizon line of the photograph taken from A. Draw from the point e the height of the steeple, as derived from the photograph taken from A, perpendicularly to the ray eA, and draw also the hypothenuse Ad. Any one intuitively perceives that the pictorial height of the steeple being ed at e, at the end of the focal length of the camera, its height at S, the horizontal position by scale of the steeple, must be Sf, and that that by scale is the true height. The length of the line Sf may therefore be obtained numerically by applying to it the scale of the base, which may be the scale of a whole map. With a greater degree of precision the same result may be reached by computation, because $Sf = AS\frac{ed}{Ae}$; $\frac{ed}{Ae}$ being the tangent of the vertical angle $d\ A\ e$, and AS the distance from the point of view A to the steeple S.

Of course the height of any natural as well as of any artificial object above the plane of the horizon may be ascertained by similar means. A steeple was chosen to illustrate both horizontal and vertical methods of determination, because it affords points that are so conspicuous as compared with those of many other objects that offer themselves to the sight in most surveys.

Surveys from this kind of photogrammetry may be plotted to any scale, within reasonable limits of size, by adopting for the base line of the survey the scale desired. In all cases, however, the photographic pictures must, in order to enable them to present correct angles for the map, be placed in the manner already prescribed, on the respective horizons as plotted on the paper to become a map.

Balloon photogrammetry has been practiced to some extent ever since the invention of the photographic dry plate. This method, however, has belonged rather to the sphere of reconnoissance than to that of surveying. When some prominent objects appear on the landscape, whose geographical relations to one another are known, the balloon photographic product may be of considerable value, if too large a circle has not been included by the camera; and this method indicated, if the desirable conditions are strictly fulfilled, may be utilized to advantage if the resulting map is not required to be of rigid accuracy. When, however, such objects are very remote from one another, even when their geographical positions are known, the spherical aberration resulting from employing a large aperture of object-glass makes a product which cannot be regarded as of high value, one which cannot properly be dignified with the name of survey in the restricted sense of the term, and to which we should prefer to apply the name of reconnoissance. Without adjusted height for the camera, without near objects of known geographical relations to one another, to obtain orientation for the results, without precise regulation of the angular aperture of the object-glass of the camera, nothing can be produced by balloon photographic process that, in the restricted sense noted, merits the name of survey.

It is on account of my perception of this low estate of balloon photogrammetry that my attention is especially drawn to devising a method of applying the art upon true principles. By my method the balloon must be captive, not free, and being captive it may be made quite small, easily managed, and inexpensive, thus rendering its employment practicable for ordinary use, especially as, according to the plan sometimes adopted in the case of the military captive balloon (to the consideration of which we shall presently come), the gas requisite for inflating the balloon can readily be carried under high pressure in metallic cylinders.

The traverse line of land surveying is merely a zigzag course, consisting of stations, the angle between each successive three of which, and distance between each successive two, is measured. From these stations details of the terrene are generally procured.

To enable a traverse line to form a portion of a general survey, there must be means adopted to place at least its initial and terminal points in relation to that survey, whereby all intermediate points fall into due relation with it.

This premised, I will now describe how my plan for introducing precision into balloon photogrammetry could be applied in various useful ways for delineations of portions of the earth's surface.

The appliances needed for carrying out the plan are a small spherical balloon capable of supporting a light photographic apparatus, swung in gimbals, and protected from injury in descent by a thin encircling cylinder of metal or of wood. A zone of cord would pass horizontally around the balloon, to which would be attached four equidistant guys of the size of codfish lines. A broad colored stripe would pass vertically around the balloon. From below the balloon would depend reophores enclosed in a graduated cord, the graduation serving the purpose of adjusting the balloon to any given height above the earth. The reophores would be electro-magnetically connected with the shutter of the camera, actuated from the ground by a small, but strong, galvanic battery.

The balloon, being inflated, would be compelled, by means of the four equatorially fastened guys, to assume a position regulated as to height by the graduated cord. This height will have been previously determined upon with reference to the scale of the map that may be desired, the focus of the camera having also been adjusted with reference to the contemplated height of the instrument above the earth. The position of the balloon would be over the middle of a given link of a traverse line, the orientation of the camera being secured by causing the vertical stripe on the balloon to range along the given link of the traverse line. Two disks, made of hoops covered with white cotton cloth, one of which should be larger than the other, would give on the photograph, points representing the termini of the link corresponding to those on the ground, and the direction in which the link, as a portion of the traverse line, is lying.

A very low grade of accuracy could be obtained by the balloon photogrammetrical process by the method of omitting all angular and linear measurements on the ground, and letting the balloon camera, placed in a generalized position with reference to the parts of a traverse line, accomplish the whole work of determining the angles and directions of the parts of the line successively submitted to its operation, as well as of delineating what it must perforce include by the photographic process in the representation of the details of the subjacent terrene. In this method the end link of a given section of the line would have to be duplicated in the advancing survey of the line, so that the relations with one another of all parts of the line should be maintained. If, additionally, the azimuth of one of the links of the line were obtained, it would communicate azimuth to all the other links. But this method can, at best, be recommended for nothing beyond the requirements of reconnoissance.

The photographing of a link of a traverse line in the precise manner first described involves, of course, the necessity that the balloon and each of the two stations representing the link over the middle of which it is floating, should be intervisible. A similar condition, as between the two stations as viewed on the ground, is indispensable. It is evident, however, that if there are trees or other obstructions on the ground, the stations might be intervisible below, and yet that each might not be intervisible with the balloon. Consequently, as not only these conditions but the condition of ample space for the management of the guys must be fulfilled, precise operations with the balloon imply the existence of open ground, or ground substantially free from obstructions to sight.

In proportion as the balloon is allowed to attain a greater and greater height, so as to include more and more of the earth's surface, the scale of the resultant map would become smaller and smaller, and the apparatus more and more unmanageable, because at a great height the guys cannot be maintained at the angles requisite to control its exact position. Therefore, it will in practice probably be found that heights of from three hundred and fifty to five hundred feet will be those most convenient for surveying by this method.

One gain made by elevation is more than counterbalanced by the loss of the clearness of delineation that belongs to a large scale. It is evident that, at moderate heights, the photographic projection of an abrupt rise of ground or other object, as, for instance, a house, on the plane of the photograph is at a greater distance by scale from the vertical passing through the balloon than it should be as related to nature, but that, as the height of the balloon above the earth increases, this error proportionately decreases. Therefore, for the moderate elevation that must be adopted for the balloon in order to manage it, we must, with broken surface, accept greater error in delineation than would attach to the same surface if greater elevation of the balloon were permissible. But we should be reconciled to this fact from the consideration that, even were it possible to manage the balloon at the height which would virtually eliminate the error of projection mentioned, the scale of the resulting map would be so small as to approach in character the results of a reconnoissance. Another circumstance should reconcile us to the insuperable fact mentioned, and that is that there are thousands of square miles in our country where, from the very fact that the surface is essentially level, the optical difficulty attaching to moderate elevation for the balloon would not exist.

Such a survey, by balloon photogrammetry, as that described could be very easily plotted by final process of photographic printing. In consequence of the fact that the balloon would be kept at a fixed height throughout a given survey, the scale of the links of the traverse line would be established through the photographic presentment of the length of those links. The scale of those links may also be fixed by the measurement of them on the ground. So the photographic scale and the other scale may be made the same, and therefore they would be made the same. The traverse line having finally been laid down on helios paper, before the paper is sensitized, the paper would then be sensitized, and the photographic plates representing the links of the traverse line would be simultaneously adjusted upon it along the traverse line as plotted, one scale, as derived from adjusting the balloon at a certain height, and the other scale, virtually the same, as derived from linear measurement along the ground, being made to accommodate themselves graphically to each other, thus eliminating error in the resultant map. This resultant map, if the picture of a plane surface, would have but one defect, that of exhibiting minute triangles of blank space where the photographic plates, cut off so as to fit along the links of the plotted traverse line, would necessarily not fill out entirely the delineation of the ground at those points, although otherwise perfecting it elsewhere, from the fact that they would form with one another a continuous series.

The captive balloon, if used only on days fit for ordinary field work, would occupy a position of almost stable equilibrium, if its power of flotation were sufficient, not only to support the photographic apparatus, but to strain upward upon the controlling guys, because the attachment of the guys would be made to the equator of the balloon, and the weight of the dependent apparatus would be close to its periphery, and therefore to the centre of the spherical figure of the balloon. In addition, for the purpose of increasing the stability of the balloon at the critical moment of taking a photograph, the operator would steady it with a gentle draught upon the dependent cord containing the reophores, at the precise point of time when he makes the electrical contact with the shutter of the camera.

I here conclude the description of that one of my proposed additions to the art of photogrammetry which relates to precision of results obtainable from it for a continuous line of survey, and invite your attention for a moment to a method I suggest of using a similar captive balloon in a manner which would be useful in military operations. It need hardly be said that, whether captive or not, balloons have heretofore been used at great disadvantage in military operations, unless we except the use made of them for escape, with indirect reference to those operations during the recent siege of Paris. If the free aëronautic balloon passes over the enemy at such a distance as to make useful what can be observed from it, the glimpse is but transient, while its nearness and immense volume place it in great danger. If, on the other hand, a captive aëronautic balloon be used for military observation, it must ascend far from the enemy, to a height which measurably neutralizes the accuracy of the information sought.

The use for military purposes of a modification of the small spherical captive balloon which I have described would be conditioned solely upon the circumstance that the wind should be blowing towards the enemy's lines. The only change in it from the one described, that would be entailed by its new purpose, would be that it should be mounted with a simple network similar to that which is used on the kite, and to which the string for flying it, fastened similarly to the way in which it is fixed on the kite, should be attached. This string, with which the balloon would be flown like a tailless kite, would contain ordinary filigree reophores, through whose instrumentality the photographic shutter of the camera would be controlled by the operator. Lying several hundred yards away, or even a mile or two, if desirable, outside of an enemy's lines of circumvallation, or line of battle, with the wind blowing in his direction, the balloon could be sent up with ballast proportioned to the general elevation intended for its soaring over his position. I have said "general elevation," because change of volume in the balloon, in accordance with the change of temperature, or increased weight on it, from an accession of moisture, preclude the possibility of calculating upon obtaining precise predetermined elevation for the balloon. The weight of the string for the length to be paid out to the contemplated distance would of course enter into the amount of ballast needed to secure an approximately special elevation at a special distance. The distance to the enemy's position being known, and the vertical angle being taken to the balloon from its point of departure, when it is approximately delivered at its destination, the exact remaining length of string, with allowance for sagging, necessary to pay out so as to cause the balloon fairly to dominate the enemy's military works or line of battle, would at once be known by a simple computation, or could be taken from a table of angles and distances. This operation being completely performed at several points along the opposing military lines, a series of pictures, at varying distances from front to rear, and from right to left of the enemy's position could be secured by means of the electro-magnetic attachment to the shutters of the photographic cameras, each individual one of which could take a number of pictures without replenishment of plates. It is evident that such a use of the balloon and the photographic camera would have proved greatly advantageous to either side in such modern sieges as those of Sebastopol, Richmond, and Paris.

On the Skull of the Dinosaurian Lælaps incrassatus Cope.

By E. D. Cope.

(Read before the American Philosophical Society, May 6, 1892.)

The characters of the skull in the carnivorous Dinosauria are only partially known, so the present opportunity is improved to add to our knowledge a considerable number of points, if not to exhaust the subject. I have temporarily in my possession two incomplete crania of the *Lælaps incrassatus*, from the Laramie formation of the Red Deer river, in the Dominion of Canada, which have been submitted to me by the Geological

Survey of the country for determination and description. I express here my thanks to the honorable Director of the Survey, Dr. A. R. C. Selwyn, for the opportunity of examining these important specimens.

The first specimen consists of the skull, from the orbits to the muzzle inclusive, with the two dentary bones with teeth adhering to the inferior surface. The second specimen includes most of the parts absent from the first. The muzzle and orbital region are wanting, but the parietal and occipital regions are present, with the basis cranii and palate; parts of the quadrate bones and both mandibular rami nearly complete with teeth.

The bones of the skull are dense and light, and some of them are pneumatic. The sutures separating the premaxillary, maxillary and nasal bones are not distinguishable in the specimen, and both are considerably injured. There is a large subround preorbital foramen whose centre is a little nearer the superior plane of the skull than the alveolar border. It is separated from the orbit by a narrow isthmus. The frontal bone is very narrow between the orbits. The prefrontal forms a vertical convex crest on each side, as represented by Marsh to exist in the *Megalosaurus nasicornis*. The orbits are longitudinally widely parallelogrammic, and are of enormous size, equaling in long diameter the length of the muzzle in front of them. The postfrontal and postorbital elements appear to be fused, and form an L-shaped bone, whose horizontal limb is supraorbital, extending forwards over the orbit anterior to its middle, and terminating in an acute apex. The other limb is vertical and postorbital, extending to the jugal bone. A small piece on the inner side of the postfrontoörbital at its posterior angle on the superior face of the skull is of uncertain determination. The maxillary diminishes rapidly in depth below the orbit and terminates a little posterior to it. The jugal overlaps it above, and probably terminated at about the posterior third of the orbit, but the suture is not clear at this point. The frontal is supported below by two vertical elements posterior to the middle of the orbit. These closely resemble the corresponding pieces in Sphenodon, and are the postoptic * and epipterygoid respectively. They are preceded by a vertical compressed element which corresponds with the orbitosphenoid of Sphenodon, but it is not perforate, and the optic foramen is posterior to it. It is elongate anteroposteriorly, and its anterior extremity is concealed anterior to the orbit. The postoptic is strongly concave at its anterior margin, and the inferior part of this border is produced anteriorly. The epipterygoid, on the other hand, is openly concave posteriorly, its inferior portion being directed posteriorly and enclosing a large foramen with the postoptic. The external face of the maxillary bones is rugose with fine ridges, and rather numerous foramina. The jugal extends well posteriorly, and increases in depth, but its posterior extremity is broken from the specimen.

The mandibular rami are compressed, and the symphysis is oblique and ligamentous. The dentary bone is followed posteriorly above by a deep surangular, with rounded superior border, whose superior outline, though

* For the definition of this element, see Proc. Amer. Philos. Soc., 1892.

convex, rises but little above the level of the dentary. The dentary is produced below it. On the inner side is seen a large splenial foramen, from which extends anteriorly a narrow strip, the splenial. The other borders of the foramen are formed by a large laminiform bone, the opercular of Cuvier, which extends to the superior border of the ramus, cutting off the dentary posteriorly. It is apparently homologous with the inferior anterior part of the coronoid. For the remaining parts of the mandibular ramus see the description of the second specimen. The external face of the dentary is roughened and presents foramina which are most numerous anteriorly, where they are connected by shallow grooves, like the rims between the holes of small Mammalia. Opposite each tooth is one or two shallow vertical grooves.

The teeth have the usual Megalosaurian form and have long roots sunk in very deep alveoli. There are eleven present in the maxillary bone, of which the terminal ones are rapidly reduced in dimensions. Fourteen teeth in the dentary bone which diminish in size at the posterior end of the series. The premaxillary teeth are lost, but none of those in the anterior part of the dentary bone have the incisor-like character of those of the genus Amblypodon of Leidy. The first tooth of the dentary is smaller than the second, and both have more convex external faces than the teeth which succeed them.

Measurements of Skull No. 1.

	MM.
Total length of specimen	600
Length (axial) to front border of preorbital foramen	140
Length to anterior border of orbit	215
Length to posterior border of orbit	385
Vertical diameter of orbit	120
Vertical diameter of skull at middle of orbit	180
Width of front at middle of orbit	80
Depth of dentary at posterior end of symphysis	90
Depth of dentary at end of dental series	127
Length of dental series	320
Length of dentary bone above	390
Length of sixth tooth above alveolus	57
Width of sixth tooth at alveolus	22

In the second skull the only part of the superior portion remaining is the brain case, and this is distorted by pressure which has forced it to the left side of the middle line. The postorbital region and the arches are gone. The occipital appears to be continuous and subhorizontal and is obtusely angulate medially above. The basioccipital is vertical as in the crocodiles proper, and the brain case is closed in front of the petrosal in much the same way, with thin ossifications. The foramen magnum is small, as is also the transversely oval occipital condyle, which looks directly posteriorly, and not downwards. On each side of the basioccipital are two large foramina, one above the other, the inferior issuing in a deep groove or fossa. They are bounded externally by a broad vertical ala. Anterior to this ala are two other large foramina, one above the other, both issuing from fossæ. One or both of these is the trigeminal. The middle line of the brain case is keeled below, except near and at the anterior extremity, where it is flat and is perforated by a transverse foramen. This is possibly a pituitary foramen, which thus penetrates the palatal roof as in the Opisthocœlus Dinosàuria as stated by Marsh.

The rami of the mandible are pressed obliquely against the inferior aspect of the skull, but are separated far enough to permit the palato-pterygoid elements to be seen. These form a rather narrow, flattened rod on each side the middle line, which extend to the robust basipterygoid processes, which look downwards. Each pterygoid then turns abruptly outwards with its edge downwards towards the quadrate, but the specimen does not permit me to discover whether it reaches that element or not. It sends a robust process to the inner side of the basipterygoid, thus extensively embracing it. The anterior part of the palate is invisible.

The relations of the dentary and surangular bones are the same as in the specimen No. 1. This specimen shows that the angular and articular are distinct elements. The angular is an elongate element, which is extensively exposed anteriorly on the internal face of the ramus, and then passes to the external face, terminating in an acuminate lamina below the articular cotylus, but not reaching the angle. The articular is only developed anteriorly on the internal border of the ramus, where it extends well forwards, extensively overlapping the angular. The surangular extends posteriorly to the borders of the articular cotylus, and spreads out below the articular as though it would enter into the composition of the angle of the jaw, which it does not. It is perforated by a round foramen near its interior border, and its inferior face is separated from the external face by a prominent longitudinal down-looking angle. The articular cotylus is transverse and is not bifossate. The quadrate contracts immediately above its condyle and is then broken off in the specimen, but it probably has a rather slender shaft.

There is a large foramen in the internal wall of the ramus which is bounded below by the articular.

A singular bone occurs in both skulls whose position I cannot determine. It is a slender, strongly curved cylindric cone, which rises from the posterior palatal region and turns upwards, outwards and then backwards and a little downwards, with a compressed acute apex. It is not articulated with any element at the apex, which lies near the jugal bone, and its basal connections are broken away in both skulls. It is possibly a part of the hyoid apparatus, but if so it is difficult to identify it with any known element. The hypohyal is more appropriate than any other, but I do not make any identification.

Measurements of Skull No. 2.

	MM.
Length of supraoccipital on middle line	170
Length of supraoccipital including occipital condyle	230
Width of basioccipital posteriorly	155
Width of foramen magnum	35
Diameters occipital condyle { vertical	40
Diameters occipital condyle { transverse	70
Width of distal end of quadrate	135
Total length of mandibular ramus	950
Length of dentary above	480
Length of fourth tooth from alveolus	55
Width of fourth tooth at alveolus	27

History.—I described this gigantic reptile in the Proceedings of the Philadelphia Academy for October, 1876, from teeth derived from the Laramie formation of Montana, and afterwards (*l. c.* December, 1876, p. 340), I described it more fully from a nearly entire dentary bone with teeth from the same region. This individual did not differ much in dimensions from those now described.

Our knowledge of the structure of the cranium of the carnivorous Dinosauria has been very slowly acquired. Buckland and Mantell originally knew only the mandibular rami, but Phillips much later obtained a maxillary bone. From these fragments he proposed a restoration on the basis of the skull of the Lacertilia, with but a single postorbital bar. In this kind of restoration Prof. Owen coincided on the occasion of his description of another maxillary bone in the Quarterly Journal, Geological Soc. of London, 1883, p. 334. In a figure of a restoration, he adopted the Lacertilian model instead of the Crocodilian, and he therefore inserted a triangular postorbital, and an elevated coronoid element. He also omitted the preorbital foramen. Dr. J. W. Hulke, at that time President of the Geological Society, expressed the opinion, on hearing Prof. Owen's paper, that Megalosaurus has two postorbital bars, an anticipation proven to be correct at a later date. In 1884, Prof. Marsh published a paper which contains a description of the skull of a species of carnivorous Dinosaur which he calls *Ceratosaurus nasicornis*. While this animal is probably a species distinct from the *Megalosaurus bucklandii*,* it has not yet been shown to belong to a different genus. In this paper the presence of a zygomatic arch like that of the Crocodilia is demonstrated for this sole order, and the preorbital foramen is also described. The general and more obvious characters of the cranium are given, but many of those which are necessary for an exact understanding of the position of the genus are not given ; especially are the characters

* Amer. Jour. Sci. Arts, 1884, p. 330. It has been shown that the character on which Prof. Marsh relied to distinguish the genus Ceratosaurus, and the family Ceratosauridæ, viz., the confluent metapodials, is pathological. The keeled process on the nose is probably only a specific character.

of the mandibular ramus omitted. In the present paper these omissions are mostly supplied, but a number of important problems remain to be definitely settled. See Trans. Amer. Philos. Soc., 1892, Vol. xvii, p. 17, where one of these is stated. I pointed out in 1866, when the genus Lælaps was described, and later, in 1869 (Vol. xiv, Trans. Amer. Philos. Soc.), that it differs from Megalosaurus in the much more acute and compressed claws. I add that the present species differs from the *M. nasecornis* of Marsh in the much larger and more anteriorly placed orbits, and in the much smaller prerobital foramen.

Figures of these remains will be given in the final publication by the Geological Survey of Canada.

Addition to the Note on the Taxonomy of the Genus Emys C. Duméril.

By G. Baur.

(Read before the American Philosophical Society, May 6, 1892.)

In a discussion about the type of Emys with Dr. L. Hejneyer, this gentleman called my attention to the fact that, according to the Code of Nomenclature adopted by the American Ornithologists' Union, the type species could not be *T. picta*, because this species is not named by Brogniart. According to his view not only the name *Emydes* ought to be used, as originally introduced by Brogniart in 1805 (Emys Dum., 1806), but also one of the species enumerated by Brogniart taken as the type. Brogniart mentions the following species with his genus *Emydes: E. ferox, E. rostrata, E. matamata, E. lutara, E. pensilvanica, E. clausa.* In 1806 Duméril referred the *E. matamata* to a new genus *Chelus ;* in 1809 Geoffrey *E. ferox* and *E. rostrata* to *Trionyx, E. pensilvanica* belonging to *kinosternon* Spix ; either *E. lutaria* or *clausa* has to be considered as type of Emydes. *E. lutaria* = *T. orbicularis* L. being the common Emysæan form, ought to be taken as type of *Emydes,* and *E. clausa* = *T. carolina* L. ought to be considered as type of *Terrapene* Merrem., of which Cistuda Fleming is a synonym.

According to this we would have the following :

Emydes Brogniart, 1805,
Type, *T. orbicularis* L.
Terrapene Merrem, 1820,
Type, *T. carolina* L.
Chrysemys Gray, 1844,
Type, *T. picta* (Herrm. MSS.) Schn

Second Contribution to the Study of Folk-Lore in Philadelphia and Vicinity.

By Henry Phillips, Jr.

(Read before the American Philosophical Society, March 18, 1892.)

Signs, Portents and Omens.

Sunday is always the best or the worst day of the week.

If one sews anything upon a garment that is already on, it is a sure sign that some one will tell a falsehood about you.

It is unlucky to measure a child with a yardstick before it can walk.

It is unlucky to get out of bed left foot foremost.

It is unlucky to count one's money, as it will surely decrease.

One must never count what is eaten, as hunger and poverty will be the result later in life.

A servant who comes on Saturday makes a short flitting.

If a man dies suddenly, leaving any appointments unfulfilled, his ghost will keep them.

It is lucky to dream of excrement.

Children who pick dandelions will urinate in their bed (*pis-en-lit*).

Bachelors' and old maids' children are always well brought up and well behaved.

Vessels named after women are unlucky as compared with those bearing the names of men.

Vessels with a boasting or high-sounding title (such as *Monarch of the Seas*, *Dreadnaught*, etc.) are unlucky.

It is unlucky to name a child after one of the same name, that has died.

When speaking of one's good fortune, one must always add: "I hope I speak in a lucky hour."

One must always wear something new on Easter day.

One must always wear something new on New Year's day.

A four-leaved clover is considered to bring good luck to its finder.

The tick of the "death watch" announces the speedy death of a member of the family.

If you can't make a fire you'll get a bad husband.

Throw pepper after a disagreeable person to prevent his return.

Make a wish when a spotted horse is seen.

It is unlucky to twirl a chair upon one of its legs.

Crusts make whiskers grow.

An M marked in the palm of the hand indicates good fortune.

A woman who cuts bread into thin slices will make a poor stepmother.

Scissors and other steel articles should be hid during a thunder storm to prevent a thunderbolt.

Touching a corpse prevents bad dreams of it.

To dream of the dead is lucky.

Nose itching means sight of a stranger.

Heads of snakes never die until sundown.

Eels put on the land turn to snakes.

Never look over a person's shoulder into a mirror.

A fork dropped foretells a male visitor; a knife, a woman.

When the wind closes a shutter a stranger is announced.

If one drops a morsel in putting it to the mouth some one wants it.

If the first visitor to the house on a New Year is a man, good luck.

Go to watch meeting New Year's eve to obtain good luck throughout the year.

To rock an empty rocking chair will make angry its most constant occupant.

A Scotchman should never give a Bible.

Meeting eyebrows denote a contrary disposition; likewise hard to trust.

Very light eyes denote a shallow, variable disposition.

> Blue eye beauty, do its mother's duty;
> Brown eye ran away and told a lie.

To see the new moon over the right shoulder is lucky; over the left, unlucky.

> Two white feet look, well about him;
> Three white feet, do well without him;
> Four white feet and a white nose—
> Throw him to the crows.

It is unlucky, when walking with a person in the street, to permit any one to pass between and divide you.

It is unlucky to pass under a ladder.

If the *left* hand itches or burns it is a sign of paying out money; if the *right*, of receiving it.

Birth, Death and Marriage.

Two spoons accidentally placed in the tea saucer signifies a wedding.

Rhymes for brides-elect:

Married in white, you have chosen all right;
Married in gray, you will go far away;
Married in black, you will wish yourself back.

A white animal entering foretells death.

A child born face downwards never lives.

To drop a wedding ring from the finger indicates divorce.

If you marry in May
You will live a year and a day.

If you marry in Lent
You will live to repent.

Folk Medicine.

To cure fits in a cat one should bite off a small piece of its tail.

Warts will be produced if one handles a frog or a toad.

Warts can be removed by anointing with fasting spittle.

When one sneezes he must say: "To your everlasting beauty."

An eelskin worn about the ankle will keep off cramps.

Piercing the ears will improve the sight.

April snow applied to the face will improve the complexion.

It is ill luck to change a sick person's bedding.

The hair of a seventh son, in succession, prevents whooping-cough.

A drop of the sufferer's urine in the ear will cure earache.

Swinging a baby completely by the skirts prevents liver trouble.

A seventh months child can live, an eighth months cannot.

A copper penny dipped in vinegar and applied to a ring-worm cures it.

Tie your stocking around your neck on retiring to cure sore throat.

Sleeping towards the east produces headache.

Steal a potato, rub one-half on a wart and lose it to remove the wart.

Seasons, Weather, etc.

Evening red and morning gray
Will send the traveler on his way.

A dried snake hung up in a draught will produce a rain.

A star near the moon means a storm.

The first three days of a month declare its character.

On the second of July the Virgin Mary goes to visit her cousin Elizabeth ; the weather on that day indicates the weather for the next six weeks, that being the length of the visit.

A green Christmas means a white Easter.

The departure and return of wild geese and crows announces winter and spring.

When the white side of the leaves is exposed by the wind a storm approaches.

When the dandelions are closed there will be rain.

In the spring there comes the blossom storm.

There is always a heavy storm to fill the streams before they freeze.

On the 2d of August comes the Lammas floods.

Ember days indicate the weather of the seasons.

The rain that makes large bubbles as it falls will be of long continuance.

If it clears up at night, the next night will be rainy.

Further Notes on Fuegian Languages.

By D. G. Brinton, M.D., LL.D.

(*Read before the American Philosophical Society, May 6, 1892.*)

Since the publication of my study on the Patagonian and Fuegian dialects in the *Proceedings* of the American Philosophical Society (No. 137, 1892), several important vocabularies have come to my notice.

An Early Fuegian Vocabulary.

One of these is the oldest known collected on the shores of Tierra del Fuego itself, that of Pigafetta having been derived from the Tsoneca, on the main land of Patagonia. That to which I refer was collected by the French navigator, Jouan de la Guilbaudière, during a sojourn of eleven months in the Straits of Magellan during the year 1695. It includes about three hundred words and short phrases, and no part of it has been published. The MS. copy in my possession I owe to the courtesy of M. Gabriel Marcel, the Librarian of the Geographical Section of the National Library of France. As, however, he intends giving it publicity in the Compte-rendu of the Congress of Americanists, it will be sufficient to illustrate its character by a limited selection of words. These show that the basis of the tongue is Alikuluf, and it differs scarcely more from the Alikuluf of the present generation than do between themselves the vocabularies of that tongue by Fitzroy and Dr. Hyades in the present century. A few words belonging to the Tsoneca and the Yahgan may be detected, probably introduced by trading natives. In the vocabulary the bracketed words preceded by an A. are from the Alikuluf of Fitzroy.

Fuegian (Alikuluf) Vocabulary of 1695.

dog, *chalqui* (A. *shilŏkĕ*).
ears, *couercal*.
egg, *lescheley* (A. *lith'le*).
eyes, *titche* (A. *tet-élo*).
fire, *ollay* (A. *tet-élé*).
forehead, *arcacol* (A. *lakoukal*).
head, *yacabed chepy* (A. *yuccaba*).
house, *hasthe* (A. *hŭt*).
man, *accheleche* (A. *ackinish*).
moon, *yacabed charlo* (comp. Alik. *yuccaba*).
mouth, *asflet* (A. *ufeare*).
nose, *loutche*.
oar, *oyeque* (A. *wy'ic*).
sea, *chapte* (A. *chahb'ucl*).
skin, *alac* (A. *uc'cŏlayk*).
smoke, *telgueche*.
sun, *arlocq*.
teeth, *chereedye*.
tongue, *paileaf*.
water, *arret*.
woman, *acche letep*.
wrist, *yacabed charcal*.

A few words show Tsoneca affinities, as:

	Fuegian.	Tsoneca.
water,	*arret*,	*karra*.
teeth,	*chereedye*,	*curr, oer*.

Language of the Onas (Aonas).

Up to the present time no linguistic material from Eastern Tierra del Fuego has been available; and consequently the ethnic affinities of the tribes that live there have been but guessed at.

Collectively these tribes are known to the Tehuel-het of Southern Patagonia as *Yakana-cunny*, "foot Indians," as having no horses and but few boats, their journeys are made on foot; while the Yahgans refer to their territory as *Onéçin*, the "land of men," whence the appellation "Onas."

