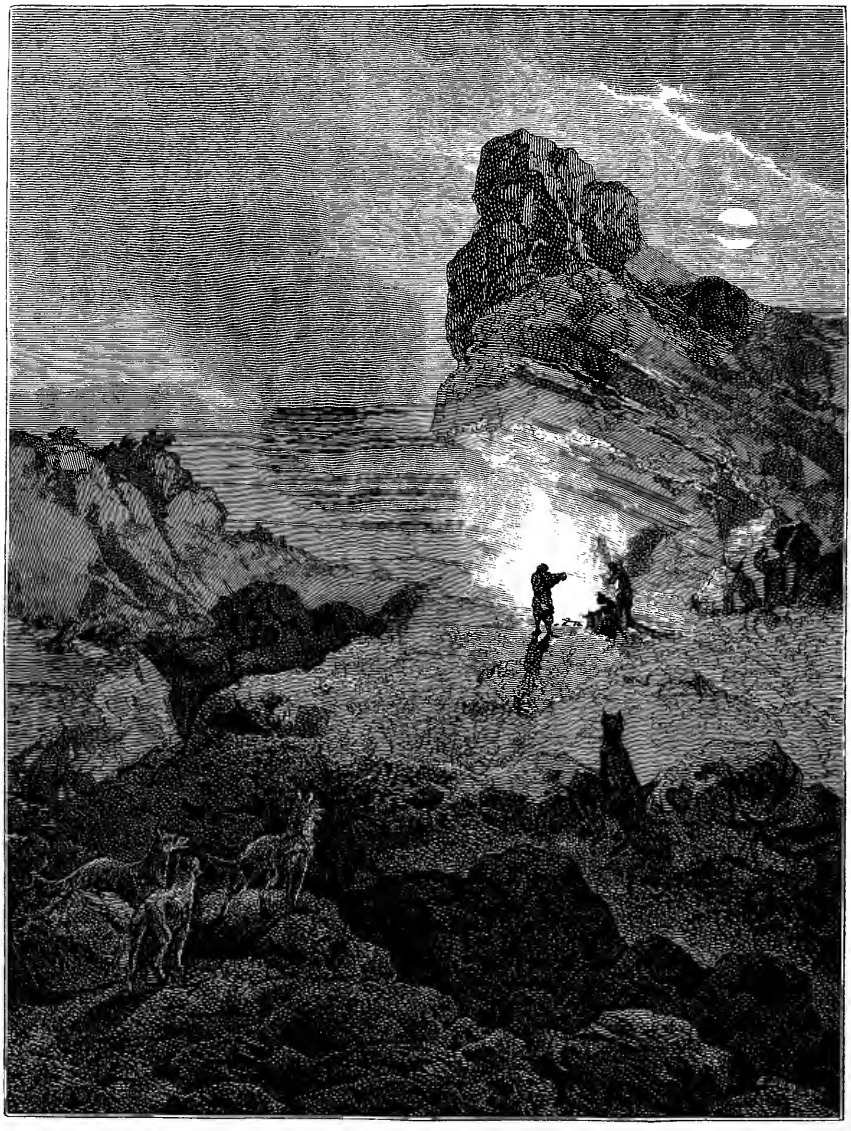


IDEAL SCENE OF TROGLODYTIC LIFE.

EARLY MAN IN EUROPE.

BY

CHARLES RAU.

ILLUSTRATED.

NEW YORK:
HARPER & BROTHERS, PUBLISHERS,
FRANKLIN SQUARE.
1876.

PREFACE.

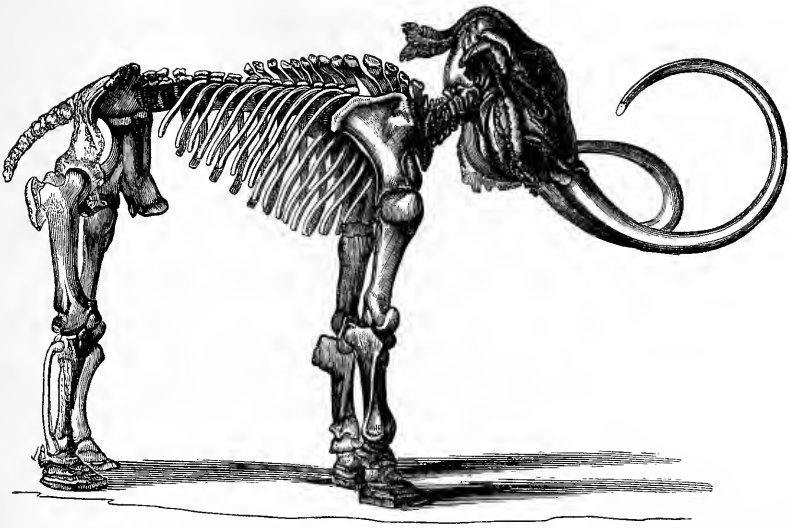
THE sketches constituting this volume appeared last year in six consecutive numbers of *Harper's New Monthly Magazine.* The publishers having concluded to offer them to the public in the form of a book, it became incumbent on the author to revise the sheets, and to make such alterations and additions as the progressive character of prehistoric investigation in Europe demanded. There are many readers who have neither the occasion nor the time for perusing the more extensive works treating of the primitive condition of man, but who desire to obtain a general knowledge of the subject. For such readers the present condensed account is intended.

THE AUTHOR.

Washington, Smithsonian Institution, January, 1876.

CONTENTS.

ILLUSTRATIONS.



SKELETON OF THE MAMMOTH.—ST. PETERSBURG.

EARLY MAN IN EUROPE.

CHAPTER I.

THE DRIFT.

All races of the earth, it is now well understood, were at a certain period of their existence so little advanced in the arts of civilization that necessity compelled them to employ wood, bone, horn, shells, but especially *stone*, as the materials for manufacturing their simple tools, weapons, and objects of personal adornment.

This period, doubtless everywhere of long duration, is called the *Stone Age*. It preceded in Europe, and probably in certain parts of Asia and Africa, the introduction of *bronze*, which is

a mixture of copper and tin, the latter metal usually forming about one-tenth of the composition; and bronze again was finally superseded by *iron*, the most important of all metals, and the great lever of civilization. Thus we have for the Old World three succeeding phases of human development — the Ages of Stone, Bronze, and Iron — which demonstrate that man slowly and gradually emerged from a condition of utter barbarism, and ultimately, after long-continued struggles, advanced toward the highest state of modern refinement. It is supposed by many persons who have not paid sufficient attention to the subject that the Stone Age was a state of existence common to the whole population of the Old World during a certain period of remote antiquity. This is an error which needs correction. The same age which was an Age of Stone in one part of the Eastern hemisphere may have been an Age of Metal in another. Thus certain nations of Europe may have been so far advanced that they used bronze, while others, as yet unacquainted with metallurgy, continued to employ stone and other available materials in the fabrication of their implements. The various degrees of technical ability attained by the aboriginal inhabitants of the American continent at the time of its discovery may be adduced as an illustration. The North American Indians north of Mexico lived, as every one knows, in an Age of Stone, fashioning out of this material their arrow and spear heads, hatchets, cutting implements, agricultural tools, and smoking utensils. It is true, they employed copper to a limited extent for similar purposes, chiefly, however, for objects of ornament. Yet they lacked, as far as investigations hitherto have shown, the knowledge of melting that metal; they simply hammered masses of native copper, obtained from the shores of Lake Superior, into the required shapes, and consequently treated copper as malleable stone. The more civilized Mexicans and Peruvians, on the other hand, were skillful workers in various metals,

such as gold, silver, copper, and tin, the last two of which they melted together, thus producing bronze, a composition, as experience taught them, much harder than pure copper.

Yet even these more advanced nations of America, notwithstanding their knowledge and frequent application of bronze, still continued to use to a great extent tools and weapons of stone at the time when their countries were invaded by the Spaniards, who consequently witnessed that curious epoch in American civilization which may be called the transition from the Age of Stone to that of Bronze. The wretched inhabitants of Tierra del Fuego are even now living in an Age of Stone, and so were many of the remote North American tribes not long ago, before the wave of emigration from the East had reached them. As for *iron*, no facts have come to light which would indicate that the extraction of this metal from its ores was practiced by *any* of the nations and tribes of America. The introduction of iron in this continent is coeval with the arrival of colonists from Europe. In the Old World, likewise, the introduction of bronze caused nowhere a sudden discontinuance of the manufacture and use of stone instruments, a fact proved by their frequent occurrence in burial-places and other deposits of the Bronze Age; and even in times when the superior qualities of iron were already known, implements of stone had not yet entirely fallen into disuse. We lay some stress on these facts, lest the reader might be led into the error of looking upon the three ages as sharply defined phases in the development of man in the Eastern hemisphere.

Among the recent results of archæological investigation in Europe which are especially calculated to throw light on the primitive condition of man, we mention first the discovery of rude flint implements associated with the bones of extinct animals, such as the mammoth, the rhinoceros, and others, in the undisturbed drift-deposits along certain rivers in France and

England. The drift-beds inclosing those implements and animal remains are formed by layers of sand, gravel, and loam, which extend along the slopes of river valleys, and reach sometimes to a height of two hundred feet above the present water-levels, although their usual elevation does not exceed forty feet. These beds of drift evidently were not deposited by the sea, but by former or still existing rivers, for the shells which they contain belong to land and fresh-water species, and not to such as inhabit the sea. The materials composing them, moreover, consist of fragments of the same rocks which occur in the areas drained by the rivers themselves, a circumstance affording another proof of their having been deposited by these waters. The latter, of course, had formerly a greater expanse, and ran at much higher levels, indicated in each case by the height of the deposits along their banks. Hence the enormous time may be inferred which it required to excavate the present river channels. The climate of Europe, there can be little doubt, was much colder when those deposits were in progress of forming than it is at present. Every spring, consequently, the melting of the accumulated masses of ice and snow caused the rivers to rise to considerable heights, flooding extensive portions of the adjacent country, deepening the river channels, and spreading over the valleys the *débris* of the surface, together with the remains of animals destroyed by the floods.

The knowledge of the occurrence of flint tools in such strata dates as far back as the beginning of the last century; but the importance attached to the subject was then overlooked, and only at the present time the full significance of these unpretending relics of by-gone ages has been duly recognized. The celebrated Cuvier, it is well known, denied, or, to say the least, doubted, the existence of fossil human remains, and his authority fixed, as it were, the opinion of men of science; for it is a general experience that prominent investigators leave not only

their achievements, but likewise their errors, as inheritances to the world.

About 1715 a spear-head-shaped flint implement, still preserved in the British Museum, was found with the skeleton of an elephant in the gravel on which London stands; and at the beginning of the present century Mr. John Frere discovered many flint articles of similar form in a fresh-water formation near Hoxne, Suffolk, in conjunction with the jaw-bone and teeth of what he called "an enormous unknown animal," which proved to be an elephant. The flint implements occurred in this place in great number—about five or six in a square yard—and the manner in which they lay seemed to favor the conclusion that they had been manufactured on the spot. The formation consisted of stratified loam and gravel, the latter containing the flint tools and the fossil bones. The bed of loam was employed at the time of Mr. Frere in the fabrication of brick; and even about 1860, when some English geologists examined the locality, the extraction of clay was still going on in the same brick-pit, and it was ascertained, moreover, that the layers still yielded from time to time these instruments of flint.

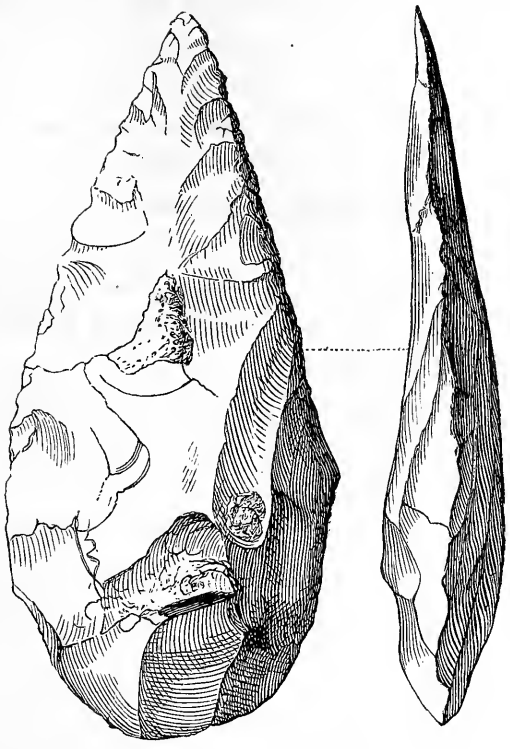
Mr. Frere's discovery, however, was little heeded at the time when it occurred, and soon vanished from the memory of men of science, until it was brought again to their notice many years afterward, when Boucher de Perthes made known the important results of his investigations. This enthusiastic and indefatigable French savant began in 1841 his examination of the gravel-beds in the valley of the Somme, at Menchecourt, near Abbeville, Picardy, during which he found in these strata a great number of flint tools of antique type, in connection with the remains of the mammoth and other extinct quadrupeds, under circumstances which warranted the conclusion that the manufacturers of the tools and those animals lived at the same period. Instigated by the success of Boucher de Perthes, Dr. Rigollot, of

Amiens, in the same valley, searched the drift-beds near that place, especially those of St. Acheul, in the suburbs of Amiens, and collected in the course of a few years several hundred specimens of flint tools, resembling in the rudeness of their make those from the gravel-pits of Abbeville. Though flint implements of similar character were afterward found in corresponding deposits in France, and quite frequently in England, those of the valley of the Somme, on account of their abundance, have attracted the greatest share of attention, and therefore have become types of the whole class.

The prevailing geological formation in the North of France, and especially in Picardy, is the chalk, containing here, as elsewhere, those well-known nodules of flint, the formerly much-sought material of which, before the introduction of percussion-caps and lucifer-matches, gun-flints and "strike-a-lights" were manufactured. In times long past, before the district of the Somme exhibited its present geological features, tertiary deposits, chiefly of a sandy character, covered these cretaceous rocks. The tertiary strata, however, mostly have been carried away by the action of water; and their materials, converted by solution and attrition into clayey substance, sand, and gravel, settled, with other *débris*, upon the denuded chalk, and thus contributed to the formation of the drift in the valley, through which the river has scooped its channel. The valley is about a mile wide between Amiens and Abbeville, and increases in width as it approaches the British Channel, into which the Somme empties.

At Menchecourt, near Abbeville, where Boucher de Perthes discovered the first flint tools, sometimes twenty or thirty feet below the surface of the soil, Sir Charles Lyell has pointed out three distinct layers, which we will describe in a few words, proceeding in descending order:

1. Brown clay, with angular flints, and occasionally chalk



DRIFT IMPLEMENT FROM ST. ACHEUL, AMIENS (HALF SIZE).

rubble, unstratified, following the slope of the hill, of very varying thickness, from two to five feet and upward.

2. Calcareous loam, buff-colored, resembling loess, for the most part unstratified, in some places with slight traces of stratification, containing fresh-water and land shells, with bones of elephants, etc.; thickness about fifteen feet.

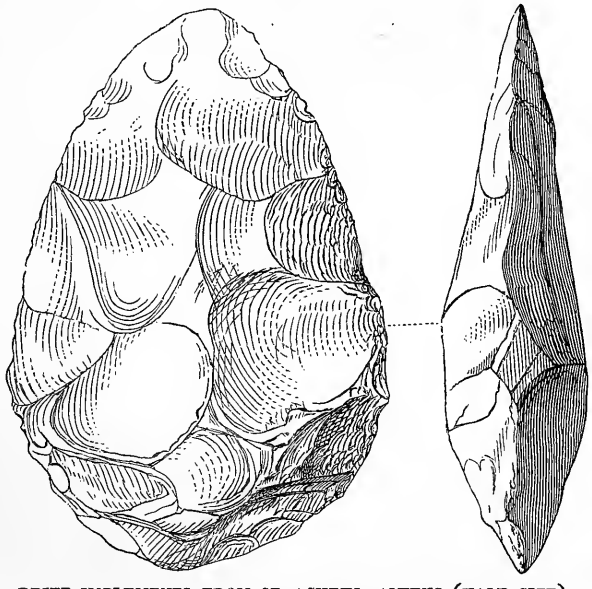
3. Alternations of beds of gravel, marl, and sand, with fresh-water and land shells, and in some of the lower sands a mixture of marine shells; also bones of elephant, rhinoceros, etc., and flint implements; thickness about twelve feet.

This third layer rests immediately upon the chalk. The mixture of fluviatile and marine shells observed in it proves, according to Lyell, that the sea sometimes gained upon the

river, whether at high tides or when the fresh-water was less in quantity during the dry season, and sometimes, perhaps, when the land was slightly depressed in level. All these accidents might occur again and again at the mouth of any river, and give rise to alternations of fluviatile and marine strata.

The flint implements themselves are very rude, and obviously indicative of the low and barbarous state of those who fashioned them. They were split from the nodules of flint so frequently occurring in the chalk; some of them even exhibit portions of the chalky crust which always surrounds these flinty bodies. The two prevailing forms of the flint tools are those of roughly wrought spear-heads and of oval or almond-shaped disks, sharpened around their edges, the latter kind being denominated "hatchets," from their resemblance to stone hatchet blades still in use among very low tribes of savages. The implements of the spear-head type are more abundant at Amiens, while the so-called hatchets prevail near Abbeville. Besides these, numerous flakes of various shapes and sizes occur in the drift of the Somme, which were in most cases the result of a single blow, being split off during the process of fashioning the more finished tools already mentioned. Many of these flakes doubtless served for cutting, scraping, and other kindred purposes. The shape of the implements designated as hatchets and spear-heads depended, in all probability, much on the original outline of the chalk-flints from which they were manufactured. These nodules are mostly of a roundish or elongated form; and in making their tools the ancient people of the Somme valley knocked two of them together until flattish fragments of suitable size came off, which they brought into the required shape by blows aimed at their circumference. Hence many of the implements are not exactly of the oval or spear-like form, but present shapes intermediate between them. As a rule, the narrower or more pointed end of these instruments is the one adapted for

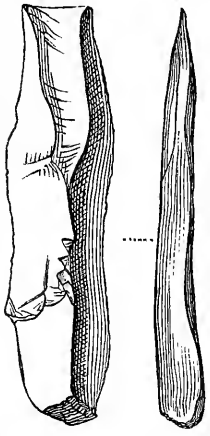
cutting. The tools of the spear-head type usually vary in length from six to eight inches, though larger ones have been found. Many of them seem to have been used with the hand, the end opposite the pointed part being often thick and massive to facilitate handling; and in some the lower end has not been fashioned at all, but has been left in its original state, when the form of the flint presented a suitable handle. Others, which are worked thinner at the lower end, perhaps were fastened to poles, and thus actually served as spear-heads.



DRIFT IMPLEMENTS FROM ST. ACHEUL, AMIENS (HALF SIZE).

Considering the strength and character of the quadrupeds surrounding these primeval people, it seems hardly probable that they could have dispensed with long weapons for attack and defense. A number of the implements called hatchets were inserted, it is believed, in cleft sticks, and fastened with the sinews or hides of animals, thus fulfilling the purpose which their name implies. Such primitive weapons were common among many races in various parts of the world, as they are, indeed, even in

our days among the natives of Australia; and the grooved North American stone tomahawk, around which a withe was bent for a handle, presents but a higher development of the rude hatchet of the drift.



FLINT FLAKE FROM MONTIERS, AMIENS (HALF SIZE).

It must be particularly stated that none of the implements found in the river drift are provided with ground edges, and that no other process but that of chipping was employed in shaping them. The art of grinding and polishing utensils of stone belongs to a much later phase of the European Stone Age, when a variety of characteristic and well-defined tools and weapons had superseded the primitive productions of the savage men who were coeval with the extinct animals. Archæologists, therefore, divide the European Stone Age into a period of chipped and one of ground stone, or, technically speaking, into a *paleolithic* (old-stone) and a *neolithic* (new-stone) period. These distinctions will be more minutely explained hereafter.

The appearance of the drift implements indicates their high antiquity. Originally split from a dull dark-gray flint, their surfaces are now altered in various ways, according to the character of the matrix which inclosed them. Those that are found in chalky or silicious sands have a polished, glossy appearance, altogether different from that of newly broken flint; others, taken from ochreous or ferruginous sands, are stained with yellow or brown colors; in some beds they appear white and porcelain-like, and in others they are covered with a calcareous film. Occasionally the surface of the flint tools is marked with those dark moss or tree-like figures called *dendrites*, which owe their origin to infiltrations of oxides of iron and manganese; and though these markings furnish no proof of very high antiquity, having

been noticed on bones obtained from later Roman graves, they are nevertheless, says Lyell, a useful test of antiquity when suspicions are entertained of the workmen having forged the hatchets they offer for sale. Generally speaking, the flint tools exhibit the same alterations of surface which characterize the flint pebbles found in connection with them. It is evident, therefore, that they are coeval with the beds of gravel in which they are inclosed.

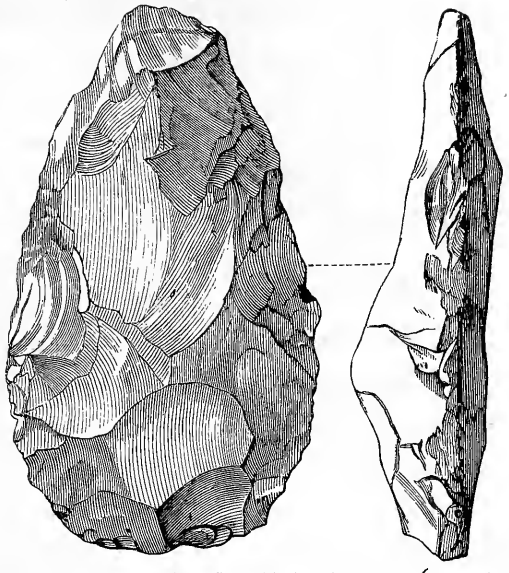
Though we have already attempted to indicate some of the probable uses to which the flint tools were applied, it must not be inferred that people in as low a state as the drift men were particularly choice in the employment of their scanty utensils, which, on the contrary, as we may suppose, had to serve for various purposes, as the exigencies of the moment required. "It is useless," says Sir John Lubbock, "to speculate upon the use made of these rude yet venerable weapons. Almost as well might we ask, to what use could they *not* be applied? Numerous and specialized as are our modern instruments, who would care to describe the exact use of a knife? But the primitive savage had no such choice of tools. We see before us perhaps the whole contents of his workshop; and with these implements, rude as they seem to us, he may have cut down trees, scooped them out into canoes, grubbed up roots, attacked his enemies, killed and cut up his food, made holes through the ice in winter, prepared fire-wood, etc."

The implements just described constitute the only remains of human industry thus far found in the river drift of Picardy, although it may be presumed that the primeval people of the Somme valley employed various objects made of wood, bone, and horn; but these, being less durable than the almost indestructible flint, have perished. Strange enough, there is some reason for the supposition that the men who once dwelt in this region, notwith-

COSCINOPORA GLOBULARIS (NATURAL SIZE).

standing their extremely low state, already evinced that love for personal adornment which seems to be innate in human nature, and has been met even among the least advanced of mankind. There occurs in the cretaceous formation a small globular petrifaction, *Coscinopora globularis*, which is either provided by nature with a hole passing through its middle, or has frequently on two opposite sides small cavities, the beginnings, as it were, of perforations, the material being softer and more spongy in the direction of the axis. Thus nature furnished objects which already presented beads, or could easily be converted into such, and it seems that the men of the drift actually employed them as ornaments; for Dr. Rigollot, in searching the gravel-beds of Amiens, often found small groups or heaps of them in one place, all perforated, just as if they had been strung together at the time when they were brought to the spot. The writer has in his possession a number of such petrifactions, exhibiting perfect as well as incipient perforations, obtained from the chalk of the Baltic island of Rügen, where they are supposed to have been used in the same manner by the ancient inhabitants.

During the years following the important discoveries of Boucher de Perthes and Dr. Rigollot, drift implements analogous to those of the Somme have been found in various parts of England, often in association with the remains of extinct animals, and thus furnishing, in corroboration of the results obtained by the French savants, the evidence of man's co-existence with creatures belonging to a long-lost fauna. The English implements occur, according to Mr. John Evans, "in beds of gravel, sand, and clay, for the most part on the slopes of existing river valleys, though occasionally at considerable distances from any stream of water, and in some rare cases not thus imbedded, but lying on the surface of the ground." Having gone into some detail in describing the drift tools of Picardy, we can not enter in this sketch upon the subject of similar British implements, but



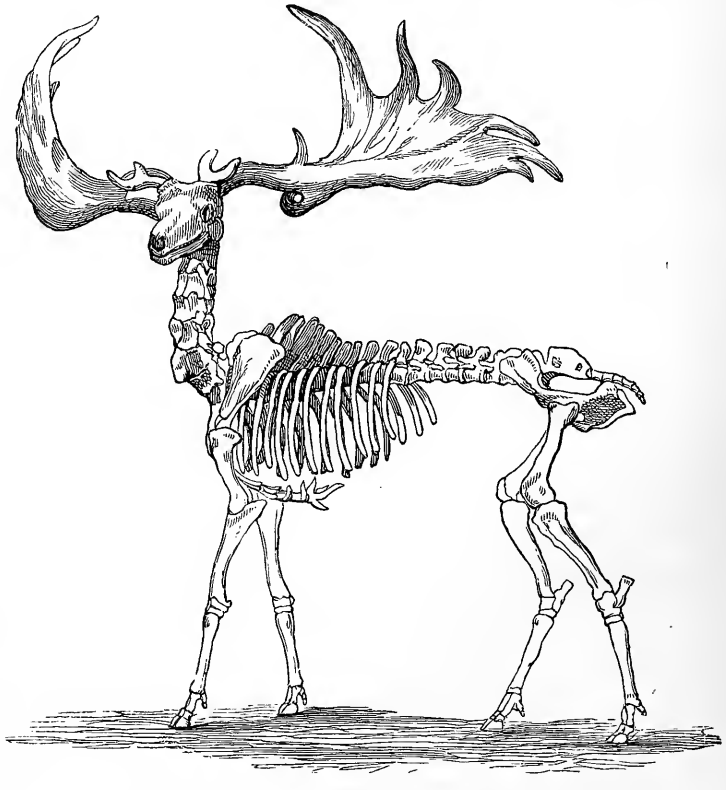
DRIFT IMPLEMENT FROM ICKLINGHAM, SUFFOLK (HALF SIZE).

must refer the reader to Mr. John Evans's excellent work on the "Ancient Stone Implements, Weapons, and Ornaments of Great Britain," in which the various river valleys and other localities yielding drift implements are enumerated, and the implements themselves carefully figured and described.

We must now proceed to give some account of the principal animals, extinct as well as still living, that co-existed with man during the drift, in order to show more clearly what position human beings occupied in that remote period.

The Mammoth (*Elephas primigenius*).—An elephant of huge size, with enormous tusks, much more curved than those of existing species. The remains of this animal, which became extinct in Europe at so early a period that not the slightest tradition of its former existence has survived, are found in the Old World from the northernmost parts of Siberia to the extreme West of Europe; it ranged as far southward as the North of Italy, but does not seem to have existed south of the Pyrenees. Bones of the mammoth also occur in North America, from Behring Strait

to Texas. These elephants abounded in Siberia, where their carcasses repeatedly have been found imbedded in ice, the flesh and skin still well preserved. Toward the beginning of this century, a Tungusian hunter discovered one inclosed by ice near the mouth of the river Lena. He waited several years until the animal had become exposed by the melting of its icy shroud, and then cut off its tusks, which he sold for fifty rubles. The flesh of the body afforded for some time food to the dogs kept by the people of the neighborhood, and to white bears, wolves, foxes, and other wild beasts, until finally Mr. Adams, a member of the Academy of St. Petersburg, put a stop to these ravages, and took pains to save the remains from further destruction. The skeleton was almost complete, excepting a fore-leg which the animals



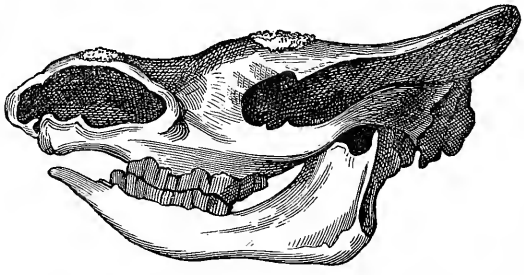
SKELETON OF THE GIGANTIC IRISH DEER.

of prey had carried off. "According to the assertion of the Tungusian discoverer," says Professor Owen, "the animal was so fat that its belly hung down below the joints of the knees. This mammoth was a male, with a long mane on the neck; the tail was much mutilated, only eight out of twenty-eight or thirty caudal vertebræ remaining; the proboscis was gone, but the places of the insertion of its muscles were visible on the skull; the skin, of which about three-fourths were saved, was of a dark-gray color, covered with a reddish wool, and coarse long black hairs. The dampness of the spot where the animal had lain so long had in some degree destroyed the hair. The entire skeleton, from the fore part of the skull to the end of the mutilated tail, measured sixteen feet four inches; its height was nine feet four inches. The tusks measured along the curve nine feet six inches, and in a straight line from the base to the point three feet seven inches. Mr. Adams detached the skin on the side on which the animal had lain, which was well preserved; the weight of the skin was such that ten persons found great difficulty in transporting it to the shore. After this the ground was dug in different places to ascertain whether any of its bones were buried, but principally to collect all the hairs which the white bears had trodden into the ground while devouring the flesh, and more than thirty-six pounds' weight of hair was thus recovered. The tusks were purchased at Yakutsk, and the whole then expedited to St. Petersburg; the skeleton is now mounted in the Museum of the Petropolitan Academy."*

Mammoth bones are found in great number in Siberia, and the tusks form a valuable article of commerce, furnishing the so-called fossil ivory. Thousands of tusks have been collected and used in turning, yet others are still procured and sold in great plenty. The mammoth roamed in large herds over the plains

* See illustration at the beginning of this chapter.

of Siberia, where it fed on the leaves of spruce and fir, and even crushed twigs of considerable size between its powerful molars. This animal, it is believed by some, existed for a long time in Northern Asia before it found its way to Europe, in which continent it does not seem to have lived prior to the period of the drift. Another species of elephant, the *Elephas antiquus*, existed during the drift time, but its remains occur less frequently than those of the mammoth.



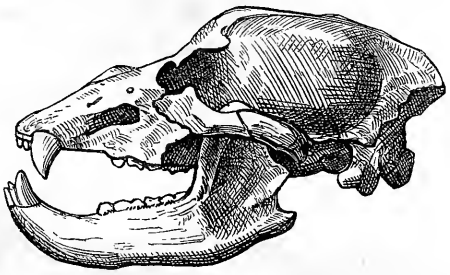
SKULL OF THE WOOLLY-HAIRED RHINOCEROS.

The Woolly-haired Rhinoceros (*Rhinoceros tichorhinus*).—An extinct animal whose remains occur mostly associated with those of the mammoth, showing that their range was nearly the same. It was frequent in Siberia, whence it seems to have emigrated to Europe with the mammoth. In its habits it resembled the last-named animal, feeding on leaves and boughs, and was likewise covered with a fur of combined wool and hair. The latter fact admits of no doubt, preserved specimens of this rhinoceros having been found imbedded in Siberian ice. This creature was large of body, but short-legged, and carried two horns upon a nose supported by an osseous septum. Several species of rhinoceros lived at the epoch under notice, among which the woolly-haired is most frequently mentioned.

The Hippopotamus.—A pachyderm denominated *Hippopotamus major*, which was not uncommon during the drift, may be identical with the species inhabiting the large rivers of Africa.

The Cave-Bear (*Ursus spelæus*).—The remains of this ani-

mal, as will be seen hereafter, are very frequent in caves; hence the name. They abound in Central Europe, especially in Germany, and in the southern parts of Russia, occurring also in Italy



SKULL OF THE CAVE-BEAR.

and Spain. The cave-bear, perhaps an earlier inhabitant of Europe than the mammoth, was a huge animal surpassing in size the North American grizzly, and must have possessed great strength, though it has been inferred from the frequent absence of the so-called gap-teeth in this species that it may have been less ferocious than its size would indicate. It is doubtful whether the cave-bear was the progenitor of any of the existing species of bear. Future investigations and comparisons probably will settle that point. Another bear of the period under notice, the *Ursus priscus*, is supposed by some to survive in the grizzly bear of this country.

The Cave-Lion (*Felis spelæa*).—A formidable animal, superior in size and strength to any of the present feline species. This carnivore, which was formerly thought to belong to the tiger kind, is now considered as a variety of the still existing lion, "possessing in an exaggerated degree the characters by which that species is distinguishable from the tiger" (Sir John Lubbock). The cave-lion has left its remains in England, France, Germany, Switzerland, and Italy, including the Sicilian Island. It deserves mention in this place that lions appear to have lived in South-eastern Europe down to historical times. According to Herodotus, they attacked in the mountains of Thessaly the

camels in the army of Xerxes; and Aristotle speaks of them as being frequent in the region between the rivers Achelous and Nessus.

The Cave-Hyena (*Hyæna spelæa*) resembled the spotted hyena of the Cape, but was larger and more powerful.

The Urus (*Bos primigenius*).—A large bovine, which became extinct in recent times. Cæsar describes these animals, which abounded at his time in the Hercynian Forest, in Germany, in the following terms: "They nearly equal the elephant in bulk, but in color, shape, and kind resemble a bull. They are of uncommon strength and swiftness, and spare neither man nor beast that comes in their way. They are taken and slain by means of pits dug on purpose. This way of hunting is frequent among the youth of Germany, and serves to inure them to fatigue. They who kill the greatest number, and produce their horns in public as a proof, are in high reputation with their countrymen. It is found impossible to tame them or to conquer their fierceness, though taken ever so young. Their horns, both in largeness, figure, and kind, differ much from those of our bulls. The natives preserve them with great care, tip their edges with silver, and use them instead of cups on their most solemn festivals." They were hunted, according to the "Nibelungenlied" of the twelfth century, in the forests near Worms, and are said to have still existed in Germany during the sixteenth century, soon after which they seem to have totally disappeared. These animals co-existed with the mammoth and the woolly rhinoceros, and their geographical distribution was extensive, remains of them occurring throughout Europe: in Great Britain, Denmark, Sweden, France, Germany, Italy, Spain, and even, it is said, in Northern Africa. The race is now extinct, unless it has survived, as some have suggested, in the large Frisian oxen, or the wild cattle of Chillingham, in England.

The Aurochs, or Bison (*Bison Europæus*).—Another large

bovine, resembling the North American bison, erroneously called buffalo. Remains of the aurochs are found in England, France, Germany, Switzerland, Italy, Denmark, Sweden, Poland, and Russia. Pliny and Seneca speak of it as existing in the great forests of Germany, but Cæsar gives no account of the animal, which is, however, mentioned, by the side of the urus, in the "Nibelungenlied," and was still hunted, it is said, in Prussia down to the year 1775, after which it became extinct in Germany. These bisons would have totally disappeared from Europe but for the care of the Russian Government, which preserves a herd of them in a forest of Lithuania, guarding against their destruction by strict laws.* A few also occur wild in the Caucasus Mountains.

The Musk-Ox, or Musk-Sheep (*Ovibos moschatus*).—Now totally extinct in the Old World, but still inhabiting in herds the arctic regions of America, seldom wandering farther south than the sixty-eighth parallel. It is a horned animal of the size of small cattle, and clad in a dense fur of long silky hair. Remains are found in Central Europe, and rarely in England.

The Gigantic Irish Deer (*Megaceros Hibernicus*).—This beautiful stag, which once inhabited Germany, France, Italy, and England, but especially Ireland, had entirely disappeared before historical times. A mysterious animal mentioned as the *schelch* in the "Nibelungenlied" has been thought to be identical with the Irish deer; yet this is an opinion unsupported by any evidence. Its bones are said to occur often in peat bogs; but Professor Owen, who made numerous inquiries on the subject, believes that the remains generally are met in a shell marl underly-

* In 1830, the herd numbered, according to Sir John Lubbock, 711 head, of which, during the Polish revolution in 1831, 115 were killed. From that time they gradually increased until 1857, when the numbers were 1898; but during the late Polish rebellion they fell to 874. Since 1863 no numbers have been given.

ing the peat. The animal was ten feet four inches high, and carried on its small head magnificent antlers, measuring eleven feet between their tips.

To this list should be added the reindeer, which played a very conspicuous part in the prehistoric times of Europe; the horse, stag, elk, hog; and likewise numerous smaller animals which lived at the period under consideration, as proved by collateral evidence, though their bones, on account of their inferior size, have not been preserved in the river gravel; and it may be stated here that only the larger and more solid bones of the elephant and hippopotamus, the ox, horse, and stag, are found in these deposits. The fauna of the European drift comprised, besides the extinct mammalians, such as the mammoth, rhinoceros, Irish deer, etc., most of the now existing species, and was consequently richer and more varied than that of the present day. As absolutely extinct can only be regarded the mammoth, the different species of rhinoceros, and the Irish deer. The cave-bear, cave-lion, cave-hyena, and others may still survive, as we have seen, under modified forms, and the term "extinct," therefore, must be applied to them in a somewhat restricted sense.

The climate of Europe, as we already observed, must have been more rigorous at that period than at present. Yet the cave-lion and hyena, and particularly the hippopotamus, elephant, rhinoceros, etc., would seem to indicate a warm rather than a cold climate. The question is certainly a perplexing one, from whatever point it may be viewed. The reader knows that the elephant and rhinoceros of that period, unlike the almost hairless species of our days, were covered with a dense fur consisting of wool and hair, which enabled them to endure an arctic temperature. The tiger of Southern Asia, it is adduced, has been seen in Siberia as far north as the fifty-second degree; and in the North of Africa hyenas are known to prowl about the highest regions of the Atlas Mountains, where during winter a severe cold, with

ice and snow, is reigning. Of the extinct carnivores, moreover, the bones only have been found, and nothing is known of their external covering, which may have been suited to a cold temperature, and the same argument is brought forward in reference to the hippopotamus. The reindeer, essentially a Northern animal both in the Old World and in North America, has long ceased to live in the West of Europe, and has retreated to the coldest part of that continent; while the musk-ox, entirely extinct in Europe, survives only in the snow regions of North America, ranging, it is believed, even higher toward the pole than the reindeer. Lastly, we have to mention, as characteristic of the European drift, the glutton, lemming, rat-hare (*Lagomys*), and pouched marmot, all of them now inhabitants of cold countries.

On the whole, the facts here enumerated are indicative of a rigorous temperature during the time, or at least a great part of the time, when the river gravels were deposited; and such a state is perfectly corroborated by geological evidence, as we will try to explain in a few words.

The quaternary formation, to which the deposits of river gravel belong, is geologically the most recent one, although it extended over an immense period of time. It was preceded by the tertiary epoch, during which a milder temperature reigned, as indicated by the character of the then existing plants and animals. "The end of the tertiary period," says Professor Vogt, "which we do not separate from the present by a sharply defined line, but by a broad transitional margin, was doubtless distinguished by a somewhat warmer climate than that which at present obtains in Central Europe. While in the middle of the tertiary period palms were growing in Switzerland, and high Californian pine-trees in Iceland, the end of the tertiary period was marked by a number of evergreen plants, with a temperature in Switzerland like that of Italy." Toward the end of the tertiary period a change in the physical condition of the earth was effect-

ed by a general refrigeration, which, of course, exerted a powerful and modifying influence on the organic beings then in existence. Under the influence of various causes not yet sufficiently recognized, large portions of Europe, Asia, and America became covered with huge masses of ice, while the lower lands of the continents were flooded by glacial waters. Land and water were then somewhat differently distributed in Europe: the Baltic, for instance, is supposed to have communicated with the White Sea and the Sea of Kara; and England, perhaps, was still connected with the main-land of Europe, and Denmark with Norway. These remarkable changes extended over an immense space of time, the *Glacial Period* of geologists. An exposition of the many curious phenomena connected with it, such as the transportation of boulders and the formation of loess, belongs to geology, and, of course, can not be attempted in this place. For our purpose it suffices to have alluded to the circumstance which inaugurated toward the end of the tertiary period that change in the temperature which permitted animals now belonging to northern climates to subsist in Western Europe.

The reign of cold, however, was not one of uninterrupted continuance. There are, on the contrary, strong reasons for believing that its rigor was moderated by long periods of comparative warmth. Mr. James Geikie published, in 1874, a work entitled "The Great Ice Age, and its Relation to the Antiquity of Man," in which he advances the view that certain animals whose remains occur commingled in river gravels and cave deposits can not have been contemporary inhabitants of the same localities of Europe, and he therefore believes in alternate changes or oscillations of climate, which permitted tropical and northern species of animals to inhabit certain districts *at different periods*, when the temperature was congenial to their respective natural habits. Southern quadrupeds, like the hippopotamus, lion, and hyena, he thinks, can not have lived side by side with the reindeer,

musk-ox, mammoth, or woolly rhinoceros; and he rejects the view of those geologists who bridge over this difficulty by assuming that certain animals of the first-named class migrated annually during the severe season to warmer regions, and returned to their old haunts again when milder weather set in. It remains to be seen whether Mr. Geikie's conclusions will meet with general approval.

The evidence that man witnessed in Europe the last glacial phenomena is not wanting. Only a short time ago there were discovered in an *interglacial* bed of lignite or brown coal at Wetzikon, in Switzerland, several wooden sticks which are cut and sharpened in a manner as to leave no doubt of their having been wrought by human hands. The bed of lignite in which these remarkable relics occurred underlies and rests upon formations of glacial origin, and has yielded bones of the *Elephas antiquus*, an extinct rhinoceros, the cave-bear, urus, and several still existing quadrupeds.* Whether the human race can be traced as far back as the tertiary period is a question which the future will decide. Some slight indications at least of man's presence before the quaternary epoch are not wanting, and the fact may yet be established by incontestable evidence.

Surrounded by an animal world such as we have described, lived the first human beings of whom any tangible tokens have been left. They subsisted by hunting and fishing, but represented, beyond question, the lowest type of that condition of human existence. Archæologists are accustomed to infer the social state of prehistoric populations from the productions of their mechanic-

---

* Speaking of the same formation of lignite, Sir Charles Lyell observes: "Although no human remains or works of art have yet been found in working the Swiss lignite, it would be rash to speculate on the non-existence of the human race in the region where these interglacial deposits accumulated on the margin of the lakes." Had the great geologist lived a year longer, he would have seen his conjecture realized.

al skill; and we have just beheld in the West of Europe a race of men who used the most primitive weapons ever found; and with these wretched arms, some of which were attached to clubs and poles, they fought the beasts of the field, and met each other in deadly combat. They were unacquainted, as it appears, with the use of bows and arrows, and with the manufacture of pottery. Indeed, they lived in the lowest stage of the Stone Age, which age, at later periods, has furnished a variety of tools and weapons remarkable for the skill, and even for the sense of elegance, of those who made them.