The Onas are taller and stronger than the aquatic Yahgans and Alikulufs, who inhabit the Fuegian archipelago, and are described as in face and figure closely resembling the typical North American Indian (Popper). For this reason, apparently, it has been assumed by recent writers that they are a branch of the tall and large-limbed Patagonians north of the Straits of Magellan.

This is the opinion advanced by Drs. Hyades and Deniker in their Report in Vol. vii of the *Mission Scientifique du Cap Horn* (Paris, 1891). They acknowledge, however, that they had been unable to obtain any linguistic material on which to institute comparisons.

Such material has fortunately been secured lately by Dr. Polidoro A. Segers, and he has printed a short vocabulary in the *Boletin del Instituto Geografico Argentino* (Buenos Ayres, 1891), for which he claims exactness. It is printed apparently in the phonetics of the Spanish alphabet, which, one would think, would be far from adequate to express the sounds of the language, if we may credit the statement of the English missionary, Mr. Brydges, that they are peculiarly harsh and guttural, "resembling the sounds made by a person who is gargling with difficulty!"

The location of the Onas is described in the *Boletin* above referred to, both by Dr. Julio Popper and Dr. Segers. The tribe is divided into a number of bands, in constant feud with each other, and all without fixed habitations. To the north, between the Bay of St. Sebastian and Cape Sunday, are the Parrikens, the Shella and the Uenenke; to the south, from about Cape Penas to the Straits of Lemaire, roam the Kau-ketshe, the Koshpijom and the Loualks. These differ among themselves in dialect, but not to such an extent as to be mutually unintelligible. The precise band from which the following vocabulary was obtained by Dr. Segers is not clearly stated, but apparently from the Parrikens.

A slight examination of this list of words is sufficient to disprove the statement made by the writers of the *Mission Scientifique du Cap Horn* that the language of the Onas is a dialect of the Southern Patagonian or Tehuelhet.

Its affinities are much closer with the Yahgan, although perhaps not near enough to allow us to speak of it as a dialect of that stock.

In the eighty-four words in Segers' vocabulary, I do not find the Yahgan correspondents for fourteen. Of the seventy remaining, twenty-three, or about one-third, are identical with the Yahgan or allied to it. Allowing for the very great difficulties in the way of a comparison of material such as I have at command, it is probable that with vocabularies carefully constructed on the same phonetic bases, and with correct identification of objects, a closer relationship between the two stocks would be demonstrated.

In the vocabulary I have placed the Yahgan equivalent in brackets, preceded by the letter Y. The Yahgan vocabularies I have employed are those of Fitzroy, Bove and the more detailed one in the *Mission Scientifique du Cap Horn*. The bracketed words preceded by Ts. are from the Tsoneca language.

Vocabulary of the Onas Language, Tierra del Fuego.

accouch, to, *tshó-ia*.
angry, *ódlá*.
arrow, *tá-al*.
arrowhead, *iash* (Y. *iakouch*).
ashes, *óuen* (Y. *ouan*).
awaken, to, *pash*.
back hair, *iani*.
basket, *touel* (Y. *taouala*).
beard, *anu-etskel*.
belly, *kashtom* (Y. *kashtamin*, liver).
black, *mái*.
bow, a, *uai-en* (Y. *uaiana*).
bowstring, *ianet-sel* (Y. *chali-sel*).
brain, *koiar*.
brother, *ié-togte*.
call, to, *cué-eke*.
crab, *kámel*.
defecate, to, *sha-áshteré*.
dirty, *keshá-a*.
drink, to, *kaieto* (Y. *kayenhama*, to drink from a cup).
eat, to, *tsham-ka* (Y. *a-tama*).
enough, *cáno*.
eyebrows, *oshel etshel* (see *eye* and *hair*).
fall, to, *ua-áa*.
fat (grueso), *elló* (Y. *oulow*).
fire, *só-ol* (Y. *içouali*, "lepierèe à feu").
flame, *ialoé*.
fog, *ástau*.
for me, *iak-ka*.
for you, *mak-ka*.
friend, male, *iosh-lelk*.
  female, *iosh-ka*.
good, *shaike*.
good-by! *eani-malk*.
good-night! *ooken*.

go out! *shoim.*
hair (in general), *etshel* (Y. *atçela*, all short hair).
heart, *sá-sa* (Y. *sa-skin*).
heaven, *mata.*
hot, *pomushk.*
I, me, *iag* (Ts. *ia*).
ice, *tal.*
knife, a, *el* (Y. *ouila*).
labial commissure, *tsha-leke.*
large, *eish* (Ts. *chaish*).
lie, a, *léke.*
mamma, *iam.*
moon, *anien.*
morning, *uánko.*
mother, *tecám.*
mouth, *conken.*
nail, of finger, *kaiu* (Y. *galouf*).
neck, *kóssel* (Y. *kaouheul*, larynx).
open, to, *áiepam.*
play, to, *tal-iá.*
rain, *shen-mush.*
ready, *tshé-iéke.*
red, *poúetel.*
run, to, *ua-akka.*
sad, *eshen.*
saliva, *compé.*
sea, *paieke* (Y. *payaka*, or *hayeca*).
shut, to, *ojeme.*
sick, *póué.*
sister, *ié-eke.*
skull, *aletaía.*
sleep, to, *ashté* (Y. *ăshă*).
slowly, *la-ió.*
small, *tshool.*
smell, to, *ke-shonuan.*
smoke, *teí.*
snow, *teu.*
soon, *to-ok.*
sun, *anigke* (Ts. *gengenko*).
thanks! *pé-ieukom-iamski.*
thick, *kátetshé.*
thou, you, *mag* (Ts. *ma*).
to-day, *má.*
urinate, to, *akketten* (Y. *ouakour*).
vagina, *pa-al.*
water, *oten.*
weak, *tshe-uel.*
winter, *sheuke.*
yawn, to, *tsha-isal.*

It will be noticed that the personal pronouns are derived from the Tsoneca, while the words for bow, bowstring and arrowhead are Yahgan. This indicates that this weapon originated with them from the latter element of their population.

The result of this comparison is to place the Onas nearer to the Yahgans than to the natives of the mainland. They are evidently a mixed people, not an independent stock, physically allied to the Patagonians, linguistically belonging in the main to the Yahgan group.

Yahgan Vocabularies.

A few words may be added on the accessible material for the study of the Yahgan language. Its grammar has been made the theme of an able analysis by Mr. Lucien Adam, and a vocabulary has been studied from the translation of the New Testament by Mr. Julius Platzmann. Both these rest on the labors of the English missionary, the Rev. Mr. Brydges. The same is apparently the case with the quite extensive and satisfactory list of words presented in the *Mission Scientifique du Cap Horn.*

The authors of the latter point out the important fact that of the 200 Yahgan (Tekenika) words collected by Fitzroy in 1830–32, 120 are wholly erroneous, most of them belonging to the Alikuluf tongue.

In the report of Commander Giacomo Bove (*Patagonia, Terra del Fuoco, Mari Australi*, Parte i, Genova, 1883), there is a Yahgan vocabulary of 164 words. It also was obtained through the instrumentality of Mr. Brydges, and is satisfactorily accurate.

THE HONGOTE VOCABULARIES.

In my previous communication on Fuegian dialects, I quoted two short vocabularies from a MS. in the British Museum said to be from the "Hongote" language, and which, from the paper forming a part of a record relating to Patagonia, I took to be dialects of that region.

This is the first opportunity I have to correct this error. Dr. Franz Boas has pointed out to me that one vocabulary is clearly Salish, and must have been collected in Fuca strait on the northwest coast. He thinks it may be the Songish dialect, a name which remotely resembles "Hongote." How it came to form a part of a mass of documents relating with this exception wholly to South America, I cannot explain. The other he considers Tlinkit. Under such circumstances and in view of the hundreds of languages on the continent, it is easy to see how such a mistake could occur. I am glad to be able to correct it promptly.

Stated Meeting, April 1, 1892.

Present, 17 members.

President, Mr. FRALEY, in the Chair.

Letters of acknowledgment were received from the Royal Society of Victoria, Melbourne (135); Musée Colonial, Haarlem, Holland (136); Dr. Paul Albrecht, Hamburg, Germany (134); Prof. Guido Cora, Turin, Italy (135); Victoria Institute, London, England (136); Pennsylvania State College Agricultural Experiment Station (136).

The following societies were placed on the Proceedings exchange list: Naturwissenschaftlicher Verein für Schleswig-Holstein, Kiel, Prussia; American Institute of Electrical Engineers, New York, N. Y.; Sociedad Cientifica Argentina, Buenos Ayres; Agricultural Experiment Stations at Blacksburg, Va., Burlington, Vt., College Station, Tex., Geneva, N. Y., Agricultural College, Mich., Baton Rouge, La., Newark, Del., and St. Anthony Park, Minn.

Accessions to the Library were reported from the Government Observatory, Madras, India; Osservatorio Marittimo, Trieste, Austria; Biblioteca N. C. V. E., Rome, Italy; Essex Institute, Salem, Mass.; Connecticut Agricultural Experiment Station, New Haven; American Museum of Natural History, New York; Agricultural Experiment Station, Newark, Del.; Dr. Charles K. Mills, Philadelphia; Department of State, Bureau of Ethnology, Superintendent of Documents, U. S. Civil Service Commission, U. S. Lighthouse Board, Washington, D. C.; Agricultural Experiment Stations at Bryan, Tex., St. Anthony Park, Minn., Topeka, Kans.; Sociedad Cientifica Argentina, Buenos Ayres, S. A.; Deutscher Wissenschaften Verein, Santiago, Chili.

Dr. Ruschenberger read an obituary notice of the late Dr. Joseph Leidy.

The decease of the following members was announced: Dr. D. Hayes Agnew, Philadelphia, March 22, 1892, æt. 74; Ario Pardee, Hazleton, March 26, 1892, æt. 82.

The President subsequently appointed Dr. William Pepper to prepare the usual obituary notice of Dr. Agnew and W. A. Ingham that of Mr. Pardee.

Prof. Cope presented a communication upon "Some Little Known Palæozoic Vertebrates."

On motion, Dr. Cope's paper on "The Osteology of the Lacertilia," offered at the last meeting for the Transactions, was authorized to be printed in the Proceedings.

Pending nomination No. 1233 and new nomination No. 1241 were read.

The Curators reported progress in the matters committed to them by resolution of March 18.

The following resolutions offered by Mr. Bache at the last meeting then came up:

Resolved. That, if the funds of the Society permit, this room be now put in charge of a Committee, for the purpose of receiving such treatment as to its walls, ceiling and columns as accord with the character of the Society, and that the Society instruct the Curators to exclude from the cases everything but such printed matter as is desirable for ready reference, and from the floor any articles which are not conducive to the primary purpose in this room of convenience of the members of the Society.

The first resolution, referring to the decoration of the room, was withdrawn, and, owing to the lateness of the hour, the further consideration of the second resolution was postponed.

On motion of Dr. Hays, the Librarian was requested to remove from their present place of storage the books, MSS., etc., belonging to the Society.

The Committee appointed February 5, 1892, on the Columbian Celebration, was increased to five members, Dr. Ryder and Mr. Horner being added.

And the Society was adjourned by the President.

April 15 falling on Good Friday, no meeting of the Society was held.

Stated Meeting, May 6, 1892.

Present, 8 members.

Mr. Richard Vaux in the Chair.

Letters were received as follows:

A circular inviting subscriptions for the erection of a monument to Prof. G. A. Hirn, in Colmar, Alsace.

Program of the First Anniversary of the Tacoma Academy of Sciences, April 28, 1892.

A circular letter from the Musée D'Oaxaca, Mexico, announcing the death of M. le Général Mariano Jiménez, Gouverneur constitutional de l'Etat de Michoacan d'Ocampo, February 28, 1892.

A letter from Mrs. Caroline Lewis, Secretary of the Loan Exhibition in connection with the University Lecture Association, Philadelphia, returning thanks to the Society for the loan of the busts of La Fayette and Franklin.

The following donations to the cabinet were received:

A photograph for the Society's album from Charles E. Sajous, M.D., Philadelphia.

A framed engraving of David Rittenhouse, LL.D., by E. Savage, Philadelphia, 1796, after the portrait by C. W. Peale, from Miss Emily Phillips.

Letters of envoy were received from the K. K. Astronomisch-Meteorologisches Observatorium, Triest, Austria; Bath and West and Southern Counties Society, Bath, England; Department of Science and Art, London, England; Department of the Interior, Washington, D. C.; Museo Nacional de Buenos Ayres.

Letters of acknowledgment of diploma were received from Rt. Rev. William Stubbs, Oxford, England; Prof. E. Mascart, Paris, France; Marquis Antonio De Gregorio, Palermo, Italy; Sir George G. Stokes, Cambridge, England; Mr. Charles Godfrey Leland, London, England; Mr. John Fulton, Johnstown, Pa.; Prof. Henry Willis, Philadelphia; Dr. W. J. Hoffman, Washington, D. C.

Letters of acknowledgment were received from the Royal Society of Victoria, Melbourne (136); Colonial Museum, Haarlem, Holland (136); Dr. Aristides Brezina, Vienna (136); Prof. Peter P. v. Tunner, Leoben, Austria (136); Gesellschaft für Erdkunde, Prof. F. Reuleaux, Berlin (136); Royal Saxon Society of Sciences (128, 135); Dr. Julius Platzmann, Leipzig (136); Union Geographique du Nord de la France, Donai, France (96–130 and Catalog, Parts i–iv); École Nationale

D'Agriculture, Montpellier, France (136); Editors of *Cosmos*, Profs. Abel Hovelacque, Emil Levasseur, Marquis de Nadaillac (136); Prof. E. Mascart, Paris (131–136); Philosophical Society, University Library, Cambridge, England (136); Yorkshire Geological and Polytechnic Society, Halifax, England (136); Zoölogical Society (Trans. xvi, 3 and 130–136), Royal Society, R. Astronomical Society, Linnean Society, Royal Institution, Geological Society, R. Meteorological Society, Prof. William Crookes, Dr. William H. Flower, Sir Rawson W. Rawson, London, England (136); Mr. Samuel Timmins, Arley, Coventry, England (136); Natural History Society of Northumberland, etc., Newcastle-on-Tyne (136); Geographical Society, Manchester, England (96–130 and Catalog); Royal Society, Royal Observatory, Edinburgh (136); Mr. Hamilton A. Hill, Boston, Mass. (134); Harvard College, Cambridge, Mass. (Catalog, Part iv); Mrs. Helen Abbott Michael, Philadelphia (135, 136); Agricultural Experiment Station, Newark, Del. (135, 136); U. S. Naval Institute, Annapolis, Md. (136); U. S. Geological Survey, Washington, D. C. (136); Rev. Henry S. Osborne, Oxford, O. (136); State Agricultural College, Manhattan, Kans. (136); State University, Iowa City, Ia. (134, 136); California Academy of Sciences, San Francisco (136); Texas Agricultural Experiment Station, College Station (135, 136 and pams.); Musée de La Plata, Argentine Republic, S. A. (135); Mr. Everard F. im Thurn, Georgetown, British Guiana, S. A. (136).

Letters of acknowledgment (137) were received from the Geological Survey, Ottawa, Canada; Hon. J. M. Le Moine, Quebec; Sir Daniel Wilson, Canadian Institute, Toronto; Bowdoin College, Brunswick, Me.; Historical Society, Society of Natural History, Portland, Me.; Prof. C. H. Hitchcock, Hanover, N. H.; Vermont Historical Society, Montpelier; Amherst College Library, Amherst, Mass.; Museum of Comparative Zoölogy, Prof. Alexander Agassiz, Mr. Robert N. Toppan, Cambridge, Mass.; Institute of Technology, Boston Society of Natural History, Mass. Historical Society, Athenæum, Messrs. Thomas M. Drown, Hamilton Hill, Robert C.

Winthrop, Boston; Mr. James B. Francis, Lowell, Mass.; Free Public Library, New Bedford, Mass.; Dr. Pliny Earle, Northampton, Mass.; Essex Institute, Salem; Prof. Elihu Thomson, Swampscott, Mass.; American Antiquarian Society, Worcester, Mass.; Prof. George F. Dunning, Farmington, Conn.; Conn. Historical Society, Hartford; N. H. Colony Historical Society; Prof. James Hall, Albany; Prof. W. Le Conte Stevens, Brooklyn; Buffalo Library; Prof. Edward North, Clinton, N. Y.; Profs. T. F. Crane, J. M. Hart, B. G. Wilder, Ithaca, N. Y.; University of the City of New York, Historical Society, Amer. Institute of Electrical Engineers, N. Y. Hospital, Amer. Museum of Natural History, Profs. J. A. Allen, Daniel Draper, R. W. Raymond, J. J. Stevenson, W. P. Trowbridge, New York; Vassar Brothers' Institute, Poughkeepsie; Oneida Historical Society, Utica; Prof. Henry M. Baird, Yonkers; U. S. Military Academy, West Point; Dr. Charles R. Dudley, Altoona, Pa.; Dr. Robert H. Alison, Ardmore; Prof. Robert W. Rogers, Carlisle; Hon. Eckley B. Coxe, Drifton; Profs. J. W. Moore, Thomas C. Porter, Traill Green, Easton; Mr. Andrew S. McCreath, Harrisburg; Mr. John Fulton, Johnstown; Linnean Society, Lancaster; College of Physicians, Engineers' Club, Library Company of Philadelphia, Numismatic and Antiquarian Society, Academy of Natural Sciences, Wagner Free Institute, Messrs. Cadwalader Biddle, Arthur E. Brown, S. Castner, Jr., Robert Patterson Field, William W. Jefferis, G. deB. Keim, Benjamin Smith Lyman, James T. Mitchell, Robert Patterson, Franklin Platt, Theodore D. Rand, J. G. Rosengarten, Coleman Sellers, William P. Tatham, D. K. Tuttle, Louis Vossion, Ellis Yarnall, Profs. John Ashhurst, Jr., E. D. Cope, F. A. Genth, Jr., H. D. Gregory, Benjamin Sharp, Albert H. Smyth, H. W. Spangler, Admiral Macauley, Drs. D. G. Brinton, John H. Brinton, George Friebis, Charles A. Oliver, C. N. Pierce, W. S. W. Ruschenberger, William H. Wahl, Philadelphia; Prof. John F. Carll, Pleasantville; Rev. G. W. Anderson, Rosemont; Dr. John Curwen, Warren, Pa.; Philosophical Society, Messrs. Philip P. Sharples, Washington Townsend, West Chester;

Agricultural Experiment Station, Newark, Del.; Mr. William M. Canby, Wilmington, Del.; Mr. Isaac C. Martindale, Camden; Free Public Library, Jersey City; Profs. Charles W. Shields, C. A. Young, Princeton; Va. Historical Society, Richmond; Mr. Jed. Hotchkiss, Staunton, Va.; University of Virginia, Leander McCormick Observatory, Dr. J. W. Mallet, University of Virginia; West Va. University, Prof. J. C. White, Morgantown, W. Va.; Prof. Lyon G. Tyler, Williamsburg, Va.; U. S. Naval Institute, Annapolis, Md.; Maryland Institute, Peabody Institute, Baltimore; Agricultural Experiment Station, College Park, Md.; Agricultural Experiment Station, Raleigh, N. C.; Georgia Historical Society, Savannah; University of Alabama, Tuscaloosa; Prof. E. W. Claypole, Akron, O.; University of Cincinnati, Cincinnati Observatory; Journal of Comparative Neurology, Granville, O.; Rev. Henry S. Osborn, Oxford, O.; Dr. Robert Peter, Lexington, Ky.; Athenæum, Columbia, Tenn.; Prof. J. L. Campbell, Crawfordsville, Ind.; Purdue Experiment Station, LaFayette, Ind.; Col. William Ludlow, Detroit, Mich.; Academy of Natural Sciences, Davenport, Ia.; Iowa State University, Iowa City; Agricultural Experiment Station, State Historical Society of Wisconsin, Madison, Wis.; University of California, Berkeley; Prof. J. C. Branner, Menlo Park, Cal.; Agricultural Experiment Station, Lincoln, Neb.; Agricultural Experiment Station, Manhattan, Kans.; Kansas Academy of Science, Topeka.

Accessions to the Library were reported from the Royal Society of Victoria, Melbourne; Bataviaasche Genootschap van Kunsten en Wetenschappen; Osservatorio Marittimo, Trieste; K. K. Geographische Gesellschaft, Vienna, Austria; Physikalische Gesellschaft, K. P. Akademie der Wissenschaften, Berlin; Deutsche Seewarte, Hamburg; Verein für Erdkunde, Metz; Koloniaal Museum, Haarlem, Holland; Société des Sciences, Liège; Institut R. Grandducal, Luxembourg; Naturwissenschaftliche Gesellschaft, St. Gall; Naturforschende Gesellschaft, Zurich; Società Africana D'Italia, Naples; R. Osservatorio Astronomico, Turin; Société Languedocienne de Geographie, Montpellier, France; M. Désiré Pector, Paris; Bath and West of England Society, and Southern Counties Association, Bath; Yorkshire Geological and Polytechnic Society, Halifax, England; Royal Meteorological Society, British Association for Advancement of Science, Solar Physics Committee, London; Natural History and Philosophical Society, Belfast; Philosophical Society, Glasgow; Mr. Horatio Hale, Clinton, Ontario, Canada; Marine Biological Laboratory, Boston; Public Library, Salem; American Antiquarian Society, Worcester; Yale University, New Haven; Historical Society, Buffalo; Columbia College, Historical Society, Prof. J. A. Allen, Hon. Seth Low, New York; Penna. State College, Harrisburg; University of Pennsylvania, Mercantile Library, Prof. Albert H. Smyth, Drs. D. G. Brinton, Charles K. Mills, C. A. Oliver, W. T. Parker, Messrs. W. S. Baker, Henry Phillips, Jr., Philadelphia; U. S. Naval Institute, Annapolis; Johns Hopkins University, Baltimore; Department of the Interior, U. S. Coast and Geodetic Survey, Bureau of Ethnology, Dr. A. C. Peale, Washington, D. C.; Elisha Mitchell Scientific Society, Raleigh, N. C.; General Society of the Sons of Revolution, Savannah, Ga.; Society of Natural History, Cincinnati; Academy of Science, St. Louis, Mo.; University of California, Berkeley; Academy of Sciences, Mercantile Library Association, San Francisco; State Board of Agriculture, Lansing, Mich.; State Historical Society, Fremont, Neb; University of Nebraska; Observatorio Meteorologico-Magnetico Central, Mexico; Museo Nacional, Buenos Aires, S. A.; Agricultural Experiment Stations: Hanover, N. H., Amherst, Mass., Uniontown, Ala., Lexington, Ky., Knoxville, Tenn., Agricultural College, Mich., Madison, Wis., Topeka, Kans., Las Cruces, N. M., Brookings, S. Dak., Tucson, Ariz.

Mr. Bache read a paper on "Civil and Military Photogrammetry."

A paper by Prof. Daniel G. Brinton, entitled "Further Notes on Fuegian Languages," was presented.

Prof. Cope presented a paper "On the Skull of the Dinosaurian Lælaps Incrassatus."

A paper by Prof. G. Baur (Worcester, Mass.), entitled "Additional Note on the Taxonomy of the Genus Emys," was presented.

Pending nominations Nos. 1233 and 1241 were read.

The following report of the Curators was presented and its consideration was postponed.

In response to the resolution of the Society, in which the Curators are instructed to state the nature of the Society's collections at present housed outside of this Hall, together with the space they would occupy if properly displayed, we have to report as follows:

1. Coins at Memorial Hall, deposited about 1878. The collection is small, probably not five hundred pieces. These could be easily displayed in a case such as that now at the southwest corner of this meeting room. There is, however, a fine oak cabinet belonging to the Society, at present in charge of the Numismatic Society, which is of ample capacity, and could be utilized if necessary.

2. The Poinsett and Keating collections of Mexican and other objects. These comprise about twenty-eight hundred objects of archæological interest. The combined collection is perhaps unique in some respects, and was deposited at the Academy of Natural Sciences in 1878. We believe that this collection could be displayed fairly well in such space as that now occupied by the cases on the north wall of this meeting room, west of the door.

3. Various paleontological specimens deposited at the Academy of Natural Sciences in 1864.

4. The French metre, loaned to the Coast Survey some forty or fifty years ago, and in use by them as a standard.

5. A stone cannon ball fired at Queen Mary and Douglass as they were escaping from Loch Leven Castle. Loaned to the Historical Society March 31, 1874.

Patterson Du Bois,
R. Meade Bache,
J. Cheston Morris.

And the Society was adjourned by the presiding member.

Stated Meeting, May 20, 1892.

Present, 24 members.

President, Mr. FRALEY, in the Chair.

Correspondence was submitted as follows:

A letter from the Committee of Philadelphia Councils on the Columbian Celebration at Chicago, in 1893, requesting the loan of certain articles owned by the Society was read and the consideration of the subject was postponed.

Letters of envoy were received from the Geological Survey of India, Calcutta; K. P. Meteorologische Institut, Berlin; K. Leopoldinisch-Carolinische Akademie, Halle a. S.; K. Sächsische Gesellschaft der Wissenschaften, Leipzig; Société de Physique et d'Histoire Naturelle, Geneva, Switzerland; Royal Statistical Society, Zoölogical Society, London, Eng.; Geographical Society, Manchester, Eng.; U. S. Coast and Geodetic Survey Office, Washington, D. C.

Letters of acknowledgment were received from Captain Richard C. Temple, Mandalay, Birmah (135); Comité Geologique de la Russie, St. Petersburg (136); Société Hongroise de Géographie, Budapest (96–130, and Catalog, Parts i-iv); Prof. A. E. Nordenskiöld, Stockholm, Sweden (136); Prof. Senat G. Capellini, Bologna, Italy (132, 133, 134, 135); Naturforschende Gesellschaft des Osterlandes, Altenburg, Germany (136); K. Geodätisches Institut, Berlin (96–130, 136, and Catalog, Parts i-iv); Redaction der Naturwissenschaftlichen Wochenschrift, Berlin (136); Naturwissenschaftlicher Verein, Bremen (136); Verein für Erdkunde, Dresden (136); Wetterauische Gesellschaft für die Gesammte Naturkunde, Hanau (135); Bibliothek der Astronomischen Gesellschaft, K. Sternwarte, Prof. J. Victor Carus (135), Dr. Caspar René Gregory (136), Leipzig; Académie Royale des Sciences, Lisbon, Portugal (131–134); Entomological Society, London (136); Prof. James Geikie, Edinburgh (136); Natural History Society, Sir J. W. Dawson, Montreal (137); U. S. Institute of Science, Halifax, N. S. (137); State Library of Massachusetts, Boston (137); R. I. Historical Society, Providence; Franklin Society, Providence, R. I. (137); Yale University, New Haven (137); Academy of Sciences (137); Editor of the *Popular Science Monthly*, New York (119, 131, 133); N. J. Historical Society, Newark (137); Prof. L. B. Hall, Haverford, Pa. (137); Mrs. Helen Abbott Michael, Messrs. Thomas M. Cleeman, Louis A. Scott, Philadelphia (137); Patent Office, Anthropological Society, U. S. Coast and Geodetic Survey, Departments of the Interior and Agriculture, Naval Observatory, U. S. Geological Survey, Mr. William B. Taylor, Profs. S. F. Emmons, Herman Haupt, C. V. Riley, Charles A. Schott, Rt. Rev. John J. Keane, Dr. W. J. Hoffman, Washington, D. C. (137); Agricultural Experiment Station, Baton Rouge, La. (137); Lick Observatory, Mount Hamilton, Cal. (137); Prof. Daniel Kirkwood, Riverside, Cal. (137); Prof. George Davidson, San Francisco, Cal. (137); Sociedad Cientifica "Antonio Alzate," Mexico (137); Museo Michoacano, Morelia, Mexico (137); Colorado Scientific Society, Denver (137).

Accessions to the Library were reported from the Geological Survey of India, Calcutta; K. P. Meteorologische Institut, Berlin; K. Leopoldino-Carolinische Deutsche Akademie der Naturforscher, Halle a. S.; Würtembergische Kommission für Landesgeschichte, Stuttgart; M. J. H. Schwarz, Kladno, Bohemia; Mittelschweizerische Geographische-Commercielle Gesellschaft, Aarau; Société de Physique et d'Histoire Naturelle, Geneva; R. Académie des Sciences, Turin, Italy; Sociedade de Geographia, Lisbon; Royal Institution, London; Royal Irish Academy, Dublin; Historical and Scientific Society of Manitoba, Winnipeg; M. Edward Collom, Rockwood, Ont.; University of Vermont, Agricultural Experiment Station, Burlington, Vt.; R. I. Historical Society, Providence, R. I.; Yale University, New Haven; Profs. J. A.

Allen, Mr. Edward L. Youmans, New York, N. Y.; Mr. William J. Potts, Camden, N. J.; Messrs. William S. Baker, Henry Phillips, Jr., Philadelphia; Interstate Commerce Commission, Washington, D. C.; Academy of Science, Mercantile Library Association, St. Louis; Colorado Scientific Society, Denver.

The following deaths were reported:

Dr. C. A. Dohrn (Stettin), May 5, 1892, æt. 87.
August William Hoffman (Berlin), May 6, 1892, æt. —

The minutes of the Board of Officers and Council were submitted and the following preambles and resolutions therefrom were read and considered.

Mr. Phillips moved:

"*Whereas*, This Society did in the year 1843 celebrate the Centennial Anniversary of its foundation by a series of addresses, meetings, receptions, exercises, etc., upon the 25th, 26th, 27th, 28th, 29th, and 30th days of May, the results of which were published in a special volume of over two hundred pages; and,

"*Whereas*, We are approaching the Sesqui-Centennial Anniversary of the same auspicious event; therefore, be it

"*Resolved*, That the Society will celebrate the same in a worthy and becoming manner.

"*Resolved*, That the President be authorized to appoint a Committee of five members to make all necessary arrangements for the same and with full power to act, and that the President be *ex officio* a member of said Committee."

The preamble and resolutions being considered by the Society were unanimously agreed to.

The President subsequently appointed as said Committee Messrs. Henry Phillips, Jr., Chairman, J. Sergeant Price, Daniel G. Brinton, Richard Vaux and William V. Keating.

Pending nominations Nos. 1233 and 1241 were read, spoken to and balloted for.

New nomination No. 1242 was read.