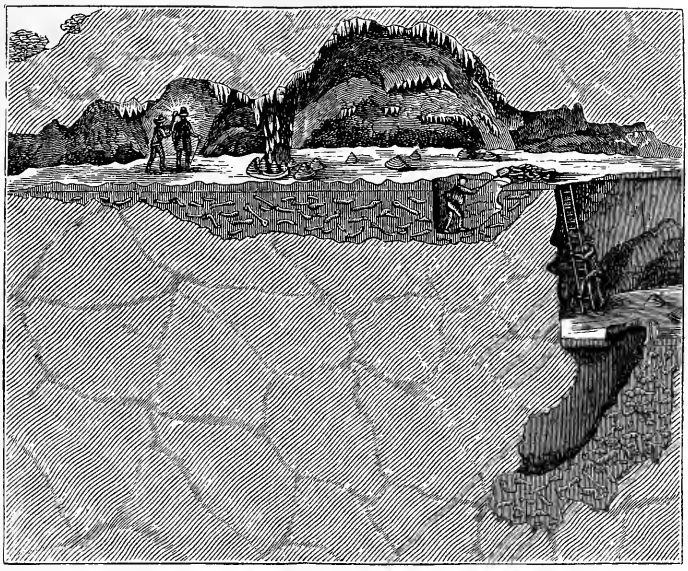
Human remains were long sought in vain in the tool and bone bearing strata of the Somme valley, and many were the reasons given to account for their absence. It was said, for instance, that the number of human beings living at the drift period must have been small in comparison with that of the animals of the same epoch, the severe struggle for existence not permitting the race to multiply in a rapid ratio; and the comparative smallness of human bones, moreover, was adduced as a ground for their disappearance. At length, however, M. Boucher de Perthes succeeded in finding, at Moulin-Quignon, near Abbeville, a human lower jaw of peculiar shape, which he extracted himself from the stratum immediately above the chalk. The jaw is of the same dark-bluish color that characterizes the surrounding sand, as well as the flint tools occurring in the latter. This discovery was followed shortly afterward by that of other human remains at the same place. The jaw-bone of Moulin-Quignon, now preserved in the Museum of Natural History at Paris, has given rise to many discussions among the learned, even to a congress of French and English savants held *in loco*. Generally speaking, French and German anthropologists consider the jaw as a relic belonging to the age of the mammoth and the worked flints, while the savants of England seem to be skeptical in the matter. No doubts, however, are entertained with regard to portions of the human skeleton

found in 1868 by Messrs. Bertrand and Reboux in the valley of the Seine, near Clichy, and elsewhere near Paris, in the same beds in which implements of the true drift type have been discovered.

We can not quote in this short sketch the computations of geologists concerning the antiquity of the river drift; for these details we must refer to the proper authorities, such as Sir Charles Lyell, Evans, and others. Yet, in conclusion, we will draw the reader's attention to a remarkable circumstance relating to the age of the drift in the valley of the Somme. There extends through a considerable portion of that valley a bed of peat from twenty to thirty feet in thickness, and undoubtedly of later origin than the drift-deposits of the same locality. In this peat are found imbedded the bones of quadrupeds and shells, all of the same species now inhabiting Europe; and, further, trunks of the alder and walnut and stems of the hazel, together with nuts of the same. The workmen who cut the peat declare that in the course of their lives none of the hollows which they have found or caused by extracting peat have ever been refilled even to a small extent, and therefore deny that peat grows. This, however, is a mistake, the increment in one generation not being perceptible to an ordinary observer. Near the surface of the peat occur Gallo-Roman remains, and, still deeper, weapons of the later Stone Period. But the depth at which these works of art are found can not be considered as a sure test of age, the peat being often so fluid that heavy substances may sink through it by their own weight. In one instance, however, Boucher de Perthes observed several large flat dishes of Roman pottery lying in a horizontal position in the peat, the shape of which must have prevented them from sinking through the underlying peat. Allowing about fourteen centuries for the growth of the superincumbent vegetable matter, he calculated that the thickness gained in a hundred years would be no more than three French centimetres, or about nine-eighths of an English inch. "This rate

of increase," says Sir Charles Lyell, from whom the above statements are taken, "would demand so many thousands of years for the formation of the entire thickness of thirty feet that we must hesitate before adopting it as a chronometric scale."

THE MAMMOTH.



SECTION OF A PART OF THE CAVE OF GAILENREUTH, BAVARIA.

CHAPTER II.

THE CAVES.

The exploration of caves in England, France, Belgium, Germany, and other parts of Europe has been even more fruitful in important results illustrative of the former condition of man than the examination of the river gravels treated in the preceding chapter. Caves, it is well known, mostly occur in limestone rocks of various geological formations, and differ very much in extent and shape. Thus the so-called grottoes are short cavities with wide external apertures, owing in many cases their origin to soft materials, such as marl, that have been carried off from beneath the harder rocks which now form their roofs, while the real caverns are frequently of surprising dimensions, extending for miles under the ground, and containing large chambers or halls, connected by galleries often so low that visitors must creep on hands and feet in order to pass through. Sometimes these chambers are not situated in the same plane, but have to be reached by

ladders from above or from below. The entrances to the caves, though in most cases nearly horizontal, or more or less inclined, are sometimes quite perpendicular, forming natural shafts. Some caves, like the celebrated Mammoth Cave in Kentucky, contain small lakes or navigable running waters, harboring curious fishes, in which, owing to the eternal darkness that surrounds them, the organ of sight has remained undeveloped.

Limestone rocks are remarkable for being traversed by many fissures and cracks, presenting natural conduits through which the atmospheric water is carried into the interior of the mountains. This water possesses the quality of dissolving to some extent the lime with which it comes in contact. In reaching the caves, it trickles from the roofs and the sides, and, having evaporated, deposits its contents in the shape of thin layers of carbonate of lime wherever circumstances favor that process. The incrustations adhering to the roof, which gradually have acquired the form of icicles, are called *stalactites*, while those on the floor appear like conical or columnar elevations, designated as *stalagmites*. Often these pendent and rising formations have met, presenting pillars or buttresses, or have assumed other strange shapes, in which the tourist, who views them by the flickering light of a torch, imagines to recognize curtains, cascades, organs, statues, altars, and other odd figurations which his fancy may suggest. How many thousands of years were required for building up these sometimes colossal accumulations of calcareous matter can not be determined, considering that the increment may not progress in an invariable ratio even in the same cave; but in order to show how slowly the deposit sometimes increases we will mention that in the celebrated cavern of Adelsberg, in Illyria, names and dates traced in the thirteenth and fourteenth centuries can be deciphered even at present, the incrustation formed since that time not having acquired a thickness sufficient to hide those inscriptions.

In caves where these calcareous formations have been progressing—for in some they are wanting—the floor is covered with a stalagmitic crust of variable thickness. Below it there occurs in many cases a more or less stratified layer of yellow or reddish earth, in some instances of considerable thickness, which frequently rests upon a basis of pebbles, differing in material from the rocks of the neighborhood, and evidently brought from distant places. The earth or mud just mentioned is often of little consistency, and almost loose, but sometimes strongly impregnated with lime, in which case it forms a cement of considerable hardness. This substance has been designated as *bone-earth*, because the bones of extinct and living animals are abundantly found in it, and likewise, though more rarely, those of man, together with rude articles of his workmanship.

Land and fresh-water shells of existing species are sometimes mingled with these remains. In general the bones lie indiscriminately scattered throughout the earth, in a manner altogether different from their relative position while belonging to the living organism, insomuch that the jaws are separated from the skulls, and that the different parts of a skeleton have rarely, if ever, been found in their proper places. Many of the bones retain their original sharpness of outline, which seems to indicate that they were still covered with the fleshy parts when introduced into the cavern; others, on the contrary, are worn and rounded by friction, thus exhibiting the unmistakable marks of their having been drifted by water. There is also a great difference in the chemical condition of the bones, some of which appear quite fresh, having retained their animal matter, while most of them are more or less void of it, and sometimes so far decayed that they crumble into dust upon being handled. Some bones, finally, have been gnawed and cracked by wild beasts.

The osseous remains of European bone-caves are chiefly those of bears and hyenas, intermingled with the bones of wolves, foxes,

gluttons, horses, oxen, stags, mammoths, and other extinct or still living mammals. From the great preponderance of the bones of carnivores, it has been suggested that the caves served formerly to those animals of prey as dens, into which they introduced their victims, torn or entire, to feed their young; and there is ample evidence that this was the case to some extent. Hyenas evidently have inhabited certain caves and reared their young in them. Bears likewise retire to caves, chiefly during hibernation, but, according to Vogt, are not in the habit of introducing bones. Yet such occupations of the caves by bears and hyenas, even through many generations, can not account for the astonishing number of bones found in some of them. In the cave of Gailenreuth, in Bavaria, were discovered within ninety years the remains of at least eight hundred cave-bears; and from the amount of bone-earth in another Bavarian cave Dr. Buckland has calculated that five thousand five hundred animals of the same species were there entombed. Large collections of bones, moreover, are found in caves with entrances so high that no living animals could have had access to them. The rolled stones, finally, which, as we have mentioned, often underlie the bone-earth or are mingled with it, certainly were not brought to their places by wild beasts.

It must be assumed, therefore, that the bone-caves owe their deposits in a great measure to the agency of water. The surface of Europe, as we have shown, was subject to great changes at those remote periods when the now lost animals were still in existence, and we have alluded to the causes by which floods, more or less extensive, were produced. When the then higher levels of the water-courses and their increased swiftness are taken into consideration, it would seem to require no great stretch of fancy for imagining in what manner pebbles, mud, shells, and bones, fresh as well as decayed, were introduced into the caves, even into such as are now found high above the bottoms of val-

leys. In some caves containing no pebbles the mud may have been gradually deposited by the melting of snow. Caves, doubtless, were the first dwelling-places of primitive man. They afforded him protection against the inclemency of the weather, against the attacks of wild beasts and of enemies of his own race. Occasionally he also deposited there his dead. Hence the human remains found in bone-caves may be, in a number of cases at least, mementoes of their former occupants. Some, however, believe that human bones and tools were mostly washed into the caves, like the animal remains and other materials there deposited.

A satisfactory solution of the question how bone-caves were filled is by no means easy, and geologists therefore are not quite agreed on that point. Several causes, such as a successive occupation by animals and man, or *vice versâ*, together with the action of water, may occasionally have co-operated in the formation of the deposit in the same cave. This view, we must expressly state, applies only to bone-caves proper; other caves undoubtedly served as the regular habitations of man, who has left there abundantly the tokens of his occupancy, as we shall have occasion to show in the sequel.

After this condensed general description of bone-caves, we will now proceed to lay before the reader a few of the most important facts resulting from the cave researches which have been carried on with uncommon zeal, especially within late years, in various countries of Europe.

In 1828, M. Tournal discovered in the cavern of Bize, Department of the Aude (Southern France), human bones and teeth, together with fragments of rude pottery, in a layer of mud and breccia containing land shells of living species and the bones of mammals, such as the aurochs and the reindeer, the latter of which is not known to have lived in historical times in France, and whose remains usually occur in that country associated with those of the mammoth. Bones of an antelope, a stag, and a goat

were also met in this cave. The human remains were found to be in the same chemical condition as those of the accompanying quadrupeds. M. Tournal concluded that these remains had not been suddenly washed in by a flood, but had been gradually introduced at successive periods. At the same time M. De Christol gave an account of his discoveries in the cavern of Pondres, near Nismes, in the neighboring Department of the Gard, where he had discovered some human bones, with those of an extinct hyena and a rhinoceros, in a deposit of mud and gravel which filled the cave up to the roof. He also found there fragments of two kinds of pottery, the rudest lying near the bottom of the cave, below the level of the extinct mammalia. The conclusions arrived at by Messrs. Tournal and De Christol, that man had co-existed with those animals, was disputed by contemporary savants; and Sir Charles Lyell himself, after having examined a number of caves in Germany, "came to the opinion that the human bones mixed with those of extinct animals, in osseous breccias and cavern mud, were probably not coeval. But of late years," says this eminent geologist, "we have obtained convincing proofs that the mammoth and many other extinct mammalian species very common in caves occur also in undisturbed alluvium (or drift), imbedded in such a manner with works of art as to leave no room for doubt that man and the mammoth co-existed."

Among cave-explorers the late Dr. Schmerling, of Liége, occupies a prominent rank. After having devoted many years to a careful examination of the caves in the valley of the Meuse and its tributaries, he published in 1833 the results of his investigations, but unfortunately died before his merits were duly appreciated by the scientific world. Many of the caves—he examined more than forty—never had been visited by explorers, and he found their floors incrusted with an unbroken stalagmitic covering, under which the bones of extinct and living animals and those of man occurred in the bone-earth. The human bones lay

scattered about like those of the animals, and corresponded in appearance and chemical condition perfectly to the latter, which were sometimes broken and rounded, and never exhibited traces of having been gnawed. Dr. Schmerling, therefore, came to the conclusion that these caves had neither served as burying-places nor had been the dens of wild beasts, but that streams communicating with the surface of the country had introduced their contents. The animal remains found by him were those of the cave-bear, cave-hyena, mammoth, rhinoceros, horse, reindeer, red deer, roe, wild cat, wild boar, fox, wolf, weasel, beaver, hare, rabbit, hedgehog, mole, dormouse, field-mouse, water-rat, shrew, and some others. Together with these were dispersed through the cave mud land shells of living species, and in rare instances bones of fresh-water fish, snakes, and birds.

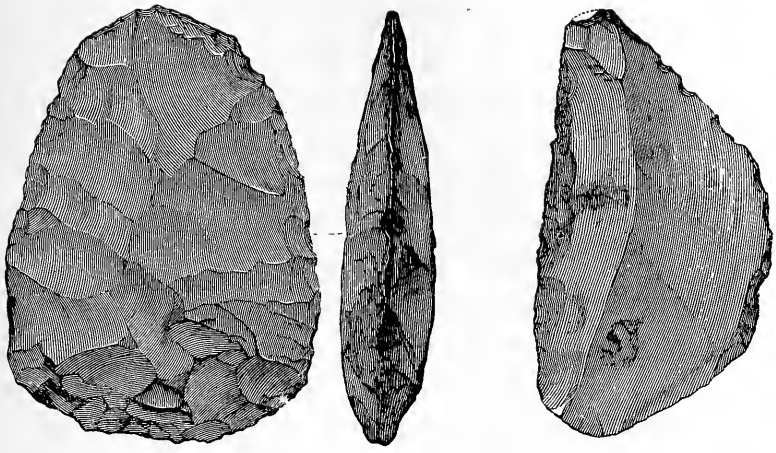
The most important remainder of man discovered by Schmerling is the skull of the Engis cavern (now totally quarried away), which was found imbedded five feet deep in a breccia, associated with the remains of the rhinoceros, reindeer, and horse. This skull, now preserved in the museum of Liége, has attracted much attention on the part of anthropologists, and has, like that found in 1857 by Dr. Fuhlrott in a cave of the Neanderthal, near Düsseldorf, elicited much comment concerning the physical and mental condition of prehistoric man. We shall have occasion to speak of these two skulls at the close of this chapter.

Dr. Schmerling found many rude flint flakes or knives, evidently made by man, dispersed through the mud of the caves; and in one cave, that of Chokier (now obliterated), he obtained a polished needle-shaped bone implement perforated at the lower extremity, which occurred in a matrix containing the remains of a rhinoceros.

The Belgian savant clearly pointed out that man once lived contemporaneously with several extinct species of quadrupeds; but his views, being contradictory to the then prevalent opinions

of geologists, did not meet with approval at the time of their publication, and his reputation as a clear-sighted investigator dates from a period when neither distrust nor applause could any longer affect him. The energy displayed by Dr. Schmerling is worthy of particular mention. He had to be let down, says Lyell, day after day, by a rope tied to a tree, so as to slide to the foot of the first opening of the Engis cave, where the best-preserved human remains were found: and after having thus gained access to the first subterranean gallery, he was compelled to creep on all fours through a contracted passage leading to larger chambers, there to superintend by torch-light, week after week and year after year, the workmen who were breaking through the stalagmitic crust, as hard as marble, in order to remove piece by piece the underlying bone breccia, nearly as hard. Thus he remained for hours with his feet in the mud and with water dripping from the roof on his head, in order to mark the position and guard against the loss of each single bone of a skeleton. And at length, after having found leisure, strength, and courage for all these operations, he looked forward, as the fruits of his labor, to the publication of unwelcome intelligence, opposed to the prepossessions of the scientific as well as the unscientific public. Such has been the fate of too many discoverers.

About the same time, when Dr. Schmerling was carrying on his explorations of Belgian caves, the Rev. J. MacEnery, of the Catholic clergy, found in Kent's cavern, near Torquay, Devonshire, in the red loam below the stalagmitic covering, not only bones of the mammoth, woolly rhinoceros, and other extinct quadrupeds, but also a number of flint tools, some of which resemble the oval-shaped kind common at Abbeville. Mr. Godwin-Austen published in 1840 an account in which he stated that he had exhumed in Kent's cavern, from the undisturbed loam below the stalagmite, works of man, such as arrow-heads and knives of flint, with remains of the elephant, rhinoceros, ox, deer, horse, bear, and

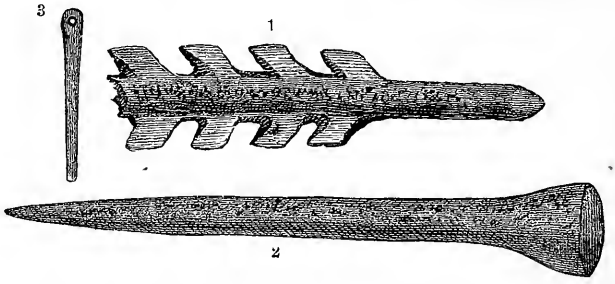


FLINT IMPLEMENTS FROM KENT'S CAVERN (HALF SIZE).

a feline animal of large size; and that all these must have been introduced before the stalagmitic flooring had been formed. In 1864, a systematic exploration of the cave was begun, and is still successfully progressing, under the superintendence of Messrs. Pengelly and Vivian.

There occurs *above* the thick and almost continuous stalagmitic floor of Kent's cavern a black mold, in which numerous relics, belonging to different times, have been found, such as stone implements of the later period, bronze articles, bone instruments, pottery (in part distinctly Roman in character), marine shells, numerous mammalian bones of existing species, and some human bones, on which it has been thought there are traces indicative of cannibalism. The red cave-earth *below* the stalagmite contains abundantly bones of extinct animals and implements fashioned by the hand of man; and in a part of the cave there extends, immediately underlying the stalagmite, a thin layer of black soil inclosing charcoal, numerous flint implements, and bones and teeth of animals. According to Mr. Evans, the principal forms of the tools are these: tongue-shaped flint implements, and others of flat ovoid form, with an edge all round; flakes of flint of various sizes and wrought into different shapes, including the so-called scrap-

ers;* the cores from which flakes have been struck; and stones which have been used as hammers or pounders. Besides these, a few pins, harpoons, and needles of bone have been discovered.



BONE IMPLEMENTS FROM KENT'S CAVERN (NATURAL SIZE).
1. Fragment of Harpoon-head. 2. Pin. 3. Fragment of Needle.

With the exception of the hippopotamus and the musk-ox, the fauna of Kent's cavern comprises all extinct species already enumerated as occurring in drift gravels, together with a number of quadrupeds still existing in Europe, like the reindeer, stag, wolf, fox, glutton, and various rodents; yet the dog, roe, sheep, goat, common ox, pig, and rabbit are wanting. Among the most interesting remains taken from beneath the stalagmite of Kent's cavern may be counted a few teeth of the sabre-toothed tiger (*Machairodus latidens*), which were found by Mr. MacEnery as well as during the later exploration. This genus appears first in the middle tertiary formations of Europe. Mr. Evans concludes, from the number and character of the tools, which bear in many cases the distinct traces of their use, from the presence of charcoal and charred bones below the stalagmite, and from various other circumstances, that the cave was, during the accumulation of the bone-earth, at all events from time to time, the habitation of man.

The Brixham cave, also situated near Torquay, was accidentally discovered in 1858, and a committee of prominent geologists procured the means for a thorough exploration, which was con-

* This class of implements will be described in another chapter.

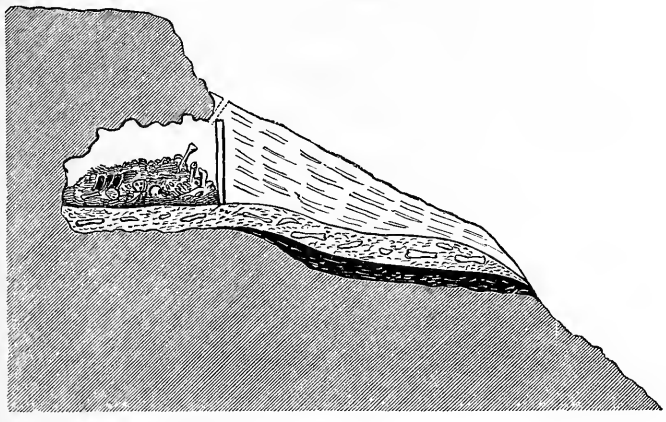
ducted by Mr. Pengelly. The cave chiefly consists of a succession of galleries of no great width, which were either entirely or partly filled with gravel, bones, and mud. At the top there occurred a layer of stalagmite from one to fifteen inches thick; next below was loam or bone-earth, of a red color, from one foot to fifteen feet in thickness; and at the bottom lay gravel containing many rounded pebbles. This stratum being probed in some places was found to exceed the thickness of twenty feet. The layer of bone-earth inclosed numerous mammalian remains, constituting a fauna almost identical with that of Kent's cavern. No human remains were found, but a number of worked flints of antique forms occurred in the lower part of the bone-earth, and some of them even in the underlying gravel. In the loam was discovered, in close proximity to a flint implement, the left hind-leg of a bear, every bone being in its natural place, which proves that the parts of the limb were still connected when it was brought to the cave. According to Mr. Pengelly, the deposit in the cave is probably owing to the transporting agency of water, in which case a valley seventy-five feet in depth, which now runs in front of the cave, could not then have existed, but must have been subsequently excavated.

Space does not permit us to describe other English caves—for instance, the Wokey hyena den, near Wells, which, it seems, was tenanted at different times by hyenas and men, and has yielded some oval-shaped flint implements of the Abbeville type; nor can we attempt to enlarge on the bone-caves of the European continent, considering that other classes of caves will yet be brought to the reader's notice. Cave researches, we may state in this place, are progressing with constantly increased energy in Europe, giving rise to a literature of monographs and larger works that has already reached an almost bewildering extent. The results, however, present only local differences, while, on the whole, the conclusions arrived at are the same, namely,

that in times anteceding any historical record or tradition tribes of savage men lived in certain districts of Europe contemporaneously with various species of animals which have either become extinct, or have migrated to other parts of Europe, or even to other continents.

The various animal remains and those of man discovered in the bone-earth of a cave may not always belong to the same epoch, especially in cases where water has been the means of their transportation. A flood, it may be argued, will sweep from the surface any thing not too heavy to be carried away by it; in places it will tear up the ground, and disentomb bones of animals that died long ago, or will remove, perhaps, remains of man, together with implements made by him, or with the bones of animals that perished either long before or long after the time of his existence. Thus it may have happened that remains of various periods became commingled in the mud of the same cave. In such cases the state of preservation of the bones themselves affords the best guidance in judging of their relative antiquity. The human bones found by Dr. Schmerling in the Belgian caves resembled in color, weight, and chemical condition perfectly those of the extinct and still living mammalia associated with them; and hence the explorer concluded, and no one now doubts, that these human and animal remains belong to the same period. Various other circumstances must be taken into consideration. The bones of extinct animals found in caves are often split lengthwise, evidently not by animal agency, but by that of man, who thus opened them in order to extract the marrow—a method still practiced by modern savages. At other times these bones bear striæ, or cuts, that could not have been produced by the teeth of wild animals, but must be ascribed to flint knives employed in detaching the flesh. The flint tools themselves, which occur commingled with the bones in caves as well as in river gravels, are quite peculiar in shape and workmanship, differ-

ing in many respects from those of the later or neolithic period of the Stone Age; and the animal remains sometimes found with these more finished instruments invariably belong to a fauna identical with that of historical times. We shall have occasion to bring forth yet stronger evidences.



SECTION OF THE GROTTO OF AURIGNAC.

The prehistoric tribes of Europe, as we have observed, sometimes buried or deposited their dead in caves. Such a primitive place of sepulture was a small grotto in a limestone hill near Aurignac, in the Department of the Haute-Garonne, Southern France. It is situated about forty feet above the valley, through which a rivulet flows, and in front of it there extends a small terrace somewhat sloping toward the valley. The entrance to this grotto was formerly hidden by a talus of small stones and earth, which the rain probably had washed down the slope of the hill. Sportsmen, however, knew that there was at this place a hole into which the rabbits escaped when pursued by dogs. One day in 1852, a laborer, employed to repair the neighboring road, introduced his arm into the rabbit-hole and drew out from it a large human bone. Suspecting that the hole communicated with a cave, he set to work digging a trench through the talus, and after a few hours' labor he found himself opposite a large

slab of rock, placed vertically, which closed the opening of the grotto. Having removed the slab, he looked into a small vaulted recess filled with human bones, among which were several entire skulls. This unusual occurrence created some excitement in the community, and the Mayor of Aurignac, Dr. Amiel, therefore ordered all the bones to be re-interred in the parish cemetery; but, being a physician, he first ascertained, by counting the corresponding bones, that they constituted the skeletons of about seventeen individuals of both sexes and all ages, and, further, that the adults must have been persons of small stature. Unfortunately these human remains are lost to science; for in 1860, when M. Edward Lartet, a distinguished paleontologist, visited Aurignac with a view to investigate the particulars of the discovery, the village sexton was unable to indicate the place where he had interred the bones. M. Lartet, not discouraged by this failure, determined to search the remaining deposits outside and inside the vault, and hired for this purpose workmen, whom he superintended during their digging operations. When these were finished, his observations resulted in the conclusion that the grotto had served as a place of sepulture, while on the small terrace in front of it funeral banquets had been held by the relatives and friends of the departed. His views were based on the following facts:

Outside of the grotto there extended over an area of six or seven square yards a layer of ashes and charcoal from six to eight inches thick, which thinned off toward the vault, not actually reaching it. This layer rested on the natural rock formation, and indicated the fire-place where the repasts were prepared and eaten. It contained broken, burned, and gnawed bones of extinct and recent quadrupeds, also rude hearth-stones, reddened by heat, and numerous works of art, but no osseous remains of man. Above this stratum lay a deposit of rubbish with similar contents and a few scattered cinders. M. Lartet identified the bones of no less than nineteen species of carnivorous and

herbivorous animals, those of the latter being most numerous. There were remains of the cave-bear, brown bear (?), badger, polecat, cave-lion, wild cat, cave-hyena, wolf, fox, mammoth (two molars and a heel-bone), woolly rhinoceros (a young animal), horse, ass (?), wild boar, gigantic Irish deer, stag, roebuck, reindeer, and aurochs. The fox, horse, reindeer, and aurochs were represented by many individuals, and seem to have chiefly served as the food of those savage feasters. The bones containing marrow had been split open by man for its extraction, many of them being also burned. The spongy parts were wanting, having been gnawed off by wild beasts, doubtless by prowling hyenas, which fed on the remnants of the meals. The bones of a young rhinoceros had been broken and gnawed in this manner. On many bones could be perceived the cuts produced by the flint implements used in removing the flesh. These remains were almost exclusively obtained from the deposits extending before the entrance of the grotto. The bones found *inside* of it, in a layer of loose earth or rubbish, generally exhibited no traces of having been gnawed or scraped, the only exception being a *calcaneum*, or heel-bone, of the mammoth, of which animal no remains excepting this bone and two molars were found. The rubbish in the grotto yielded nearly all the bones of a cave-bear's leg, close together and uninjured, also the artificially shaped and perforated tooth of an animal of the same kind, teeth of the cave-lion, and some tusks of the wild boar. Hence it was inferred that those ancient hunters were in the habit of entombing trophies of the chase and food with their dead, in accordance with a custom that was and still is common among many tribes of savages.

The articles fashioned by man which were obtained from the deposits in the vault and outside of it consisted of numerous flint flakes or knives, sling-stones, chips, a flint core or nucleus from which flakes had been split, and one of those flat round stones

with cavities on both sides supposed to have been used in making flint tools. Among other instruments, further, may be mentioned arrow-heads without barbs, made of reindeer horn, and a well-shaped and sharply pointed bodkin cut from the horn of the roe-deer. Lastly, there were found with the skeletons in the vault eighteen small perforated disks, made of a kind of cockle-shell, or *Cardium*, which doubtless had originally been strung together for the purpose of ornament.*

What we have just stated is a *résumé* of the account given by M. Lartet after his first exploration of the Aurignac grotto. He subsequently revisited that locality, and continued his researches, in the course of which he obtained results not altogether in keeping, as it appears to us, with his former experiences. The number of skeletons found in the cave, the stone slab by which it was protected, and various other circumstances plainly indicate its use as a burial-place; and there can be no doubt that the terrace in front of the cave was often resorted to by savage hunters, who feasted there on the spoils of the chase. Yet the burials may be of much later date than the feasts. "It is very much to be regretted," said Sir John Lubbock ten years ago, "that M. Lartet was not present when the place was first examined; for it must be confessed that if he had seen the deposits before they were disturbed, we should have been able to feel more confidence that the human skeletons belonged to the same period as the other remains." In 1870, M. Cartailhac, of Toulouse, paid a visit to Aurignac, "in order to see the celebrated grotto, and to collect such objects as might have been left there." In examining the cave, he noticed a difference in the color of its walls, from which he judged that the lower deposits must have been of a yellow color, and covered by a layer

* Quite similar flat shell-beads were formerly made by the aborigines of North America.

of much lighter tint; and while minutely searching the crevices of the cave, he found in the darker ground a tooth of the rhinoceros, one of the reindeer, and fractured bones of the cave-bear. The level of the higher deposit, on the other hand, yielded some small bones of living wild animals and of man, and also a pierced disk of *Cardium* and a fragment of pottery. The lower deposit of the cave, it would thus appear, corresponded with that outside of it, while the layer inclosing the human skeletons was formed at a subsequent time. However that may be, the chief result of M. Lartet's discoveries remains intact: he has furnished another proof that man was the contemporary of extinct animals, which served him for food, and that consequently the age of mankind reaches back to a very remote period.

THE NEANDERTHAL SKULL (SIDE VIEW).

THE ENGIS SKULL (SIDE VIEW).

Among the thus far discovered human remains referable to the far-distant epoch under notice, the Neanderthal skull, already mentioned, and that of the Engis cavern have chiefly excited the interest of the learned, and have caused much speculation concerning the physical and intellectual qualities of the primeval inhabitants of Europe. The first-named skull, or rather skull fragment—for it consists only of the upper portion of the cranium—belonged to a skeleton which was found in 1857 in a small grotto in the Neanderthal, or Neander *valley*, not far from Düsseldorf, Rhenish Prussia. Quarrying operations led to the clearing of the grotto, situated about sixty feet above the bed of the

small river Düssel, which flows through the valley. It contained a horizontal layer of hard loam intermixed with rolled gravel, a drift deposit identical with that occurring in all caves of the Düssel Valley, and in which the bones of extinct quadrupeds are sometimes found imbedded. In this gravelly loam of the Neanderthal grotto the workmen found, two feet below the surface, a human skeleton, which they threw out in an unceremonious way, and which would have been lost to science but for the interference of Professor Fuhlrott, of Elberfeld, who rescued from total destruction the upper part of the skull, the thigh and arm bones, a collar-bone, a part of the pelvis, a shoulder-blade, and several fragments of the ribs. These remains are undoubtedly of the highest antiquity, possessing the same qualities which characterize the bones of the mammoth, cave-bear, etc., occurring in the neighboring districts, and inclosed by the same kind of loam that contained the skeleton. Professors Fuhlrott, Vogt, and other anthropologists, therefore, conclude that the Neanderthal man lived together with the mammoth and other extinct animals of the drift period. The body probably had been washed into the grotto during high water. The skull was first described anatomically by Professor Schaaffhausen, of Bonn. He pointed out its enormous ridges above the orbits of the eyes, behind which the frontal bone is considerably depressed, its elongated, elliptical shape, narrow and low forehead, and unusual thickness. The other bones of the skeleton were found to correspond in length to those of a European of middle stature, but they were much stouter, and exhibited a greater development of the muscular ridges. On the whole, Professor Schaaffhausen comes to the conclusion that the individual to whom the Neanderthal skull belonged must have been distinguished by slight development of brain and uncommon strength of bodily frame. According to Professor Huxley, the skull in question is the most ape-like of the human crania yet discovered, and Professor Vogt expresses

himself to the same effect by stating that it has more of the simian or monkey type than any other known race skull. Yet Huxley is far from regarding the Neanderthal bones as the remains of a being intermediate between man and apes. At most, he thinks, they demonstrate the existence of a man whose skull may be said to revert somewhat to the pithecoid or ape type. Both Huxley and Vogt detect in the Neanderthal skull an approximation to the cranial formation of the Australian.*

The Engis skull, likewise fragmentary, but more complete than the one just described, was found, as we have stated, five feet deep imbedded in a breccia, in juxtaposition with remains of the rhinoceros, reindeer, and horse. This skull, it will be noticed by a comparison of the drawings presented on page 53, indicates a far higher type than that of the Neanderthal. According to Huxley, "there is no mark of degradation about any part of its structure. It is, in fact, a fair average human skull, which might have belonged to a philosopher, or might have contained the thoughtless brain of a savage."

In the first chapter we alluded to human bones found by Messrs. Bertrand and Reboux in the valley of the Seine, at Clichy, in the suburbs of Paris, in the same drift-beds in which flint implements of the oldest or paleolithic types had been discovered. The remains, among them a skull, occurred seventeen feet below the surface. The skull, which exhibits marked traces of inferiority, being narrow and slanting from the front to the back, is supposed to be that of a woman.

Among the latest discoveries of remains of prehistoric man are those made by M. Rivière, who found in 1872, in one of the caves of Mentone, near Nice, France, the almost entire skeleton of a man above middle size, imbedded twenty feet below the

* It should be stated that some anthropologists, among them Dr. Barnard Davis and Professor Virchow, consider the peculiar shape of the Neanderthal skull as a deformity caused by disease.

surface of the deposit. The full day-light reaches the farthest end of the cave, a circumstance which enabled the discoverer to have the skeleton carefully photographed, just as it appeared after the removal of the superincumbent accumulations. The engravings made after this photograph present the skeleton stretched out in an attitude of repose, the head apparently supported by the left hand, as if the man had been surprised by death during sleep. The bones and the surrounding earth were of a reddish color, produced by oxide of iron. Many pierced shells and teeth of the stag covered the skull, doubtless forming originally a chaplet or some other head ornament. A bone implement lay across the forehead, and two spear-heads of flint were placed below the occiput. Remains of the urus, cave-bear, cave-lion, cave-hyena, woolly rhinoceros, wolf, stag, chamois, and others, together with many marine and land shells, were found in the deposits above the skeleton; also chipped flint implements in great number, but neither ground tools nor pottery. The skeleton, now in the collection of the Jardin des Plantes in Paris, shows no marked approximation to the simian type, excepting, perhaps, the *tibiæ*, or shin-bones, which are more flattened than in the European of the present time. The skull is of a decidedly elongated form, exhibiting a somewhat narrow forehead.

Professor Vogt draws attention to the extreme scarceness of remains of extinct animals in this cave, conjecturing their presence might be owing to a secondary deposit.

In 1873, M. Rivière discovered in another cave of the neighborhood a second human skeleton, less complete than the one exhumed by him in the preceding year, but likewise stained by oxide of iron, and decked with shell ornaments. A few unpolished flint implements lay near this skeleton.

Later in 1873, and in the following year, he further succeeded in finding in caves near Mentone three additional skeletons, two of them belonging to children, the other to an adult individual.

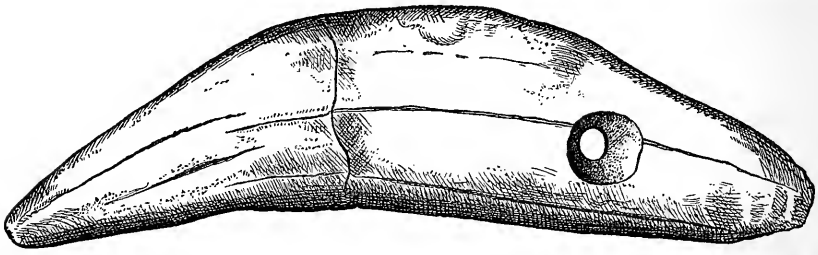
The head of the latter was surrounded with pierced sea-shells and teeth of the stag, originally constituting an ornamental head-dress. There were also found the remains of a necklace and of bracelets of shells and teeth. Curiously enough, this skeleton, too, was stained with oxide of iron, like those previously discovered by M. Rivière, who thinks that the covering of the corpse with micaceous specular iron formed one of the funeral customs of the people who deposited their dead in these caves. With this skeleton, which belonged to a vigorous individual of good stature, and resembled in its details that first discovered by M. Rivière, were found a tooth of a cave-bear, bones of ruminants, pachyderms, and rodents (not specialized in the report before us), and a number of shells of edible marine mollusks; also implements of bone and stone, the latter merely chipped, and mostly consisting of sandstone, limestone, and other materials, but rarely of flint, as in the preceding cases. No implements or ornaments accompanied the skeletons of the children.

Sir Charles Lyell is of opinion "that the time of inhumation of the remains of elephant, rhinoceros, and cave-bear in subaërial breccias at different altitudes in the cliffs of the neighborhood will have to be critically ascertained before their geological bearing on the age of the human skeletons can be finally settled."

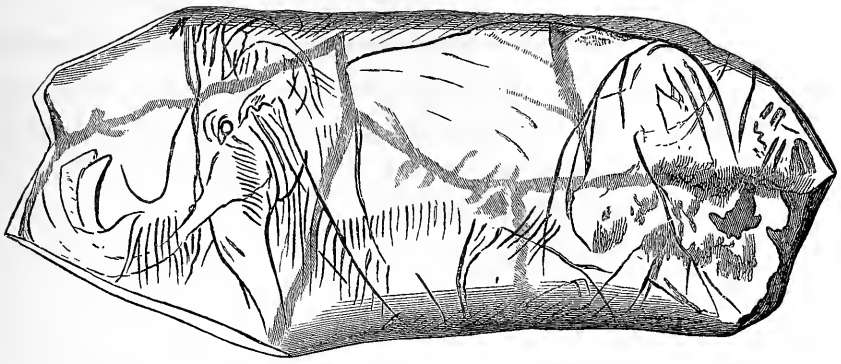
Generally speaking, the fauna of the caves thus far treated in these pages is analogous to that of the river drift, and the same peculiarities characterize the drift implements and those occurring, commingled with osseous remains, in the mud of caves. The bone and tool bearing strata of the drift and the older cave deposits, therefore, may be assumed to belong to one period, provided that this term is taken in its broadest and most expanded sense.

In the next chapter we shall lead the reader once more into caves, but into such as served as the regular habitations of human beings who were, to all appearance, somewhat more advanced and

lived at a later period than the earliest European tribes, of whom we know now at least that they existed. The merit of having established a fact of such importance belongs to that indefatigable class of investigators whose aim it is to bring light into the darkest recesses of hoary antiquity.



PERFORATED TOOTH OF A LION. FROM THE LOWEST DEPOSIT OF A GROTTO NEAR SORDE, ON THE RIVER OLORON, SOUTHERN FRANCE (NATURAL SIZE).



REPRESENTATION OF A MAMMOTH ON A PLATE OF IVORY (REDUCED).—FROM LA MADELAINE.

CHAPTER III.

THE TROGLODYTES.

THERE are two valleys in France which have become localities of particular interest—we might almost say classical ground—to the student of prehistoric archæology. One of them, the Somme Valley, has been brought to the reader's notice in a previous chapter; and we now invite him to follow us to the valley of the Vézère, an affluent of the river Dordogne, which drains a portion of South-western France known under the name of Aquitania in ancient times. The valley of the Vézère is very rich in caves, which occur in the picturesque formations of cretaceous limestone bordering the meandrous river, and form a peculiar feature in its beautiful scenery. These caves, however, are not always such large halls and galleries as we have heretofore described, but in some instances mere hollows, or "rock-shelters" (*abris* in French), owing their origin to the disintegration of soft strata which offered less resistance to atmospheric influences than the harder rocks covering them. In times long past, rude tribes of hunters and fishers used these hollowed rocks as dwelling-places, leaving there abundant tokens of their occupancy, which enable us to gain a pretty distinct view of their mode of life. Indeed, though their very existence was unknown to us not

many years ago, we are now in some respects better acquainted with them than with certain nations of antiquity whose names are inscribed on the pages of history. Yet it was not prehistoric man alone who sought the shelter of these caves. "As civilization advanced," says Sir John Lubbock, "man, no longer content with the natural but inconvenient abode thus offered to him, excavated chambers for himself, and in places the whole face of the rock is honey-combed with doors and windows leading into suits of rooms, often in tiers one above another, so as to suggest the idea of a French Petra. In the troublous times of the Middle Ages many of these no doubt served as very efficient fortifications, and even now some of them are still in use as store-houses and for other purposes. At Brantôme I saw an old chapel which had been cut in the solid rock, and resembled the descriptions given of the celebrated rock-cut temples in India."

The archæological celebrity of the valley of the Vézère is owing to a group of caves and hollows situated on both sides of the river, at short distances from each other, and all embraced in the Department of the Dordogne. They were conjointly explored by M. Edward Lartet, the distinguished French archæologist previously mentioned, and Mr. Henry Christy, an English gentleman of wealth and great scientific acquirements. This remarkable partnership of French and English intelligence and industry resulted in the publication of the "Reliquiæ Aquitanicæ," a comprehensive and richly illustrated work, which, notwithstanding its Latin title, is written in the English language. We state with regret that both authors died before their work was completed.