The following report and resolutions were presented by Mr. Williams:

Your Committee, appointed under a resolution passed as follows:

"*Resolved*, That a Committee of three be appointed by the President to consider and report to the Society upon the advisability of an annual grant for the purpose of aiding the publication or assuming the entire cost of publishing transcripts of the Babylonian tablets on deposit in the Museum of the University of Pennsylvania"

has the honor to report that the collection of clay tablets inscribed in cuneiform from the Temple of Bel at Niffer, now deposited in the Museum of the University of Pennsylvania, numbers nearly seven thousand specimens and constitutes the most important collection of this character in the country, and one of the most important in the world, ranking third among such collections. The consecutive character of these temple archives, the long period they cover, and their complete and varied character, render their publication of the utmost importance to the world of learning, while the circumstance that similar records are frequently repeated render it possible to give a fair summary by publishing portions arranged in selected series, by dynasties and with reference to the subjects treated. It is therefore practicable to publish successive volumes of these texts, each of which shall be complete in itself, and which do not necessarily involve the publication of others in the series, though the value of all will be greatly increased by the publication of the whole.

The first cuneiform text was published by the East India Company in 1804, the inscription in its collection being engraved. Publications of texts have since been made by the British Museum, by the French and German Governments, by various learned societies and by private publishers, aided by subscriptions and grants. The experience of nearly a century has conclusively established that the best results in development of research and in aid of study are secured by publishing a transcription of cuneiform texts, without translations. The texts once published, the material for study now inaccessible in the Museum is opened to all scholars.

The transcription of a series of these tablets is now nearly completed by a member of this Society, Dr. H. V. Hilprecht. Its publication will fill about seventy plates of a size similar to the quarto page of the Transactions of the Society, and cost, if reproduced by any photo-lithographic process, about $500. Other similar volumes will be produced in the future, and while the publication of the first of these issues will not pledge the Society to publish its successors, this fact ought to receive due consideration. In any case, only a small portion of the 7000 tablets will be published, and years will pass before even eight or ten volumes of like size will be presented for publication.

The publication of the first volume presents therefore a single issue on a subject of the utmost importance to sound scholarship, a credit to American learning, and a work which will not see the light by private enterprise. Your Committee feels that this is a case which appeals directly to this Society, coincides with its past policy, and is certain to add to the value and importance of its Transactions. On inquiry it appears that a sum nearly sufficient for this expenditure can be secured out of this year's appropriations, and the remainder can be provided for out of next year's income. The Transactions offer a medium in all respects suitable, its page being of the proper size and the method of publication enabling the volume to be issued separately and should the series be continued, they can be numbered consecutively. Your Committee therefore recommend the passage of the following resolutions .

"*Resolved*, That it is the sense of the Society that the publication of the cuneiform texts transcribed from the tablets in the Museum of the University of Pennsylvania be begun by the publication of a single volume, without committing the Society to the publication of successive volumes in the series.

"*Resolved*, That this volume be submitted for approval to the Publication Committee of the Society and be issued by the Committee as a part of the Transactions, due reference being had to future publications in the series, if the same shall be determined upon in due course under the rules and order of the Society."

TALCOTT WILLIAMS,
J. SERGEANT PRICE,
PATTERSON DU BOIS,
Committee.

After a discussion the resolutions were adopted, and also a third resolution offered as an amendment by Mr. Martindale:

Resolved, That the sum of $500 in addition to the amount already appropriated for the publications of the Society be granted in order to further the publication of the texts referred to in the foregoing report.

The deferred business of the Society was taken up and considered, and the following resolution offered by Mr. Bache, was considered :

Resolved, That the Society instruct the Curators to exclude from the cases in the meeting room of the Society everything but such printed matter as is desirable for ready reference, and from the floor any articles which are not conducive to the primary purpose in this room of convenience of the members of the Society.

After discussion, the motion was voted upon and lost.

The report of the Curators presented at the last meeting of the Society was read.

The following motion of Dr. Morris, offered March 18th, was then taken up and considered.

"*Resolved,* That the Secretaries be requested to ask from the Academy of Natural Sciences, the Numismatic and Antiquarian Society and the Historical Society, the return of all the articles belonging to this Society that are now deposited with them."

And after discussion the portion relating to the deposit of the coins of the Society with the Numismatic and Antiquarian Society was withdrawn.

The following resolution was then offered as an amendment by Mr. Williams:

Resolved, That the resolution be referred to the Curators with instructions to report a plan for cataloging and labeling the Poinsett and Keating Collection, and of placing it where it will best serve the purposes of ethnological study.

The amendment was agreed to by a vote of 13 to 7.

The following gentlemen were declared duly elected members of the Society:

2203. Mr. Harold Goodwin, Philadelphia.
2204. Mr. Joseph D. Potts, Philadelphia.

And the Society was adjourned by the President.

PROCEEDINGS

OF THE

AMERICAN PHILOSOPHICAL SOCIETY,

HELD AT PHILADELPHIA, FOR PROMOTING USEFUL KNOWLEDGE.

VOL. XXX. DECEMBER, 1892. NO. 139.

On the Mutual Relations Between the Orbits of Certain Asteroids.

By Daniel Kirkwood, Riverside, Cal.

(Read before the American Philosophical Society, September 2, 1892.)

The present writer, several years since,* called attention to the fact that in some parts of the asteroid zone the orbits of particular members have a striking resemblance to each other. These significant coincidences have been regarded by astronomers as worthy of study, and, in addition to the binary and ternary clusters pointed out by the writer, others have been designated by Tisserand,† of Paris, and by Monck, of Dublin.‡ These groups, according to the former, cannot be regarded as chance arrangements. "A glance at the list," says Mr. Monck, "will show that the resemblance frequently extends beyond a single pair and embraces what may be called a family—a circumstance which is known to occur in the case of comets also." The writer's list (which might be extended) is as follows :

GROUPS OF ASTEROIDS.

	NAMES.	a	e	i		π	
I.	Huberta ...	3.4586	0.1103	6°	16′	329°	45′
	Hermione ..	3.4535	0.1255	7	36	357	36
II.	(106) Dione......	3.1670	0.1788	4	38	25	57
	(104) Clymene ...	3.1560	0.1407	2	53	62	30
	(171) Ophelia....	3.1554	0.1142	2	33	148	31
	(62) Erato	3.1241	0.1756	2	12	39	0
	(287) Silesia......	3.1190	0.1217	3	40	65	16
	(212) Medea	3.1157	0.1013	4	16	56	18
	(86) Semele.....	3.1015	0.2193	4	47	29	10
	(305)	3.0973	0.1927	4	26	104	37
	(345) Vera........	3.0966	0.1975	5	11	27	48
	(223) Rosa.......	3.0937	0.1206	1	59	106	35
	(268) Adorea.....	3.0853	0.1285	2	25	184	48

*1887. †Annuaire, 1891. ‡ *Sid. Mess.*, October, 1888, p. 334.

	Names.	a	e	i		π	
III.	(238) Hypatia....	2.9081	0.0876	12°	23′	28°	24′
	(191) Kolga......	2.8967	0.0876	11	29	23	21
IV.	(1) Ceres	2.7673	0.0763	10	37	149	38
	(237) Cælestina ..	2.7607	0.0738	9	46	282	49
V.	(116) Sirona......	2.7669	0.1433	3	35	152	47
	(278) Paulina	2.7575	0.1331	7	50	199	52
	(213) Lilaea......	2.7563	0.1437	6	47	281	4
VI.	(206) Hersilia	2.7399	0.0389	3	46	95	44
	(203) Pompei	2.7376	0.0587	3	13	42	51
	(160) Una........	2.7287	0.0624	3	51	55	57
	(301) Bavaria	2.7258	0.0660	4	53	24	4
VII.	(97) Clotho	2.6708	0.2550	11	46	65	32
	(3) Juno.......	2.6683	0.2579	13	1	54	50
VIII.	(249) Asporina ...	2.6947	0.1050	15	38	256	6
	(218) Bianca	2.6653	0.1155	15	13	230	14
IX.	(66) Maia	2.6454	0.1758	3	6	48	8
	(37) Fides	2.6440	0.1750	3	7	66	26
X.	(193) Ambrosia ..	2.5758	0.2854	11	38	70	52
	(134) Sophrosyne	2.5647	0.1165	11	36	67	33
XI.	(79) Eurynome .	2.4436	0.1945	4	37	44	22
	(19) Fortuna....	2.4415	0.1594	1	33	31	3
XII.	(249) Ilse	2.3793	0.2195	9	22	14	16
	(115) Thyra......	2.3791	0.1939	11	35	43	2
	(84) Clio	2.3629	0.2360	9	40	339	20

Note.—*a*, *e*, *i* and *π* represent the distances, eccentricities, inclinations and perihelia respectively.

Remarks.

1. The second cluster has eleven known members, the average inclination being about 3° 35′, that is, no one differs from the mean as much as 2°. Of the other groups, several are not less striking in the closeness of their relations.

2. When the earth, as well as Mars itself, was yet a part of the solar atmosphere, these individual planetoids were starting on the paths prescribed them. Into how many nebulous fragments they may have been subdivided, and to what extent these ramifications may yet be traced, let the astronomer of the future inquire.

Further Notes on the Betoya Dialects; from Unpublished Sources.

By Daniel G. Brinton, M.D., LL.D.

(*Read before the American Philosophical Society, October 7, 1892.*)

Last spring the Librarian of the Lenox Library, Mr. Wilberforce Eames, called my attention to a manuscript in that collection, with the following title: "*Arte de lengua de las Misiones del Rio Napo de la Nacion Quenquehoyos, y idioma general de los mas de ese Rio, Payohuates, Genzehuates, Ancoteres, Encabellados. Juntamente tiene la doctrina Christiana en dicha lengua y en la del Ynga. Al remate.*"

It is a duodecimo of seventy-five leaves, complete, clearly written, and dated at the close "Mayo 4 de 1793." It begins with a brief exposition of the grammatic principles of the language, and follows with a vocabulary of about 1700 words, covering 34 leaves. At the close are versions of the Doctrina in the same tongue and in the Kechua. Through the kindness of Mr. Eames I had opportunity to examine the MS. carefully, and to make from it a number of extracts which enable me to present the subjoined sketch of the language.

The stock to which it belongs is one concerning whose grammatic character the material hitherto available has been quite meagre. In a former contribution to the Proceedings of this Society I have shown that what are distinctively known as the Rio Napo dialects belong to the Betoya linguistic stock, and are affiliated with others which can be traced over ten degrees of latitude, from 3° south to 7° north latitude.

The dialect presented in the present MS. is a comparatively pure and well-marked member of the stock, and is nearly related to the Correguage of the head waters of the Caqueta and Putumayo rivers, of which vocabularies have been published by different travelers.

By Hervas, and a number of other writers who have copied from him, these Rio Napo dialects have been classed with the Zaparro stock, with which they have no relationship whatever.

Nouns.

Nouns are usually employed with suffixes denoting relation which allow them to be arranged with a resemblance to declensions.

Following the analogy of the Latin Grammar, the author presents five such declensions of masculine and feminine nouns, with some variations for neuters. The endings of his oblique cases are as follows:

Case Endings.

DECLENSIONS.	1.	2.	3.	4.	5.
Genitive,	*co,*	*que,*	*ye, que,*	*ye,*	*he.*
Dative,	*ni,*	*ni,*	*ni, pi,*	*ni,*	*ni.*
Accusative,	*nam,*	*te,*	*te,*	*te,*	*te.*
Ablative,	*pi, pio, nam,*	*pi, pio,*	*pi, pio, ani,*	*pi, are, ani,*	*pi, na.*

The plural is formed by reduplication, or by the general termination *zea* or *cea*, which means "all;" or *guati;* or, for inanimate objects, *na*.

The ablative suffix, *pi* or *pio*, is instrumental; *are* signifies accompaniment.

The termination *na or nam* of the accusative indicates motion.

The following example of a noun of the first declension will be a sufficient illustration.

Sigua-ye—music.

	SINGULAR.	PLURAL.
Nom.,	*siguaye,*	*siguayezea.*
Gen.,	*siguaco,*	*siguaqunazea.*
Dat.,	*siguaconi,*	*siguanizea.*
Acc.,	*siguaconam,*	*siguatezea.*
Voc.,	*siguaye,*	*siguaquenazea.*
Abl.,	*siguayepi,*	*siguapizea.*

Gender.

This language is remarkable for the well-defined distinction it presents between masculine and feminine forms. The feminine termination is *o*, which, by assimilation, may also modify other vowels. It is present in both nouns, adjectives and pronouns; *e. g.:*

He is a bad man, *ha quaque pain.*
She is a bad woman, *y-o coaco romio.*

The masculine and feminine forms can also be applied to inanimate objects.

This thing (masc.), *i-ie.*
This thing (fem.), *i-o.*
That thing (masc.), *he-y.*
That thing (fem.), *he-co.*

There is no regular termination to nouns which distinguishes the animate from the inanimate classes. Nevertheless, such a distinction is clearly recognized in the tongue; and also the distinction between rational and irrational beings.

The termination *pi* indicates animate rational beings, singular or plural; as, *pain pi raye*, some people are coming.

The termination *guati* or *huati* (*guay* or *huay*), is the plural for animate beings, whether rational or irrational, masculine or feminine; as, *Quito huati*, people of Quito, *romi-huati* or *nomio guay*, womenfolk.

The plural termination for inanimate beings is *na;* as, *zonque-na*, the trees.

Other plurals are irregular.

Pronouns.

The same forms serve for both personal and possessive pronouns.

I, my,	*ye* or *ye-pi.*
Thou, thine, thy,	*mue.*
Thou thyself,	*mue-repa.*
That one (masc.),	*ha*, or *an*, or *haon.*
That one (fem.),	*haon*, or *aon-pi.*
She,	*y-o.*
We, our (masc. and fem.),	*may*, or *yeque*, or *yequepi.*
You, your (masc. and fem.),	*musa.*
They, their (masc. and fem.),	*imbue.*

Examples:

My clothing, *ye-ca.*
Thy wife, *mue-rexo*, or *mue-nexo* (from *exhe*, wife).
It is my son, *yeque çiva-e.*

Numerals.

1,	*Tey* (masc.); *teo* (fem.); only one, *teirepa* (one itself).
2,	*Cayapa.*
3,	*Toazumba.*
4,	*Cajezea* (2 with plural termination).
5,	*Teente* (hand).
6,	*Teyentetey* (hand + 1).
7,	*Teyente cayapa* (hand + 2).
8,	*Teyente toazumba* (hand + 3).
9,	*Teyente caesea* (hand + 4).
10,	*Caya ente*, or *caya huenā* (two hands).
11,	*Caya ente-tey* (two hands + 1).
15,	*Toazumba-ente* (three hands).
16,	*Toazumba-ente-tey* (three hands + 1).
20,	*Caesea ente* (four hands).

Particles.

Like other languages of this class, much of the force of the expression depends on the use of certain particles, employed as prefixes, suffixes or infixes. The following examples will suffice:

Hua, causative, as, I smell (I observe an odor), *ye ezi*.
I smell (I cause an odor), *ye huazi*.
Eagi, expresses desire or wish.
Cono, to drink; *cono-eagi*, I want to drink.
Caye, has an imperative sense.
Yere, to cut; *yere-e-caye*, to order to cut.
Mapay, indicates negation.
He comes, *rayge;* he comes not, *ray-mapay-ge*.
Que, co, ne, ni are particles of interrogation.

Terms of Consanguinity.

A number of these are given, but their distinction is not well explained.

My father, *ye-aque*, or *hucaque*, or *aqma*.
My mother, *ye-aco*, or *hucaco*, or *acoma*.
My son (child), *ye-mamaque*, fem. *e-mamaco;* or *ye-zenque*, fem. *ye-zenco*.
My grandfather, *ye co-e*, or *nenco-e*.
My grandmother, *ye-coe-o*, or *nenco-o*.
My uncle, *ye-pereque*.
My aunt, *ye-pueco*.

On the use of these the author adds the following note:

"Lo comun es que los tios á sus sobrinos dicen hijos, y los sobrinos padres los suegros hijos los hermanos tios y cunados de hermanos."

Verbs.

Conjugation of the verb oye, *to love.*

Present.

I love, *ye oye*.	We love, *may oniñ*.
Thou lovest, *oye mue*.	You love, *musa oy'ye*.
He loves, *an oyni*.	

Imperfect.

I loved, *ye ouha*.	We loved, *may ouahue*.
Thou lovedst, *mue ouhue*.	You loved, *musa oyci seaha-e*.
He loved, *heque ouha*.	They loved, *an guati ou huapa*.

Preterit.

I have loved, *yeohue*.	We have loved, *may oysi queae*.
Thou hast loved, *mue oysiqueco*.	You have loved, *musa oysi queae*.
He has loved, *ian oysi queae*.	They have loved, *an guati oysisea-e*.

PLUPERFECT.

I had loved, *ye oy paa*, etc.

FUTURE.

I shall love, *oysi'ye*.
Thou wilt love, *oygen mue*.
He will love, *oysipi yan*.
We shall love, *onui yeque*.
You will love, *oini musa*.
They will love, *oycipi yan guati*

IMPERATIVE.

Love thou, *oyni'mue*.

Verbs can be formed from nouns or adjectives by adding the particle *gi*; as,

Smoke, *pia*; it smokes, *piagi*.

THE LORD'S PRAYER.

1. *May aque matemote payque.*
Our father heaven-at is there.

2. *Mue mami oisique pae.*
Thy name be sacred.

3. *Mue payquero rauyena.*
Thy kingdom come.

4. *Mue yeye neçique paye.*
Thy will on earth rule.

5. *Omaje* ^{sto}*huay matemote nesique paye.*
Even as thy holiness in heaven (and) on earth rules.

6. *Aunre yure omansepi mayni insigen.*
Give to eat to-day as to us each day.

7. *May coayrosere huaneyeyen.*
Our sins pardon.

8. *Omaje may huanienuu.*
Even as we pardon.

9. *Tin huati mainre coayocere.*
Those who us sin against.

10. *Coayoyete mainre tantahe.*
Doing evil us keep from.

11. *Zea coayete mainpi pirahe.*
All evils us from deliver.

Notes.

1. *Matemote* appears to be a locative reduplicated form from *emue*, above; *payque*, to be in a place.

3. *Payquero*, from *pain*, man, master; *quero*, place or town; *rauyena*, from *raye*, to come.

4. The phrase "Creator of heaven and earth" is translated *matemote yejare nesiquete.*

5. The words *neçique paye* seem to be repeated by error.

6. *Aunre,* from *aunne,* to give to eat, derived from *anye,* to eat; *insigen,* from *sia,* day; another word for day is *munçe;* both are evidently from *nçe* or *ense,* sun.

7. *Coayocere,* sins, from *coa* or *qua,* bad.

8. *Huanienuu;* the vocabulary gives *huaneyeye,* to pardon.

10. *Coayoye* or *coayoze,* evils; *coayeteyoye,* to commit sin.

11. *Pirahe,* deliver; so in the Signarse, "Deliver us, O Lord," *mainpi pirahe may aque Dios.*

The following is the version in "Encabellada," given from the Mezzofanti Collection in Teza's *Saggi Inediti de Lingue Americane* (Pisa, 1868):

May ake matemote payque mue mami, oycique paye mue paykero: mayni raygen mue yeye nezique paye exanie yexana, matemote yoygi. Zia omuncepi aunre mayni incigen: may quayeyocere guaniyenigen exanie may quayeyocehuatire guaniyenichañu: quayeyote maypi piraygen ziaqua quachacere mayni rebaygen.

It is evident that this is the same dialect, but a version by a different hand, in which a varied phraseology has at times been adopted.

VOCABULARY.

Above, upon, *emue.*
Alive, living, *huaje.*
All, *zia,* or *ziaye,* or *zea.*
Ashes, *unta.*
Bad, *coa.*
  it is bad, *qua-gi.*
Beard, *zebi, zehue.*
Before, *yehua.*
Belly, *apue,* or *etapue.*
Below, *ōca, ocare, huehue.*
Bird, *pi-ha.*
Black, *neaque,* or *neaxaye.*
Blood, *zi-e.*
Blue, *pocoro.*
Body, *juru.*
Bone (of animals), *huay tarapue.*
  (of man), *pain tarapue.*
Boy, *zin* or *ziba-e.*
  (fem.) girl, *ziba-o.*
Bread, *haun.*
Breast, *cutihue.*
Brownish (morado), *cariri.*
Build, to, *enene.*
Burn, to, *vye,* or *eoye.*
Canoe, *yogue,* or *comu.*
Come, to, *raye,* or *rayge,* or *mane.*
Cotton, *yei,* or *yeg-y.*
Dance, to, *reroye,* or *nanuye,* or *nemcaye.*
Dead, *juyneique,* or *junçe.*
Deity, *ayreoque.*
Dog, *yay,* or *gho-pe*
Drink, to, *uncusi.*
Earth, land, *yexa.*

Ears, *caxoro*.
Eat, to, *anye*.
Egg (raw), *hua jezia*.
(cooked), *quaco jezia*.
Enemy, *juajo pain*, or *guato pain*.
Eyes, *nañqua*, or *nañcoca*.
Face, *zi-a*.
Father (spiritual), *pairi*.
(natural), *jaque*, or *vacaque*.
Feather, *ca*.
Female, *romio*, or *nomio*.
Finger, *monô*.
Fire, *toa*.
to light a fire, *toare zoanŭ*.
Flesh, meat, *huay*.
Flower, *zaza*.
Flute, *hetuhue*.
Foot, *nenye*, or *nencaye*.
Foretell, to (by magic), *viniare caye*.
Forehead, *ziatarapue* (see "Face," "Belly").
Go, to, *zaiye*.
Green, *huaxe*.
Guacamayas, *ma* (= red, from the color of the plumage).
Hamack, *ham*, or *hamxe*.
Hand, *hente*.
right hand, *heja gente*.
left hand, *ari gente*.
Head, *ziumbue*.
Hear, to, *hachaye*.
Heart, *ahue*.
of animals, *zeme*.
of inanimate things, *joyo*.
Heat, burning, *nçe*.
Horn, of animals, *xexo*.
as a wind instrument, *ruruhue*.
Hot, *raca*.
House, *hue*.
new house, *mama hue*.
old house, *punca hue*.
to build a house, *hue enene* (see "To make").
Husband, *eghe*, or *paque*, or *yohemue*.
Image, idol, *toyace*.
Iron, *quena*.
Jar, *qua-curo*
Kill, to, *huaye*.
Know, to, *quachaye*.
Lake, lagoon, *zitara*, or *copora*, or *guayra*.
Lance, spear, *huy*.
Light, *toa*, or *zeunze toa* (= fire).
Lion, *mayay*.
Maize, *bea*, or *hueha*.
young, *huinia hueha*.
pounded, *cata vea*.
roasted, *jarose vea*.
Make, to (hacer), *yoye*, or *nene*.
Male, *emue*.
Man, *pain*, or *hain*.
Master, *paque*.
Mat, *punti*.
Milk, *oge*.
Moon, *nianâg*, or *pain*.
the moon shines, *nâneg meagi*.
full moon, *nânâ tubetotagui*.
Mother, *aco*, or *bucaco*, or *hacoma*, or *jacore*.
Mouth, *heopo*.
Nail, of finger, *coo*.
Name, *mami*.
Name, to, to call, *cuymiane*.
Navel, *zumjupue*.
New, *mama*.
Night, *nâmi*.
Nose, *uncuepue*, or *aqueeze*, or *un-eye*.
Old man, *aypue*.
Old woman, *a-yo*, or *punq-yo*.
Pardon, to, *huaneyeye*, or *tauye*.
Parrot, *huee*.
People, person, *pain*.
hostile people, *guato pain*.
friendly people, *voi pain*.
Perish, to, *chaye*, or *xuxu-chaye*
Place, *rovue*, or *quero*, or *taco*, or *rare*.
Poor, *yehui*.
Pretty, *ayreo*, or *aydeoge*.

Rain, *ôco* (= water).
  it rains, *ôcooi.*
Red, *ma.*
  bright red, *malay.*
Relation, male, *xoyque.*
  female, *xoyco.*
Road, *ma-a.*
Round, *cahua.*
Salt, *hazi,* or *anzi,* or *quena ocha,* or *o-a,* or *tere.*
  to salt, *anzi pegenaye.*
Scorpion, *puny.*
See, to, *inaye.*
Seed, grain, *ca.*
Servant, slave, *joya.*
Shaman, priest, *viniapain* (see "To foretell").
Shoulders, *ete.*
Silver, *rehua.*
Sin, *coa-yoye* (see "Bad").
Sleep, to, *cane.*
Smell, to, *yeye-ye.*
Small, little, *arimania.*
Smoke, *pia.*
Soul, *joyo* (see "Heart").
Spittle, *co-o.*
Spring, fountain, *oco renia* (see "Water").
Star, *manûco.*
  the Pleiades, *vze po.*
Stick, *tarapue.*
Stone, *quena.*
Straw, *taya juinze.*
Sun, *nçe,* or *ense.*
  the sun rises, *nçe nantagi.*
Talk, to, *n-caye,* or *cocacaye.*
  speech or words, *caye.*
  language, *coca.*
Thief, *naaque.*
Tiger, *ayro-yay* (see "Woods," "Dog").
Time, *rem.*
Tobacco, *mueto.*
  in powder, *xea,* or *xena mueto.*
To-day, *yure.*
Tongue, the, *zemeno, zemeyo.*
Town, village, *quero,* or *taco,* or *raripue* (see "Place").
Turtle, *cohue,* or *puca,* or *taxeya.*
Urine, *cone.*
Water, *ôco.*
  drinking water, *ocoraca.*
  clear water, *cositaye oco.*
Weight, *requexi.*
  to weigh in a balance, *cuencuesi.*
Wind, *tutu.*
Wish, to, *yeye.*
White, *poo.*
Woods, forest, *ayro,* or *mue.*
Yellow, *zeno, zonio,* or *paco*
Yesterday, *niamina.*

On the Phylogeny of the Vertebrata.

By E. D. Cope.

(Read before the American Philosophical Society, October 7, 1892.)

I have traced the origin* of the Mammalia to the Theromorous reptiles of the Permian epoch, for the following reasons. The latter include the Pelycosauria, Cotylosauria, Procolophonina and perhaps other orders. In both classes there is only one postorbital arch of the skull, and this is the zygomatic. In both (excepting Prototheria and Procolophonina †)

* Proceeds. Amer. Philos. Soc., 1884, p. 43.
† Seeley, Philos. Trans. Royal Soc., 1889, 269.

the coracoid element is of reduced size, and is coössified with the scapula. In both (except Cotylosauria) the capitular articulation of the ribs is intercentral. In both, the humerus has distal condyles and epicondyles, and there is an entepicondylar foramen in the Pelycosauria as in the lower Mammalia. The posterior foot is constructed in the Pelycosauria almost exactly like that of the Prototheria. The single occipital condyle of the reptiles is not found in the Mammalia, but in some of the Lacertilia (Uroplates, Gecco) there are two condyles, the median (basioccipital) portion of the single condyle being rudimental. The Pelycosauria could not, however, have given origin to the Prototheria, since in that subclass of mammals there is a well-developed coracoid. But in the Procolophonina this element is developed as in the Prototheria. Moreover, the Pelycosauria and the Procolophonina have the interclavicle, which is an element of membranous origin, while in the Prototheria we have the corresponding cartilage bone, the episternum. This element is present in the Permian order of the Cotylosauria, which is nearly related to the Pelycosauria. This order has, however, single-headed ribs, springing from the diapophyses, which is not usual in the Mammalia. But in some Cotylosauria the diapophyses are short, and in the Monotremata the postcervical ribs are single-headed, so this character may not prove an insurmountable one. It is evident that the Mammalia were derived from some type probably referable to a Permian reptilian order of the Theromorous series, although to which one is not yet known.

The Reptilia have been supposed by Hæckel to have taken their origin from the Batrachia. I have indicated that it is probable that the Batrachian order, which stands in this relation to the Reptilia, is the Embolomeri of the Permian epoch. This conclusion rests on the following considerations. The Reptilian order of the Cotylosauria approaches the Batrachia of the subclass Stegocephali in the overroofing of the posterior regions of the skull; in the presence of vomerine teeth, and in the absence of obturator foramen of the pelvis. In some Cotylosauria (Diadectidæ) the stegocephalian intercalary bone of the skull is well developed. But in the Cotylosauria, the vertebral column consists mainly of centra, while in the Stegocephali it consists entirely or partly of intercentra. But in the Embolomeri the centra are well developed, and are larger than the intercentra anterior to the pelvis. Hence this is the only order of Stegocephali from which the Reptilia could have been derived.

Hæckel derived the Batrachia from the Dipnoi (Dipneusta), and I followed him in this belief, being strengthened in it by Huxley's ascription of an autostylic suspensorium of the mandible* to both divisions. This phylogeny is questioned by Pollard† and by Kingsley‡ who would see the ancestry of the Batrachia in the Crossopterygian fishes on embryological grounds derived from a study of Polypterus. In support of their

* Proceedings Zoölogical Society of London, 1876, p. 59.

† Anatomischer Anzeiger, vi, p. 338, 1891.

‡ American Naturalist, 1892, p. 679. Kingsley would also derive the Dipnoi from Crossopterygia.

view I would cite the absence of the maxillary arch in the Dipnoi, and its full development in the Stegocephali, which are the ancestral Batrachia. The large development of the dorsal and anal fins in the Dipnoi is not favorable to the Hæckelian view; nor do the paired fins approach as nearly to the limbs of Batrachia as do those of some other fishes. It has been shown by Huxley that the suspensorium of the Batrachia is hyostylic in its earliest stages, and that it becomes autostylic at a later period of development. The Batrachia may then have originated from a hyostylic Teleostomous fish; *i. e.*, one with complete maxillary arch. Among Teleostomata we naturally look for forms with limbs which approach nearest the Batrachian type, and in which median fins are feeble or wanting. Such are the Rhipidopterygia, which include the families of Holoptychiidæ, Tristichopteridæ, Osteolepididæ, Cœlacanthidæ and perhaps some others. These families, except the last, abounded in the waters of the Devonian period, at the time when the ancestors of the Batrachia also

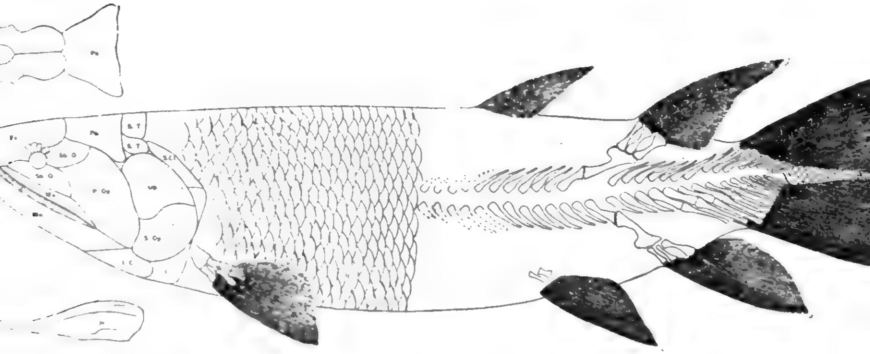


Fig. 1. *Eusthenopteron foordii* Whiteaves; ⅓ natural size. Devonian of New Brunswick. From Whiteaves.

existed. All of them agree in possessing the median fins of greatly reduced proportions, and the mesodermal or internal elements of the paired fins more like the limbs of the Batrachia than are those of any known fishes. The constitution of the superior cranial wall is a good deal like that of the stegocephalous Batrachia. The characters of the fins can be learned from the accompanying figure of the *Eusthenopteron foordii* Whiteaves, one of the Tristichopteridæ. The pectoral fin well-nigh realizes Gegenbaur's theory of the derivation of the Chiropterygium from the Archipterygium.