The caves and rock-shelters forming the group chiefly treated in the work just mentioned are *Le Moustier*, *La Madelaine*, *Laugerie Haute*, *Laugerie Basse*, *Gorge d'Enfer*, *Les Eyzies*, and *Cro-Magnon*. In prehistoric times those localities, or "stations," as they are called, undoubtedly were inhabited by man for a very

long period, during which the fauna underwent noticeable changes, at least in regard to the numerical proportion of the then existing species of animals, while in the same epoch a decided progress is traceable in the mechanical acquirements of man. So much can be inferred from the animal remains and works of art found in the different caves of the Vézère. Developments of such character are not the result of a few centuries, and hence a far greater length of time must be allowed for their realization. The people of whom we are about to treat have been called *cave-men*, or *troglodytes*, because they selected caves as their abodes whenever they could avail themselves of such natural retreats. Yet it must not be inferred that the population of a whole district was lodged in this manner, considering that caves afforded room only to a limited number of persons, while others not thus favored doubtless lived in rude dwellings of their own construction, the traces of which, of course, have now totally disappeared. The rock-shelters, perhaps, formed in some cases the roofs under which huts were built. Generally speaking, the deposits in the caves under notice consist of broken bones, pebbles, and articles of flint, horn, and bone, intermingled with charcoal in fragments and dust, the whole often being cemented together, and forming a kind of tufa. These accumulations sometimes extend to a depth of eight or ten feet and a length of sixty or seventy feet. The cave-people of the Vézère district were more advanced and lived at a later period than the men whose implements are found in the gravel-beds of the Somme. These conclusions have been drawn from the fauna of the caves, and from the greater skill displayed by the cave-dwellers in the manufacture of their implements of war and peace. At the time when these caves served as the abodes of hunting tribes, the mammoth, cave-hyena, cave-lion, cave-bear, gigantic Irish deer, and others had not yet become extinct, but had apparently much decreased in number, while the reindeer, which inhabits in our time the northernmost portions

of Europe, was prevailing, for which reason this epoch has been styled the *Reindeer Period* by archæologists.* Together with the reindeer, as common in the time of its preponderance, must be mentioned the horse, aurochs, ibex, and chamois, the last two of which have now left the lowlands and sought refuge in the more congenial temperature of Alpine heights. The *Antilope Saïga*, an animal which now inhabits portions of Russia and Asia, belonged at that time to the fauna of France, as shown by a small number of its bones found by M. Lartet and others. Remains of the mammoth and of the other extinct quadrupeds, with which the reader has been made acquainted in the preceding chapters, are of very rare occurrence in these caves. Plates of the molar teeth of the mammoth were found at various stations, and worked ivory at Les Eyzies and La Madelaine. A portion of a mammoth's pelvis was discovered at Laugerie Basse, and the stump of a tusk of this huge quadruped in the cave of Cro-Magnon. As paleontological peculiarities special to a single locality, Lartet and Christy mention: in the Moustier cave, the half of a lower jaw of a hyena; at Les Eyzies, a metacarpal of a large feline (probably *Felis spelæa*), bearing the marks of scraping, such as are found on the bones of the herbivores eaten by the cave-people; at Laugerie Haute, two molars of the gigantic Irish deer; and at Laugerie Basse, the phalanges of a great bear, marked with notches made by a cutting instrument. The scarcity of remains of extinct animals would render it doubtful, indeed, whether the cave-dwellers of the Vézère co-existed with them, if there were no other evidences, yet to be brought forward, which settle that point in a conclusive manner.

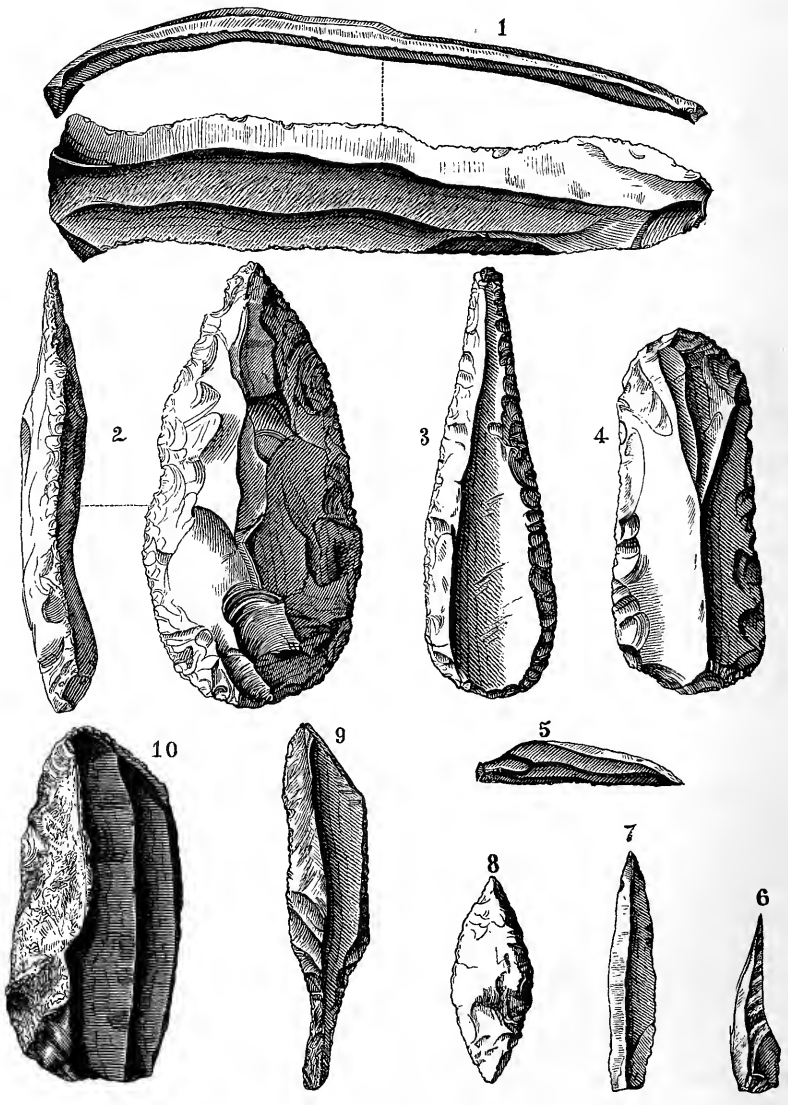
The animals most frequently hunted by the troglodytes, and furnishing their principal food, were the reindeer and the horse,

* This term is not generally adopted, but we retain it for the sake of classification.

the first-named quadruped being of additional value to them on account of its antlers, which they worked very skillfully into implements of various descriptions. It appears, however, that they fed on every kind of animal they could obtain by force or cunning, not excepting carnivores, such as wolves and foxes. Remains of the stag are said to be rare, and still rarer those of the wild boar. Bones of birds and fishes, more especially of the salmon species, occur abundantly at some stations. It does not appear that these people kept any domesticated animals: neither the reindeer nor the horse seems to have been tamed by them, though there is some difference of opinion on that point. They had no sheep, goats, or cattle, and there were no dogs to protect the cave-men's rude dwellings, or to share with them the excitement of the chase. The absence of the dog, in particular, may be inferred from the appearance of the bones occurring in the cave-refuse; for this animal, according to the experiences of Professor Steenstrup, eats only the soft, spongy parts of bones, especially of bird-bones, leaving the remainder uninjured. No bones mutilated in this manner have been found in the caves under notice, which fact furnishes additional evidence that the cave-people kept no tamed dogs. To Professor Vogt the absence of the dog is suggestive of the non-domestication of the reindeer, which, he thinks, can not be subdued by man, and properly guarded, without the assistance of that animal.

The caves were the banqueting halls of their inhabitants, and here the refuse of the meals accumulated, which now affords us the means of studying the bill of fare. The backbones of large quadrupeds, such as the horse and the ox, are not found in the caves, probably because these animals, being too heavy for transportation, were dismembered on the spot where they had been slain, for the purpose of carrying the extremities with their fleshy parts, together with the heads, separately to the rock-dwellings. This procedure was dispensed with when the game consisted of

a reindeer or other less bulky quadruped. Such animals were brought home entire, as shown by the frequent occurrence of their complete skeletons in the refuse of the caves. Like other



FLINT IMPLEMENTS FROM THE DORDOGNE CAVES (HALF SIZE).

1. Flake (Gorge d'Enfer). 2. Almond-shaped blade (Le Moustier). 3, 4. Scrapers (Cro-Magnon). 5, 9. Knife-shaped implements (Laugerie Basse and Les Eyzies). 6, 7. Piercing implements (Laugerie Basse). 8. Arrow-head (Laugerie Haute). 10. Nucleus, or core (Les Eyzies).

savages, the troglodytes used to break the bones and heads of the animals they had killed, in order to obtain the marrow and brain.* Though charcoal abounds in the caves, as we have stated, the bones generally show no marks of roasting—a circumstance rather puzzling to those who have speculated on the cavemen's method of cooking. Having no vessels of clay, it has been thought they used to cook their meat in wooden troughs filled with water, which they brought to the boiling-point by means of heated stones thrown into it.† Pebbles that might have served for this purpose are numerous in the caves. The French anthropologist, Dr. Paul Broca, thinks it much more probable that they cooked their food under the ashes, like certain savages of our own time. No traces of vegetable food have thus far been discovered; they subsisted, it appears, chiefly by hunting and fishing. Bones gnawed by animals are not found in the caves themselves, doubtless because the troglodytes had the means of closing in the night, or while absent, the entrances of their abodes, and to protect them from the invasion of wolves, foxes, and other prowling beasts of prey.

The reindeer hunters of the Dordogne Department displayed, as has been stated, much more skill in the manufacture of im-

---

* The Prairie Indians, after a buffalo hunt, skillfully open the large bones of these animals and extract the marrow, which they deem a great delicacy. They use the brain of the buffalo, elk, deer, etc., as a softening material in the preparation of skins.

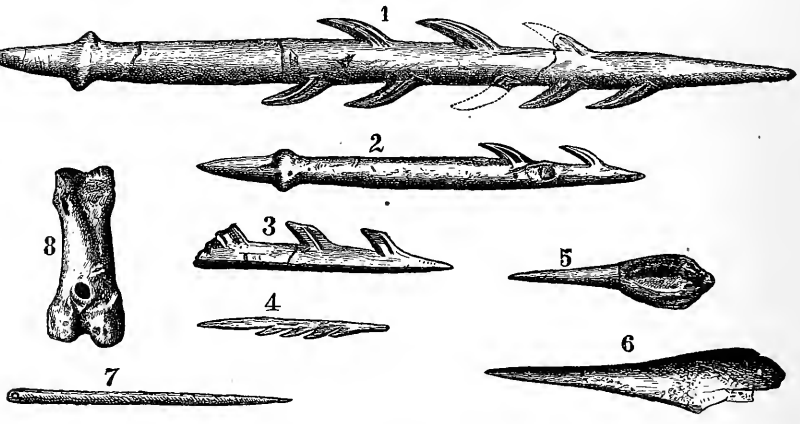
† This practice prevailed among several North American tribes who were unacquainted with the manufacture of pottery. The Assinneboins, for instance, cooked their game in its own hide. Having taken off the skin, they pressed it down into a hole dug for the purpose, thus forming a receptacle that would hold water. In this most primitive kettle they boiled the meat by immersing red-hot stones. Among the Scotch Highlanders, even in the time of Bruce, the raw hide of an animal, stretched on four sticks, was used to form the bag in which the flesh was seethed. They employed also wooden vessels, hollowed by the dirk, for the purpose of heating water by means of hot pebbles thrown into it.

plements than the people whose relics are found in the river gravels and in the cave deposits of earliest date. Flint continued to be the kind of stone almost exclusively used by them; but the articles made of this material show a great variety of forms, and sometimes a finish which almost assimilates them to the manufactures of the later or neolithic phase of the Stone Age. Yet the people of the Vézère Valley were still ignorant of the art of grinding and polishing stone implements, no articles thus improved having been found in the cave deposits, which consequently belong to the paleolithic period, when chipping alone was employed in the manufacture of instruments.* The accumulations in the caves contain, according to Lartet and Christy, "innumerable chips and countless thousands of blades of flint, varying in size from lance-heads, long enough and stout enough to have been used against the largest animals, down to lancets not larger than the blade of a penknife, and piercing instruments of the size of the smallest bodkin." Quite numerous are the so-called nuclei or cores, that is, blocks of flint from which narrow flakes have been struck off by carefully directed blows, producing facets that give the objects an almost prismatic appearance. Some of the cores exhibit ten or twelve facets. The presence of these nuclei of course indicates that flint implements were made in the caves. The flakes detached from these blocks are usually somewhat curved, owing to the peculiar fracture of flint, and sharp on both sides. They were either left in their original state and employed in various ways, or chipped into the form intended by the maker, to serve for cutting, sawing, and other purposes. Some of these implements terminate in stems, or tangs, doubtless for insertion into handles of wood, horn, or bone. The most delicate articles of flint made by the Dordogne cave-men

* In some caves, however, pebbles with shallow cavities produced by grinding have been found. They will be described hereafter.

were those destined to serve as piercers or awls. We must not omit to mention the scrapers, which have occurred quite frequently at different stations, as, for instance, at Cro-Magnon. They are oblong flakes, one end of which is brought to a rounded beveled edge by a series of small blows. The lower side always presents the unaltered fracture of the flint. The part opposite the curved edge is often worked into a sort of handle, which gives the implements a somewhat spoon-like appearance; others have both ends rounded, and are then designated as double scrapers. Representations of both kinds are given. These tools, which occur in almost all countries of the world, are supposed to have been used for scraping the skins to be made into garments or other coverings. Their shape certainly fits them well for that purpose; but they may also have served in other operations. The Eskimos employ to this day quite similar stone scrapers, set in well-shaped handles of ivory or wood. Flint arrow-heads have been found at different stations, a fact proving that the cave-dwellers were acquainted with the use of the bow. Well-defined spear-heads of flint are not wanting, and at the cave of Le Moustier large almond-shaped blades, chipped only on one of the flat sides, were frequent, and are supposed to have formed the armatures of spears. This station, further, is remarkable for implements resembling much the so-called hatchets of the Somme Valley, and for a peculiar class of cutting implements or "choppers," with a single broad convex edge, and adapted by a thick back to be held in the hand. They are thought to have been used for breaking the marrow-bones. The flint implements of Le Moustier somewhat approach the drift types, and are generally of a ruder character than the chipped articles found at the other stations, which fact, in connection with various other circumstances, renders it almost certain that this cave was inhabited by man at a much earlier epoch than any other of the group under notice. Round stones, much battered, are frequent in the rock-

dwellings, and represent the hammers of the troglodytes. A pebble of suitable size and weight was the primitive hammer of man in all parts of the world.



HORN AND BONE IMPLEMENTS FROM THE DORDOGNE CAVES (NEARLY HALF SIZE).

1, 2, 3, 4. Barbed points of reindeer horn, used as heads of lances, harpoons, and perhaps of arrows (La Madelaine). 5, 6. Bone awls (Cro-Magnon). 7. Needle of reindeer horn (La Madelaine). 8. Whistle of reindeer bone (Laugerie Basse).

The implements of horn and bone, which evince still more skill and patient labor than the flint tools just described, were likewise manufactured in the caves, many unfinished articles of this class having been discovered in the rubbish. Among such relics we will mention chisels, awls, needles, round and tapering lance-heads (with beveled lower ends for insertion into wooden shafts), harpoon-shaped lance-heads, barbed arrow-heads, small spoon-like instruments (supposed to have served for extracting the marrow from bones), whistles, and various other objects, the use of which is not always quite evident. These tools and weapons are mostly cut from reindeer horn, a material of great hardness, and therefore well fitted for the purposes to which it was applied. Illustrations of the principal forms are given. We would particularly draw the reader's attention to the armatures with barbs either on one side or on both, the manufacture of which must have been the result of long-continued painful labor,

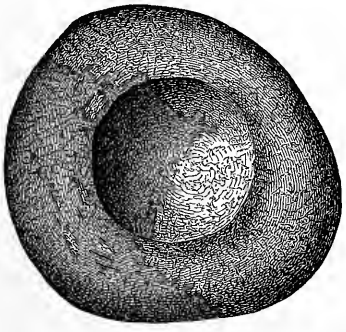
considering the inadequate flint tools by means of which the work was executed. What an amount of sawing, cutting, and scraping was necessary to produce, for instance, the figured implement with barbs on both sides! These harpoon-like armatures, attached to shafts, may have served both for hunting and for spearing fish, perhaps also for war, since it can not be supposed that the troglodytes lived always in harmony. Near the tapering lower end of the barbed weapons will be noticed little eminences or knobs, perhaps designed to aid in fixing the implement in the shaft. It also has been suggested that the troglodytes employed harpoons with loosely inserted heads, which became detached from the pole after the fish had been struck. In this case the knob may have served for the attachment of a line. Harpoons of this description are in use among the Eskimos and other fishing tribes of the North American coasts. The barbs, it will further be seen, are provided with incisions or grooves, supposed by some to have served for the reception of poison, an opinion which we can not share, knowing that the arrow-shafts of many Indian tribes, such as the Sioux, Blackfeet, and others, exhibit longitudinal grooves, intended to facilitate the flowing of the wounded animal's blood. With a similar view, the troglodyes may have cut grooves in the barbs of their weapons, if, indeed, these incisions were not merely designed for ornamentation. Some of the barbed armatures which are of small size have been classed as arrow-heads. The sewing-needles of horn and bone deserve particular mention. They are of various sizes, sharply pointed, and well polished, and provided with round eyes of such smallness and regularity that doubts were at first entertained whether they had been drilled with stone, until M. Lartet successfully employed certain instruments of flint, found among the *débris*, in perforating horn and bone with holes not larger than those eyes. M. Lartet also discovered small pieces of sandstone bearing straight and rather deep grooves, and evident-

ly used for grinding those needles into shape. Needles of bone or walrus ivory, almost identical with those under notice, were formerly in common use among the Eskimos, who made their thread from the tendons of the wild reindeer. The discovery of these needles in the cave deposits is in so far of interest as the fact is thereby established that the troglodytes were sufficiently advanced to practice the simple art of sewing, and perhaps that of dressing the skins employed in the manufacture of garments which they had to wear on account of the then still reigning low temperature.

Characteristic relics of these hunters are the whistles with which they gave each other signals when in the pursuit of the chase. These curious instruments, which have been found at several stations, consist of a bone of the hind-foot of a reindeer or chamois, and are pierced on one side with an oblique hole reaching only as far as the cavity of the bone. Upon blowing into the hole a shrill sound is produced. How many thousands of years may have elapsed since the sharp call of those whistles rallied the savage hunters when they were following the track of the reindeer or the horse!

Thus it will be seen that our cave-dwellers were tolerably well provided with the accoutrements for the chase, which evidently was their principal occupation. Their methods of fishing probably consisted in harpooning and shooting; but as the salmon was the chief object of their fishery, it is likely that the practice of spearing prevailed. At the time of the troglodytes the salmon came up from the sea as far as the Vézère, where it is now no longer to be found, owing to obstructions in the Dordogne below the confluence of the two rivers. Fishing with nets is not believed to have been in use among the ancient people of this district, and it is doubtful whether they had boats. The river, says Dr. Broca, was then sufficiently narrow to allow the use of the harpoon from its banks.

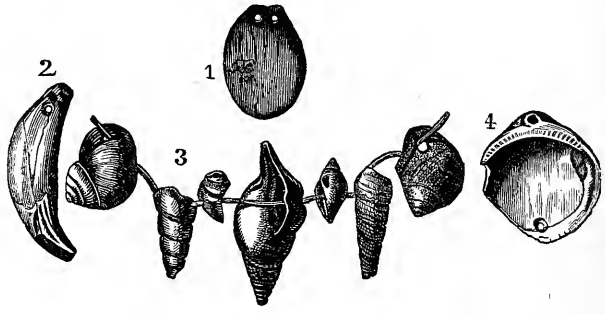
The contents of the rock-dwellings, it must be understood, exhibit no uniformity in the products of human industry, having been inhabited by the hunters for a very long period, during which they improved perceptibly in the mechanical arts. In the Moustier cave, the first that served as an abode of man, as we have stated, somewhat rude implements abounded, while articles of bone or reindeer horn were totally wanting. Remains of the reindeer were less numerous in this cave than those of the horse and the aurochs. The reindeer, consequently, was not yet as frequent during its occupation as it afterward became in the valley of the Vézère. The station of Laugerie Haute has yielded superior articles of flint, especially points of arrows and spears, while arrow or harpoon heads of reindeer horn were exceedingly scarce. The latter, again, have abundantly occurred at Laugerie Basse, La Madelaine, and Les Eyzies, supplanting, to a great extent, the articles of flint.



HOLLOWED PEBBLE OF GRANITE (ABOUT ONE-THIRD OF NATURAL SIZE).—LES EYZIES.

But we must return to the cave-dwellers. There is evidence that they were not insensible to the charms of personal decoration. They probably painted themselves, in the fashion of still existing savage tribes, with red color which they scraped off from pieces of soft red hematite. Such pieces, with the marks of scraping, have been found in the caves; also pebbles of granite and other stone, more or less hollowed on one side by grinding, which may have served for rubbing paint. It has been suggested that these

hollowed stones were mortars in which the cave-men bruised grain; but they are almost too small to have been designed for that use. It remains doubtful whether the cave-men, as has been suggested, practiced tattooing. Some of their engravings on reindeer horn, of which more will be said presently, represent the human hand and fore-arm, the latter being marked with regular designs, which have been thought to indicate tattooing, though they may be just as well referable to a part of the dress, or, what appears to us most probable, to some covering for guarding the left wrist and fore-arm against the severe rebound of the bow-string, similar contrivances being in vogue among the aboriginal archers of this country.



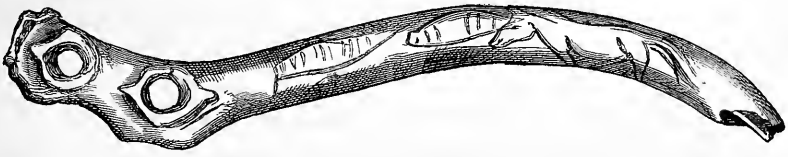
ORNAMENTS FROM THE DORDOGNE CAVES (NEARLY HALF SIZE).

1. Oval plate of ivory, with holes for suspension (Cro-Magnon). 2. Perforated tooth of a wolf (La Madelaine). 3. Pierced recent marine shells (Cro-Magnon). 4. Pierced fossil marine shell (La Madelaine).

The troglodytes employed for ornamental purposes shells, which they pierced with holes, in order to string them together. In the cave of Cro-Magnon were found about three hundred pierced shells (mostly *Littorina littorea*), all belonging to still existing marine species, and probably obtained from the shores of the Atlantic Ocean. At other stations pierced fossil marine shells, doubtless derived from the *Faluns* or shell-marls of Touraine, have occurred. They wore also small oval plates of ivory pierced for suspension, and, perhaps as trophies of the chase or

as amulets, perforated teeth of the wolf, urus, ibex, reindeer, horse, and other animals.

Having given a brief account of the cave-men's industrial acquirements, we will now proceed to say something concerning their progress in *art;* for, strange as it appears, these people evinced, notwithstanding their otherwise low condition, a decided taste for drawing, and even for carving. Their delineations, traced with a pointed flint on horn, bone, ivory, or slate, consist occasionally in geometrical figures composed of parallel lines, rows of dots, lozenges, etc., but mostly in outlines of fishes or of quadrupeds, such as the horse, reindeer, stag, ibex, aurochs, mammoth, and others. These animals appear either single or in groups, and often exhibit their characteristic features in a degree to render them recognizable almost at the first glance. Sometimes, however, the drawings resemble the first awkward attempts of children at representing animals, in which cases, of course, it remains doubtful what creature the primitive artist intended to delineate, whether an ox, a horse, a reindeer, or some other quadruped. Such representations have chiefly been found at the stations of Les Eyzies, Laugerie Basse, and La Madelaine. The figures of animals are often traced on the stems or beams of reindeer antlers, which are

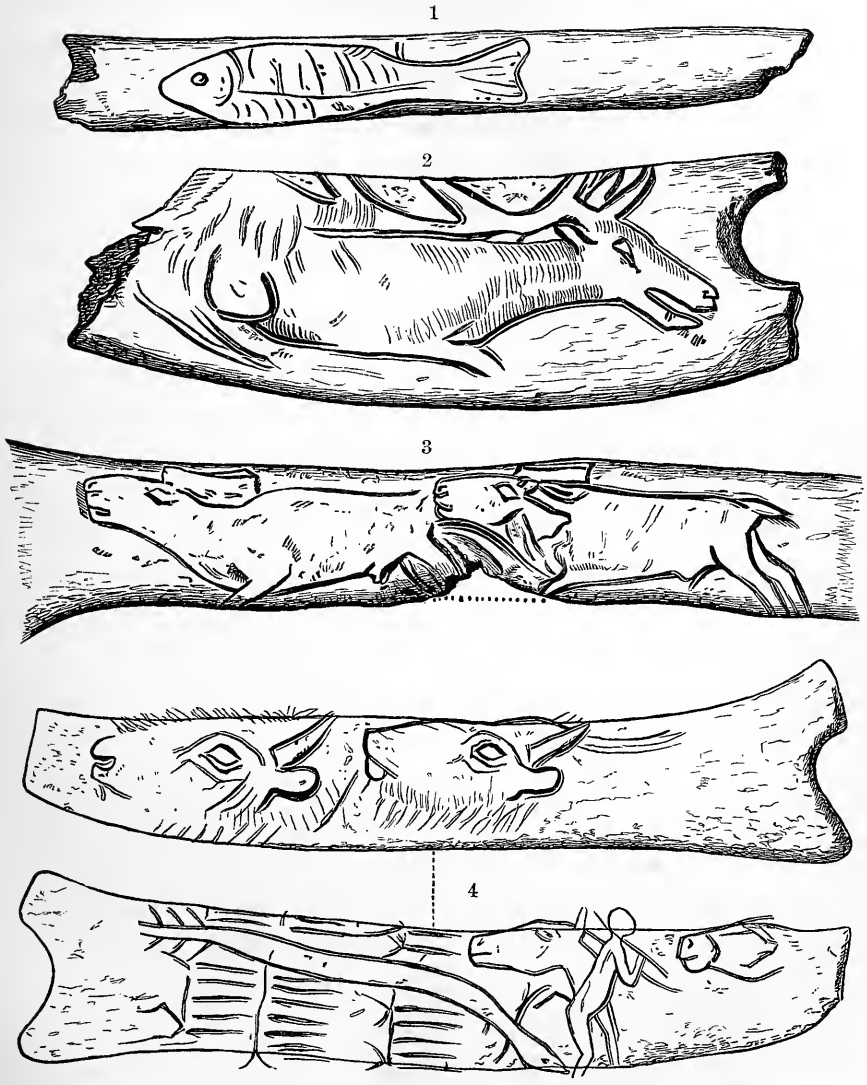


REPRESENTATIONS OF FISHES AND A HORSE ON A BATON OF REINDEER HORN (LENGTH, ONE FOOT).—LA MADELAINE.

in such cases carefully worked, and pierced at the broader extremity with round holes, varying in number from one to four. These remarkable objects can not have served as weapons, being too light for such an application; yet their frequent occurrence and uniformity of type show that they possessed a conventional significance, and therefore have been regarded as badges of authority

or distinction worn by the chiefs or prominent men of the tribe, like the batons which in our day indicate the dignity of a marshal. The number of holes in these decorated reindeer horns is thought to have been proportionate to the position occupied by the wearer. Supposing the somewhat hazardous interpretation to be correct, it would follow that the troglodytes already were sufficiently numerous to form a society in which the distinctions of rank were recognized.

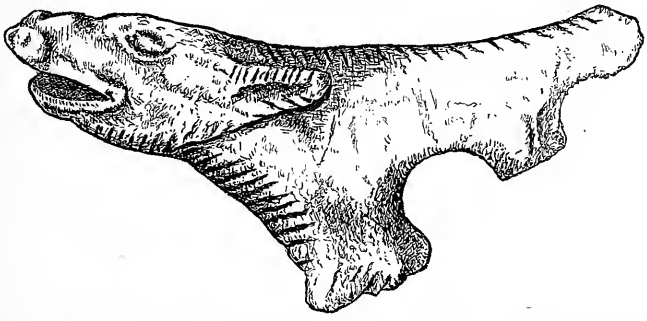
We present a number of illustrations which will enable the reader to judge of the cave-men's attainments in the fine arts. On a "baton" pierced with two holes will be seen representations of two fishes and a horse. The delineations of the last-named animal are very numerous, and indicate a stout, large-headed, and short-necked race, similar to that still living in Northern Europe. "Whoever," says Professor Carl Vogt, "has seen Icelandic horses running at large in the island recognizes here instantly their prototype;" and the authors of the "Reliquiæ Aquitanicæ" mention the horse as being so frequently represented at the Dordogne stations "as almost to lead one to suppose that the figure of this animal had been adopted as a social or national emblem by the people of this region." We further draw attention to the figure of a squatting (perhaps dying) stag, traced on stag horn, a material very rarely found in the caves, but in this instance significantly selected by the ancient artist. This stag can be distinguished from the reindeer by the shape of its antlers. Another piece of reindeer horn shows on one side two heads of the aurochs, very buffalo-like, and on the other two heads of horses, and a man dragging, as it appears, a large eel behind him. The man's figure is rudely drawn, and not above an inch in length. He is in a state of perfect nudity, and carries a stick on his shoulder. A drawing on reindeer horn from Laugerie Basse (not among our illustrations) represents a tolerably well executed human figure, likewise nude, and in the act of throwing a dart at an aurochs.



DELINEATIONS ON PIECES OF ANTLER.—LA MADELAINE.

1. Drawing of a fish on reindeer horn (natural size). 2. Representation of a squatting stag on stag horn (natural size). 3. Running reindeer on reindeer horn (about three-fourths of natural size). 4. Piece of reindeer horn, showing on one side two heads of the aurochs, and on the other a human figure, an eel (?), two horse heads, and three rows of marks. The portions which would not be visible, owing to the roundness of the piece of horn, have been drawn beyond its contour (about three-fourths of natural size).

Among the carved articles, which are much rarer than the drawings, and generally inferior to the latter, may be mentioned a small dagger of reindeer horn, with a handle carved in the shape of a leaping reindeer, its fore-legs bent along the belly, and the antlers thrown backward and resting on the neck. We give the drawing of a broken baton of reindeer horn, carved at its extremity in imitation of an animal in which we fail to recognize a distinct species. This specimen was found by M. Massenat at Laugerie Basse.

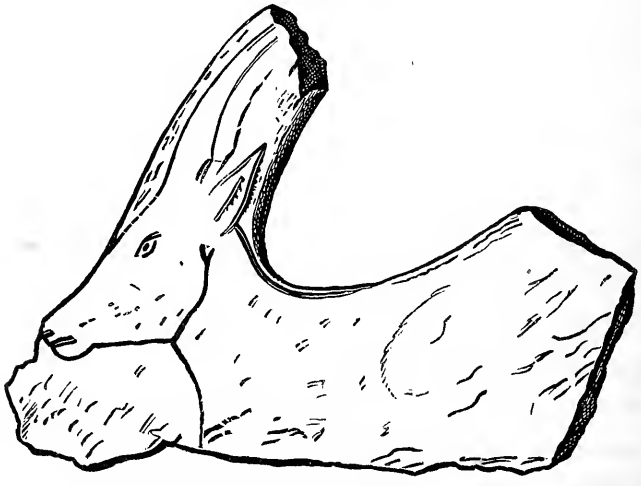


FRAGMENT OF A BATON OF REINDEER HORN TERMINATING IN AN ANIMAL'S HEAD (NATURAL SIZE).—LAUGERIE BASSE.

But none of the representations afford as much interest as those of the mammoth, of which several were discovered, engraved as well as carved. The most remarkable of them, traced on a plate of ivory, was found among the *débris* of La Madelaine, in presence of M. Lartet, Dr. Falconer, and M. De Verneuil. The drawing in this specimen* is natural and bold, and the peculiarities of the mammoth are faithfully depicted. We see here the characteristic frontal formation, the long curved tusks, the pendent trunk, and, above all, the long mane of the neck, which is distinctly indicated by many lines. Such a mane, it will be remembered, still adhered to the carcass of a mammoth found imbedded in ice at the mouth of the river Lena, in Siberia. All doubts must

* See illustration at the beginning of this chapter.

cease in view of such tangible evidence: none but a contemporary of the mammoth was able to trace the animal's likeness on ivory. "If the representation had been merely that of an elephant," says Sir Charles Lyell, "we might have conjectured that some African tribe migrating to the South of France had brought with them a drawing of the animal as it still survives in that country. But the characteristic wavy lines of the long hair of the mammoth allow of no escape from the conclusion that the cave-men saw this animal in life, and that they were sufficiently advanced to make a tolerably faithful sketch of it."



DRAWING OF THE ALPINE IBEX ON REINDEER ANTLER (NATURAL SIZE).—LAUGERIE BASSE.

This artistic tendency among a people that occupied in other respects a very low position, and had not even discovered, as it appears, the art of forming vessels of clay, presents, indeed, a perfect anomaly, considering that man in Europe at a much later period of the Stone Age, when he already devoted himself to agricultural pursuits, produced nothing in the line of art that can be compared with the drawings and carvings of those prehistoric people in the South of France. Yet, however praiseworthy their success in primitive industry and art may appear, they certainly

can not be commended for their sense of cleanliness. Like the Eskimos, whom they resembled in many respects, they allowed the offal of animals to accumulate in and near their dwellings: a habit which certainly would have proved injurious to their health if the temperature of Middle Europe had not then been colder than at the present time. They chose, moreover, the sunniest positions for their habitations; and that they were not in the habit of exchanging them for cooler ones in summer is proved by the occurrence of reindeer horns and bones belonging to animals of every age, which consequently were brought to the caves at all seasons of the year.* In fact, the mere presence of the reindeer, musk-ox, glutton, chamois, ibex, marmot, and other animals which now either inhabit Northern regions or the cold heights of mountains, points to a rigid climate. In one word, Europe was during the reindeer period still affected by those glacial influences to which we have alluded in a former chapter.

The cave-dwellers of the Vézère were free from cannibalism—a praise that can not indiscriminately be bestowed upon other savage European tribes belonging to that period, or even to later times. Indeed, human bones split apparently for the extraction of marrow, or roasted, have been discovered in various parts of Europe under circumstances which, to say the least, render it probable that the primitive inhabitants of certain districts indulged in that most repugnant practice. We merely mention the fact, not wishing to swell these pages with details of such unpleasant nature. Yet, according to the statements of Herodotus, Strabo, and other ancient authors, anthropophagy was still practiced in Europe during historical times, and this loathsome habit yet survives among many modern tribes, some of which doubtless enjoy a state of culture superior to that attained by the Euro-

* "We conclude," says Dr. Broca, "that the troglodytes had a fixed place of abode; in other words, that they were not nomads." The same view was held by Lartet and Christy.

pean of the Stone Age. As for this continent, we will remind the reader of the comparatively civilized Mexicans, among whom human sacrifices and cannibalism were prevailing to a horrible extent at the time when the Spaniards invaded and overthrew their empire. The early works on North America, too, give many instances of cannibalism as practiced by the aborigines of the present United States; yet, strange enough, these facts are either not mentioned at all, or smoothed over by some of the modern authors treating of the former history and the ethnology of this country.

The cave of Cro-Magnon, situated near the village of Les Eyzies, and discovered in 1868 in the course of railroad labors, deserves particular mention, for here were found the remains of four adult human individuals and of a child, undoubtedly referable to the cave-people. This locality has been carefully explored by M. Louis Lartet, son of the distinguished paleontologist, and described by him in the "Reliquiæ Aquitanicæ." The contents of the cave formed various beds, composed of charcoal, broken and burned bones, worked flint, flint cores, and implements of bone and horn. The layers were separated by accumulations of limestone rubbish and earth. From the character and succession of the deposits, it has been argued that the cave was at first merely resorted to at different times by hunters, but afterward used as a habitation, until the accumulated refuse and *débris* gradually raised the floor so as to leave but little room between it and the roof. The cave was then abandoned by the living, but afterward used as a burial-place for their dead. The bones of the latter constituted, as we have said, the remains of five individuals, but only three skulls were sufficiently preserved for examination. They belonged to two men, one of them seemingly very old at the time of his death, and to an adult woman who must have died by violence, the skull showing in front a rather long and broad aperture, undoubtedly produced by a heavy blow with a

flint weapon. Near the female skeleton were lying the remains of an infant, probably born before it had reached its full normal development. The woman's skull being partly repaired at the place of the fracture, physicians are of opinion that she survived some time the infliction of the wound, and prematurely gave birth to the child while in that condition. Are not these circumstances suggestive of a tragedy that was enacted, with all its ingredients of jealousy and revenge, ages ago among the cave-dwellers of the Dordogne? The fractured female skull is not the only token of a rude mode of life observable on the human remains of Cro-Magnon, one of the thigh-bones of the old man being marked with a hollow, evidently the result of an old wound which he may have received in the chase or in war.

Dr. Paul Broca, of Paris, an authority of the highest order, has minutely examined these human remains, and established the physical characteristics of the cave-people as far as the rather scanty material permitted. The troglodytes of the Vézère were a tall race, surpassing in height the average Frenchmen of our time. The old man measured nearly six feet, and the woman was tall in proportion. These people possessed heavy frames and strong muscles, which have left their traces in the hollows and ridges of the bones. Their elongated skulls, though exhibiting some features characteristic of men who lead the life of savages, were well formed and large, exceeding in capacity the mean of those of existing European nations. The cave-men had broad faces, and, to judge from the development of the maxillary bones, they must have been endowed with extraordinary powers of mastication. Their *tibiæ*, or shin-bones, instead of being triangular in the section, like those of the present Europeans, are flattened, thus approaching the formation of the same bones in the gorilla. The like feature, the reader will remember, was noticed in the first human skeleton discovered by M. Rivière in one of the caves of Mentone, and this peculiarity may ultimately be found to be

characteristic of the primeval European in general.* Although the men of the Vézère Valley were a tall race, it must not be inferred that all Europeans of that period showed a similar physical development; on the contrary, the human remains found, for instance, in Belgian caves—we allude to later discoveries than those of Schmerling—indicate a people below the middle size, Europe probably being already in those remote times inhabited by various though scanty populations, differing from each other in stature as well as in other physical qualities. The troglodytes of the Vézère, it seems, represented a superior type of their time. "If they were in a savage state," says Broca, "it was because the surrounding conditions were unfavorable to their development. The conformation of their skulls shows that they were capable of culture, and, under favorable auspices, would have made great and rapid advances in civilization."

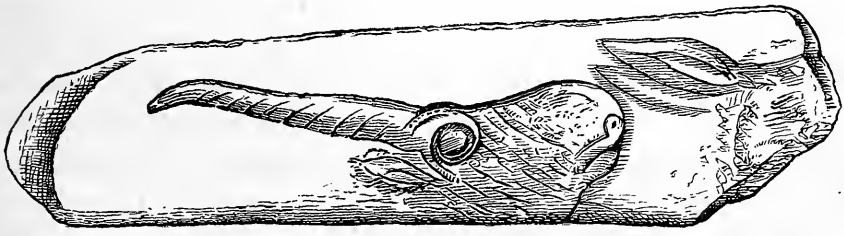
Near the human remains in the Cro-Magnon cave lay about three hundred marine shells, of which mention was made, a few oval plates of ivory, perforated for suspension, several drilled teeth of animals, worked antlers of the reindeer, chipped flints, and a large block of gneiss, split and presenting a smooth surface. Among the animal remains of the cave may be mentioned those of a huge bear, of the mammoth (stump of a tusk only), cave-lion, wolf, fox, hare, spermophile or pouched marmot, wild boar, reindeer, aurochs, and horse, the last-named animal being more numerous than either the reindeer or the aurochs. The cave of Cro-Magnon thus appears to have been resorted to at an earlier period than other stations of the Vézère Valley where the reindeer predominates.

We must now dismiss the troglodytes who once dwelt in the valley of the Vézère; but before doing so we will review their

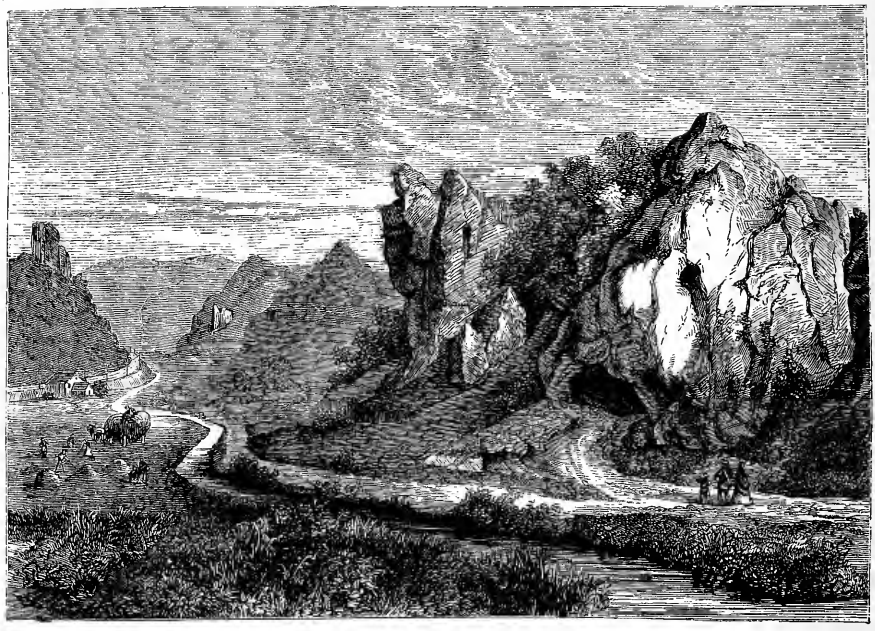
* The late Professor Jeffries Wyman, of Cambridge, first noticed the same formation of the *tibiæ* in skeletons exhumed from mounds in Kentucky, Tennessee, Michigan, and Florida.

condition of existence in a few words, in order to show in what respects they differed from later and more advanced men of the European Stone Age, of whom we shall speak in succeeding chapters.

They subsisted by fishing and hunting, adding, as may be assumed, to their animal food such fruits as were spontaneously offered by nature. They had made no steps toward an agricultural state, and domesticated animals probably were entirely wanting. As dwellings they used caves, overhanging rocks, and doubtless rude huts constructed of boughs, skins, or other materials. Their tools and weapons were made, sometimes very skillfully, of stone, horn, and bone. They employed only *chipped* stone implements, and were, as it appears, unacquainted with the art of making vessels of clay. Their dress consisted of skins sewed together with sinews. An artistic tendency which manifested itself in primitive attempts at drawing and carving must be regarded as a feature distinguishing them from the populations of the later Stone Age.



HEAD OF THE *ANTILOPE SAÏGA* ENGRAVED ON BONE (NATURAL SIZE).—FROM THE GROTTO OF GOURDAN, NEAR MONTRÉJEAU, HAUTE-GARONNE.



ENTRANCE TO THE HOHLEFELS CAVE, WÜRTEMBERG.

CHAPTER IV.

THE TROGLODYTES—Continued.