The question of the ancestry of the Batrachia cannot be considered to be yet settled.

The ancestral type of fishes is probably the Ichthyotomous order of the subclass of sharks (Elasmobranchii).* They are hyostylic, and have cranial

* Cope, Proceedings Amer. Philos. Soc., 1884, p. 585.

segmentation, the basioccipital element being conspicuous. The fins are all primitive, and those of all other types of fishes might have been derived from them. Opposed to this estimate of their relation to other vertebrates is the fact that they have not been yet found prior to the Carboniferous period. But our knowledge of the fishes of the Devonian is yet very imperfect. The types ancestral to the Pisces must have existed in the Silurian, and forms which may well have fulfilled this function have been discovered there. I refer to the Agnatha, which have been traced to the summit of the Devonian. The Silurian Agnatha are the Pteraspridide, which display the lowest type, and the Cephalaspididæ, and these were succeeded by the Pterichthyidæ in the Devonian. There is a wide gap between these forms and any of the fishes, and nothing can be affirmed plausibly with regard to the phylogeny. There are superficial resemblances between the dorsal and ventral dermal scuta of the Pterichthyidæ and the Arthrodirous Dipnoi, but there is no considerable affinity between those divisions.

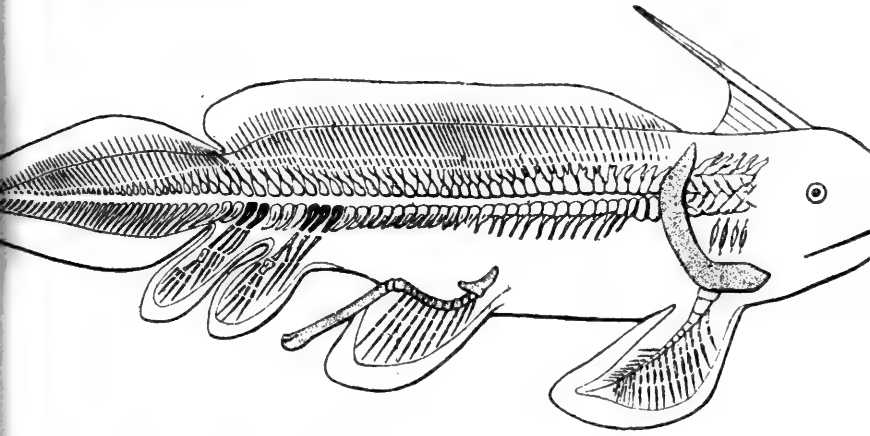


Fig. 2. *Xenacanthus dechenii,* one of the Ichthyotomi; restored by Dr. H. E. Sauvage. From the Coal Measures of France.

The extinct Agnatha agree with the existing lampreys in the absence of lower jaw and pectoral (scapular) arch, and both must be traced, in accordance with Hæckel's phylogeny, to the Acrania, which is now represented by the amphioxus (genus Branchiostoma). This order is easily the ancestor of existing Vertebrata, and shows points of resemblance to both Tunicata and worms. It has been suspected by Dohrn to have undergone degeneration, which may have been the case, since this phenomenon is so abundantly exhibited by both Tunicata and worms. It is not difficult to believe with Kowelewsky, that the Acrania were derived from the Tunicata. Semper has suspected, on the other hand, that the ancestors of the Vertebrata are to be found in the Annelide worms.

On Some Points in the Kinetogenesis of the Limbs of Vertebrates.

By E. D. Cope.

(Read before the American Philosophical Society, October 7, 1892.)

The following paper is designed to supplement some omissions from my previous discussion of this subject in the memoir "On the Mechanical Causes of the Origin of the Hard Parts of the Mammalia."*

I. The Segmentation of the Chiropterygium.

The segmentation of the limbs in the Vertebrata is a simple mechanical problem. Paleontology and embryology concur in proving that the limbs originated in primitive folds in the external integument, and that their connection with the internal skeleton was of later accomplishment. At first free, they sought points of support on the skeleton, but did not lose their free mobility when this contact was attained. Appropriately to the mechanical conditions of rigidity and flexibility necessary to their use in a fluid medium, they were originally composed of slender rods which were segmented by interruptions at suitable points. The articulations of the fin rays of fishes have been made the subject of an interesting research by Ryder, who finds them to be fractures, due to flexures during motion in the water medium.† The limb of land vertebrates (the chiropterygium) was derived from one of the forms of fins (rhipidopterygium) of water vertebrates. This is the simple type of primitive fin displayed by the Paleozoic Teleostomi of the superorder Rhipidopterygia. Whether the subdivisions of the chiropterygium, the propodial, metapodial and phalangeal bones, etc., were divided from the primitive branches of the archipterygium, as held by Gegenbaur; or whether they have developed by sprouting from a simple axial series of segments, as held by Baur; or whether, as I have suggested, it is a derivation from the rhipidopterygian type of paired fin (Fig. 1, p. 280), is not yet decided. In either case, the limbs of the first land animals were segmented and flexible at the joints between the segments. The necessities of such limbs are twofold: first, to serve as supports when at rest or in progression; second, to be applied to the body in protection from enemies, or in aiding the functions of feeding, reproduction, etc. The first function requires principally mobility at the point of connection with the body. The second, flexibility at some point on the shaft of the limb. The two kinds of movements in question would conserve two principal points of flexure, and these would be for the fore limb, just what we find, the shoulder and elbow joints; and for the hind limbs, the hip and knee joints. The two median joints are directed in opposite ways, the elbow backwards and

* American Journal of Morphology, iii, 1889, p. 137.

† Proceedings of the American Philosophical Society, 1889, p. 547.

the knee forwards. This diversity is clearly due to the diverse positions of the functioning regions. The opposite extremities of the alimentary canal, the posterior including the exits of the urogenital organs, requires that the fore limbs should bend forwards, and the posterior limbs backwards. And the constantly recurring necessity for the exercise of these flexures must necessarily have developed the appropriate articulations in preference to all others. The terminal flexure, that of the wrist or ankle, has been evidently due to a similar mechanical cause; viz., the flexure due to pressure of the weight of the body on the terminal segments when in contact with earth. The distal segments are the most slender in all types, and least able to maintain a linear direction under pressure, hence, they have flexed easily and thus the line of separation between leg and foot had its origin.

II. The Origin of the Crests of the Humeral Condyles.

I have already pointed out (*op. cit.*) the kinetogenetic origin of the tongue and groove articulations in the Mammalia.

An excellent example is furnished by the elbow joint of the Quadrumana and Diplarthra. In the lower Mammalia, including the Carnivora (*op. cit.*, Pl. ix, fig. A), the distal end of the humerus presents a submedian groove which receives the ulna, and on the inner side of it, a more or less convex surface, which is applied to the head of the radius. The coronoid process of the ulna is narrow and its dense bounding walls impinge on the broad face of the humeral condyle in flexion and extension, and transfers to it the force of impact when the foot strikes the ground. In either case, strong pressure has been brought to bear on the humeral condyle and it has yielded to the denser body of the ulna, thus forming the groove in question. In such Mammalia, the effect of the head of the radius on the humeral condyle has been similar and in the same direction, *i. e.*, upwards. The dense edges of the former have impressed themselves on the latter, while the unsupported middle portion has yielded in the direction of gravity, and the result is what we find, *i. e.*, a cup-shaped surface of the head of the radius, and a convexity of the humeral condyle, adapted to it.

Among specializations of the elbow joint, I call attention to two. In the Quadrumana, the head of the radius, probably owing to continued supination of the manus, occupies a position at the external side of the coronoid process of the ulna, and impinges on the outer part of the condyle of the humerus. The concavity of its head and the convexity of the humeral condyle are visible as before, but a prominent tongue or keel, which has been called the intertrochlear crest, separates the ulnar and radial surfaces of the humerus. (Fig. B). This keel occupies the groove or interval which separates the head of the radius from the coronoid process of the ulna. It is plain that we have here another tongue and groove joint, produced by the mutual adaptation of parts, under strain, pressure and impact. The other extreme of elbow joint is found in that of the diplarthrous Ungulata (Fig. E). Here the head of the radius, while retaining its normal position on the inner side of the forearm, is extended to the external side of the ulna and even beyond it, adapting itself to the entire width of the humeral condyles. The same structure is found in the specialized forms of both series of Diplarthra, the Perissodactyla and Artiodactyla. This expansion of the head of the radius appears to be in direct relation to the duration through long geologic ages of the impacts which have affected the limbs of these, the swiftest of the Mammalia. That the head of the radius should be spread so as to fit the entire surface of the humerus as an effect of continued impact, seems to be a mechanical necessity. But in addition to this we find a tongue-and-groove adaptation in which the crest (which I have called the trochlear crest), articulates with a groove in the head of the radius. The internal articulation of the humerus with the radius has the usual form, convex and concave distad. The trochlear crest marks the external border of the olecranar groove of the humerus. But the external part of the humeral condyles is converted into a roller which is set off from the trochlear crest, by the abrupt contraction of its diameter ; while the corresponding part of the head of the radius projects to fit it exactly.

A probable explanation of the form of this roller may be derived from a consideration of the almost identical structure of the metapodio-phalangeal articulation in the Artiodactyla. The internal and external sides of the distal metapodial condyles are not similar ; a character very distinct in the Artiodactyla (Fig. E). This is simply due to the unequal pressure exerted on the two extremities of the condyle by the phalanges, owing to the divergent direction of the digits when serving as a support. In the distal end of the humerus, the same effect is seen, the external part of the condyle nearly resembling the corresponding part of the meta podial bones. This is traceable to the same cause, viz., the divergent position assumed by the forearm on the humerus, when the weight is sup ported on one fore leg only. This brings the line of pressure through the external part of both the head of the radius and the humeral condyle (Fig. 42).

Although I have already given what is essentially the same explanation of this structure (*op. cit.*, p. 199), the above renders clearer some points

III. Atrophy of the Ulna and Fibula.

Successive atrophy of the ulna and fibula is coextensive with reduction of the number of the digits in the ungulate Mammalia, and with the development of the digital patagium in the bats. This is in broad contrast to the subequal development of the ulna and radius in the Cetacea, where the fore limb functions as the blade of an oar. The cause of the reduction of the two elements in the Ungulata is the restriction of the functions of the fore and hind limbs to the radius and tibia respectively. The distal extremities of the ulna and fibula in primitive Ungulata were supported by the external bones of the carpal and tarsal series respectively. The reduction of the external digit deprives the external bones in question of their share in the support of the general weight, and consequently relieves them of impact, which now passes through the longer median digits which remain. The median digits, on the other hand, support the radius and tibia through the medium of the carpus and tarsus, and it is these elements, therefore, which function in the use of the limb. We have here an evident illustration of the effect of disuse in effecting the atrophy of an element, and of use in increasing the size and complexity of an adjacent element of the same organism. No other explanation seems possible, for the elements which are reduced and those which are enlarged are subjected in every other respect to the same conditions.

On False Elbow Joints.

By Prof. E. D. Cope, Ph.D.

(Read before the American Philosophical Society, December 2, 1892.)

I have in various papers formulated and defended the hypothesis that the peculiar characters of the articulations of the mammalian skeleton are due to mechanical causes operating throughout the ages of geologic time.* I had previously traced the succession of these modifications from simple reptilian types, through various stages, to the highly specialized and mechanically perfect structures seen in the higher Mammalia. The series of forms revealed by paleontologic research is so complete as to leave little doubt in the mind as to the manner and cause of their origin. The theory thus derived, which I have called kinetogenesis, depends for its demonstration on two assumptions. The first is that living osseous tissue is plastic, and is therefore readily modified in its form by impacts, strains, friction, etc.; and the other is that one which is necessary to all evolutionary hypotheses, that acquired characters are inherited. I do not propose to discuss here the latter proposition, but I desire to offer some evidence in support of the former. Marey tells us,† as a result of a study of pathological conditions of articulations, that "after dislocations the old articular cavities will be filled up and disappear, while at the new point where the head of the bone is actually placed, a fresh articulation is formed, to which nothing will be wanting in the course of a few months; neither articular cartilages, synovial fluid, nor the ligaments which retain the bone in place."

Specimens demonstrating the truth of this statement of Marey are also

* *Origin of the Fittest*, 1887, p 368 *et seq.*; "The Mechanical Origin of the Hard Parts of the Mammalia," *American Journal of Morphology*, 1889, p. 148.

† *Animal Mechanism*, 1874, pp. 88, 89.

demonstrative of the truth of the doctrine of kinetogenesis. Two such have recently come under my observation—both of them cases of dislocation of the elbow joint. One of these is that of a man (No. 1838, Wistar and Hornor Museum of the University of Pennsylvania), where the cubitus is luxated backwards. The other is that of a horse, where the cubitus is luxated outwards, which I owe to the kindness of Dr. William B. Werntz, Vet., of Philadelphia. These specimens are especially instructive as exhibiting the different effects of different luxations of the same articulation.

Elbow of Man.

The human elbow, for which I am indebted to the authorities of the University of Pennsylvania, is so dislocated as to have allowed little flexion and extension during life, but the radius retained rotary motion. The humeral condyle rests on the ulna anterior to the coronoid process, and the head of the radius is in contact with the posterior side of the external epicondyle. It has resulted in consequence of the abnormal position of the humerus, that a new coronoid process has developed as far anterior to the true coronoid as the latter is anterior to the olecranon; and that a new humeral cotylus has appeared between the two coronoids whose fundus is considerably elevated above that of the old one. In consequence of the contact of the head of the radius, a deep cotylus has been formed on the posterior face of the external epicondyle and adjacent part of the condyle of the humerus, which is well adapted to the radial head. From both of these new cotyli I removed a layer of articular cartilage, and the osseous surface is as smooth and dense as those of normal articulations. The edges of the cotyli are not as smooth as those of the normal, but display the greater or lesser irregularities of unfinished osseous deposit, except the internal border of the radial cotylus of the humerus which is perfectly regular.

Remarkable exostoses accompany the development of the cotyli. The normal humeral cotylus of the ulna is partially filled with rough osseous deposit. The internal epicondyle of the humerus sends a process downwards and posteriorly towards this cotylus, which it does not reach, but projects freely. The external epicondylar region develops three processes of which the posterior and inferior anterior (distal) embrace the head of the radius, forming the posterior and anterior boundaries of the radial cotylus. Two ridges of exostosis of the shaft terminate at the posterior process. The superior anterior process is short, and projects freely distad. But a small portion of the condyle proper retains its articular surface; that is the posterior part of the internal condyle which articulates with the ulna. The remaining surface of the condyles is concealed by irregular bone deposits which quite obliterate its normal form, especially on the posterior (olecranar) surface, where the deposit is thickest and most irregular.

Elbow of a Horse.

I am informed by Dr. Werntz that the horse with dislocated elbow lived for about two years after the accident, in the country, dying of pneumonia. It used the leg (the left one) to a moderate degree, walking on the extremity of the hoof, with the elbow everted.

It results from the dislocation, that the internal part of the head of the radius was in life without opposing humeral surface. The trochlear crest of the humerus rotated inside of the median ridge of the head of the radius ; and the interior roller of the humerus projected freely within the internal border of the head of the radius. The external border of the humeral condyles corresponds to the trochlear groove of the head of the radius, which, of course, it does not fill. Since the internal face of the olecranar process rotates on the external epicondyle of the humerus, it follows that the external face of the olecranar process has no contact and was unused.

The mechanical result of this position of the parts is as follows : The internal side of the olecranar process develops friction on the external surface of the external epicondyle of the humerus. The trochlear crest of the humerus produces the same along the inner side of the median crest of the head of the radius. The expansion of diameter of the internal roller of the humerus produces friction on the internal edge of the head of the radius.

The structural result may be divided into two divisions : *first*, those developed at points of contact of the parts thus abnormally brought together, and *second*, those which appear at points abnormally separated.

Class First. (1) A large new facet is developed on the posterosuperior aspect of the external epicondyle of the humerus (*1a*, Figs. 1 and 3), which lies in an arc continuous with that of the external roller (or condyle), and whose surface is directed downwards and outwards. It occupies the usual position of the external *flexor metacarpi* muscular insertion, which is in the normal humerus a truncate oval, looking downwards and backwards. This surface has been almost entirely removed, the posterior face of the lateral rib of the humerus terminating below in an obtuse acumination, instead of the form described. The form of the new facet is not entirely due to the planing down or absorption of this region. The external epicondylar fossa is filled with exostoses, of which a large one in a superior position contributes material for the inferior part of the new facet. The posterior rib of the humerus is also exostosed so as to present a rough surface of greater transverse extent than in the normal humerus. This mass overhangs the new olecranar facet, forming a guide to its free extremity in rotation, the latter thus running in an open groove. Thus is further luxation in a measure provided against.

(2) The internal half of the humeral facet of the olecranar process is narrowed, and its prominent internal rim rounded off; and it is con-

tinued to the radial articular surface, instead of being separated by an interruption as seen in the normal horse. In extension and flexion the prominent posterior border of the new olecranar facet of the humerus rotates behind the humeral olecranar facet just described. Posterior to this depressed surface there rises an abnormal bony crest which is concentric with the olecranar and humeral surfaces, and serves as a guide in extension and flexion of the crest of the humerus which moves in the surface in front of it, which becomes, through the presence of this crest, an open groove (*1c*, Figs. 4, 5).

(3) A triangular shallow facet is formed on the posterior part of the head of the radius corresponding to the trochlear crest of the humerus (*1f*, Figs. 2, 4).

(4) A corresponding facet appears on the posterior part of the trochlear crest of the humerus, which penetrates the dense layer (*1e*, Fig. 1).

(5) The internal extremity of the humeral surface of the head of the radius is beveled off by the expansion of the internal roller of the humerus, forming a new facet of perfect articular character (*1b*, Figs. 1, 2, 4).

(6) A facet corresponding to (5) is developed on the internal roller at its middle, considered either transversely or anteroposteriorly. It is of an elongate oval form, and its superior portion penetrates the dense layer (*1d*, Fig. 1).

Class Second. (1) The trochlear groove of the head of the radius has nearly closed its anterior and posterior margins by osseous outgrowths, the largest of which, the posterior, so fills it as to support the external part of the external humeral condyle in extension and flexion (*2a*, *2b*, Figs. 2, 4, 6).

(2) Exostoses exist on the external side of the humeral facets of the olecranar process, which fill part of the concave arc of the ulna, necessary for adaptation to the external border of the humerus in its new position (*2c*, Figs. 4, 6).

(3) At the internal and posterior sides of the head of the radius a mass of exostoses causes a considerable thickening of the bone. Its thickness on the internal side is just equal to the free projection of the internal roller of the humerus within the head of the radius. It is not, however, built up to the plane of the head of the radius, and so does not yet support the humerus.

Summary.—As a result of the abnormal action of this luxated elbow we have the following production of new structures. Four complete new facets, viz.: One on the humerus, one on the ulna, one on ulna and radius, and one on the radius. Two incomplete new facets on the humerus. The development of two new crests, which serve as guides to rotating margins. Second, the partial filling by exostosis of two unused facets, one on the ulna, and one on the radius; third, the filling by exostosis of an epicondylar fossa which serves to build out a new facet; and, fourth, the building out by exostosis of the head of the radius, which if continued would have extended the head of the radius for adaptation to the inwardly luxated humerus.

Etiology.—That the new structures described are due to the abnormal mechanical relations of the bones, will be questioned by no one. We observe three distinct processes of osseous metabolism due to these conditions. These are: *First*, the removal of tissue from its original locality, and the substitution of dense tissue for spongy tissue at the point of removal. This has been accomplished at three points. A. Where the inferior extremity of the external posterior rib of the shaft of the humerus has been largely cut away, in adaptation to the movement of the olecranar crest of the ulna, and a dense layer developed over the new surface thus produced. B. Where the internal border of the head of the radius has been beveled off. C. Where the internal face of the humeral facet of the olecranar process of the ulna has been planed down without exposing the spongy bone. That this process was not completed at some points is shown by the two new facets of the humeral condyles, where the dense layer is penetrated and no corresponding dense layer established on the spongy layer thus exposed (Figs. *1d* and *1e*).

Second. The deposit of osseous bodies beneath the synovial walls where the bursa was kept expanded by the failure of the articular ends of the bones to maintain contact, as in the case of the trochlear groove of the head of the radius, and the external side of the humeral facet of the olecranar process of the ulna.

Third. The development of exostoses at the insertions of articular ligaments and tendons at the following three points: A. At the insertion of the *flexor metacarpi externus* ligament, at the exterior border of the posterior face of the inferior end of the shaft of the humerus, which crest overhangs the new facet above described. B. Where the osseous crest is developed on the ulna, concentric with the interior humeral facet of the olecranar process. C. Where extensive exostosis appears on the internal side of the head of the radius. D. Where the external epicondylar fossa is filled with exostoses (other ligamentous exostoses at 3*e*, *f* and *g*, Figs. 1, 2, 4, 5).

From the above analysis we may derive the following conclusions as to the nature of the metabolism in the several cases:

Class First Continued excessive friction removes osseous tissue from the points of contact until complete adaptation is accomplished and the friction is reduced to a normal minimum.

Class Second. Where the normal friction is wanting, and an inflammatory condition is maintained by a pulling stress on the investing synovial membrane, excess of osseous deposit is produced.

Class Third. Stress on the articular ligaments and tendons stimulates osseous deposit at their insertions, which deposit may be continued into their substance. This is a pulling stress.

Conclusions.—We find illustrated in these specimens three kinds of osseous structures which are observed in normal vertebrate skeletons.

These are, articular facets, osseous deposit at presumed points of irritation from various stimuli, and the development of bone at ligamentous and tendinous insertions. To the combination of the causes which produce the first and second effects we owe most of the secondary peculiarities of the vertebrate skeleton; and to the third we owe the fundamental construction of the skeleton on which the secondary modifications have been superposed. It is not important to our contention if the histological structure of some of the abnormal osseous deposits in our specimen may differ slightly from the normal tissues sought to be explained by it. This may be accounted for by the different circumstances to which the two sets of phenomena are due. In the dislocation the change from the antecedent state of the parts is violent and abrupt. In the evolution of the vertebrate skeleton the process was slow and gradual. In the cases of the luxations nature had to meet the changed conditions by correspondingly abnormal measures. In orderly evolution "*saltus non fecit.*" It may, however, be justly inferred, that if such characteristic structures can be produced in the space of months, how much more easy has it been for stimuli of allied character to develop the features of normal articulations during the ages of geologic time.

We have here, also, an instructive lesson as to the matter of inheritance. Every one knows that mutilations, luxations, etc., are not usually inherited. This is because they are not "acquired" in the proper sense of the word. Since characters truly acquired are inherited, it is evident that a long continuance of the stimulating cause is necessary to produce a true acquisition. The difference between a character produced by causes apart from the normal life of an animal and not repeated, and those produced by causes operating daily and hourly for geologic ages, is necessarily very great. And, as Prof. Scott * remarks, the latter have not been acquired during the lifetime of each generation, since they are found in the young before birth, before external stimuli have had the opportunity to exert their influence.

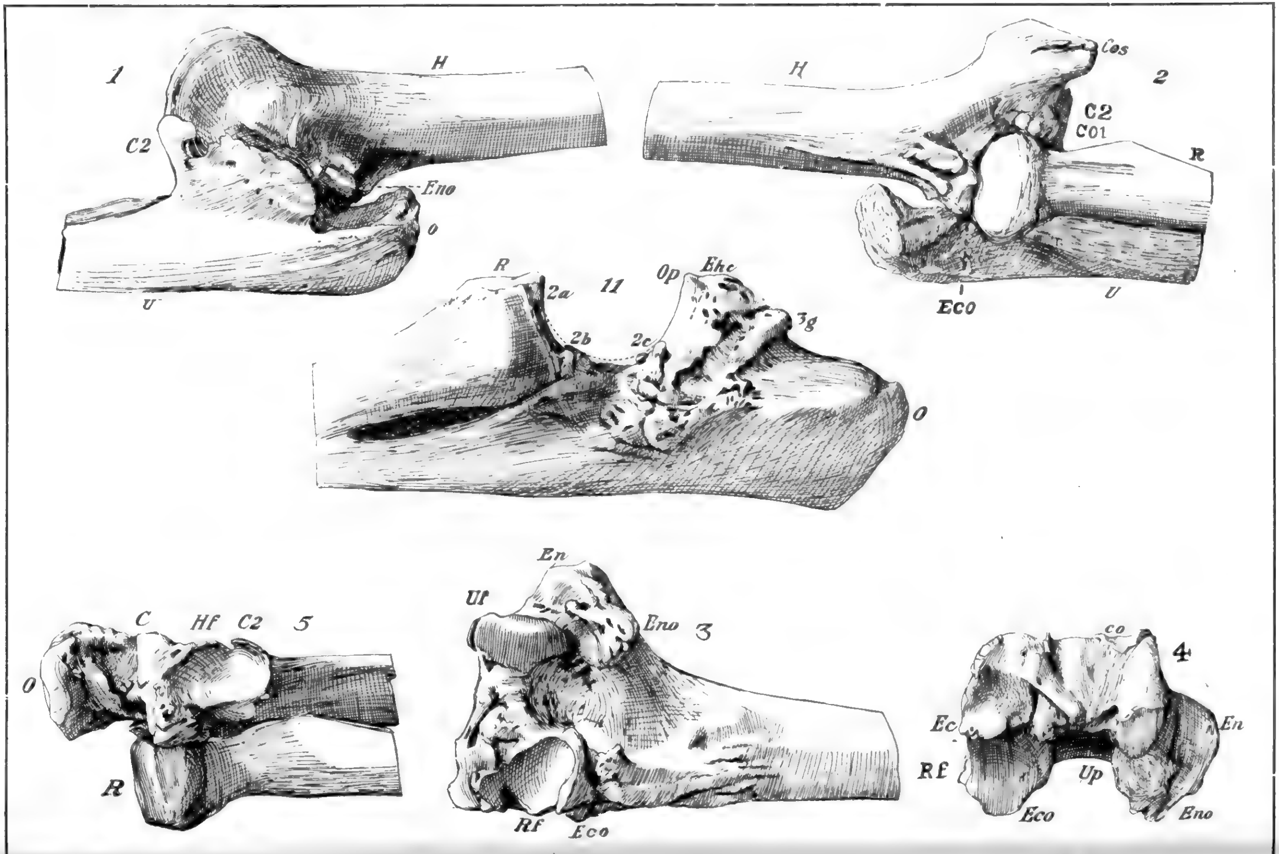
Explanation of Plates.

Figs. 1–5. *Homo sapiens*, luxated elbow joint; one half natural size.

1. Luxated elbow joint, from within.
2. Luxated elbow joint, from outer side.
3. Humerus, posterior view of distal region.
4. Humerus, distal view.
5. Ulna and radius, anterior (superior) view.

Lettering.—*H*, humerus; *U*, ulna; *R*, radius; *C*, coronoid process; *C2*, second (abnormal) coronoid process; *O*, olecranon; *En*, entepicondyle; *Ec*, ectepicondyle; *Eno*, entepicondylar exostosis; *Eco*, ectepicondylar exostosis; *Co*, condylar exostosis; *Cos*, superior condylar exostosis; *Coi*,

* "On the Osteology of Mesohippus and Leptomeryx," *American Journal of Morphology*, 1891, p. 385.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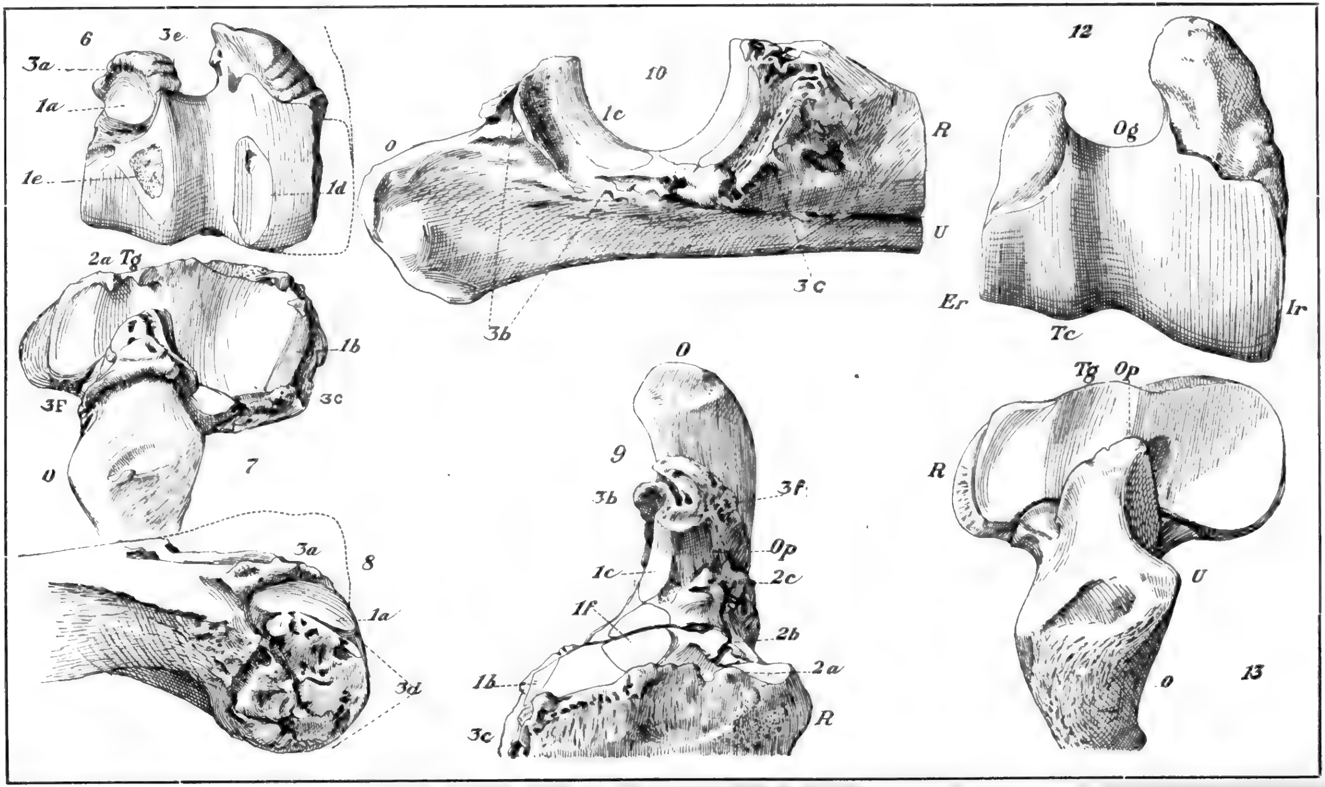

Equus caballus.

inferior condylar exostosis; *Hf*, humeral facet; *Rf*, radial facet; *Uf*, ulnar facet.

Figs. 6–11. Bones of abnormal left elbow joint of horse; one-half natural size.
12, 13. Normal bones of elbow joint of horse; one-half natural size.
6–12. Humerus, distal views.
7–13. Cubitus, proximal views.
8. Humerus, external view of distal extremity.
9. Humeral articulation of cubitus, from above.
10. Cubitus, internal view.
11. Cubitus, external view.

Additional lettering.—*Op*, olecranar process of ulna; *Cp*, coronoid process of ulna; *Og*, olecranar groove of humerus; *Tc*, trochlear crest of humerus; *Tg*, trochlear groove of humerus; *Ehc*, external humeral facet of coronoid process; *Ihc*, internal humeral facet of coronoid process.

The lettering of the abnormal facets and exostoses in Figs. 6–11 conforms to that of the same in the etiological classification on page 289.

Stated Meeting, September 2, 1892.

Present, 3 members.

President, Mr. Fraley, in the Chair.

The decease of the following members was announced:

M. F. Longstreth, Sharon Hill, Pa., December 27, 1891, æt. 73.

H. Burmeister, Buenos Ayres, May 6, 1892, æt. 86.

John R. Baker, Philadelphia, June 22, 1892, æt. 74.

George William Curtis, New York City, August 31, 1892, æt. 68.

Correspondence was submitted as follows:

A letter accepting membership from Mr. Joseph D. Potts, Philadelphia, dated May 24, 1892.

A letter acknowledging receipt of diploma from Dr. Caspar René Gregory, Leipzig.

A circular from the R. Accademia delle Scienze di Torino, announcing the death of its Vice-President, Prof. Comm. Giovanni Flechia, June 3, 1892.

A circular from the Committee for the Erection of a Monument to the Memory of M. A. de Quatrefages, inviting subscriptions for that purpose.

A circular from the Royal Society of N. S. Wales, offering its medal and £25 for the best communication containing the results of original research or observation upon the various subjects named.

An invitation from the Buffalo Historical Society to the unveiling of the statue of Red Jacket, erected by that Society, to take place June 22, 1892.

An invitation from the Deutsche Anthropologische Gesellschaft, to attend the Twenty-third Congress, to take place at Ulm, August 1 to 3, 1892.

A circular from the American Chemical Society, New York, announcing the Fifth General Meeting, to be held at Rochester, N. Y., August 16 and 17, 1892.

A program of meetings and excursions of the Sixth Session of the Congrès Géologique International, to take place at Zurich, in 1894.

Announcement of the Tenth Session of the Congrès Internationale des Orientalistes, to be held at Lisbon, September 23 to October 1, 1892.

A letter from Mr. Lorin Blodgett, dated Philadelphia, July 16, 1892, enclosing memorandum of a project devised by his ancestor, Samuel Blodgett, for the formation of a National University, to be erected in Washington, D. C.

A letter from C. H. Hart, Esq., giving reasons to show that the portrait labeled Francis Hopkinson was really that of Samuel Vaughan. The communication was referred to the Curators.

Letters of envoy were received from the Australasian Association for the Advancement of Science, Sydney; Naturforsche Gesellschaft, Dorpat, Russia; Comite Geologique, Observatoire Physique Central, St. Petersburg; Institut Météorologique de Roumaine, Bucarest; Société R. Norvégienne des

Sciences, Throndhjem; Université Royale, Lund, Sweden, Musée Teyler, Harlem, Holland; Maatschappij der Nederlandsche Letterkunde, Leiden, Holland; Naturforschende Verein, Brünn, Austria; K. Akademie der Wissenschaften, Berlin; K. Sächsische Gesellschaft der Wissenschaften, Leipzig; Gesellschaft zur Beförderung der gesammten Naturwissenschaften, Marburg; Centralbureau der Internationalen Erdmessung, Potsdam, Prussia; Altertumsverein für Zwickau und umgegend, Zwickau, Saxony; École Polytechnique, Bureau des Longitudes, Musée Guimet, Paris; Meteorological Office, Royal Statistical Society, London, Eng.; Royal Irish Academy, Dublin; Geological Survey of Pennsylvania, Harrisburg; U. S. Fish Commission, Washington, D. C.; University of Wisconsin, Madison.

Letters of acknowledgment (Transactions xvii, 1 and 2) were received from the Observatoire Physique Central de Russie, St. Petersburg; Geological and Natural History Survey, Ottawa, Canada; Museum of Comparative Zoölogy, Cambridge, Mass.; American Antiquarian Society, Worcester, Mass.; Yale University, New Haven, Conn.; State Library, Albany, N. Y.; Buffalo Library, N. Y. Historical Society, New York; New Jersey Historical Society, Newark; Academy of Natural Sciences, Franklin Institute, Library Company, Philadelphia; U. S. Geological Survey, Washington, D. C.; University of California, Berkeley; California Academy of Sciences, San Francisco; State Historical Society of Wisconsin, Madison.

Letters of acknowledgment were received from the Institut Egyptien, Cairo (135); R. Society of N. S. Wales, Sydney (135); I. Academy of Sciences (136, 137), Russian Chemical Society, St. Petersburg (136); Observatory, Taschkent (136); Université Royale, Lund, Sweden (132–136); Société Hongroise de Geographie, Budapest (136); K. K. Central Anstalt für Meteorologie, etc. (137), K. K. Naturhistorisches Hofmuseum (136), Prof. Franz v. Hauer (134–137), Dr. Frederick S. Krauss (134–136), Drs. M. Much, Frederick Müller (136), E. Suess (135, 136), Vienna, Austria; Naturforschende Gesellschaft des Osterlandes, Altenburg (137); University, Bonn (136); Prof. H. von Helmholtz, Charlottenburg (132, 133, 135, 136, 137); K. Sächsisches Meteorologisches Institut, Chemnitz (96–130, 136, 137, and Catalogue Parts i–iv); Verein f. Erdkunde, Dresden (137); Naturforschende Gesellschaft, Emden (136, 137); Oberhess. Gesellschaft für Natur- und Heilkunde, Giessen (136); Naturhistorische Gesellschaft, Hanover (136); Verein der Freunde der Naturgeschichte, Mecklenburg (131–136); K. Sternwarte (136), Prof. J. Victor Carus (136), Dr. Julius Platzmann (137), Leipzig; Naturwissenschaftlicher Verein, Osnabrück (96–136, and Catalogue Parts i–iv); Prof. Dr. Johannes Dümichen, Strassburg (135); Royal Zoölogical Society, Natura Artis Magistra, Amsterdam (136); Royal Zoölogical and Botanical Society, The Hague (136); Tyler Museum, Harlem, Holland (136); Société Royale de Geographie, Antwerp, Belgium (134); R. Accademia dei Lincei, R. Comitato Geologico D'Italia, Prof. Guiseppe Sergi, Rome (136); Académie R. des Sciences, Prof. Guido Cora, Turin (136); Société D'Emulation, Abbeville (136); Société de Borda, Dax (136); Société des Sciences Naturelles and Archieologiques de la Creuse, Guéret (136); "Le Cosmos" (137), Musée d'Histoire Naturelle (134), Marquis de Nadaillac, Profs. Abel Hovelacque, Léon de Rosny (137), Paris; Mr. Samuel Timmins, Arley, near Coventry, Eng. (137); Philosophical Society, University Library, Cambridge, Eng. (137); Mr. Alfred R. Wallace, Parkston, Dorset, Eng. (137); British Museum of Natural History (128, 131, 132, 133, 137), Royal Society, Local Government Board, Royal Meteorological Society, Department of Science and Art, Royal Geographical Society, Royal Institution, Royal Astronomical Society, Linnean Society (137), Sir James Paget (137), Dr. W. H. Flower (128, 131, 132, 133, 137), Messrs. C. Juhlin Dannefeld, Charles G. Leland, Rawson W. Rawson (137), London, Eng.; Geographical Society, Manchester (137); Natural History Society, Newcastle-on-Tyne (137); Radcliffe Observatory, Prof. J. J. Sylvester, Oxford, Eng. (137); Royal Geological Society of Cornwall, Penzance, Eng. (137); Royal Society, Royal Observatory, Edinburgh (137); Philosophical Society, Glasgow (137); Prof. James E. Oliver, Ithaca, N. Y. (130, 137); Columbia College, Editors of "Popular Science Monthly," N. Y. Mathematical Society, Mr. James Douglas, New York (137); Geological Society of America, Rochester, N. Y. (137); N. J. Natural History Society, Trenton (137); Dr. Persifor Frazer, Mr. Joseph D. Potts, Philadelphia (137); Rev. F. A. Muhlenberg, Reading, Pa. (136, 137); Maryland Historical Society, Baltimore (137); Smithsonian Institution, Washington, D. C. (540 packages, 137); Michigan Agricultural College, Ingham Co. (135, 136, 137); Kansas State Historical Society, Topeka (128); Sociedad Cientifica "Antonio Alzate" (127, 132, 133), Observatorio Astronomico N. M., Tacubaya (137); Agricultural College of New Mexico, Las Cruces (137); Bishop Crescencio Carrillo, Merida, Yucatan (137); Museo Nacional, Buenos Ayres, S. A. (135).

Letters of acknowledgment (138) were received from Mr. Horatio Hale, Clinton, Ontario; Hon. J. M. Le Moine, Quebec; McGill College, Natural History Society, Montreal; Geological Survey, Ottawa; Canadian Institute, Toronto; Historical and Scientific Society, Winnipeg; Bowdoin College, Brunswick, Me.; Society of Natural History, Portland, Me.; Prof. Charles E. Hitchcock, Hanover, N. H.; Vermont Historical Society, Montpelier; Hatch Experiment Station, Amherst, Mass.; Mr. Robert N. Toppan, Museum of Comparative Zoölogy, Cambridge, Mass ; Massachusetts Institute of Technology, State Library of Massachusetts, Boston Society of Natural History, Massachusetts Historical Society, Messrs. Hamilton A. Hill, Robert C. Winthrop, Boston; Essex Institute, Salem, Mass.; Rhode Island Historical Society, Providence Franklin Society, Providence, R. I.; Mr. George F. Dunning, Farmington, Conn.; Connecticut Historical Society, Hartford; New Haven Colony Historical Society; Prof. James Hall, Albany, N. Y.; Buffalo Library, N. Y.; Prof. E. North, Clinton, N. Y.; Profs. J. M. Hart, J. E. Oliver, B. G. Wilder, Ithaca, N. Y.; New York Hospital, Historical Society, Academy of Medicine, Columbia College, Entomological

Society, Mathematical Society, Astor Library, American Museum Natural History, University of the City of New York, "Popular Science Monthly," Prof. J. A. Allen, Messrs. James Douglass, R. W. Raymond, New York; Vassar Brothers' Institute, Poughkeepsie, N. Y.; Geological Society of America, Rochester, N. Y.; U. S. Military Academy, West Point, N.Y.; Prof. Henry M. Baird, Yonkers, N. Y.; Mr. Isaac C. Martindale, Camden, N. J.; Free Public Library, Jersey City, N. J.; New Jersey Historical Society, Newark; Prof. C. A. Young, Princeton, N. J.; Oneida Historical Society, Utica, N. Y.; Dr. Robert H. Alison, Ardmore, Pa.; Prof. Charles F. Himes, Carlisle, Pa.; Hon. Eckley B. Coxe, Drifton, Pa.; Prof. M. H. Boyé, Coopersburg, Pa.; Profs. Trail Green, Thomas C. Porter, J. W. Moore, Easton, Pa.; Mr. Andrew S. McCreath, Harrisburg, Pa.; Prof. Lyman B. Hall, Haverford, Pa.; Mr. John Fulton, Johnstown, Pa.; Linnean Society, Lancaster, Pa.; Prof. John F. Carll, Pleasantville, N. J.; Rev. F. A. Mühlenberg, Reading, Pa.; Rev. G. W. Anderson, Rosemont, Pa.; Dr. John Curwen, Warren, Pa.; Mr. Philip P. Sharples, Hon. Washington Townsend, Philosophical Society, West Chester, Pa.; College of Physicians, Academy of Fine Arts, Historical Society of Pennsylvania, Library Company of Philadelphia, Numismatic and Antiquarian Society, Engineers' Club, Wagner Free Institute of Science, Messrs. Charles Bullock, Henry C. Baird, S. Castner, Jr., Thomas M. Cleemann, Patterson Du Bois, Edward Hopper, Joseph S. Harris, James T. Mitchell, Robert Patterson, Franklin Platt, J. D. Potts, J. G. Rosengarten, Theodore D. Rand, Coleman Sellers, L. A. Scott, D. K. Tuttle, Louis Vossion, Charles Stewart Wurts, Ellis Yarnall, Mrs. Helen Abbott Michael, Profs. John Ashhurst, Jr., H. D. Gregory, F. A. Genth, Jr., L. M. Haupt, H. W. Spangler, Drs. W. G. A. Bonwill, D. G. Brinton, George Friebis, Persifor Frazer, William Goodell, George R. Moorehouse, John Marshall, Charles A. Oliver, C. N. Peirce, W. S. W. Ruschenberger, Benjamin Sharp, H. Clay Trumbull, William H. Wahl, Philadelphia, Pa.; Mr. William M. Canby, Wilmington, Del.; Maryland Institute, Baltimore;

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Donation to Cabinet—Phototype of Dr. Benjamin Franklin, from Mr. Julius R. Sachse, Philadelphia, Pa.

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Petersburg; Société Finno-Ougrienne, Helsingfors; Société des Naturalistes, Kief; Société des Naturalistes, Odessa; Institut Météorologique de Roumaine, Bucarest; Naturforsche Gesellschaft, Dorpat; University, Lund, Sweden; K. Norske Videnskabers Selskab, Throndhjem; Naturforschender Verein, Brünn, Austria; K. K. Sternwarte, K. Böhmische Gesellschaft der Wissenschaften, Prag; K. Akademie der Wissenschaften, Geologische Reichsanstalt, K. K. Naturhistorische Hof-Museum, Vienna; Physiologische Gesellschaft, K. P. Geologische Landesanstalt und Bergakademie, Berlin; Naturwissenschaftlicher Verein, Bremen; Naturwissenschaftliche Gesellschaft (Isis), Dresden; Oberhessische Gesellschaft, Giessen; Naturhistorische Gesellschaft, Hanover; K. Gesellschaft der Wissenschaften, Göttingen; Gesellschaft zur Beförderung der Gesammten Naturwissenschaften, Marburg; Centralbureau der Internationalen Erdmessung, Potsdam; Altertumsverein für Zwickau und umgegend, Zwickau; Nederlandsche Maatschappij ter Bevorderung van Nijverheid, Musée Teyler, Hollandaise Maatschappij der Wetenschappen, Harlem; Friesch Genootschap van Geschied-Oudheiden Taalkunde, Leeuwarden; Maatschappij der Nederlandsche Letterkunde, Leiden; K. Bibliothek, 's Gravenhage; Société R. Malacologique de Belgique, Bruxelles; Musée d'Histoire Naturelle, Lausanne; Prof. E. Renevier, Lausanne; R. Accademia di Scienze Morale e Politiche, Naples; Ministiro di Agricoltura, Industria e Commercia, R. Comitato Geologico d'Italia, R. Accademia dei Lincei, Prof. Giuseppe Sergi, Rome; M. L. Michael-Angelo Billia, "Il Nuovo Resorgimento," Milan; R. Accademia di Scienze Morale e Politiche, Naples; Société Linnéenne, Bordeaux; Académie N. des Sciences, Arts, etc., Caen; Société N. des Sciences, Arts, etc., Cherbourg; Académie des Sciences, Arts, etc., Dijon; Union Géographique du Nord de la France, Douai; Société de Geographie, Lille; École Polytechnique, Zoölogical and Anthropological Societies, Musée Guimet, Bureau des Longitudes, Muséum d'Histoire Naturelle, "La Revue des Revues," Paris; R. Cornwall Polytechnic Society, Royal Observatory, Greenwich; Philosophi-

Teeth simple, conic ; situated on premaxillary, maxillary and dentary

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THE four pages herewith sent (219-222) are to be substituted for the corresponding pages in Volume XXX, No. 138, Proceedings American Philosophical Society.

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specimen in Museum Academy Natl. Sciences, Philadelphia.

Fig. 1. Skull, three views ; 2, skeleton of pectoral region ; 3, skeleton of sacro-pelvic region.

Fig. 4. *Anniella pulchra* Gray ; skull, × 3 ; from San Diego, California ; from specimen in my private collection presented by Mr. James S. Lippincott.

Fig 5. *Rhineura floridana* Baird ; skull, × 3 ; from Volusia, Fla. ; from specimen in my private collection from Mrs. A. D. Lungren.

The principal characters of the osteology of the Feylinia and Anniella I described in the Proceeds. Academy Philadelphia, 1864, pp. 228–230 ; and the pelvic arch of the latter and of Rhineura in a paper now in press in the *American Journal of Morphology*. Additional characters of all the above forms are described in the preceding pages.

Lettering.—Pmx., premaxillary ; *N.*, Nasal ; *F.*, frontal ; *P.*, parietal ; *So.*, supraoccipital ; *Mx.*, Maxillary ; *Pef.*, prefrontal ; *L.*, lachrymal ; *J.*, jugal ; *Pof.*, postfrontal ; *Pob.*, postorbital ; *Pofb.*, postfrontoörbital ; *St.*, supratemporal ; *Pao.*, paroccipital ; *Eo.*, exoccipital ; *Os.*, orbitosphenoid ; *Pop.*, postoptic ; *Epg.*, epipterygoid ; *Pe.*, petrosal ; *Q.*, quadrate ; *Stp.*, stapes ; *V.*, vomer ; *Pl.*, palatine ; *Pg.*, pterygoid ; *Ecp.*, ectopterygoid ; *Sp.*, sphenoid ; *Bo.*, basioccipital ; *Art.*, articular ; *Co.*, coronoid ; *Ang.*, angular ; *Spl.*, splenial ; *D.*, dentary ; *Cl.*, clavicle ; *R.*, rib ; *S.*, sacrum ; *Pv.*, pelvis.

Plate III.

Hyoid bones of Lacertilia.

Fig. 1. *Sphenodon punctatum* Gray ; nat. size ; from specimen presented by Sir James Hector.
2. *Chamæleon* sp. ; from Cuvier ; nat. size.
3. *Gecko verticillatus* Laur. ; nat. size ; from Cuvier.
4. *Aristelliger præsignis* Hallow. ; nat. size ; dissected and drawn by Dr. E. E. Galt.

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Teeth simple, conic; situated on premaxillary, maxillary and dentary bones only. Premaxillary with but one, a median tooth.

The genus Lepidosternum, as typified by the *L. octostegum*, differs from Rhineura in that the nasal bones are excluded from the nareal borders by the maxillary, and from contact with each other by the prolonged spine of the premaxillary. In both of these points Rhineura agrees with Amphisbæna. In Lepidosternum also there is a Meckelian groove, and the angle is turned vertically downwards. In *Amphisbæna* (*fuliginosa*) there is a groove and no angle.

Plate II.

Figs. 1–3. *Feylinia currorii* Gray; × 2; from Gaboon. West Africa; specimen in Museum Academy Natl. Sciences, Philadelphia.

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2. *Chamæleon* sp.; from Cuvier; nat. size.

3. *Gecko verticillatus* Laur.; nat. size; from Cuvier.

4. *Aristelliger præsignis* Hallow.; nat. size; dissected and drawn by Dr. E E. Galt.

Fig. 5. *Phyllodactylus tuberculatus* Wiegm. ; $\times$ 2 ; dissected and drawn by Dr. E. E. Galt.
6. *Thecadactylus rapicaudus* Houtt. ; $\times$ 2.
7. *Eublepharis elegans* Gray ; $\times$ 2 ; Dr. Galt.
8. *Eublepharis variegatus* Baird ; $\times$ 2.
9. *Calotes cristatellus* Kuhl ; nat. size.
10. *Phrynocephalus mystaceus* Pallas ; nat. size.
11. *Uromastix hardwickii* Gray ; nat. size ; from the Zoölogical Garden of Philadelphia.
12. *Holbrookia maculata* Gir. ; $\times$ 2 ; from specimen from Otto Lerch, San Angelo, Tex.

Plate IV.

Fig 13. *Phrynosoma coronatum* Blv. ; $\times$ 3 ; Dr. Galt.
14. *Sceloporus undulatus* Daud. ; $\times$ 2.
15. *Uta stansburiana* B. & G. ; $\times$ $\frac{5}{2}$.
16. *Sauromalus ater* Dum. ; nat. size.
17. *Crotaphytus wislicenii* B. & G. ; $\times$ 2.
18. *Anolis carolinensis* D. & B. ; $\times$ 2.
19. *Ctenosaura teres* Harl. ; nat. size (not adult).
20. *Iguana tuberculata* Laur. ; from Cuv. ; nat. size.
21. *Anguis fragilis* L. ; $\times$ 4 ; from Northern Italy.
22. *Dracæna guianensis* Daud. ; nat. size ; from specimen from Zoölogical Garden, Philadelphia.

Plate V.

Fig. 23. *Gerrhonotus multicarinatus* Blv. ; $\times$ 2 ; Dr. Galt.
24. *Ophisaurus ventralis* Daud. ; $\times$ 2 ; Dr. Galt.
25. *Heloderma suspectum* Cope ; nat. size ; Dr. Galt.
26. *Xenosaurus grandis* Gray ; $\times$ 2.
27. *Varanus niloticus* Linn. ; nat. size ; Dr. Galt.
28. *Scincus officinalis* Laur. ; $\times$ 2 ; from Cuvier.
29. *Eumeces fasciatus* L. ; $\times$ 3 ; Dr. Galt.
30. *Egernia cunninghamii* Gray ; nat. size ; the ends of the ceratobranchials are cut off in the specimen.
31. *Liolepisma laterale* Say ; $\times$ 2 ; from Hidalgo, Mexico (*L. gemmingerii*).
32. *Gongylus ocellatus* Forsk. ; $\frac{3}{2}$.

Plate VI.

Fig 33. *Celestus striatus* Gray ; nat. size.
34. *Gerrhosaurus nigrolineatus* Hallow. ; $\times$ 2.
35. *Zonurus cordylus* Linn. ; $\times$ 2.
36. *Mancus macrolepis* Cope ; $\times$ 3.
37. *Xantusia riversiana* Cope ; $\frac{3}{2}$ nat. size.
38. *Lepidophyma flavomaculatum* Dum. ; three times nat. size.
39. *Psammodromus algirus* Linn. ; $\times$ 2.

Fig. 40. *Lacerta ocellata* Daud. ; nat. size.
41. *Tupinambis teguexin* Daud.; nat. size; from Cuvier.
42. *Cnemidophorus tessellatus* Say ; × 2.
43. *Anniella pulchra* Gray ; × 4 ; from specimen from James S. Lippincott.
44. *Chirotes canaliculatus* Bonn.; × 4.
45. *Amphisbæna alba* Linn.; $\frac{3}{5}$ nat. size.
46. *Rhineura floridana* Baird ; × 4.

Lettering.—*Gh.*, glossohyal ; *Bh.*, basihyal ; *Hh.*, hypohyal ; *Ch.*, ceratohyal ; *CB. I*, first ceratobranchial ; *CB. II*, second ceratobranchial ; *EB.*, epibranchial; *St.*, stapes ; *E. St* , epistapedial ; *S. St.*, suprastapedial.

ERRATA.

Page 211, line 16, for 41 read 37.

Page 211, line 27, for Plate v, Fig. 26, read Plate vi, Fig. 38

Page 216, lines 25-30. This description of the pelvis of Anniella is erroneous. I describe it in a paper in press in the *American Journal of Morphology*, and not having the MS. with me when the present paper was written, trusted to memory, and confused it with the pelvis of Feylinia.

On Some New and Little Known Paleozoic Vertebrates.

By E. D. Cope.

(Read before the American Philosophical Society, April 1, 1892.)

It has been long known that the Catskill-Chemung beds of Northern Pennsylvania contain a fish bed rich in specimens. This deposit has been traced from Warren, on the west, to Susquehanna county, inclusive, on the east. It is now known that at the close of the Chemung epoch, as at the close of the Devonian in Belgium and Scotland, land emergences took place, producing more or less continued brackish and fresh-water conditions. The latter received the deposits known as the Catskill in the Eastern United States, and their alternations with Chemung beds containing Chemung invertebrate fossils are now well established as facts of our geological history. A recent visit to Tioga and Bradford counties, in Pennsylvania, has recently afforded me the opportunity of inspecting some of the localities where vertebrate fossils occur. These have been already referred to by Prof. J. S. Newberry in his work on the Paleozoic fishes of North America. Guided by two geologists residing in the regions in question—Mr. Andrew Sherwin, of Mansfield, Tioga county, and Mr. A. T. Lilley, of Leroy, Bradford county—I had an excellent opportunity of observing the mode of occurrence of the fossils and of obtaining specimens. I wish here to express my particular indebtedness to these gentlemen for the aid they have rendered me.

The locality I visited, near Mansfield, is typical Catskill. The list of species obtained is not large. They are :

Bothriolepis nitidus Leidy. *Holonema rugosum* Clayp. *Ganorhynchus* *oblongus*, sp. nov. *Osteolepis* or *Megalichthys*, fragments. *Holoptychius americanus* Leidy. *Holoptychius giganteus* Agass.

From Chemung beds near Leroy I obtained :

Holonema rugosum Clayp. *Holonema horridum*, sp. nov. *Holoptychius filosus*, sp. nov.

From another locality, probably Chemung, near Leroy :

Bothriolepis minor Newb. *Coccosteus macromus*, sp. nov. *Osteolepis* or *Megalichthys*, fragments.

At the last-named locality the specimens are very abundant, but mostly dissociated, so that it is rarely that two pieces of the same fish are found in their natural relations. The bed where they occur is in some places carbonaceous from the abundant organic matter deposited there. Fragments of the Osteolepid fish above referred to are abundant, but they are too scattered for identification.

To the species found in Pennsylvania, I add the description of a fine Megalichthys from the Carbonic of Kansas.

OSTRACOPHORI.

Holonema horridum, sp. nov.

This large species is represented by the nearly perfect mold of a plate whose position may be determined by the following considerations. It has almost exactly the form of the lateral plate of the specimen of the *Holonema rugosum* Clayp., to which I referred in describing the supposed pectoral spine of that species.* From the fact that the specimen referred to presents two median scuta, I have supposed that it is a part of the carapace. It is, however, true that the exposed surface of the long anterior median plate is acuminate in front, showing that the anterior lateral plates join anterior to it. This is not known to occur in the carapace, but is characteristic of the plastron. That this conclusion is correct is shown by the character of the median posterior scute of *H. rugosum*, shortly to be described. This being the case, it is necessary to admit that there are two median scuta, a character thus far unknown in the Antiarcha, and one which distinguishes the genus Holonema from Bothriolepis.

On this interpretation, the scute to be described is the posterior lateral of the left side of the plastron. It is about three fifths the size of that of the *Holonema rugosum* and is considerably longer than that of the *Bothriolepis nitidus* Leidy. It differs from both species in its superficial sculpture. In the last-named species this is generally concentric to a non-central point. In the *Holonema rugosum* the sculpture radiates from a more or less central point. In the present species the pattern is longitudinal

* Proceedings U. S. Natl. Museum, 1891, p. 456.

cal and Literary Society, Leeds; Royal Society, Linnean Society, Meteorological Council, London; Literary and Philosophical Society, Manchester; Natural History Society of Northumberland, Durham, etc., Newcastle-on-Tyne; Royal Irish Academy, Dublin; Geological and Natural History Survey of Canada, Ottawa; Canadian Institute, Toronto; Novascotian Institute of Science, Halifax; Society of Natural Sciences, Portland; Agricultural Experiment Station, Amherst, Mass.; Massachusetts Historical Society, Mr. Robert T. Swan, Boston; Messrs. Hilborne T. Cresson, Andrew McFarland Davis, Cambridge, Mass.; Free Public Library, New Bedford, Mass.; Rhode Island State Agricultural Experiment Station, Providence; Connecticut Historical Society, Hartford; Yale University, American Oriental Society, New Haven, Conn.; Brooklyn Library; Prof. James Hall, Albany, N. Y.; Agricultural Experiment Station, Geneva, N. Y.; American Institute of Electrical Engineers, Academy of Sciences, Council of the Scientific Alliance of New York, American Museum Natural History, Meteorological Observatory, New York; New Jersey Agricultural Experiment Station, Geological Survey of New Jersey, Trenton; Pennsylvania Geological Survey, Harrisburg; State College, Pennsylvania; Zoölogical Society, Messrs. R. Meade Bache, Amos P. Brown, A. F. Chamberlain, John Ellis, Moses Klein, Henry Phillips, Jr., Philadelphia; Agricultural Experiment Station, College Park, Md.; Peabody Institute, Baltimore, Md.; Smithsonian Institution, Philosophical Society, Geological Survey, U. S. Naval Observatory, War Department, U. S. Board of Geographical Names, Bureau of Education, Director of the Mint, U. S. Fish Commission, Washington, D. C.; Col. C. C. Jones, Jr., Augusta, Ga.; Historical Society, Savannah, Ga.; Tulane University, New Orleans, La.; Archæological and Historical Society, Columbus, O.; Cincinnati Observatory; University of Chicago; University of Michigan, Ann Arbor; Public Library, St. Louis, Mo.; Geological Survey of Missouri, Jefferson City; Wisconsin Academy of Sciences, Agricultural Experiment Station, Madison; State University of Iowa, Iowa

City; Editor of "Kansas University Quarterly," Lawrence; Washburn College, Agricultural Experiment Station, Topeka, Kans.; Agricultural Experiment Station, Fargo, N. Dak.; Museo Michoacano, Morelia, Mexico; Bishop Crescencio Carrillo, Merida, Yucatan; Institut Egyptien, Cairo.

A paper by Prof. Daniel Kirkwood, entitled "On the Mutual Relations Between the Orbits of Certain Asteroids," was presented by the Secretary.

Pending nomination No. 1242 was read.

Deferred business was laid over.

And the Society was adjourned by the President.

Stated Meeting, September 16, 1892.

Present, 5 members.

President, Mr. FRALEY, in the Chair.

Correspondence was submitted as follows:

A letter from Mr. Harold Goodwin, Philadelphia, accepting membership.

New exchanges—Naturforscher Gesellschaft, Dorpat, Russia; Directeur de "La Revue des Revues," Paris; Agricultural Experiment Stations, Fargo, N. Dak., Brookings, S. Dak.