The stations of the reindeer period in France are not confined to the valley of the Vézère, many others having been discovered in different parts of that country; but as we can not attempt any thing like completeness in these pages, we have selected as the subject of the preceding chapter that group which is considered the most interesting on account of the important facts resulting from its exploration. A few words, however, must be devoted to the cave of Bruniquel, situated on the left bank of the river Aveyron, in the Department of the Tarn-et-Garonne, and not far from Montauban. This cave, explored by its owner, the Vicomte de Lastic, proved exceedingly rich in animal remains and manufactured objects, which lay beneath a crust of stalagmite. Flint flakes, nuclei, and implements abounded, and about a hundred

barbed harpoon-heads of horn were found, many of them ornamented with designs of animals. There occurred also bone needles and pins, and portions of implements made of the tusks of the mammoth. Pottery was totally wanting in this cave, as it was in those which have thus far been described. The people who lived in Southern France during the reindeer period apparently yet lacked the knowledge of forming vessels of clay. Remains of the reindeer were very numerous, representing, according to Professor Owen, more than a thousand individuals, while those of the horse amounted to a hundred. The fauna comprised, generally speaking, thirteen species of quadrupeds, six of them extinct; four of birds (sea-eagle, falcon, raven, partridge); one species of fish (salmon); and sixteen species of Atlantic and Mediterranean shells. The presence of the marine shells indicates that the troglodytes of Bruniquel sometimes visited both sea-boards, from which they were not very far distant, bringing home the shells they had gathered there. Lastly, there must be mentioned among the remains obtained from this station a number of fragments of human skulls and other bones, which were found below the stalagmite of the cave.

Finally, before leaving the soil of France, we must give a short account of the celebrated station near the village of Solutré, in the Department of the Saône-et-Loire. This remarkable abode of prehistoric man, which has been described by Messrs. De Ferry and Arcelin, is not a cave, but an uncultivated area of rising ground, which may with some propriety be called an ossuary, on account of the amazing quantity of bones here exhumed, among which those of the horse are most numerous, constituting the skeletons of at least two thousand individuals. Less frequent, but still quite abundant, are remains of the reindeer, bespeaking several hundred animals of this species. Their antlers often appear in such an excellent state of preservation that they emit, when worked, the peculiar odor of fresh horn. There have fur-

ther been found remains of an elephant (probably the mammoth), the aurochs, stag, and great lion. The ancient people who once occupied this place buried their dead in the ground, but, curiously enough, amidst the refuse of meals, on hearths covered with the still glowing ashes. Thus, at least, the mode of burial is described by the explorers, who disinterred more than fifty skeletons, mostly belonging to aged persons and children. The hut in which the deceased used to dwell, they think, was destroyed, and served as his tomb. Some of the graves are composed of rough stone slabs, so placed as to form parallelograms. According to Dr. Pruner-Bey, the skulls obtained from the ancient cemetery of Solutré exhibit, on the whole, a type approaching the cranial formation of modern Laplanders and Finns. Well-made flint implements, said to resemble those of Laugerie Haute, in the Dordogne district, have been found in abundance; also worked bones, some fragments of pottery, and a headless stone figure of an animal with parted hoofs. To the north of this remarkable ossuary rises a steep rock, accessible only from one side. M. Arcelin conjectures that the ancient hunters availed themselves of the peculiar formation of this rock for capturing the wild horses whose bones are so plentifully scattered through the ground at its base. They managed, he thinks, to drive the steeds up to the summit of the rock, forcing them to rush over the precipice. Other hunters, lying in wait at the foot of the rock, had but little difficulty in dispatching the injured animals. This horse-chasing at Solutré has been depicted in illustrated French works, and undoubtedly presents a wild and drastic scene; but who can decide whether the creation of the artist has any foundation in reality? There is certainly something anomalous about the station of Solutré, and its exploration has given rise to animated discussions, and even to some literary skirmishes, among French savants. It is possible that the locality was resorted to at different times by tribes whose relics became commingled. This, of course, is mere-

ly a suggestion which we throw out, and not a definite opinion. Future investigations may serve to clear up the doubtful points.

The reindeer was not wanting in Germany during the period under consideration. As far as known, the range of this animal in Europe extended from the Baltic provinces of Russia to the foot of the Pyrenees; how far it wandered in a more southern direction has not yet fully been ascertained. Reindeer remains, especially antlers, have often occurred in Mecklenburg, where they were found in peat bogs, during the draining of ponds and the construction of high-roads, and in the course of labors of similar nature. But these discoveries merely proved that the animal lived at one time in the North of Germany, and had no reference to its co-existence with man.* Of late years, however, several stations, analogous to those of France, have been discovered in Würtemberg, and to Dr. Oscar Fraas, of Stuttgart, belongs the merit of having explored and described these ancient resorts of man.

The station at Schussenried, near Ravensburg, in the above-named kingdom, is of great interest on account of its peculiar character, and therefore deserves a short notice in this chapter. In the year 1865, the owner of a mill in that neighborhood caused the digging of a long and deep trench, in order to supply his mill-race with water, having been deprived of that necessary element by the draining of a neighboring pond. The fosse cut through a mass of gravel, evidently brought there by glacial action, and forming at this place a depression or hollow, which contained a deposit of relics, presently to be described. This de-

* Cæsar's remarks concerning a one-horned animal living, as he says, in Germany have been thought to refer to the reindeer. His description, it is true, answers in some respects; yet it is not quite certain, after all, whether he really alludes to that animal. It is strange, at any rate, that no remains of the reindeer have been found in the oldest lacustrine pile-works of Switzerland, which certainly belong to a much earlier time than the beginning of the Christian era.

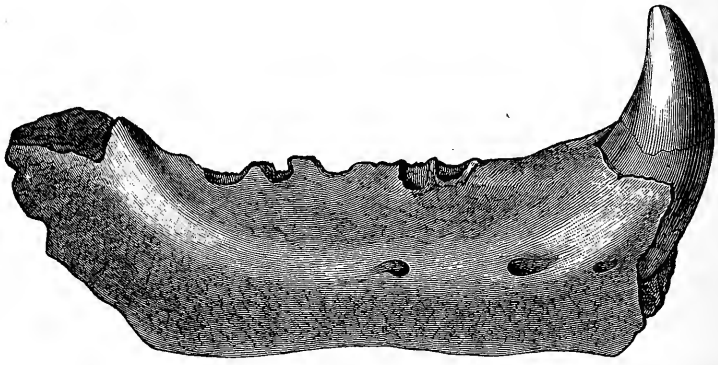
posit, it must be understood, occurred, as far as we can judge from the profile drawing before us, about twelve feet below the surface of the soil, being covered by a layer of calcareous tufa from four to five feet thick, upon which rested a bed of peat of still greater thickness. The hollow containing the relics, of course, was open at the time when men left there the traces of their presence, which were gradually buried by the deposits of carbonate of lime and vegetable matter just mentioned, to come to light again, ages afterward, almost in the shape of a geological formation. The relic bed consisted of broken bones of animals, charcoal, ashes, blackened hearth-stones, flint implements, and various manufactures of reindeer horn, the whole enveloped by fine sand, and, strange to say, by *moss* of a dark-brown color, and, owing to its constant contact with percolating water, in such an excellent state of preservation that Professor Schimper, of Strassburg, an authority on mosses, had no difficulty in recognizing the different species. None of them flourish any longer in the plains of Germany, but they are still found in Alpine regions near or above the snow-line, and in Norway, Lapland, Spitzbergen, Labrador, and Greenland. "There can be no doubt," says Fraas, "that mosses are much surer tests in determining the character of a climate than the movable animal world, which is not fettered to the soil. Mosses are much more affected by changes in the temperature, by humidity, and other atmospheric agents, than quadrupeds, and the value of these vegetable remains in their bearing on the antiquity of the deposit should not be undervalued."

The locality was, to all appearance, a camping-place where the ancient inhabitants cooked their meals and manufactured implements, and not merely a place set apart, as Dr. Fraas seems to think, to receive all sorts of refuse. Primitive man made no such nice distinctions, but left things where he dropped them. The presence of ashes, charcoal, and hearth-stones blackened by fire indicates that the spot was *inhabited*, periodically at least, by the

ancient Suabian huntsmen. Perfectly in keeping with the Northern character of the moss was the fauna of Schussenried. The reindeer evidently formed the chief object of the chase, being represented by several hundred individuals at this station. We further have to mention the glutton, and two species of fox no longer to be found in Germany, but confined to high latitudes. The presence of a small kind of ox, of a large-headed horse, the brown bear, wolf, and hare, would furnish no additional evidence of a severe climate; while the wild swan, which was a favorite game of the Schussenried hunters, points again to such a state of temperature. This swan, which now visits Würtemberg merely as a bird of passage, and falls so rarely a victim to the sportsman that the killing of one is reported in the newspapers, seems to have been an inhabitant of that region during the period under notice. All these animals were eaten by the ancient people, who likewise broke the skulls and bones to secure their contents. This was done by means of round pebbles about the size of a fist, and bearing the marks of their use, which are also visible on the bones. Such primitive hammers occurred in great abundance. No remains of the dog were found, nor bones showing the traces of having been gnawed by that animal: these men probably possessed no domesticated animals of any kind. Not a single fragment of pottery occurred among the rubbish, and hence it may be inferred that the reindeer hunters were yet unacquainted with the fabrication of earthenware. Like the troglodytes of the Dordogne, they made an extensive use of the antlers of the reindeer, fashioning them into weapons and tools which, being more or less similar to those already described, need not be specialized in this place. Even the pierced baton-like articles were present, though not embellished with designs of animals, like those of the cavemen of the Vézère. As for the numerous articles of flint found at the Schussenried station we can not make any statements, no drawings or precise descriptions of these objects being given in

the account of Dr. Fraas, from which our data are extracted. None of them, however, were polished.

Dr. Fraas has explored several Suabian caves in which remains of extinct animals and of the reindeer occurred associated with objects wrought by man. We will give some account of the remarkable cave in the Hohlefels, or "hollow rock," in the



IMPLEMENT MADE OF THE JAW OF A CAVE-BEAR (NEARLY HALF SIZE).—HOHLEFELS CAVE.

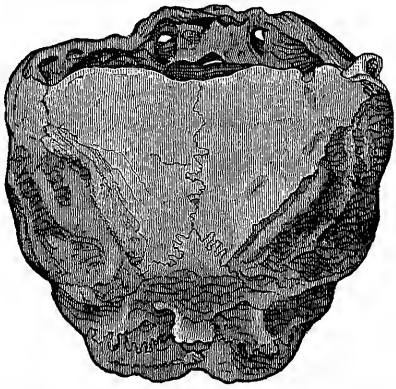
romantic valley of the small river Ach, near Blaubeuren. This station is not a rock-shelter or grotto, but a real cave, about a hundred feet high, and, including some lateral galleries, nearly of the same length and width. The entrance, situated ten feet above the brook, is eighty feet long, and sufficiently high to render access easy. The natural adit being somewhat crooked, no light penetrates into the cave, which therefore served as the refuge of a multitude of bats. These nocturnal creatures hung in clusters from the vaulted roof, and their whispering was the only sound heard in this lonely place. Years ago the cave had been visited at times by an old itinerant dealer in petrifacts, who hunted there for fossil bears' teeth, many of which are still preserved in the collections of Würtemberg. He marked his specimens as being derived from a cave near Blaubeuren, yet he never told the purchasers in what cave he had found them, and died without revealing his secret. Long afterward the Hohlefels cave

was identified as the locality where the old man had obtained the fossil teeth. Though the floor and walls of the cave are always wet, there is no trickling water that could cause the formation of stalactite properly so called, thin layers of friable matter being the only calcareous deposits at this place.

When Dr. Fraas commenced his operations in the fall of 1870, he imagined that he was examining one of those ancient dens of bears so frequent in Germany, and flattered himself with the hope of soon finding the skulls of bears and their complete extremities. Though he exhumed at the outset bones of the reindeer and rhinoceros, he still clung to his first view, supposing these remains had been dragged into the cave by bears. Shortly afterward, however, he came, to his surprise, upon objects unmistakably fashioned by man, such as pierced horse-teeth, worked reindeer horn, small pieces of pottery, and flint flakes; and it now became evident that this cave was not merely a den of bears, but a primitive human habitation belonging to a period of remotest antiquity. This circumstance heightened the importance of the exploration, which was now carried on with the greatest minuteness. After having removed a superficial layer of black mold intermingled with charcoal, Dr. Fraas reached a bed of wet yellow loam or clay, in which he caused a long and broad trench to be dug. This loam, which formed the "archæological stratum," that is, the matrix containing relics, was examined to a depth of twelve or thirteen feet, beyond which it still reached farther downward, though yielding no longer remains in sufficient number to warrant further digging.

The principal game of those Suabian hunters evidently was the bear, which furnished not only meat and marrow, but also in his dense fur the clothing that enabled his human destroyers to withstand the rigor of a low temperature. The remains of several species of bears were found in this cave, but those of the cave-bear (*Ursus spelæus*) occurred in greatest abundance. Their

skulls had been broken for removing the brain, and hence Dr. Fraas was unable to obtain a single entire bear's skull in this cave. The Suabian troglodytes made a curious use of the lower jaws of these animals. They broke or cut them in two halves, and further modified them by the removal of some portions, thus producing implements which doubtless were employed like hatchets in skinning and dismembering the killed animals. Many of the bones found in the Hohlefels cave show the deep impressions left by the sharp corner teeth of these transformed bears' jaws. The occurrence of a single jaw thus prepared would furnish no evidence of such a use; but as many specimens trimmed in the same way have been found at this place, there can be no doubt as to their application as implements or as weapons, even if there were no corroboration in the fact that corresponding tools have



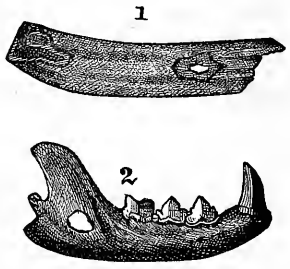
REINDEER SKULL TRANSFORMED INTO A VESSEL (NEARLY HALF SIZE).—HOHLEFELS CAVE.

occurred in French caves and elsewhere. Primitive man, restricted as he was in his resources, necessarily hit, independently of place, upon the same expedients to satisfy his simple wants.

The reindeer was represented in this cave by about sixty individuals, mostly young animals. The men of the Hohlefels made its compact horns into points, apparently arrow-heads, and into piercing tools, serving as needles in the manufacture of skin garments. These representatives of needles are not provided with

eyes like the well-formed articles of the same class in the caves of the Vézère, but simply consist of pointed rods scraped into shape with a sharp-edged flint. Reindeer skulls were sometimes converted by these cave-men into dippers or drinking-cups, the manufacture of which required but a series of blows with the hatchet of bear's jaw, by which the superfluous portions were removed. Yet, notwithstanding this rude labor, the primitive vessels produced by it are not badly made, showing that a certain sense of neatness is inherent in man, and manifests itself even in a very low stage of his existence.

Next in frequency to the reindeer was the wild horse, a small race, with a large head and slender limbs, not unlike the pony of our days. The troglodytes used to pierce the incisors of this animal at the root, not by a regular drilling process, but in some other rough way, as shown in the annexed drawing. Drilled teeth of wild animals, it is well known, are often worn as trophies of the chase by savage hunters, and in such cases are indicative of personal valor and success. In accordance with this principle, it would have been more becoming if the hunters of the Hohlefels cave, instead of wearing the teeth of the comparatively timid horse, had decorated themselves with those of the great bear or the lion as tokens of their victories over these dangerous beasts. Yet no pierced teeth of such animals have been discovered in the cave, those of the horse being exclusively treated in this manner. Dr. Fraas therefore regards, with justness, as we think, the pierced horse-teeth as amulets, which were worn from some superstitious motive; and he draws attention to the peculiar esteem in which, according to Tacitus, horses were held among the ancient Germans. "The well-known superstition," says this valued author, "which in oth-



AMULETS FROM THE HOHLEFELS CAVE (HALF SIZE).

1. Pierced tooth of a horse. 2. Pierced jaw of a wild cat.

er countries consults the flight and notes of birds, is also established in Germany; but to receive intimation of future events from horses is the peculiar credulity of the country. For this purpose a number of milk-white steeds, unprofaned by mortal labor, are constantly maintained at the public expense, and placed to pasture in the religious groves. When occasion requires, they are harnessed to a sacred chariot, and the priest, accompanied by the king or chief of the state, attends to watch the motions and the neighing of the horses. No other mode of augury is received with such implicit faith by the people, the nobility, and the priesthood. The horses upon these solemn occasions are supposed to be the organs of the gods, and the priests their favored interpreters." Dr. Fraas also refers to the custom still prevailing among the German peasantry of nailing horseshoes to the doors of stables and barns as a protection against witchcraft.* The reader will remember what Lartet and Christy say concerning the frequency of delineations of the horse in the stations of the Dordogne, and the importance attached to that animal by the ancient hunters of the Aquitanian district.

To judge from the number of remains of the bear, reindeer, and horse, these animals were chiefly hunted by the troglodytes, bones of other quadrupeds being far less frequent in the Hohlefels cave, as, for instance, those of the urus and another bovine species of small size, perhaps the musk-ox, and of the mammoth, rhinoceros, wolf, fox, antelope, otter, and a kind of hog not yet identified. The cave-lion was represented by a much-injured lower jaw and a few other bones, which indicated an animal greatly superior in size to a full-grown African lion. "How this terrible cat succumbed to man," says Fraas, "is certainly a mystery." The other felines of this cave were the lynx and the wild

* It would be hazardous, however, to infer from these superstitions that there existed any consanguinity between the Germans described by Tacitus and the troglodytes of Suabia.

cat. The first-named carnivore became extinct in Würtemberg not many years ago, the last one having been killed in 1846. The wild cat still survives in that kingdom. It is worthy of remark that a number of lower jaws of the wild cat found in the Hohlefels and other Suabian caves were pierced for suspension at the broader extremity, a circumstance illustrative, as in the case of the pierced horse-teeth, of some strange belief among the troglodytes. Remains of the hare are exceedingly scarce. Was this animal, owing to a superstitious prejudice, rejected as food by the ancient Suabian hunters, as it is even now by the Laplanders and other Northern populations, who are generally not very choice in the means of satisfying their hunger? We shall have occasion to refer again to this apparent repugnance to the hare among the primitive populations in other parts of Europe. The Mosaic law, it is well known, pronounced the hare unclean, and the ancient Britons, according to Cæsar, abstained from eating its flesh. We draw particular attention to the absence of remains of the dog and of any other domestic animal in the deposit of the cave. The number of bones of wild swans, geese, and ducks indicates that these birds were much hunted by the cave-men, who, it seems, did not disdain even the smaller species of the feathered tribe. There occurred in the cave some human bones bearing the unmistakable traces of having been gnawed by wild beasts, doubtless by bears. "Such distinct evidence of the work of the carnivores," says Dr. Fraas, "would lead to the conclusion that there were times when the bear was the sole master of this retreat, into which he dragged his victims—men, horses, oxen—in order to tear them or to gnaw their bones." Man, it may be assumed, often became the prey of those terrible beasts, among which he had to carry on his struggle for existence.

Allusion having been made to the implements of reindeer horn which were found associated with the animal remains in this cave, little more need be said about them. The drawings

given by Dr. Fraas represent, with the exception of handle-shaped blunt articles, probably used in skinning animals, and of piercers, hardly any well-defined tools or weapons; and unless we adopt the view that the troglodytes possessed better implements, which they took care not to mingle with the rubbish, they must be considered as rather deficient in mechanical skill, and far inferior in that respect to the reindeer hunters of the Dordogne. The stone articles found in the cave are mere flakes split from blocks of jurassic flint occurring in the neighborhood, and in no way altered or brought to a definite shape by the process of chipping. They were evidently the simple tools employed for fashioning the articles of horn and bone. Though heavier stone implements have not been met in the cave, it is obvious that its ancient inhabitants could not have dispensed with them, and their absence may be merely accidental. Indeed, Dr. Fraas mentions among the discovered objects a reindeer skull from which the antlers had been detached by means of a sharp heavy stone, probably a hatchet, the strokes of which are plainly visible. It appears somewhat strange that these exceedingly primitive people were acquainted with the manufacture of pottery—a fact proved by small fragments of vessels which Dr. Fraas found commingled with the animal remains and objects shaped by the hand of man. According to his express statement, the digging operations were carried on in a part of the cave that never had been disturbed, and the small pieces of earthenware, consequently, must be considered as coeval with the other relics. The sherds themselves, consisting of hardened clay mixed with sand, were too small for allowing any conjecture as to the form of the vessels when in a perfect state.*

* It is no easy matter, indeed, to assign to this human habitation a place in the relative chronology of prehistoric times. The prevalence of the great bear over the reindeer, together with the exceedingly primitive character of the manufactures of bone, horn, and flint, points to a period anterior to the

Recent explorations in Poland have shown that the primitive inhabitants of that country were rude hunters and troglodytes like the tribes occupying, as we have seen, the more western districts of Europe. Not long ago, a cavern situated in a valley three leagues distant from Cracow was examined by Count Zawisza, who discovered there numerous remains of animals, partly belonging to extinct species, and, in addition, the unmistakable evidences of the former presence of man. The cave, which occurs in jurassic rock, is about forty-three feet wide and sixty-two deep, branching off at its farthest end into two lateral galleries, respectively forty-six and nineteen feet long. No water penetrates into the cave, where, consequently, stalagmitic formations are not met. Having dug through the upper part of the floor, which consisted of vegetable earth, mold, and *débris*, the explorer came upon ashes (indicative of a hearth), flint implements, and split bones of the reindeer, cave-bear, horse, elk, and other quadrupeds. At a greater depth the flint implements were of larger size, and there appeared broken bones of the mammoth, together with molars and a small tusk of that animal; also an amulet or ornament of ivory, and perforated teeth of the cave-bear, wolf, fox, stag, and

occupation of the Dordogne caves, while the occurrence of pottery, however rude, would seem to indicate a later age. Yet the cave-bear was very common in Germany, as shown by the immense number of bones of this animal in German caves, and may have survived longer in that country than in France. The presence or absence of pottery, on the other hand, affords, in our opinion, no absolute test of relative antiquity, considering that in those remote times, when men were not numerous, and doubtless divided into many tribes separated by great distances, a uniformity in mechanical acquirements can not be supposed to have existed. Thus, the cave-dwellers of Suabia, though possessing the art of pottery, may have lived in earlier times than the more advanced reindeer-hunters of the Vézère, who yet lacked the knowledge of manufacturing vessels of clay. For the sake of illustration we will allude to the aboriginal tribes of this country, some of which practiced pottery, while others, although by no means deficient in mechanical skill, were unacquainted with the manufacture of earthen vessels, and used, as we have previously stated in a note, wooden troughs and skins in their stead.

elk. The accumulations forming the hearth reached to a depth of four feet, and exhibited no marked stratification. In the larger gallery were found many bones and horns of the reindeer and elk, a large tusk and other remains of the mammoth, and numerous instruments of flint, but no traces of a hearth. This place seems to have been used as a sort of ossuary by the troglodytes. The smaller gallery, which is very narrow and low, has not been carefully examined.