Letters of envoy were received from the Magyar Tudományos Akadémia, Budapest; Académie des Sciences, Cracow; K. Geologische Landesanstalt und Bergakademie, Berlin; Vogtländische Alterthumsforschende Verein, Hohenleuben; Ministère des Travaux Publics, Paris.

Letters of acknowledgment were received from the South African Philosophical Society, Cape Town (134, 135); Capt. Richard C. Temple, Bombay, India (136); Société de Geographie de Finlande, Helsingfors (96–130, 136, 137, and Catalogue, Parts i–iv); Observatoire Physique Central, St. Petersburg (137); Prof. Japetus Steenstrup, Copenhagen (136, 137);

Naturforschende Verein, Brünn, Austria (134, 135); Dr. Francis Pulzsky, Budapest (135); Naturhistorische Landes-Museum von Kärnten, Klagenfurt (136); Astronomische und Meteorologische Observatorium, Triest, Austria (125–130, 136); Section für Naturkunde des Ö. T. C. bei K. K. Naturhistorische Hofmuseum (136), Anthropologische Gesellschaft (136), Dr. Edward Suess (137, 138), Dr. Friedrich S. Krauss (Diploma), Vienna; Gesellschaft für Erdkunde, K. Geologische Landesanstalt und Bergakademie, Prof. F. Reuleaux, Berlin (137); Naturhistorischer Verein, Bonn (136); Schlesische Gesellschaft für Vaterländische Cultur, Breslau (136); Verein für Erdkunde, Dresden (138); Deutsche Seewarte, Hamburg (137); Naturhistorische Gesellschaft, Hanover (137); Vogtländische Alterthumsforschende Verein, Hohenleuben (137); Gesellschaft zur Beförderung der Gesammten Naturwissenschaften, Marburg (134); Verein für Erdkunde, Metz (137); K. P. Geodätische Institut, Potsdam (137); Verein für Vaterländische Naturkunde in Würtemberg, Stuttgart (135); Schweiz. Naturforschende Gesellschaft, Bern (137, 138); Prof. Carl Vogt, Geneva (137, 138); Société Vaudoise des Sciences Naturelles, Lausanne (137, 138); R. Accademia de Scienze, Lettere, etc., Padova (136); Marquis Antonio de Gregorio, Palermo (136); R. Osservatorio, Torino (136); Ministère des Travaux Publics, M. Victor Duruy, Profs. Emil Levasseur, E. Mascart, Paris (137); Mr. Samuel Timmins, Arley, Coventry, Eng. (Diploma and 138); Philosophical Society, Cambridge, Eng. (Trans., xvii, 1, 2, and 138); Royal Society (Trans., xvii, 1, 2, and 138); R. Meteorological Society, Royal Institution of G. B., R. Geographical Society, Victoria Institute, Mr. C. Juhlin Dannfeldt, Prof. William Crookes, Sirs Joseph D. Hooker, James Paget, Henry Thompson, London (138); Manchester Geographical Society (138); Natural History Society of Northumberland, Durham and New Castle-on-Tyne (138); Royal Society of Edinburgh (Trans., xvii, 1, 2, and 138); Royal Observatory, Edinburgh (138); Philosophical Society, Glasgow (138); R. I. State Agricultural Experiment Station, Kingston (137, 138); Prof. J. J. Stevenson, New York (138); Prof. W. Le Conte

Stevens, Troy, N. Y. (138); Prof. E. D. Cope, Mr. H. H. Houston, Philadelphia (138); U. S. Geological Survey, Washington, D. C. (Trans., xvii, 1, 2, and 138); Leander McCormick Observatory, University of Virginia (138); "Journal of Comparative Neurology," Granville, O. (138); Dr. Robert Peter, Lexington, Ky. (138); Kansas Academy of Science (138), Washburn College (137), Topeka; Prof. Daniel Kirkwood, Riverside, Cal. (138); Bishop Crescencio Carrillo, Merida, Yucatan (138).

Accessions to the Library were announced from the Comité de Conservation des Monuments de l'Art Arabe, Cairo; New Zealand Institute, Wellington; K. K. Mineralogische Gesellschaft, St. Petersburg; K. Zoologisch. Botanische Genootschap, 's Gravenhage; Genootschap van Kunsten en Wetenschappen, Batavia; Académie des Sciences, Cracow; K. K. Militär Geographische Institut, K. K. Geologische Reichsanstalt, Vienna; K. Akademie der Wissenschaften, Physiologische Gesellschaft, Berlin; Naturhistorischer Verein, Bonn; Verein für die Geschichte und Altertumskunde, Erfurt; Oberlausitzer Gesellschaft der Wissenschaften, Görlitz; Vogtländische Alterthumsforschende Verein, Hohenleuben; Verein für Vaterländische Naturkunde, Stuttgart; Mr. T. Cannizzaro, Messina, Italy; Ministère des Travaux Publics, Paris; Royal Society, London; University of Toronto; American Academy of Arts and Sciences, Mr. Samuel A. Green, Boston, Mass.; New York Agricultural Experiment Station, Geneva; Cornell University, Ithaca; Mr. William John Potts, Camden; New Jersey Historical Society, Newark; American Academy of Political and Social Science, Rev. S. F. Hotchkin, J. F. Sachse, Miss Rebecca Elmslie, Philadelphia; Weather Bureau, Hydrographic Office, U. S. Naval Observatory, Washington, D. C.; University of California, Berkeley.

The following decease of members was announced:

John G. Whittier, born December 7, 1802; died September 7, 1892.

Prof. Joseph Lovering, Cambridge, Mass., born December 25, 1813; died January 18, 1892.

Pending nomination 1242 and new nominations 1243 and 1244 were read.

On motion, the Society

Resolved, **That Dr. Charles E. Sajous be appointed a delegate to represent this Society at the Congrès des Américanistes, to be held at Huelva in October, 1892, provided that the same shall entail no expense upon this Society.**

And the Society was adjourned by the President.

Stated Meeting, October 7, 1892.

Present, 16 members.

President, Mr. FRALEY, in the Chair.

Correspondence was submitted as follows:

A circular letter from Prof. Edward C. Pickering, Cambridge, Mass., in regard to a large southern telescope, and soliciting funds for same.

Accessions to the Library were reported from the Government Geologist, Adelaide, Australia; Académie Royale des Sciences, Amsterdam; "Flora Batava," Leiden; Mr. G. Bauer, Agram, Hungary; K. K. Naturhistorische Hofmuseum, Vienna; Mr. Albin Weisbach, Freiberg, Baden; Verein für Naturkunde, Offenbach a. M.; Société Languedocienne de Géographie, Montpellier; University Library, Cambridge, England; Radcliffe Observatory, Oxford; Natural History and Antiquarian Society, Penzance; Royal Dublin Society; Department of Agriculture, Ottawa, Canada; Agricultural Experiment Station, Bangor, Me.; Pope Manufacturing Co., Boston; Harvard University, Cambridge; Mr. Andrew McFarland Davis, Salem; American Antiquarian Society, Worcester; Dr. George Eastburn, American Meteorological Society, Public Opinion Co., New York; Numismatic and Antiquarian Society, Mr. Henry Phillips, Jr., Philadelphia.

Letters of envoy were received from the Académie des Sciences, Amsterdam; Radcliffe Observatory, Oxford, England; Zoölogical Society, London; Royal Dublin Society; Geological and Natural History Survey, Department of Agriculture, Ottawa, Canada.

Letters of acknowledgment were received from the Royal Society of Victoria, Melbourne (136); Naturforsch. Gesellschaft, Dorpat, Russia (134); K. Danske Videnskabernes Selskab, Copenhagen (136); Académie Royale des Sciences, Amsterdam (135, 136); Académie des Sciences, Cracow, Austria (136); Prof. Peter Tunner, Leoben (137); K. K. Central Anstalt für Meteorologie (138); Dr. Aristides Brezina, Vienna (137); Naturforschende Gesellschaft des Osterlandes, Altenburg (138); K. Meteorologische Institut (137), K. Geologische Landesanstalt u. Bergakademie (138), Berlin; Oberhessische Gesellschaft für Naturkunde und Heilhunde, Giessen (137); Geographische Gesellschaft, Hannover (136); K. Sächsische Gesellschaft der Wissenschaften (136), K. Sternwarte, Profs. Otto Böttlingk, I. Victor Carus (137, 138), Leipzig; Verein für Erdkunde, Metz (136); Verein der Freunde der Naturgeschichte, Mecklenburg (137); Naturwissenschaftliche Verein, Osnabrück (137); R. Biblioteca N. C., Firenze, Italy (136); R. Società Italiana D'Igiene, Milan (136); R. Biblioteca Universitaria, Pisa (136); R. Comitato Geologico D'Italia, Rome (137); Société de Geographie, Rédaction "Cosmos," Dr. E. Hamy, Profs. Abel Hovelacque, E. Levasseur, Paris (138); University Library, Cambridge, England (138); Linnean Society, London (138); Prof. W. Boyd Dawkins, Manchester, England (137, 138); Radcliffe Observatory, Oxford (134, 135, 136, 138, and Trans., xvii, 1 and 2); Tacoma Academy of Science (138); Prof. Joseph LeConte, Berkeley, Cal. (138); Prof. Robert W. Rogers, Carlisle, Pa. (138).

The Wyoming Historical and Geological Society presented a copy of "The Wyoming Memorial Medal" in white metal.

The deaths of Joseph Ernest Renan (Paris), October 2, 1892, æt. 70, and Thomas Chase (Providence, R. I.), October 6, 1892, æt. 66, were announced.

Prof. Daniel G. Brinton presented a paper entitled "Further Notes on the Betoya Dialect from Unpublished Sources."

Prof. E. D. Cope presented a paper on "The Phylogeny of the Vertebrata."

Also a paper on "Some Points in the Kinetogenesis of the Limbs of Vertebrata."

Pending nominations Nos. 1242, 1243 and 1244 were read.

The following report was presented from the Michaux Committee, and the resolution appended was, on motion, adopted:

To the American Philosophical Society:

The Michaux Committee respectfully reports, that at a meeting of the Committee, held on September 16, 1892, a letter was received from Dr. J. T. Rothrock, enclosing the following list of the time and subjects proposed for the Fourteenth Course of lectures given under the auspices of the American Philosophical Society:

WEDNESDAY EVENINGS.

Nov.	9.	Trees of Pennsylvania (illustrated).
"	16.	History and Fertility of Soil (illustrated).
"	23.	What is Economic Botany?
"	30.	Plant Form Applied to Decorative Art (illustrated).
Dec.	7.	Plant Structure Applied to Mechanical Art (illustrated).
"	14.	How to Plant and Grow Trees.
"	21.	How to Care for Trees.

It is expected that the lectures will be delivered in the Hall of the Academy of Natural Sciences, which has been kindly tendered to him by the Academy for that purpose.

The Committee approved of the proposition and requests the Society to make an appropriation of $244 out of the income of the Michaux Fund to meet the expenses of the lectures.

The Committee submits the following resolution, which it desires shall be passed by the Society:

"*Resolved,* That the sum of two hundred and forty-four dollars be appropriated out of the income of the Michaux Fund towards the expenses of the Fourteenth Course of the Michaux Forestry Lectures by Dr. J. T. Rothrock."

By order of the Committee,

J. Sergeant Price, *Secretary.*

The following letter was read and the Curators were requested to report to the Society upon the request it contained:

PHILADELPHIA, May 20, 1892.

FREDERICK FRALEY, ESQ.,

President of the American Philosophical Society:

Dear Sir:—The Joint Special Committee appointed by the Councils of Philadelphia to secure a proper representation of historical and other exhibits from Philadelphia at the World's Columbian Exposition, to be held at Chicago, propose taking the Liberty Bell and other objects in possession of the city, and are desirous of securing additional relics. An inspection of the contents of the Hall of your Society convinced the Committee that an exhibition of the following objects in your possession would greatly add to the interest of Philadelphia's display, viz.:

1. Chair in which Thomas Jefferson wrote the Declaration of Independence.
2. Chair owned and used by Benjamin Franklin.
3. Electrical device invented by Franklin.
4. Chair of Joseph Bonaparte from his residence at Bordentown.
5. Polygraph used by Jefferson.
6. Unsigned copy of the Declaration of Independence made by Jefferson, with interlineations.

And other relics of historical and antiquarian interest.

Proper attention will be given to the care and preservation of all articles exhibited under the custodianship of the Committee.

I therefore earnestly request that your Society will take into consideration the proposition to permit the above-named articles to be exhibited at Chicago under the auspices of our Committee.

Yours truly,

ELIAS P. SMITHERS, *Chairman.*

The Secretaries were authorized to reprint four pages in Prof. Cope's paper on "The Osteology of the Lacertilia," and to distribute the same with the next number of the Proceedings.

And the Society was adjourned by the President.

October 21, 1892, having been designated by the President of the United States and by the Governor of the State of Pennsylvania as a public holiday, no meeting of the American Philosophical Society was held on that evening.

Stated Meeting, November 4, 1892.

Present 14 members.

Vice-President, Dr. Ruschenberger, in the Chair.

Correspondence was submitted as follows:

An invitation from the Naturforschende Gesellschaft des Osterlandes, Altenburg, to be present at its seventy-fifth anniversary, October 8 and 9, 1892.

A circular from the University of Padua, announcing the commemoration of the four hundredth anniversary of the connection of Galilæo Galilæi with the University.

Letters of envoy were received from the Geological Survey of India, Calcutta; K. P. Meteorologisches Institut, K. Geologische Landesanstalt und Bergakademie, Editors of "Lateinische Litteraturdenkmäler," Berlin; Schlesische Gesellschaft für Vaterländische Cultur, Breslau; Department of the Interior, Washington D. C.; Direccion Général de Estadistica, Mexico.

Letters of acknowledgment were received from the Geological Survey of India, Calcutta (137); Dr. Otto Donner, Helsingfors, Finland (136–138); Société Imp. Mineralogique (137); Russian Chemical Society (137, 138); Central Physical Observatory (138); Imperial Academy of Sciences, St. Petersburg (138, and Trans., xvi, 1 and 2); R. Norwegian Society of Science, Throndhjem (137, 138); Société R. de Geographie, Antwerp, Belgium (125–130, 136–138); Société Hongroise de Geographie, Budapest (137, 138); Academy of Science, Cracow, Austria (137); Naturhistorisches Landesmuseum von

Karten, Klagenfurt, Austria (137); Dr. Hermann Rollett, Baden bei Wien (136, 137); Drs. Friederich S. Krauss, M. Much, Vienna (137, 138); Anthropologische Gesellschaft, Redaction der "Naturwissenschaftlichen Wochenschrift," Berlin (138); K. Meteorologische Institut, Chemnitz (138); Naturwissenschaftliche Gesellschaft "Isis," Dresden (137, 138); Vogtländische Altertumsforschende Verein, Hohenleuben (138); Verein der Freunde der Naturgeschichte, Mecklenburg (138); Geodätisches Institut, Potsdam (138); Würtembergische Verein für Handels-Geographie, Stuttgart (137); R. Instituto Lombardo di Scienze e Lettere, Milan (137); Societa Africana d'Italia, Naples (137); Marquis Antonio Di Gregorio, Palermo (137); Prof. G. Sergi, Rome (137); R. Osservatorio, Turin (137); Marquis de Nadaillac, Prof. E. Mascart, Paris (138); Prof. J. P. Postgate, Cambridge, Eng. (137, 138); Dr. Friederich Müller, Oxford, Eng. (137); Prof. James Geikie, Edinburgh (138); Dr. J. McK. Cattell, New York (138); Oneida Historical Society, Utica (137, 138); Mr. Cadwalader Biddle, Admiral E. Y. Macauley, Philadelphia (138); Smithsonian Institution (Trans., xvi, 1 and 2, and 132–136); Academy of Sciences, Chicago (137).

Accessions to the Library were reported from the Imperial Geographical Society, St. Petersburg; Société R. des Antiquaires du Nord, Copenhagen; K. K. Central-Anstalt für Meteorologie, etc., Vienna; Editors of "Naturwissenschaftliche Wochenschrift," "Lateinische Litteraturdenkmäler," Berlin; Schlesische Gesellschaft für Vaterländische Cultur, Breslau; Physikalisch-Medicinische Societät, Erlangen; Sächsische Geschichte und Alterthumskunde, Dresden; Senckenbergische Naturforschende Gesellschaft, Frankfurt-a.-M.; Verein für Thüringische Geschichte und Alterthumskunde, Jena; Verein für Lübeckische Geschichte, etc., Lübeck; Naturhistorische Gesellschaft, Nürnberg; Prof. F. von Sandberger, Würtzburg; Rédaction "Cosmos," Paris; Royal Society of Antiquaries, Dublin; Université, Laval, Quebec; Geological Survey, Ottawa; Bureau of Statistics of Labor, Massachusetts Historical Society, Athenæum, Boston; Harvard University, Cambridge;

Messrs. Thomas H. Dudley, William John Potts, Camden; Bureau of Statistics of New Jersey, Trenton; Academy of Natural Sciences, Editors of the "Medical and Surgical Reporter," Messrs. MacCalla & Co., Levytype Co., Messrs. John F. Lewis, Henry Phillips, Jr., Philadelphia; National Academy of Sciences, Smithsonian Institution, Census Office, War Department, Washington, D. C.; Colorado Scientific Society, Denver; Direccion Géneral de Estadistica, Mexico.

The decease of the following members was announced:

Dr. Pliny Earle, Northampton, Mass., May 17, 1892, æt. 83.

Sir Daniel Wilson, Toronto, August, 1892, æt. 77.

James B. Francis, Lowell, Mass., September 17, 1892, æt. 78.

Dr. Brinton read a paper "On the Etrusco-Libyan Elements in the Song of the Arval Brethren."

Pending nominations Nos. 1242, 1243 and 1244, and new nomination No. 1245 were read.

The Committee on Publication reported in favor of the publication of Dr. Hilprecht's Assyrian Transcripts, which was agreed to and publication ordered in the Transactions.

Dr. Morris, on behalf of the Curators, presented a report on the portrait owned by the Society labeled Francis Hopkinson, stating that in their belief it was that of Samuel Vaughan.

Mr. Fraley gave what in his opinion were the facts of the case. On motion of Mr. Fraley, the Society resolved to place the name of Samuel Vaughan on the portrait referred to.

And the Society was adjourned by the presiding member.

Stated Meeting, November 18, 1892.

Present, 11 members.

Mr. Thomas H. Dudley in the Chair.

Correspondence was submitted as follows:

An invitation from the Historical Society, Chicago, to be present at the laying of the cornerstone of their new building, November 12, 1892.

New exchanges ordered: Naturforscher-Gesellschaft, Dorpat, Russia; Université Laval, Quebec, Canada; Société d'Historie et d'Archæologie de Chalon-sur-Saone, Montbéliard, France.

Letters of acknowledgment were received from the Société Imperiale Mineralogique (138, and Trans., xvii, 1, 2); Comité Géologique de la Russe (137, 138); Prof. Serge Nikitin, St. Petersburg (136, 137, 138); Musée R. d'Histoire Naturelle de Belgique, Bruxelles (135–138); K. Universitetet, Lund, Sweden (137); K. Bibliothek (137); Gesellschaft für Erdkunde, Berlin (138); Naturwissenschaftlicher Verein, Bremen (138); K. Sächsischer Altertumsverein, Dresden (137); Senckenbergische Naturforschende Gesellschaft, Frankfurt a. M. (135); Prof. E. Hæckel, Jena (136, 137); Naturwissenschaftlicher Verein, Kiel (135–137); Societa Africana d'Italia, Naples (138); R. Biblioteca Universitaria, Pisa (137); R. Accademia dei Lincei (138); Prof. G. Sergi, Rome (138); Société d'Borda, Dax (137); Société des Sciences Naturelles et Archéologiques de la Creuse, Guéret (137); Société des Antiquaires de la Morinie, St. Omer (137); Geological Society, London (137); Royal Geological Society of Ireland, Dublin (137, 138, and Trans., xvii, 1, 2); Instituto Fisico, Geografico Nacional de Costa Rica; San José de Costa Rica, A. C. (96–130, 136, 137).

Letters of envoy were received from the Faculté des Sciences, Marseille; Musée Guimet, Société Philologique, Paris; Royal Statistical Society, London; Department of the Interior, Washington, D. C.

Accessions to the Library were reported from the Asiatic Society of Japan, Yokohama; Verein für Kunst und Alterthum in Oberschwaben, Dr. Reinold Kapff, Ulm, Würtemberg; Société des Antiquaires de Picardie, Amiens, France; Société des Sciences Physiques et Naturelles, Commission Météorologique de la Gironde, Bordeaux; Faculté des Sciences de Marseille; Société d'Histoire et d'Archéologie de Chalon-sur-Saone, Montbéliard; Société d'Anthropologie, Société

Philologique, Musée Guimet, Paris; Société des Antiquaires de la Morinie, St. Omer; Editors of the "Yale Review," Boston; Royal Society of Canada, Montreal; Dr. Daniel G. Brinton, Mr. Henry Phillips, Jr., Philadelphia; Miss R. C. Longstreth, Sharon Hill; Hydrographic Office, Department of the Interior, Washington, D. C.

Photographs of Dr. John J. Stevenson, New York, and Mr. M. Fisher Longstreth, Sharon Hill, Pa., were received for the Album.

Dr. W. P. Wilson presented for the Transactions a paper by James Ellis Humphrey on "The Saprolegniaceæ of the United States, with Notes on Other Species." On motion the paper was referred to a Committee of three members of the Society, to be appointed by the President at his leisure.*

The Secretaries presented a "Kwakiutl Vocabulary," by Dr. Franz Boaz (of Worcester, Mass.).

Mr. Lorin Blodgett exhibited a cosmical map of the Northern Hemisphere, and made some remarks thereon.

Dr. Cope read a paper on "A False Elbow in a Horse."

Pending nominations Nos. 1242, 1243, 1244, and new nominations Nos. 1245, 1246, 1247 and 1248 were read.

Dr. Morris as Curator placed before the Society some of the interesting articles found by him in the museum, such as the theodolite belonging to the Proprietor's family, used in laying out the lots of Philadelphia, and on Mason and Dixon's line, presented by Dr. Physick; the model of a mowing machine presented in 1771; of a fire-escape, by Rev. Dr. Collin, in 1791; of a bathometer deposited by Jefferson in 1806; of a torpedo-boat, by Fulton, in 1815, etc.

Dr. Morris suggested the following heads as useful for classifying the cabinets, at least temporarily, viz.:

Objects illustrating American antiquities, such as the Peale collection, the Poinsett collection, and many Indian relics.

Objects illustrating progress of science and art, and the history of thought in other countries.

* The President subsequently appointed as said Committee, Dr. Rothrock and Messrs. Meehan and Martindale.

Objects illustrating mechanical arts and appliances, for agriculture, commerce, navigation, etc.

Geological, mineralogical and botanical specimens—in the latter class are many of great value, including Muhlenberg's Herbarium.

Scientific instruments, and instruments of precision—some of them rare and possessing great historical value.

Miscellaneous objects of interest to the student of the progress of human thought and civilization.

On motion the Curators were authorized to have framed for display a series of plaster medallions.

And the Society was adjourned by the presiding member.

Stated Meeting, December 2, 1892.

Present, 13 members.

President, Mr. FRALEY, in the Chair.

Correspondence was submitted as follows:

Letters of envoy were received from the K. Sächsische Gesellschaft der Wissenschaften, Leipzig; Zoölogical Society of London; Hon. Henry C. Baird, Philadelphia.

Letters of acknowledgment were received from the Royal Society of Victoria, Melbourne (138); Prof. Japetus Steenstrup, Copenhagen (138); K. Zoologisch. Botanische Genootschap, 'S Gravenhage, The Hague (138); Kolonial Museum (137, 138); Fondation de P. Teyler van der Hulst, Harlem (137, 138, and Trans., xvii, 1, 2); Akademija Umiejetnósci, Krakau, Galicia (138); Prof. Peter von Tunner, Leoben, Styria (138); Dr. Aristides Brezina, Vienna (138); Deutsche Geologische Gesellschaft, Berlin (138).

Accessions to the library were reported from the Geological Survey of India, Calcutta; Société Finno-Ougrienne, Helsingfors; Naturforscher-Verein, Riga; K. D. Videnkaberns Selskab, Copenhagen; Naturforschende Gesellschaft, Emden; Dr. James Henry's Trustees, Dublin, Ireland; Société de l' Histoire de France, Marquis de Nadaillac, Prof. Paul Topinard, Paris; Victoria Institute, London; University of the State of New York, Albany; Mr. Mark V. Slingerland, Ithaca; Mr. Henry Phillips, Jr., Philadelphia; Bureau of Education, Prof. Cleveland Abbe, Washington, D. C.; Observatorio Astronómico Nacional de Tacubaya, Mexico; Société Scientifique du Chili, Santiago.

The Committee on Dr. J. E. Humphrey's paper was continued.

The report of the Treasurer was read and referred to the Finance Committee.

The report of the Publication Committee for the year was made.

The report of the Library Committee was approved.

On motion, Prof. Cope was permitted to withdraw the paper presented by him at the last meeting, and to substitute therefor one on "False Elbow Joints."

Pending nominations Nos. 1142 to 1248, and new nominations Nos. 1249 and 1250 were read.

And the Society was adjourned by the President.

Stated Meeting, December 16, 1892.

Present, 18 members.

President, Mr. Fraley, in the Chair.

Correspondence was submitted as follows:

A letter from the K. K. Geographische Gesellschaft, Vienna, discontinuing exchanges with the Society, as it has determined in future only to exchange with Geographical Societies.

A circular from the Comité G. A. Hirn, Colmar, Alsace, soliciting subscriptions for the completion of the monument to be erected to Prof. G. A. Hirn.

A letter from Mr. Harold Goodwin, Philadelphia, a new member, apologizing for not having previously taken his seat.

Letters of envoy were received from Mr. Henry Carey Baird, Philadelphia; Library of Oberlin College, Oberlin, O.; Texas Academy of Science, Austin.

Letters of acknowledgment were received from the Institut Egyptien, Cairo (136, 137); Prof. Francis Pulzsky, Budapest, Hungary (134, 136–138); University of Bonn (138); Naturforschende Gesellschaft, Freiburg i. B. (138); Dr. Albin Weisbach, Freiberg, Saxony (137); Prof. Dr. Doëderbeen, Strassburg, Alsace (135–138); I. R. Accademia Degli Agiate Rovereto, Tyrol (137); Société Geologique de France, Paris (137, 138).

Accessions to the Library were reported from the Physikalisch-Œkonomische Gesellschaft, Königsberg; Nassauische Verein für Naturkunde, Weisbaden; Societá Africana D'Italia, Naples; Naturforschende Gesellschaft, Zurich; Instituto y Observatorio de Marina, San Fernando; Royal Astronomical Society, London; Hon. R. C. Winthrop, Astronomical Observatory of Harvard College, Cambridge, Mass.; Geological Society of America, Rochester, N. Y.; Dr. Charles A. Oliver, Messrs. Abraham Jordan, Henry Phillips, Philadelphia; U. S. Coast and Geodetic Survey, Bureau of Education, Washington, D. C.; Oberlin College; Texas Academy of Science, Austin; Free Public Library, San Francisco, Cal.

The Committee upon Dr. Humphrey's paper for the Transactions reported it worthy of publication, which was so ordered and the Committee discharged.

This being the regular evening for the election of members, pending nominations Nos. 1242 to 1248 were read, spoken to and balloted for.

New nominations Nos. 1249, 1250 and 1251 were read.

The death of Dr. John S. Newberry, December 7, 1892, æt. 70, was reported.

The report of the Finance Committee was presented and the appropriations for the ensuing year were passed.

The Curators presented the following report:

CURATORS' REPORT UPON THE SOCIETY'S RESOLUTION OF MAY.

1. The Curators respectfully state that the cataloging and labeling of the Poinsett and Keating collection beyond that which has been already done is impracticable under present conditions. And we would suggest that such a proposition as that involved in the Society's resolution is a matter demanding the consideration and personal supervision of a specialist in American archæology.

2. Before it is possible to determine where the collection will best serve the purposes of ethnological study, the Curators believe that this Society should have an official declaration from the Academy of Natural Sciences: First, as to its desire to retain it. Secondly, as to the manner of display which the Academy would guarantee for it, and any conditions which the Academy would propose to put upon the retention of the aforesaid collection as a loan from this Society.

PATTERSON DU BOIS, *Chairman.*
J. CHESTON MORRIS,
(as to Section 1 only.)
R. MEADE BACHE.

Dr. Morris from the Curators presented a minority report as to the second section of their communication as follows, viz.:

Whereas, The Museum of the Society is now in a fireproof building, and has space where the Keating and Poinsett collections can be well displayed for purposes of study, and the reasons for its deposit in the care of the Academy of Natural Sciences no longer exist; therefore, be it

Resolved, That the Academy of Natural Sciences be requested to return these collections in accordance with the terms of deposit.

J. CHESTON MORRIS, M.D.,
one of the Curators.

Dr. Morris moved that the Academy of Natural Sciences be requested to return the said Poinsett, etc., collection.

Mr. Williams moved, as an amendment, that the majority report be adopted.

After a discussion the amendment was adopted and the majority report was agreed to.

The request of Dr. Elliott Coues for the withdrawal of the Lewis and Clark Note-books, accompanied by proper vouchers, was read.

Dr. Morris moved that the subject be referred to the Library Committee with power to act.

Mr. Price offered the following substitute, which was accepted by Dr. Morris and adopted by the Society.

Dr. Coues, a member of the Society from Washington, having presented a request to the Society that the Lewis and Clark papers deposited with the Society, on April 8, 1818, under a receipt of that date be loaned to him for the purpose of preparing a new edition of the travels of those gentlemen, it was on motion of Mr. Price :

Resolved, That the Librarian be authorized to lend to Dr. Coues all the papers now in our possession deposited by Lewis and Clark in the year 1818, as per said receipt, he taking from the doctor his obligation (with a sufficient penalty) to take care of them, keep them when not in his library in some safe deposit vault at Washington, and return them at the expiration of three months unless further time shall be given to him to retain them.

Mr. Williams offered the following resolution, which after discussion was adopted :

Resolved, That the Curators of the Society be requested to report upon the cost of placing the Poinsett and Keating collection in this Museum and caring for it, and upon other collections or institutions in this city, if any, with which this collection could be deposited with advantage to the cause of science and the study of this collection, and upon some plan for arranging the collections of the Society in its Museum in accordance with the wishes, if any, of the donors of different collections.

The result of the balloting for members was reported to the President, who declared the following named to have been duly elected members of the Society.

2205. Mr. Charles H. Cramp, Philadelphia.
2206. Prof. Samuel G. Dixon, M.D., Philadelphia.
2207. Prof. John M. Macfarlane, D. Sc., Lansdowne, Phila.
2208. Prof. Francis X. Dercum, M.D., Philadelphia.
2209. Prof. James Ellis Humphrey, D. Sc., Amherst, Mass.

And the Society was adjourned by the President.

The Etrusco-Libyan Elements in the Song of the Arval Brethren.

By D. G. Brinton, M.D., LL.D.

(*Read before the American Philosophical Society, November 4, 1892.*)

In two communications to the American Philosophical Society, published respectively in 1889 and 1890, I offered a series of considerations which led me to believe that there existed an affinity, or ethnic relationship, between the ancient Etruscans and the Libyans, or Berber tribes, of North Africa.* In the present paper I would supplement what I there said by a brief study of the Etrusco-Libyan elements in one of the oldest literary monuments of Roman antiquity—the Song of the Arval Brethren.

These *Fratres Arvales* were a priestly sodality, which, according to tradition, dated back to the foundation of Rome, Romulus himself having been one of the twelve members of which the sacred college was composed. Their function was to perform certain acts of worship at a festival in the month of May in honor of "the divine goddess" *Dea Dia*, whose proper name is nowhere mentioned. The object of the festival was propitiatory to the divinities of agriculture, that the fields might yield bounteous harvests; whence the brotherhood derived its name—*ut ferunt fruges arva.* The rites consisted of sacrifices, processions, and, at a certain stage of the proceedings, of the repetition of a very ancient song, the words of which, as being too archaic for the members, were in the time of the Empire written down in small books, which the Brethren held in their hands as they chanted.

Although classical authors scarcely mention the Arval Brethren, we have very minute accounts of their rites, for it was their laudable custom at the close of each annual festival to inscribe the fact of the celebration with its date and some other particulars on a slab of stone. Nearly one hundred of these memorials have been discovered from time to time, and on one of the tablets, exhumed in 1778, recording the annual festival in May, A.D. 218, the Brethren had the happy idea to cause the song itself to be inscribed. They apparently gave the "copy" to the local stonecutter, and did not stay to read the proof, for he has made several palpable blunders, such as spelling the same word differently in different

* "The Ethnologic Affinities of the Ancient Etruscans," *Proc. Amer. Phil. Soc.*, Vol. xxvi; "On Etruscan and Libyan Names," *ibid.*, Vol. xxviii.

lines; but, as each line is repeated three times, we have a strong check on his vagaries. All critics agree, however, as to its value as a monument of antiquity, and one of its most recent editors does not go too far when he calls it "by far the most venerable specimen of Latin which we possess."*

Its interpretation has tasked the ingenuity of the learned; but, before I proceed to that, I will recall some facts about the origin of this priestly sodality. It was distinctly and wholly Etruscan, and was traditionally connected with the woman, Acca Larentia, and her Etruscan husband, Tarrutius. There are many stories told about Acca, and there are, according to some, a false and a true Acca; but those well acquainted with the kaleidoscope of mythology will find no difficulty in reconciling the beautiful and notorious Acca who was chosen, along with a plenteous board and a skin of old wine, to make merry the night with Hercules; the lascivious Acca, whom shepherds called *Lupa*, for she was as "salt as wolves in pride;" with the Acca who ruled the Lares, guardian spirits of the virtuous household, as her by-name *Larentia* indicates. As for her forename, *Acca*, *Aχca*, it occurs in Etruscan inscriptions, though its form has been doubted by some good scholars.

The story—or one of the stories, and the most consistent—ran that Hercules, after his joyous rendezvous, gave her the extremely sane and modern advice to marry the first rich man she could capture. This proved to be the worthy Tarrutius, by whom she achieved the noble maternity of twelve sons, all of whom grew to manhood; and the position in the envied fraternity of the first who died was promptly taken by Romulus, who had already made a name for himself by plowing his furrow around the Palatine Hill, and declaring himself master of the situation. Acca survived her husband, inherited all his property, as the Etruscan custom was, and left it all by will to the Roman people, while her sons, along with Romulus, constituted themselves a holy brotherhood, pledged to call upon the ancient gods of their mother's religion once every year, in the springtime, to bless the fields, and send plenteous returns for the farmer's toil.

Such were the Arval Brethren; and in the pleasant Maytime of each year they met and fared forth from Rome along the Via Campana for five miles, when they reached the grove and temple

* F. D. Allen, *Remnants of Early Latin*, p. 66.

of the Dea Dia. There they spent three days—a charming escapade, no doubt, from city life—slaughtering a white heifer, also some specially fed young pigs, *porcilias piaculares*, and not forgotten by neighboring farmers with delicate spring vegetables, as we may gather from the records. Then came the antique song and solemn dance in the temple of the Goddess, the Brethren clad in quaint traditional garb, and crowned with wreaths of leaves and early wheat.

We may well suppose that with this history and these customs we should look among the Arval Brethren for true folklore, for the preservation of some of the ancient names and ideas of the Etruscan religion, in a day when they had quite passed out of the ken of the current worship and mythology of Rome. The place to look for it, of course, is in their Song, and I think we find it there with a plainness that cannot be mistaken, and yet which none of the commentators and critics has heretofore brought out, or even referred to.

The accurate text of that Song is subjoined. In giving it, I choose, in cases of discrepancy, where the majority of the sculptor's readings—that is, two out of three—are the same.

The Song.

ENOS LASES IVVATE
ENOS LASES IVVATE
ENOS LASES IVVATE

NEVE LVERVE MARMAR SINS INCVRRERE IN PLEORES
NEVE LVERVE MARMAR SINS INCVRRERE IN PLEORES
NEVE LVERVE MARMAR SINS INCVRRERE IN PLEORES

SATVR FVFERE MARS LIMEN SALI STA BERBER
SATVR FVFERE MARS LIMEN SALI STA BERBER
SATVR FVFERE MARS LIMEN SALI STA BERBER

SEMVNIS ALTERNEI ADVOCAPIT CONCTOS
SEMVNIS ALTERNEI ADVOCAPIT CONCTOS
SEMVNIS ALTERNEI ADVOCAPIT CONCTOS

ENOS MARMOR IVVATO
ENOS MARMOR IVVATO
ENOS MARMOR IVVATO

TRIVMPE TRIVMPE TRIVMPE TRIVMPE TRIVMPE

The translation of the first line offers no particular difficulty, as the initial *E* is prothetic and strengthening, and there are plenty of examples where *s* is preserved between two vowels for later *r*. Nor about line second is their serious controversy. The compound *iverve* may fairly be *luem ruem* (*ruinam*), and we may render:

> "Help us, O Lares;
> And, O Marmar, let not blight nor ruin fall upon the flowers."

Or, perhaps, instead of *pleores*=*flores*, we may take it *pleores*=*plures*, and translate "upon the multitude," though this has less pertinence.

But the third line is where the commentators have broken down. The latest authority within my reach, Prof. Allen, of Yale College, gives it up as hopeless, and leaves it untranslated. Mommsen proposes that it shall be split in two, one half an appeal to the gods, *Satur esto, fere mars!* "Be satiate, fierce Mars," and the other half to the individual brethren, *In limen insili! Sta! Verbera* (limen)!

This is terribly strained. Mars was not a fierce deity, nor god of war to the Etruscan, but of peace, of agriculture, and of the springtime. He was guardian of the husbandman, not of the warrior. The word *Berber* is repeated three times, without any variation, and is plainly a reduplicated proper name, like *Marmar* in the previous line, to which it bears a distinct rhythmical relation. The stonecutter would not have made the same error three times over in such a common word as *verbera*, if that had been his copy. For these reasons, and others which he himself advances, and which, being of a purely scholastic character, I need not quote, the distinguished linguist of the Collège de France, Prof. Michel Bréal, proposes the reading:

> "Sata tutere, Mars; clemens satis esto, Berber."

He is convinced that we must accept the last word as *Berber*, but as to its significance he is at a loss, and suggests that it may be "une variante de Marmar."

This suggestion has not been admitted even by those who accept his reading. They have presented various guesses; none near the mark, if we may judge by their reception.* But suppose, along

* See Ch. Schœbel, in *Actes de la Société Philologique*, Tome xiv, p. 200 sq.

with Lases, Marmar and Mars, it is a more or less Latinized form of a pure Etruscan word, what could we make of it?

The first difficulty is that the Etruscan probably had no *b*, in which they resembled many of the modern Berber dialects, where it is also lacking. There was some intermediate labial in Etruscan which the Romans rendered by either *f*, or *v*, or *b*. Probably it was close to the Greek digamma, *F*. Did the Etruscans have a god *Fer*, or *Ver?* Undoubtedly. That was the exact name of the deity whom Varro calls *Deus Etruriæ princeps*, "chief of all the gods of Etruria." The Latin writers give his full name as Vertumnus; but that the last two syllables do not belong to the name, but constitute an appellative suffix, the analogy of the Etruscan words *Vol-tumna*, *Luχumna*, and many others, has long since convinced Etruscologists.*

The functions of this god *F*er were most appropriate to the rites of the Arval Brethren. The gardens of the spring, the harvests of the summer, but especially the maturing grain and fruit of the autumn, were his special care. Thus he came to be a chief god, one who looked after home life and works. He was the culture-hero of the Etruscans, analogous to such figures as Michabo and Viracocha in native American mythology.

But here a striking identity meets us. Among the Libyans of Northern Africa this same divinity, with the same attributes and the same name, appears to meet us. Their chief god was also *Ber* (*Fer*, *Ver*); he was their protector and mythical ancestor; from him they claimed their name, *Berbers*, *Brebres*, etc.; and to this day the secluded tribes of the Sahara point to sacred spots where their famed progenitor and teacher was buried.†

It would be an easy error to suppose that *Ver* was the Latin word for spring from the Greek, and that in the Pantheon *Ver* was the personation of the season of spring; but this was not the case. The *Vertumnalia* were in the fall of the year, in the month of October, and were never supposed to have reference to any such

* See Deecke, note to Müller, *Die Etrusker*, Bd. ii, s. 51 *et al.* In some of the Latin geographers the name Berenice, that of a Libyan city, is spelled Verenice (Borsari, *Geografia della Tripolitana*, p. 191).

† "L'ancêtre commun de toutes les tribes berbères," Duveyrier, *Les Touaregs du Nord.* He is the *Iarbas* of Greek legend, son of Jupiter Ammon and a Libyan nymph, and king of the Getuli, to escape whose pressing solicitations Queen Dido plunged the sword into her own bosom. His immediate descendants are still referred to by the Touaregs as the *Iabbaren.*

impersonation. This fact brings out the antithesis in the line between the two divinities named. Marmar was the god of the early season and of the spring crops, Berber or Ver of the autumn and the late crops, and this was the reason for bringing them together in this adjuration for the fertility of the fields.

The meaning of Ber in the ancient Libyan language I have partly discussed elsewhere. It is from the biliteral root **B R**, the primitive meaning of which was "to overflow," or something equivalent to that idea. Applied to population, it was "to migrate," "to journey forth," and, as only freemen could have that privilege, it came to mean "to be free," and it was apparently in that proud significance in which it was adopted a patronymic. In its earlier sense it was and is applied to water which boils over, and in a neuter form it signifies "to be in excess," "to be abundant," and hence "to abound in," "to be fruitful in" (*foissoner*). Here we see where the meaning of *Ver* comes in, as the god of the harvest, of the fruitage and the vintage.

In the ancient Numidian epigraphy we find this name repeatedly inscribed on tombstones, usually with a similar suffix, *Vermim, Vermimo, Vermima,** in which we easily see the biliteral Berber radical **M M**, from which are derived the terms for both mother *Imma*, and son *Emmi*. Whether the termination *-umnus*, so common in Etruscan names, and occasionally written *ummus* (*lucumno, lucummo*), is not this same termination may be suggested, in which case *Vertumnus* would mean "Son of Ber." And, in this connection, I must not omit to mention that precisely the reduplicated form *Marmar* is found on Numidian inscriptions two or three centuries before our era.†

Passing to the fourth line of the Song, its first word seems a stumbling block. Some think *semones* is an abbreviation of *semihomines*, and means "demi-gods;" others would derive it from *sero, semen*, and take it to refer to gods of sowing, and hence agricultural; while Mommsen understands it as *se-homines*, "apart from men," applied to divinities in general. Most authorities suppose *advocapit* to be a mistake for *advocabite;* and the translation

* See Halévy, *Essai d'Epigraphie Libyque*, Inscriptions 7, 22, 23, 24, and others. The termination *mim* occurs in other inscriptions, as No. 47, *Uba-mim;* No. 152, *Ar-mima*, etc.

† As in Halévy's collection, No. 100, etc. The Libyan general conquered by Pharaoh Merenptah was named Marmariu, "Son of Marmar." The radical **M R**, in the Berber dialects, means "to be great" and "to be old," the ideas of age and power being in them, as in so many tongues, synonymous.

of the line is given, "Call ye, in turns, on all the Semones." I should prefer to consider that *semones* refers distinctively to the two gods named *Marmar* and *Berber*, and that *advocapit* is an abbreviated form of the passive future, used impersonally, while *conctos* should have its original meaning, not "all," but "conjoined," "united," referring solely to the two divinities who are appealed to in the Song. It should then be rendered, "To these united gods of the crops (*i. e.*, the one of the early, the other of the later, season) praise shall be rendered."

The last lines offer no particular difficulties, so I offer this free paraphrase of the whole Song:

THE SONG OF THE ARVAL BRETHREN.

Come to our aid, O Lares !
O Marmar ! Let nor blight nor ruin fall upon the flowers.
The sown seeds, O Marmar ! protect ; and favor the product, O Berber !
Praise shall be paid in turn to these associated gods of the crops.
Come to our aid, O Marmar !
Shout for joy ! shout for joy ! shout for joy !

The similarities which I here point out have an additional interest in the light of some recent discoveries in Egyptian archæology.

It has been generally accepted that the Tur-sha, who, about the close of the thirteenth century B.C., invaded Egypt from the West along with the Libyans, were Etruscans; but only recently has it been shown by conclusive evidence that the Etruscans continued to live in the Western Fayoom and on the Libyan boundary of Egypt for many centuries afterwards. One part of this evidence is from Egyptian inscriptions. At Medinet Gurob, close to the Libyan boundary, Mr. Flinders Petrie exhumed the coffin of a man bearing the inscription *An-en-Tur-sha*, "A man of the Tur-sha," showing that prominent citizens of Egypt (the coffin was that of a wealthy person) were at that time recognized as of the *Tur-sha* blood.

Still more extraordinary was the discovery of an Etruscan Ritual Book in this portion of Egypt, the celebrated Agram Codex, which has lately been published by Prof. Krall, of Vienna. He considers it conclusive as to the existence of an Etruscan settlement in this part of the Egyptian dominions.*

* *Die Etruskischen Mumienbinden des Agramer National-Museums*, ss. 18, 19 (Wien, 1892). He quotes and discusses Petrie's researches at Medinet Gurob.

Such facts lead us to inquire particularly as to what we know from the oldest authors concerning the population of the territory immediately west of lower Egypt. On turning to the best and oldest authority, Herodotus, who obtained his information from members of the Greek colony at Cyrene, I was surprised to find that he locates precisely in the region referred to a tribe whose name, as he gives it, is evidently that of the Tur-sha—to wit, the *Adurmachides.** It is possible that *machides* is a Cyrenaic Greek termination, meaning "warriors;" at any rate we have the stem *Adur* or *Atur,* which is precisely what recurs in *Etruria.* It is undoubtedly a Libyan word, from the root D R or D R'R, whence the words for mountain, *adar* or *adrar.* The *Tur-sha* were, therefore, the mountaineers, those dwelling in the range of mountains which rise to form the eastern Libyan plateau. The analogy between *adar* and *adrar* on the one hand, and *adur* and *etrur,* on the other, is very noticeable. As the Italian Etruscans made little use of the letter *d,* substituting for it the *t,* we have the very common Tuscan radical *tur* or *tar,* as in the name of the field which the mother of the Arval Brethren on dying left to Romulus, the *ager turax* or *tarux.*†

* He assigns their position as "from the borders of Egypt to Port Plynus," and distinguishes them from the Ammonii of the Oasis of Jupiter Ammon, the modern El Giwah (*Hist.*, Book iv, cap. 168). The latter to this day speak a well-marked Berber dialect, as is proved by the short vocabulary collected by Bayle St. John.

† Both orthographies are sanctioned by Müller, *Die Etrusker*, Bd. ii, s. 107.

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LIST OF SURVIVING MEMBERS

OF THE

AMERICAN PHILOSOPHICAL SOCIETY,

HELD AT PHILADELPHIA

FOR

PROMOTING USEFUL KNOWLEDGE.

Corrected to January 6, 1893,

BY

HENRY PHILLIPS, JR.,

A Secretary of the Society.

List of surviving Members of the American Philosophical Society, held at Philadelphia for Promoting Useful Knowledge.

The addresses here given so far as known are at the present time. Corrections of this list are respectfully solicited.

A name printed in *italics* indicates that the Society is uncertain as to whether such member is still living and desires information on the subject.

The Society will be happy to receive *photographs* (cabinet size preferred) of such of its members as have not already sent.

A

Name.	Date of Election.	Present Address.
1687. ABBÉ, CLEVELAND	July 21, 1871,	Army Weather Bureau, Washington, D. C.
2170. ABBOTT, CHARLES C.	Dec. 20, 1889,	Bristol, Pa.
1463. ABBOT, HENRY L.	April 18, 1862,	New York city, N. Y.
1809. ÅCKERMAN, RICHARD	July 21, 1876,	Stockholm, Sweden.
1713. ACLAND, HENRY W.	Jan'y 17, 1873,	Oxford, England.
2128. ADAM, LUCIEN	Dec. 17, 1886,	Rennes, France.
2081. ADAMS, H. B.	May 21, 1886,	Baltimore, Md.
1381. *Adamson, Rev. John C.*	July 13, 1856.	
1779. AGASSIZ, ALEXANDER	April 16, 1875,	Cambridge, Mass.
1642. AGASSIZ, ELIZABETH.	Oct. 15, 1869,	" "
2091. ALBRECHT, PAUL	May 21, 1886,	Hamburg, Germany.
1860. ALISON, ROBERT H.	May 3, 1878,	Ardmore, Pa.
1869. ALLEN, JOEL ASAPH	Sept. 20, 1878,	New York, N. Y.
1776. ALLISON, JOSEPH	April 16, 1875,	Philadelphia.
1927. AMES, CHARLES G.	Jan'y 21, 1881,	Boston, Mass.
2064. ANDERSON, GEORGE B.	Feb'y 19, 1886,	West Point, N. Y.
1655. ANDERSON, GEORGE W.	Oct. 15, 1869,	Rosemont, Pa.
2164. ANGELL, JAMES B.	Oct. 18, 1889,	Ann Arbor, Mich.
1122. *Angelis, Pedro de.*	Jan'y 17, 1840,	*Buenos Ayres, S. A.*
2102. ARGYLL, DUKE OF	May 21, 1886,	London, England.
1761. ARMSTRONG, WM. GEORGE	July 17, 1874,	Newcastle-on-Tyne, England.
1996. ASHHURST, JOHN	Jan'y 18, 1884,	Philadelphia.
2012. ASHHURST, RICHARD L.	April 18, 1884,	"

B

	Name.	Date of Election.		Present Address.
1995.	BACHE, R. MEADE	Jan'y	18, 1884,	Philadelphia.
1832.	BACHE, THOMAS HEWSON	Feb'y	2, 1877,	"
1630.	BAIRD, HENRY CAREY	Jan'y	15, 1869,	"
1991.	BAIRD, HENRY M.	Jan'y	18, 1884,	Yonkers, N. Y.
2075.	BAKER, WILLIAM S.	May	21, 1886,	Philadelphia.
2191.	BALL, ROBERT	May	15, 1891,	Dublin, Ireland.
1936.	BARBER, EDWIN ATLEE	April	15, 1881,	West Chester, Pa.
1818.	BARCENA, MARIANO	Feb'y	2, 1877,	Mexico.
1741.	BARKER, GEORGE F.	April	18, 1873,	Philadelphia.
2011.	BARKER, WHARTON	April	18, 1884,	"
2144.	BARNARD, WILLIAM T.	May	20, 1887,	Boonton, N. J.
1902.	BARTHOLOW, ROBERTS	April	16, 1880,	Philadelphia.
1133.	BARTLETT, W. H. C.	April	17, 1840,	Yonkers, N. Y.
2119.	BASTIAN, ADOLPH	Dec.	17, 1886,	Berlin, Germany.
1968.	BELL, ALEXANDER GRAHAM	July	21, 1882,	Washington.
1966.	BELL, JOSEPH SNOWDEN	July	21, 1882,	Philadelphia.
1802.	BELL, LOWTHIAN	April	21, 1876,	Newcastle-on-Tyne, England.
2149.	BIDDLE, ALEXANDER	Feb'y	17, 1888,	Philadelphia.
2154.	BIDDLE, ARTHUR	Dec.	21, 1888,	"
1920.	BIDDLE, CADWALADER	Oct.	15, 1880,	"
1831.	BIDDLE, CRAIG	Feb'y	2, 1877,	"
2134.	BILLINGS, JOHN S.	Feb'y	18, 1887,	Washington, D. C.
2157.	BLAIR, ANDREW A.	May	17, 1889,	Philadelphia.
1554.	*Blair, Thomas S.*	Jan'y	19, 1866,	*Pittsburgh, Pa.*
1669.	BLAKE, WILLIAM PHIPPS	Oct.	21, 1870,	New Haven, Conn.
1790.	BLASIUS, WILLIAM	Oct.	15, 1875,	Philadelphia.
1700.	BLODGET, LORIN	April	19, 1872,	"
1444.	BÖHTLINGK, OTTO	Jan'y	17, 1862,	Leipzig, Germany.
2047.	BONWILL, W. G. A.	Oct.	16, 1885,	Philadelphia.
1126.	BOYÈ, MARTIN H.	Jan'y	17, 1840,	Coopersburg, Pa.
1826.	BRACKETT, CYRUS FOGG	Feb'y	2, 1877,	Princeton, N. J.
2083.	BRANNER, JOHN C.	May	21, 1886,	Palo Alto, Cal.
2195.	BREZINA, ARISTIDES	May	21, 1886,	Vienna, Austria.
1636.	BRINTON, DANIEL G.	April	16, 1869,	Philadelphia.
2069.	BRINTON, JOHN H.	Feb'y	19, 1886,	"
1745.	BRITTON, J. BLODGETT	Oct.	17, 1873,	"
2080.	BROOKS, WILLIAM KEITH	May	21, 1886,	Baltimore, Md.
1881.	BROWN, ARTHUR ERWIN	April	18, 1879,	Philadelphia.
1333.	BROWN-SEQUARD, E.	Jan'y	20, 1854,	Paris, France.
1614.	BRUGSH, HENRI	Jan'y	15, 1869,	Berlin, Prussia.
1547.	BRUSH, GEORGE J.	Jan'y	20, 1865,	New Haven, Conn.
1653.	BULLOCK, CHARLES	Oct.	15, 1869,	Philadelphia.
1452.	BUNSEN, ROBERT W.	Jan'y	17, 1862,	Heidelberg, Germany.
2008.	BURK, ISAAC	Jan'y	18, 1884,	Philadelphia.
2007.	BURK, JESSE Y.	Jan'y	18, 1884,	"
1938.	BUTLER, WILLIAM	April	15, 1881,	West Chester, Pa.

C

1788.	CAMPBELL, JOHN LYLE	July	16, 1875,	Crawfordsville, Ind.
1606.	CANBY, WILLIAM MARRIATT	Oct.	16, 1868,	Wilmington, Del.
2051.	CANNIZZARO, TOMMASO	Oct.	16, 1885,	Messina, Italy.
1731.	CAPELLINI, GIOVANNI	April	18, 1873,	Bologna, Italy.
1796.	CARLL, J. F.	Oct.	15, 1875,	Pleasantville, Pa.
2130.	CARRILLO, CRESCENCIO	Dec.	17, 1886,	Merida, Yucatan.

	Name.	*Date of Election.*	*Present Address.*
1911.	CARSON, HAMPTON L.	April 16, 1880,	Philadelphia.
1707.	CASSATT, ALEXANDER JOHNSON	Oct. 18, 1872,	"
2147.	CASTNER, SAMUEL, JR.	Dec. 16, 1887,	"
2152.	CATTELL, J. MCKEEN	May 18, 1888,	New York, N. Y.
1675.	CATTELL, WILLIAM C.	Jan'y 20, 1871,	Philadelphia.
1908.	CHANCE, HENRY MARTYN	April 16, 1880,	"
1783.	CHANDLER, C. F.	April 16, 1875,	New York, N. Y.
1778.	CHAPMAN, HENRY C.	April 16, 1875,	Philadelphia.
2132.	CHARENCEY, COMTE HYACINTH DE	Dec. 17, 1886,	St. Maurice les Charencey, France.
2111.	CHILDS, GEORGE W.	Dec. 17, 1886,	Philadelphia.
2158.	CLARK, CLARENCE H.	May 17, 1889,	"
1717.	CLARKE, THOMAS C.	Jan'y 17, 1873,	New York, N. Y.
1983.	CLAYPOLE, E. W.	Jan'y 19, 1883,	Akron, Ohio.
2048.	CLEEMANN, T. M.	Oct. 16, 1885,	Philadelphia.
1876.	CLOISEAUX, DES, A.	Oct. 18, 1879,	Paris, France.
1999.	COHEN, J. SOLIS	Jan'y 18, 1884,	Philadelphia.
2005.	COLERIDGE, LORD	Jan'y 18, 1884,	London, England.
1555.	COPE, EDWARD D.	Jan'y 19, 1866,	Philadelphia.
1367.	COPPÉE, HENRY	Jan'y 18, 1856,	Bethlehem, Pa.
2129.	CORA, GUIDO	Dec. 17, 1886,	Turin, Italy.
1474.	CORNELIUS, ROBERT	Oct. 17, 1862,	Philadelphia.
1867.	COUES, ELLIOTT	Sept. 20, 1878,	Washington, D. C.
1662.	COX, J. D.	April 15, 1870,	Cincinnati, O.
1672.	COXE, ECKLEY B.	Oct. 21, 1870,	Drifton, Pa.
2207.	CHARLES H. CRAMP	Dec. 16, 1892,	Philadelphia.
1836.	CRANE, THOMAS F.	Feb'y 2, 1877,	Ithaca, N. Y.
1393.	CRESSON, CHARLES M.	April 17, 1857,	Philadelphia.
2100.	CROOKES, WILLIAM	May 21, 1886,	London, England.
2172.	CRUZ, FERNANDO (of Guatemala)	Dec. 20, 1889.	
1439.	CURWEN, JOHN	April 18, 1861,	Warren, Pa.

D

1567.	DA COSTA, J. M.	Oct. 19, 1866,	Philadelphia.
1354.	DANA, JAMES D	July 21, 1854,	New Haven, Conn.
1806.	DANNEFELD, C. JUHLIN	April 21, 1876,	Stockholm, Sweden.
1516.	DAUBRÉE, A.	July 17, 1863,	Paris, France.
1811.	DAVENPORT, SAMUEL	Oct. 20, 1876,	Adelaide, S. Australia.
1557.	DAVIDSON, GEORGE	Jan'y 19, 1866,	San Francisco, Cal.
1923.	DAWKINS, WILLIAM B	Oct. 15, 1880,	Manchester, England.
1468.	DAWSON, JOHN W	April 18, 1862,	Montreal, Canada.
2131.	DELGADO, JUAN DE DIAS DE LA RADA Y.	Dec. 17, 1886,	Madrid, Spain.
2013.	DICKSON, SAMUEL	April 18, 1884,	Philadelphia.
2208.	DIXON, SAMUEL G.	Dec. 16, 1892,	"
2108.	DOLLEY, CHARLES S.	Dec. 17, 1886,	"
2089.	DONNER, OTTO.	May 21, 1886,	Helsingfors, Finland.
1946.	DOOLITTLE, C. L.	Oct. 21, 1881,	Bethlehem, Pa.
1839.	DOUGLASS, JAMES, JR.	April 20, 1877,	Spuytenduyvil, N. Y.
1924.	DRAPER, DANIEL	Oct. 15, 1880,	New York, N. Y.
2200.	DREXEL, A. J.	Feb'y 19, 1892,	Philadelphia.
1787.	DROWN, THOMAS M	July 16, 1875,	Boston, Mass.
1918.	DU BOIS, PATTERSON	Oct. 15, 1880,	Philadelphia.
1878.	DUDLEY, CHARLES BENJAMIN	Jan'y 17, 1879,	Altoona, Pa.
1921.	DUDLEY, THOMAS H	Oct. 15, 1880,	Camden, N. J.
2063.	DUNCAN, LOUIS	Feb'y 19, 1886,	U. S. Navy.

Name.	Date of Election.	Present Address.
1573. Dunning, George F.	Jan'y 18, 1867,	Farmington, Conn.
1727. Dupont, Edouard	April 18, 1873,	Brussels, Belgium.
2086. Duruy, Victor	May 21, 1886,	Paris, France.
1679. Dutton, Clarence E	Jan'y 20, 1871,	Washington, D. C.

Name.	Date of Election.	Present Address.
2208. Dercum, Francis X.	Dec. 16, 1892,	Philadelphia.

2180. Field, Robert Patterson . . .	May 16, 1890,	Philadelphia.
1901. Flint, Austin, Jr	April 16, 1880,	New York, N. Y.
1621. Flower, Wm. Henry.	Jan'y 15, 1869,	London, England.
1875. Foggo, Edward A.	Oct. 18, 1879,	Philadelphia.
2197. Forbes, George	Oct. 16, 1891,	London, England.
1170. Fraley, Frederick	July 15, 1842,	Philadelphia.
1912. Fraley, Joseph C.	April 16, 1880,	"
1695. Frazer, Persifor	Jan'y 19, 1872,	"
2171. Friebis, George	Dec. 20, 1889,	"
1459. Froude, J. A.	Jan'y 17, 1862,	London, England.
2179. Fullerton, George S.	May 16, 1890,	Philadelphia.
1739. Fulton, John.	April 18, 1873,	Johnstown, Pa.
1914. Furness, Horace Howard . . .	April 16, 1880,	Philadelphia.
1130. Furness, William H.	April 17, 1840,	"

G

1988. Garrett, Philip C	April 20, 1883,	Philadelphia.
2079. Gates, M. E	May 21, 1886,	Amherst, Mass.
1025. Gatschet, Albert S.	Oct. 17, 1884,	Washington, D. C.
1897. Geikie, Archibald	Jan'y 16, 1880,	London, England.
1803. Geikie, James.	April 21, 1876,	Edinburgh, Scotland.
1339. Genth, Fred. Augustus.	Jan'y 20, 1854,	Philadelphia.
2067. Genth, F. A., Jr.	Feb'y 19, 1886,	"
1355. Gibbs, Oliver Wolcott.	July 21, 1854,	Cambridge, Mass.
1587. Gill, Theodore Nicholas . .	July 19, 1867,	Washington, D. C.
1800. Gilman, Daniel C.	April 21, 1876,	Baltimore, Md.
1940. *Giraldes, J. P. C. Cassado de.* . .	July 20, 1827.	
1950. Gladstone, Wm. Ewart	Oct. 21, 1881,	London, England.
2162. Goode, G. Brown	Oct. 18, 1889,	Washington, D. C.
1835. Goodell, William	Feb'y 2, 1877,	Philadelphia.
1680. Goodfellow, Edward.	Jan'y 20, 1871,	Washington, D. C.
2203. Goodwin, Harold	May 20, 1892,	Philadelphia.
1271. Gould, Ben. Apthorpe	Jan'y 17, 1851,	Cambridge, Mass.
1851. Gray, Elisha.	Jan'y 18, 1878,	Chicago, Ill.
1605. Green, Traill	Oct. 16, 1868,	Easton, Pa.
1504. Green, William Henry	April 17, 1863,	Princeton, N. J.
1880. Greene, William H.	April 18, 1879,	Philadelphia.
2155. Gregorio, Il Marchese Antonio de	Dec. 21, 1888,	Palermo, Italy.

Name.	Date of Election.	Present Address.
2159. Gregory, Henry D.	May 17, 1889,	Philadelphia.
2188. Gregory, Caspar René.	May 15, 1891,	Leipzig.
1229. *Grimaldi, Ceva*	Oct. 16, 1846,	*Naples, Italy.*
1939. Griscom, Wm. Woodnutt	April 15, 1881,	Haverford, Pa.
1815. Grote, Augustus Radcliffe	Oct. 20, 1876.	
2090. Gubernatis, Angelo de	May 21, 1886,	Florence, Italy.
1438. *Guyangos, Puscual de.*	April 19, 1861,	*Madrid, Spain.*

H

2054. Haeckel, Ernest.	Oct. 16, 1885,	Jena, Prussia.
2066. Hagen, H. A.	Feb'y 19, 1886,	Cambridge, Mass.
1658. Hale, Edw. Everett	Jan'y 21, 1870,	Roxbury, Mass.
1709. Hale, Horatio	Oct. 18, 1872,	Clinton, Canada.
1853. Hall, Asaph	Jan'y 18, 1878,	Washington, D. C.
1795. Hall, Charles Edward	Oct. 15, 1875,	Westport, N. Y.
1356. Hall, James	July 21, 1854,	Albany, N. Y.
2027. Hall, Lyman B	Jan'y 16, 1885,	Haverford, Pa.
1412. Hammond, William A	Oct. 21, 1859,	New York, N. Y.
2194. Hamy, E. T.	May 15, 1891,	Paris, France.
1337. Harding, George	Jan'y 20, 1854,	Philadelphia.
2136. Harris, Joseph S.	May 20, 1887,	"
1827. Hart, James Morgan.	Feb'y 2, 1877,	Ithaca, N. Y.
1510. Hartshorne, Henry.	July 17, 1863,	Philadelphia.
1764. Hauer, Franz Ritter von.	Oct. 16, 1874,	Vienna, Austria.
1681. Haupt, Hermann.	April 21, 1871,	St. Paul, Minn.
1862. Haupt, Lewis M.	May 3, 1878,	Philadelphia.
2082. Hayes, R. Somers.	May 21, 1886,	New York, N. Y.
2071. Hays, J. Minis	Feb'y 19, 1886,	Philadelphia.
2165. Hazlehurst, Henry	Oct. 18, 1889,	"
1985. Heilprin, Angelo	April 20, 1883,	"
1734. Helmholtz, Heinrich	April 18, 1873,	Berlin, Prussia.
1963. Hill, Hamilton Andrews	April 21, 1882,	Boston, Mass.
2110. Hilprecht, Hermann V.	Dec. 17, 1886,	Philadelphia.
1768. Himes, Charles Francis	Oct. 16, 1874,	Carlisle, Pa.
1663. Hitchcock, Charles Henry	April 15, 1870,	Hanover, N. H.
2160. Hoffman, Walter J.	Oct. 18, 1889,	Washington, D. C.
2068. Holland, James W.	Feb'y 19, 1886,	Philadelphia.
1898. Holmes, Oliver Wendell	Jan'y 16, 1880,	Boston, Mass.
1624. Hooker, Joseph D.	Jan'y 15, 1869,	London, England.
1652. Hopper, Edward	Oct. 15, 1869,	Philadelphia.
1607. Horn, George Henry	Oct. 16, 1868,	"
2070. Horner, Inman.	Feb'y 19, 1886,	"
1941. Hotchkiss, Jedediah.	Oct. 21, 1881,	Staunton, Va.
1696. Hough, George W.	Jan'y 19, 1872,	Chicago, Ill.
1698. Houston, Edwin J.	Jan'y 19, 1872,	Philadelphia.
2143. Houston, Henry H	May 20, 1887,	"
2084. Hovelacque, Abel	May 21, 1886,	Paris, France.
1843. Humphrey, H. C	July 20, 1877,	
2211. Humphrey, James Ellis	Dec. 16, 1892,	Amherst, Mass.
1623. Huxley, Thomas Henry	Jan'y 15, 1869,	London, England.
1426. Hyrtl, Joseph	July 20, 1860,	Vienna, Austria.

I

2052. Im Thurn, Everard F.	Oct. 16, 1885,	Georgetown, British Guiana.
1773. Ingham, Wm. Armstrong.	April 16, 1875,	Philadelphia.

J

Name.	Date of Election.	Present Address.
2010. JAMES, EDMUND J	April 18, 1884,	Philadelphia.
1933. JANNET, CLAUDIO	April 15, 1881,	Paris, France.
2049. JAYNE, HORACE	Oct. 16, 1885,	Philadelphia.
1954. JEFFERIS, WILLIAM W	Jan'y 20, 1882,	"
1942. JONES, CHARLES C., JR.	Oct. 21, 1881,	Augusta, Ga.
2017. JORDAN, FRANCIS, JR.	April 18, 1884,	Philadelphia.

K

1989. KANE, ELISHA KENT.	April 20, 1883,	Kane, Pa.
2169. KEANE, JOHN J.	Dec. 20, 1889,	Washington, D. C.
1348. KEATING, WILLIAM V	April 21, 1854,	Philadelphia.
2021. KEEN, WILLIAM W.	July 18, 1884,	"
1962. KEIM, GEO. DE BENNEVILLE.	April 21, 1882,	"
2118. KIEPERT, HENRI.	Dec. 17, 1886,	Berlin, Prussia.
1161. KENDALL, E. OTIS	Jan'y 21, 1842,	Philadelphia.
1708. KING, CLARENCE	Oct. 18, 1872,	New York, N. Y.
1284. KIRKWOOD, DANIEL	April 18, 1851,	Riverside, Cal.
1767. KÖNIG, GEORGE A	Oct. 16, 1874,	Houghton, Mich.
2167. KRAUSS, FRIEDERICH S	Dec. 20, 1889,	Vienna, Austria.

L

1026. *Labouderie, J.*	April 19, 1833,	*Paris, France.*
1694. LAMBERT, GUILLAUME.	Jan'y 19, 1872,	Louvain, Belgium.
1858. LANDRETH, BURNET.	Jan'y 18, 1878,	Bristol, Pa.
1781. LANGLEY, SAMUEL P.	April 16, 1875,	Washington, D. C.
1721. LA ROCHE, C. PERCY	Jan'y 17, 1873,	Rome, Italy.
1711. LAUTH, FRANZ JOSEPH	Oct. 18, 1872,	Munich, Bavaria.
1974. LAWES, JOHN BENNETT	Jan'y 19, 1883,	Rothamstead, Herts, Eng.
1595. LEA, HENRY CHARLES.	Oct. 18, 1867,	Philadelphia.
1737. LE CONTE, JOSEPH.	April 18, 1873,	Berkeley, Cal.
2125. LEEMANS, CONRAD.	Dec. 17, 1886,	Leyden, Holland.
1986. LEHMAN, AMBROSE E.	April 20, 1883,	Philadelphia.
2182. LELAND, CHARLES G.	May 16, 1890,	London, Eng.
2174. LE MOINE, J. M.	Dec. 20, 1889,	Quebec, Canada.
1934. LE ROY-BEAULIEU, PAUL.	April 15, 1881,	Paris, France.
1382. LESLEY, J. PETER	July 13, 1856,	Philadelphia.
1376. LETCHWORTH, ALBERT S.	Jan'y 18, 1856,	"
2085. LEVASSEUR, EMILE.	May 21, 1886,	Paris, France.
1415. LEWIS, FRANCIS W.	Jan'y 20, 1860,	Philadelphia.
1383. *Leyburn, John.*	July 13, 1856,	*Baltimore, Md.*
1756. LOCKYER, JOSEPH NORMAN.	April 17, 1874,	London, England.
2202. LOW, SETH	Feb. 19, 1892,	New York, N. Y.
1872. LONGSTRETH, MORRIS	Sept. 20, 1878,	Philadelphia.
1015. *Lorin, Theodore*	April 20, 1832,	*Paris, France.*
2019. LUBBOCK, JOHN	July 18, 1884,	London, England.
2003. LUDLOW, WILLIAM.	Jan'y 18, 1884,	U. S. A.
1629. LYMAN, BENJAMIN SMITH	Jan'y 15, 1869,	Philadelphia.

M

1058. *Macedo, J. L. DaCosta*	April 15, 1836,	*Lisbon, Portugal.*
2209. MACFARLANE, JOHN M.	Dec. 16, 1892,	Lansdowne, Pa.
1994. MAISCH, JOHN M.	Jan'y 18, 1884,	Philadelphia.
1970. MALLERY, GARRICK, JR	Oct. 20, 1882,	Washington, D. C.
2042. MALLET, JOHN WM.	Jan'y 16, 1885,	University of Virginia, Va

	Name.	Date of Election.	Present Address.
1847.	Mansfield, Ira Franklin	Jan'y 18, 1878,	Cannelton, Pa.
1857.	March, Francis Andrew	Jan'y 18, 1878,	Easton, Pa.
1861.	Marks, William D	May 3, 1878,	Philadelphia.
1604.	Marsh, Othniel C	Oct. 16, 1868,	New Haven, Conn.
2078.	Marshall, John	May 21, 1886,	Philadelphia.
1018.	*Martinez, Juan Josè*	April 20, 1832,	*Spain.*
2184.	Mascart, E.	Dec. 19, 1890,	Paris, France.
1572.	Mason, Andrew	Jan'y 18, 1867,	New York, N. Y.
2196.	Maspero, Gaston	May 15, 1891,	Paris, France.
1654.	Mayer, Alfred M	Oct. 15, 1869,	Hoboken, N. J.
2107.	McAlister, James	Dec. 17, 1886,	Philadelphia.
1928.	McCauley, Edward Y	Jan'y 21, 1881,	"
1685.	McCosh, James	April 21, 1871.	
1888.	McCreath, Andrew S.	July 18, 1879,	Harrisburg, Pa.
1821.	McKean, William V.	Feb'y 2, 1877,	Philadelphia.
2004.	McMaster, John Bach	Jan'y 18, 1884,	"
1677.	Meehan, Thomas	Jan'y 20, 1871,	"
1903.	Merrick, John Vaughan	April 16, 1880,	"
1947.	Merriman, Mansfield	Oct. 21, 1881,	Bethlehem, Pa.
1744.	Messchert, Mathew Huizinga.	Oct. 17, 1873,	Douglassville, Pa.
2142.	Michael, Helen Abbott.	May 20, 1887,	Philadelphia.
2175.	Mitchell, James T.	Feb'y 21, 1890,	"
1461.	Mitchell, S. Weir	Jan'y 17, 1862,	"
2114.	Monier-Williams, Monier	Dec. 17, 1886,	London, England.
1791.	Moore, Gideon E	Oct. 15, 1875,	New York, N. Y.
2029.	Moore, James W	Jan'y 16, 1885,	Easton, Pa.
1841.	Morehouse, George R	April 20, 1877,	Philadelphia.
1054.	*Morelli.*	Jan'y 15, 1836,	*Naples, Italy.*
1976.	Morris, J. Cheston.	Jan'y 19, 1883,	Philadelphia.
1577.	Morton, Henry	Jan'y 18, 1867,	Hoboken, N. J.
2121.	Much, Matthæus.	Dec. 17, 1886,	Vienna, Austria.
1866.	Mühlenberg, F. A.	Sept. 20, 1878,	Greenville, Pa.
2120.	Mueller, Friederich	Dec. 17, 1886,	Vienna, Austria.
1486.	Mueller, F. Max.	Jan'y 16, 1863,	Oxford, England.
2192.	Munroe, Charles E.	May 15, 1891,	Washington, D. C.
1892.	Muoni, Damiano	Jan'y 16, 1880,	Milan, Italy.
2062.	Murdock, J. B.	Feb'y 19, 1886,	U. S. Navy.
1937.	Murray, James A. H.	April 15, 1881,	Oxford, England.

N

2087.	Nadaillac, Marquis de.	May 21, 1886,	Paris, France.
1852.	Newcomb, Simon	Jan'y 18, 1878,	Washington, D. C.
1582.	Newton, Hubert Anson	April 19, 1869,	New Haven, Conn.
1703.	Nichols, Starr Hoyt	July 19, 1872,	New York, N. Y.
2060.	Nikitin, Serge	Feb'y 19, 1866,	St. Petersburg, Russia.
1805.	Nordenskiöld, Adolf Eric	April 21, 1876,	Stockholm, Sweden.
1712.	Norris, Isaac.	Oct. 18, 1872,	Philadelphia.
2106.	Norris, William F.	Dec. 17, 1886,	"
2046.	North, Edward.	Oct. 16, 1885,	Clinton, N. Y.

O

2072.	Oliver, Charles A.	Feb'y 19, 1886,	Philadelphia.
1715.	Oliver, James E.	Jan'y 17, 1873,	Ithaca, N. Y.
2195.	Oppert, Jules.	May 15, 1891,	Paris, France.
2135.	Osborn, Henry F.	Feb'y 18, 1887,	Princeton, N. J.
1581.	Osborn, Henry S.	Jan'y 18, 1867,	Oxford, O.
2039.	Osler, William	Jan'y 16, 1885,	Baltimore, Md.
1801.	Owen, P. Cunliffe	April 21, 1876,	London, England.

P

	Name.	Date of Election.	Present Address.
1868.	PACKARD, A. S., JR.	Sept. 20, 1878,	Providence, R. I.
1578.	PACKARD, JOHN H.	Jan'y 18, 1867,	Philadelphia.
1331.	PAGET, JAMES	Jan'y 20, 1854,	London, England.
1984.	PANCOAST, WILLIAM HENRY	Jan'y 19, 1883,	Philadelphia.
1673.	PARIEU, ESQUIRON DE	Jan'y 20, 1871,	Paris, France.
2036.	PARVIN, THEOPHILUS	Jan'y 16, 1885,	Philadelphia.
2056.	PASTEUR, LOUIS	Oct. 16, 1885,	Paris, France.
2035.	PATTERSON, C. STUART	Jan'y 16, 1885,	Philadelphia.
1282.	PATTERSON, ROBERT	April 18, 1851,	"
1320.	PATTERSON, THOMAS L.	April 15, 1853,	Cumberland, Md.
1772.	PEARSE, JOHN B.	Jan'y 15, 1875.	*Boston, Mass.*
1859.	PEIRCE, C. NEWLIN	May 3, 1878,	Philadelphia.
1722.	PEMBERTON, HENRY	Jan'y 17, 1873,	"
2104.	PEÑAFIEL, ANTONIO	May 21, 1886,	Mexico.
2073.	PENNYPACKER, SAMUEL W.	May 21, 1886,	Philadelphia.
1518.	PENROSE, R. A. F.	July 17, 1863,	"
2059.	PEPPER, EDWARD	Feb'y 19, 1886,	Paris.
1666.	PEPPER, WILLIAM	July 15, 1870,	Philadelphia.
951.	*Pereira, Josè Maria Dantes*	April 18, 1828,	*Lisbon, Portugal.*
1705.	PETER, ROBERT	July 19, 1872,	Lexington, Ky.
1824.	PHILLIPS, HENRY, JR.	Feb'y 2, 1877,	Philadelphia.
1760.	PLATT, FRANKLIN	July 17, 1874,	"
2127.	PLATZMAN, JULIUS	Dec. 17, 1886,	Leipzig, Germany.
2053.	POMIALOWSKY, JOHN	Oct. 16, 1885,	St. Petersburg, Russia.
1539.	PORTER, THOMAS CONRAD	Oct. 21, 1864,	Easton, Pa.
2203.	POTTS, JOSEPH D.	May 20, 1892,	Philadelphia.
2044.	POTTS, WILLIAM JOHN	Oct. 16, 1885,	Camden, N. J.
2097.	POSTGATE, J. P	May 21, 1886,	Cambridge, England.
2161.	POWELL, J. W.	Oct. 18, 1889,	Washington, D. C.
1619.	PRESTWICH, JOSEPH	Jan'y 15, 1869,	Shoreham, England.
1592.	PRICE, J. SERGEANT	Oct. 18, 1867,	Philadelphia.
1780.	PRIME, FREDERICK, JR	April 16, 1875,	"
2088.	PULZSKY, FRANCIS	May 21, 1886,	Buda-Pesth, Hungary.
1758.	PUMPELLY, RAPHAEL	April 17, 1874,	Newport, R. I.

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973.	*Quadrada, Francisco de Paolo*	Oct. 16, 1829,	*Madrid, Spain.*
1143.	*Quaranta, Barnardo.*	Jan'y 15, 1841,	*Naples, Italy.*

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1736.	RAND, THEODORE D.	April 18, 1873,	Philadelphia.
1849.	RANDALL, F. A.	Jan'y 18, 1878,	Warren, Pa.
1644.	RAWLINSON, GEORGE.	Oct. 15, 1869,	Oxford, England.
1765.	RAWSON, RAWSON W	Oct. 16, 1874,	London, "
2099.	RAYLEIGH, LORD	May 21, 1886,	Essex, England.
1784.	RAYMOND, ROSSITTER W	April 16, 1875,	New York, N. Y.
1585.	RAYNOLDS, WILLIAM F.	April 19, 1867,	Detroit, Mich.
1591.	READ, JOHN MEREDITH	July 19, 1867.	
2077.	REED, HENRY	May 21, 1886,	Philadelphia.
1889.	REMSEN, IRA	July 18, 1879,	Baltimore, Md.
1948.	RENARD, A	Oct. 21, 1881,	Brussels, Belgium.
1343.	RENARD, CHARLES	Jan'y 20, 1854,	Moscow, Russia.
1890.	RENEVIER, E.	July 18, 1879,	Lausanne, Switzerland.

Name.	Date of Election.	Present Address.
1816. REULEAUX, F.	Feb'y 2, 1877,	Berlin, Prussia.
2122. RÉVILLE, ALBERT	Dec. 17, 1886,	Paris, France.
1500. RICHARDSON, BEN. WARD	April 17, 1863,	London, England.
1808. RILEY, CHARLES V	April 21, 1876,	Washington, D. C.
1957. ROBINS, JAMES W	April 21, 1882,	Philadelphia.
1390. ROGERS, FAIRMAN.	Jan'y 16, 1857,	Newport, R. I.
2177. ROGERS, ROBERT W.	Feb'y 21, 1890,	Carlisle, Pa.
1906. ROGERS, WILLIAM B., JR	April 16, 1880,	Philadelphia.
1462. RÖHRIG, F. L. O.	April 18, 1862,	Los Angeles, Cal.
2050. ROLLETT, HERMANN	Oct. 16, 1885,	Vienna, Austria.
1907. ROOD, OGDEN N	April 16, 1880,	New York, N. Y.
1964. ROSNY, DE, LÉON	July 21, 1882,	Paris, France.
1732. ROSSI, GIOVANNI BATTISTA.	April 18, 1873,	Rome, Italy.
2198. ROSENGARTEN, JOSEPH G.	Oct. 16, 1891,	Philadelphia.
1718. ROTHERMEL, PETER F.	Jan'y 17, 1873,	Limerick P. O., Pa.
1838. ROTHROCK, JOSEPH T	April 20, 1877,	Philadelphia.
1264. RUSCHENBERGER, WM. S. W.	Oct. 19, 1849,	"
1620. RUTIMEYER, CARL L.	Jan'y 15, 1869,	Basel, Switzerland.
2109. RYDER, JOHN A	Dec. 17, 1886,	Philadelphia.

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1766. SADTLER, SAMUEL PHILIP	Oct. 16, 1874,	Philadelphia.
2148. SAJOUS, CHARLES E.	Feb'y 17, 1888,	Paris, France.
1563. SANDBERGER, FRIDOLIN	April 20, 1866,	Würtzburg, Bavaria.
1958. SARGENT, CHARLES SPRAGUE	April 21, 1882,	Brookline, Mass.
1730. SAUSSURE, HENRI DE.	April 18, 1873,	Geneva, Switzerland.
1877. SCHORLEMMER, C.	Oct. 18, 1878,	Manchester, England.
1498. SCHOTT, CHARLES ANTHONY	April 17, 1863,	Washington, D. C.
1864. SCHURZ, CARL	Sept. 20, 1878.	
1725. SCLATER, PHILLIP LUTLEY.	April 18, 1873,	London, England.
1919. SCOTT, LEWIS A.	Oct. 15, 1880,	Philadelphia.
2112. SCOTT, W. B.	Dec. 17, 1886,	Princeton, N. J.
1870. SCUDDER, SAMUEL HUBBARD.	Sept. 20, 1878,	Cambridge, Mass.
1656. SEIDENSTICKER, OSWALD	Jan'y 21, 1870,	Philadelphia.
1883. SEILER, CARL	April 18, 1879,	"
1704. SELLERS, COLEMAN	July 19, 1872,	"
1533. SELLERS, WILLIAM.	April 15, 1864,	"
1770. SELWYN, ALFRED R. C.	Oct. 16, 1874,	Montreal, Canada.
1728. SELYS, DE, LONGCHAMPS.	April 18, 1873,	Liége, Belgium.
2057. SERGI, GIUSEPPE.	Oct. 16, 1885,	Rome, Italy.
1965. SÈVE DE BAR, EDOUARD	July 21, 1882,	Ramsgate, England.
2076. SHARP, BENJAMIN.	May 21, 1886,	Philadelphia.
1944. SHARPLES, PHILIP PRICE	Oct. 21, 1881,	West Chester, Pa.
1960. SHARPLES, STEPHEN PASCHALL.	April 21, 1882,	Boston, Mass.
2002. SHARPLESS, ISAAC	Jan'y 18, 1884,	Haverford, Pa.
1792. SHEPPARD, FURMAN.	Oct. 15, 1875,	Philadelphia.
1797. SHERWOOD, ANDREW	Oct. 15, 1875,	Mansfield, Pa.
1822. SHIELDS, CHARLES W.	Feb'y 2, 1877,	Princeton, N. J.
1532. *Shinz, Carl.*	April 15, 1864,	*Strasburg, Germany.* (?)
2146. SMITH, EDGAR F.	Oct. 21, 1887,	Philadelphia.
1544. SMITH, GOLDWIN.	Jan'y 20, 1865.	
1789. SMITH, STEPHEN	Oct. 15, 1875,	New York, N. Y.
2141. SMYTH, ALBERT H.	May 20, 1887,	Philadelphia.
1742. SNOWDEN, A. LOUDON	Oct. 17, 1873,	"
2009. SNYDER, MONROE B.	Jan'y 18, 1884,	"
2189. SPANGLER, HENRY W	May 15, 1891,	"

	Name.	Date of Election.	Present Address.
1720.	SPOFFORD, A. R.	Jan'y 17, 1873,	Washington, D. C.
1949.	STALLO, JOHN B.	Oct. 21, 1881,	Cincinnati, O.
1446.	STEENSTRUP, J. J. S.	Jan'y 17, 1862,	Copenhagen, Denmark.
1990.	STEVENS, WALTER LECONTE	Jan'y 18, 1884,	Troy, N. Y.
1840.	STEVENSON, JOHN JAMES	April 20, 1877,	New York, N. Y.
2168.	STOKES, GEORGE G.	Dec. 20, 1889,	London, England.
1834.	STRAWBRIDGE, GEORGE	Feb'y 2, 1877,	Philadelphia.
1559.	STRONG, WILLIAM	Jan'y 19, 1866,	Washington, D. C.
1820.	STUART, GEORGE	Feb'y 2, 1877,	Philadelphia.
2193.	STUBBS, WILLIAM	May 15, 1891,	Oxford, England.
2093.	STUER, DIONYS	May 21, 1886,	Vienna, Austria.
2094.	SUESS, EDWARD	May 21, 1886,	" "
2023.	SYLE, E. W.	July 18, 1884,	Philadelphia.
1844.	SYLVESTER, J. J.	July 20, 1877,	Oxford, England.
2092.	SZOMBATHY, JOSEF	May 21, 1886,	Vienna, Austria.

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1786.	TATHAM, WILLIAM P.	April 16, 1875,	Philadelphia.
1846.	TAYLOR, WILLIAM B.	Oct. 19, 1877,	Washington, D. C.
2098.	TEMPLE, RICHARD CARNAC	May 21, 1886,	Upper Burmah, India.
2006.	THOMAS, ALLEN C.	Jan'y 18, 1884,	Haverford, Pa.
1807.	THOMSON, ELIHU	April 21, 1876,	Swampscott, Mass.
1993.	THOMPSON, HEBER S.	Jan'y 18, 1884,	Pottsville, Pa.
1726.	THOMPSON, HENRY	April 18, 1873,	London, England.
1755.	THOMPSON, ROBERT ELLIS	April 17, 1874,	Philadelphia.
1754.	THOMSON, FRANK	April 17, 1874,	"
1723.	THOMSON, WILLIAM	April 18, 1873,	London, England.
1909.	THOMSON, WILLIAM	April 16, 1880,	Philadelphia.
1530.	THURY, A.	April 15, 1864,	Geneva, Switzerland.
1688.	TILGHMAN, BENJAMIN C.	July 21, 1871,	Philadelphia.
1233.	TILGHMAN, RICHARD A.	April 16, 1847,	"
1657.	TILGHMAN, WILLIAM M.	Jan'y 21, 1870,	"
2176.	TIMMINS, SAMUEL	Feb. 21, 1890,	Arley, near Coventry, Eng.
2123.	TOPINARD, PAUL	Dec. 17, 1886,	Paris, France.
2065.	TOPPAN, ROBERT NOXON	Feb'y 19, 1886,	Cambridge, Mass.
1597.	TOWNSEND, JOSEPH B.	Jan'y 17, 1868,	Philadelphia.
1955.	TOWNSEND, WASHINGTON	Jan'y 20, 1882,	West Chester, Pa.
1691.	TROWBRIDGE, WILLIAM P.	Jan'y 19, 1872,	New York, N. Y.
2024.	TRUMBULL, HENRY CLAY	July 18, 1884,	Philadelphia.
1973.	TSCHERMAK, GUSTAF	Oct. 20, 1882,	Vienna, Austria.
1983.	TURRETTINI, THEODORE	Dec. 19, 1890,	Geneva, Switzerland.
2166.	TUTTLE, DAVID K.	Oct. 18, 1889,	Philadelphia.
2163.	TYLER, LYON G.	Oct. 18, 1889.	Williamsburg, Va.
1529.	TUNNER, PETER	April 15, 1864,	Leoben, Austria.
1602.	TYNDALL, JOHN	April 17, 1868,	London, England.
2138.	TYSON, JAMES	May 20, 1887,	Philadelphia.

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2185.	UNWIN, WILLIAM C.	Dec. 19, 1890,	London, England.

V

2000.	VAUX, RICHARD	Jan'y 18, 1884,	Philadelphia.
2045.	VERE, DE, SCHEELE M.	Oct. 16, 1885,	University of Virginia, Va.
1475.	VIRCHOW, RUDOLPH	Oct. 17, 1862,	Berlin, Prussia.
1646.	VOGT, CARL	Oct. 15, 1869,	Geneva, Switzerland.
2115.	VON MELTZEL, HUGO	Dec. 17, 1886,	Koloszvar, Hungary.
1670.	VOSE, GEORGE LEONARD	Oct. 21, 1870,	Boston, Mass.
2186.	VOSSION, LOUIS	Dec. 19, 1890,	Philadelphia.

W

Name.	Date of Election.	Present Address.
2034. WAGNER, SAMUEL	Jan'y 16, 1885,	Philadelphia.
1748. WAHL, WILLIAM H.	Jan'y 16, 1874,	"
1724. WALLACE, ALFRED R	April 18, 1873,	Parkston, Dorset, England.
2156. WARD, LESTER F.	May 17, 1889,	Washington, D. C.
2033. WEIL, EDWARD HENRY	Jan'y 16, 1885,	Philadelphia.
2028. WEISBACH, ALBIN	Jan'y 16, 1885,	Freiburg, Saxony.
1639. WHARTON, JOSEPH.	April 16, 1869,	Philadelphia.
1637. WHITE, ANDREW D.	April 16, 1869,	Ithaca, N. Y.
1848. WHITE, ISRAEL C.	Jan'y 18, 1878,	Morgantown, W. Va.
1487. WHITNEY, JOSIAH DWIGHT . . .	Jan'y 16, 1863,	Cambridge, Mass.
1502. WHITNEY, WILLIAM DWIGHT. . .	April 17, 1863,	New Haven, Conn.
1863. WILDER, BURT GREEN	May 3, 1878,	Ithaca, N. Y.
2151. WILLIAMS, TALCOTT	May 18, 1888,	Philadelphia.
2178. WILLIS, HENRY	Feb'y 21, 1890,	"
2150. WILSON, EDMUND B	Feb'y 17, 1888,	Bryn Mawr, Pa.
2041. WILSON, JAMES C.	Jan'y 16, 1885,	Philadelphia.
1747. WILSON, JOSEPH M.	Jan'y 16, 1874,	"
2137. WILSON, WILLIAM POWELL . . .	May 20, 1887,	"
1896. WINTHROP, ROBERT C.	Jan'y 16, 1880,	Boston, Mass.
2140. WIREMAN, HENRY D.	May 20, 1887,	Philadelphia.
1561. WISTER, OWEN JONES	April 20, 1866,	"
1884. WOOD, RICHARD.	April 18, 1879,	"
1762. WOODWARD, HENRY.	July 17, 1874,	London, England.
1751. WOOTTEN, J. E.	Jan'y 16, 1874,	Reading, Pa.
1854. WORMLEY, THEODORE G.	Jan'y 18, 1878,	Philadelphia.
1932. WURTS, CHARLES STEWART . . .	Jan'y 21, 1881,	"
2061. WYCKOFF, A. B.	Feb'y 19, 1886,	U. S. Navy.

Y

1904. YARNALL, ELLIS	April 16, 1880,	Philadelphia.
1759. YOUNG, CHARLES AUGUSTUS . . .	April 17, 1874,	Princeton, N. J.