During the excavations nearly two thousand chipped flint implements resembling those from the Dordogne caves were obtained, and the frequent occurrence of nuclei proved that instruments had been made in the cave. The flint employed by the troglodytes is identical with the kind occurring in large nodules in the jurassic formations of the neighborhood. From the total absence of broken pottery in the rubbish of the cave it may be inferred that its ancient inhabitants were unacquainted with the manufacture of clay vessels.

Among the animal remains obtained in this cave we mention first those of the mammoth, consisting of tusks, molars, several shin-bones, a pelvis, and various other portions of skeletons, which belonged to three individuals. Bones of the brown bear, aurochs, stag, roe, and wild boar were rare, but very numerous those of the cave-bear, reindeer, elk, and a horse of large size. The wolf, common fox, arctic fox, hare, badger, squirrel, mouse, goose, and a wading bird (represented by an artificially notched bone) complete the fauna of this primitive resort of man. The fact that the dog is not enumerated in the list can not surprise the reader, who is aware of the absence of its remains in corresponding cave deposits of Southern France and Würtemberg. This animal, as will be seen, became attached to man at a later period of the Stone Age. Dr. Fraas, to whom the animal remains of this locality had been submitted for examination by Count Zawisza, noticed that the Polish cave-men, like those of

Suabia, were in the habit of utilizing the lower jaw of the cave-bear by transforming it into a rude kind of hatchet, to be used for dismembering game, or as a weapon when occasion required. A few human bones were discovered among the rubbish; but these, as well as the bones of the wild boar, roe, and goose, have, according to Dr. Fraas, a more recent appearance than the rest of the remains, and may have been brought to the cave by animals of prey, such as wolves and foxes, at a period subsequent to its occupation by the ancient hunters.

A second cave, in the neighborhood of that just described, has been explored by Count Zawisza. This cave, too, had served as an abode of man, but apparently in later times, as indicated by its fauna—aurochs, horse, stag, wild boar, and roe—and by the presence of rude hand-made yet ornamented pottery, and of a few polished stone axes which lay among chipped implements of flint.*

Quite extensive cave researches lately have been made in Belgium, at the expense of the Government, by M. Edward Dupont, the worthy successor of Dr. Schmerling, whose important labors were brought to the reader's notice in a preceding chapter. M. Dupont's explorations comprised a great number of caverns situated in the valley of the river Lesse, a tributary of the Meuse, and more than half of them have furnished unmistakable traces of prehistoric man. These caves contain, in descending order, beds of brick-earth with angular pebbles, and stratified clay with coarse gravel, corresponding, according to M. Dupont, to similar, or rather the same, deposits in the valley, in which, he thinks, the water reached at times a height sufficient to wash its contents of earthy matter, clay, and gravel into the caves, often surprising the troglodytes, and compelling them to sudden flight. The old-

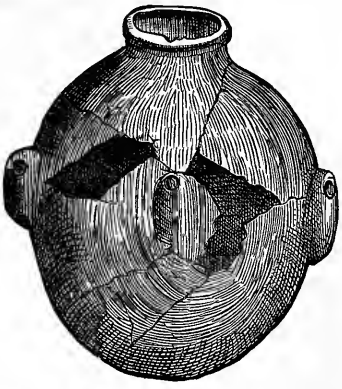
* Some caves, there can be no doubt, were resorted to during neolithic times.

er strata inclose remains of the mammoth, rhinoceros, and cave-bear, sometimes associated with rude flint hatchets, while the upper layers are chiefly characterized by bones of the reindeer and knife-shaped flakes of flint. It remains to be seen whether the views of the Belgian savant will be generally adopted by European geologists, some of whom, we are bound to say, hesitate to accept his conclusions.

Want of space prevents us from giving a *résumé* of M. Dupont's discoveries, which would alone furnish sufficient material for an extensive chapter. A few remarks only can be offered to the reader. The Belgian reindeer hunters, like those of the Dordogne, inhabited caves, and manufactured their tools and weapons of flint, reindeer horn, and bone, yet without that degree of skill which is displayed in similar works of the French troglodytes. Their artistic attempts were of the most primitive character. Mention is made of an unintelligible drawing on a piece of reindeer horn, and of a small exceedingly rude statuette representing a squatting human figure without arms, both found in a cave called Trou Magrite. The occurrence of "batons" in some caves also has been recorded. These people subsisted, it seems, entirely by the chase, the horse, reindeer, chamois, goat, ox, boar, brown bear, fox, hare, water-rat, several kinds of birds, and some species of fish principally constituting their bill of fare. They disposed of the bones of their game in the manner now sufficiently familiar to the reader. In the cave of Chaleux, M. Dupont found the teeth of forty horses, and so many bones of this animal that a large wagon was required to remove them. He collected in the same cave twenty-two pounds of scorched or roasted bones of the common water-rat, which proves that these primitive people contented themselves with such small animals when nobler and more substantial game was not to be had. Many remains of man were discovered by M. Dupont in the course of his explorations; so, for instance, in the Trou de la Naulette a lower human

jaw, supposed to belong to the age of the mammoth, and distinguished by a deficient development of the chin, "exaggerating," according to M. Dupont, "those points in which the most inferior of the living races are distinguished from ourselves."

The Trou du Frontal is supposed to have been a sepulchral place of the reindeer period. Here were found the bones of sixteen human individuals, children and adults, but only two skulls in a sufficient state of preservation to allow comparisons. These skulls are not elongated, but round, and one of them is remarkable for an extremely oblique position of the teeth—or prognathism—a feature considered as characteristic of inferior races of man. The bones lay mingled together in a recess of the cave which was originally closed by a stone slab, like the burial grotto of Aurignac, and contained also a hearth, around which was scattered the refuse of meals, probably held in honor of the dead. In this cave were found the fragments of a rude clay vessel which, after its restoration, presents the form given in our drawing. It has a rounded bottom, and is therefore provided with pierced projections to facilitate suspension. The occurrence of pottery, it should be stated, was not confined to the Trou du Frontal, other Belgian stations having likewise furnished fragments of earthen vessels. It is worthy of special mention that in this cave, and in others of the neighborhood, pierced fossil shells and minerals have occurred, which evidently were brought from considerable distances. The *Cerithium giganteum*, for instance, a shell of large size, can not have been obtained from nearer localities than the environs of Rheims or Versailles, and much of the flint used as the material for tools is identical with a variety found in the Department of

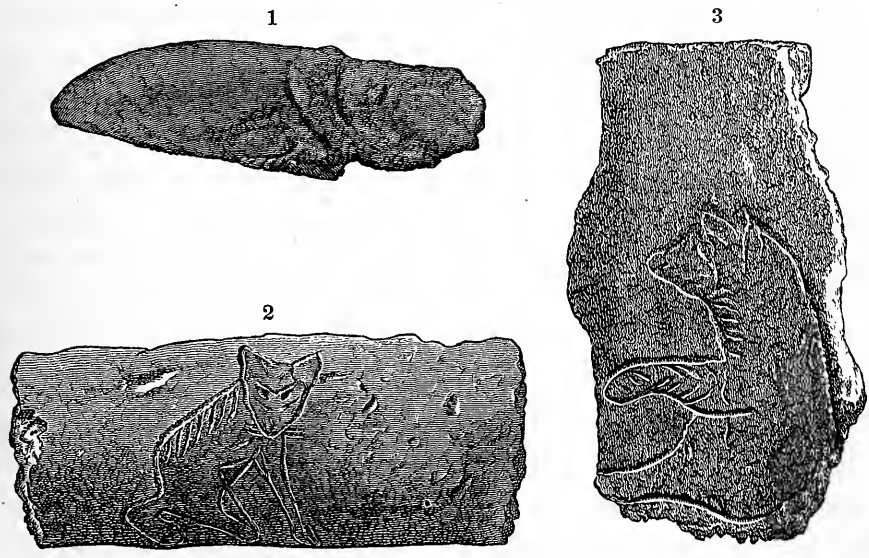


RESTORED EARTHEN VESSEL.—FROM THE TROU DU FRONTAL.

the Marne, in France. These facts indicate that a kind of traffic or exchange already existed in the earliest times among the barbarous tribes of Europe.

The latest, but certainly not the least interesting, discoveries relating to the reindeer epoch were made in Switzerland during the year 1874. Two caves in the neighborhood of Schaffhausen, one of them near the railroad station of Thayngen, had long been known and frequently visited, though never with the intention of exploring them, until two gentlemen, Messrs. Merk and Joos, were seized with the prevailing enthusiasm for cave researches, and dug into their floors in order to ascertain what they contained. The exertions of these explorers were rewarded by the discovery of two important stations of the reindeer period, analogous to those with which the reader is acquainted. The Thayngen cave, in particular, has yielded an abundance of animal remains and of manufactured objects, affording additional means for interpreting man's mode of life during the epoch which we have been attempting to describe. It is undoubtedly one of the most interesting prehistoric retreats as yet discovered in any part of Europe. To judge from the number of remains of the reindeer and Alpine hare, these animals were chiefly hunted by the Swiss cave-men; for, after the classification of the bones and teeth had been completed, the presence of at least five hundred hares was ascertained, while the reindeer remains pointed to two hundred and fifty individuals. The fauna of this locality further comprises the horse, stag, ibex, chamois, wolf, several kinds of fox (among them the arctic fox), the glutton, brown bear, aurochs, mammoth, rhinoceros, and cave-lion, the last-named three species indicated by rather scanty remains, which occurred in the lower part of the cave deposit. Remains of the cave-bear and cave-hyena are not enumerated. Among the birds white grouse, ducks, and swans predominate, and their bones (which contain no marrow) have been left entire; the large bones of quadrupeds,

however, invariably appeared in fragments, and the pebbles used for breaking them were lying among the refuse. It should be mentioned that the deposit in the cave of Thayngen contained no distinct traces of the dog or of other domestic animals, which, as the reader knows, are generally missing at the stations of the reindeer period. Had they not yet made their appearance in Europe at this epoch? However that may be, we shall meet them hereafter as the associates of the more advanced prehistoric inhabitant of that part of the world.



REPRESENTATIONS OF ANIMALS FROM THAYNGEN, SWITZERLAND (NATURAL SIZE).

1. Head of a musk-ox carved from reindeer horn. 2 and 3. Drawings of a fox and a bear.

In technical ability the troglodytes of Thayngen were equal, to say the least, to the reindeer hunters who have left their traces in the caves and rock-shelters of Southern France. Like the latter, they employed the antlers of the reindeer as the material of which they manufactured their needles, piercers, and arrow-heads, and these tools and weapons are said to be worked with an astonishing degree of precision. The implements for making them consisted, as in other corresponding localities, of flint flakes, many

of which were found imbedded in the floor of the cave. Here, too, were met specimens of prehistoric art in the shape of representations of animals drawn on reindeer horn, bone, and small plates of brown coal, and even carvings were not wanting. Among the latter should be mentioned the head of a musk-ox, somewhat clumsily executed, it must be admitted, yet recognizable by the peculiar position of the horns. The head, of which we give a drawing, appears to have originally belonged to an entire figure of the animal. Among the osseous remains of the cave, however, none of the musk-ox have occurred, and their absence may perhaps be accounted for by the scarcity of the species. Far better are the engraved delineations of animals, as, for instance, several drawings of the horse, which rival, according to Professor Rütimeyer, similar designs seen in illustrated works of our time. They are, indeed, minutely and correctly drawn, showing an equine type with erect mane, shaggy fur, and slender limbs. We further reproduce here two drawings on bone, representing a fox and a bear. Both are excellent specimens in their way, displaying a close observation of nature, and even a certain humor, which is more particularly expressed in the attitude and sly face of the fox. But the most notable object of this class discovered in the Thayngen cave is a delineation on a piece of reindeer horn, representing a reindeer in the act of browsing. This drawing betokens no small degree of skill, and undoubtedly ranks, for the present, as the best of its kind transmitted to us from those remote times. The designer evidently was a Landseer among the troglodytes. We place a copy of the drawing before the reader, who has become acquainted with the most remarkable productions of a similar character derived from the stations of the Dordogne, and is thus enabled to make comparisons. The representation, it will be seen at once, is not a correct one in an artistic sense, but nevertheless an admirable work, when the circumstances under which it originated are taken into considera-

tion. The original tracing, of course, follows the curvature of the reindeer horn, while our copy represents the drawing as though it had been executed on a plain surface.

An artistic tendency, it thus becomes manifest, was not confined to the troglodytes of Southern France, but was shared by the primitive people who lived under analogous conditions of existence in the north of the present Helvetian republic. The question, however, whether such a peculiar similarity of taste also implies an affinity of race can not be answered before more convincing proofs have come to light.

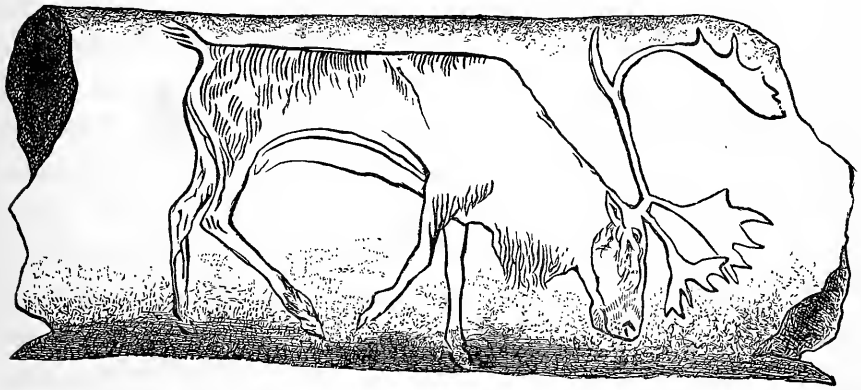


FIGURE OF A BROWSING REINDEER ENGRAVED ON REINDEER HORN (NATURAL SIZE).—FROM THAYNGEN, SWITZERLAND.

IDEAL REPRESENTATION OF A SWISS LAKE-VILLAGE.

CHAPTER V.

KITCHEN-MIDDENS AND LAKE SETTLEMENTS.

The later or neolithic period of the European Stone Age, upon which we are now entering, marks a great advance in the industrial acquirements and social condition of prehistoric man — a change due in a great measure to the altered climate of Europe, which had gradually lost its prevailing severe character, and given place to a more steady temperature approaching that of our time. Such a change, however slow in its progress, could not fail to exert its influence upon the organic world, and we therefore meet at this period a fauna of essentially modified character. The mammoth, rhinoceros, Irish deer, great bear, lion, and hyena had worked out their mission in Europe; while the musk-ox, reindeer, chamois, ibex, and other quadrupeds adapted

to a rigid temperature had either migrated northward or chosen the cold heights of mountains as their abodes. On the other hand, several species of animals, some of them, perhaps, derived from distant countries, appear as the domesticated associates of man, who was now no longer a mere savage hunter, but had become, in some districts at least, a tiller of the soil and a consumer of vegetable food, though still applying himself to the chase and to fishing. During the paleolithic ages, of which an account was given in the preceding chapters, man made his stone tools and weapons almost exclusively of flint, reducing them to the intended shape by chipping alone, not having learned yet to improve their form and efficiency by the process of grinding. It was quite different in the times which we are now considering. The stone implements of the neolithic period exhibit a greater variety of well-defined forms, and are no longer exclusively made of flint, but also of other kinds of stone, such as diorite, serpentine, basalt, quartzite, and similar suitable materials. Many are brought into their final shapes by grinding and polishing—a method which characterizes the later Stone Age, as we have stated in our first chapter. Neolithic axes and chisels are mostly polished. Yet the practice of chipping flint into arrow and spear heads, knives, scrapers, etc., had by no means fallen into disuse, the articles produced in this way being, on the contrary, not only very numerous, but also of superior workmanship, insomuch that flint-chipping may be said to have assumed in this period almost the character of an art. The manufacture of clay vessels was general during this epoch.

Were the men of neolithic times the descendants of the contemporaries of the mammoth, the great bear, and the reindeer, or immigrants from abroad—perhaps from Asia—who brought with them new arts and the animals they had tamed in their old homes? Both views have their supporters. There certainly seems to be a gap between paleolithic and neolithic implements,

the gradual transition from one class to the other not being as yet represented with sufficient distinctness by intermediate forms. Prehistoric archæology, however, is almost daily enriched with new discoveries, and thus we may hope that this interesting question ultimately will be decided, either in one direction or the other.

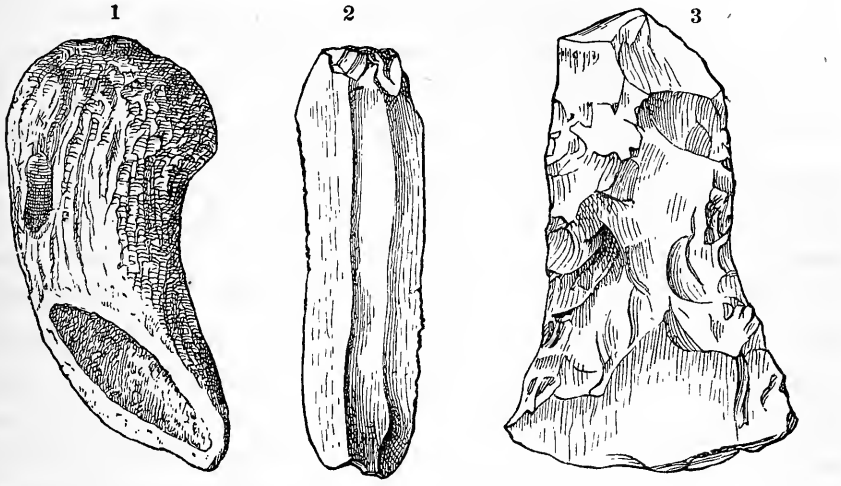
On the indented coasts of the Danish islands of Seeland, Fünen, Möen, and Samsöe, and along the fjords of the Peninsula of Jütland, there occur, mostly in the immediate neighborhood of the sea, considerable accumulations of shells, which were formerly supposed to have been deposited by the sea at a time when the level of the land was lower than at present. It was noticed, however, that the shell-heaps showed no trace of the stratification which always characterizes marine deposits, and that they, instead of inclosing shells of mollusks of every age, contained merely those of full-grown specimens, which belonged, moreover, to a limited number of edible species. Upon further examination there were found among the shells the broken bones of different species of wild quadrupeds and birds, and the remains of fishes; also implements of flint, horn, and bone, fragments of a rude kind of pottery, charcoal, and ashes, but no objects of metal whatever. The artificial origin of these accumulations being now established, they were recognized as the amassed remains of the repasts of a population that dwelt in former ages on the shores of the Baltic, pursuing the chase, but chiefly the capture of fish and shell-fish. The Danes signify shell-heaps of this description as *Kjökkenmöddings*, a word meaning "kitchen refuse" in literal translation; but the term *kitchen-middens* is often employed in English, *midden* being a name still used in the North of England to designate a refuse-heap. More than fifty kitchen-middens have been examined conjointly by Messrs. Forchhammer, Steenstrup, and Worsaae, distinguished respectively for their proficiency in the departments of geology, natural

history, and archæology; and the results of their investigations, contained in several reports addressed to the Academy of Sciences of Copenhagen, have added in a great measure to our knowledge of prehistoric man in the North of Europe.

The thickness of the shell-beds, it was ascertained, varies from three to five feet, though they reach in some places to a height of ten feet. Their length sometimes amounts to a thousand feet, and they vary in width, though not exceeding two hundred feet. One of the largest Kjökkenmöddings is that of Meilgaard, in the north-east of Jütland. Very extensive accumulations sometimes present an undulating surface, the refuse having been heaped up more abundantly in some points than in others; and occasionally the heaps surround an irregular free space, where the coast people doubtless had built their huts, which certainly were of the most primitive description, probably consisting of a number of poles stuck in the ground and covered with skins. The oyster is the species of shell-fish occurring most abundantly in the kitchen-middens, and constituting sometimes almost entirely their contents. Next follow, in the order of their frequency, the cockle, mussel, and periwinkle, or *Littorina*. In regard to the oyster, it is worthy of remark that this bivalve has disappeared from the neighborhood of the kitchen-middens, being now confined to a few localities on the Cattegat. Yet even there it never attains the large size characterizing the oysters of the ancient shell-beds. The cockles and periwinkles, too, though still living in the same waters, are much smaller than those of ancient times. These changes have been attributed to a diminution of the saline matter in the water of the Baltic Sea. Among the remains of fishes, those of the herring, cod-fish, flounder, and eel are quite frequent, and their presence proves that the coast people ventured upon the open sea, doubtless in small boats formed of trunks of trees, and hollowed by the application of fire. Remains of aquatic birds, such as wild ducks, geese, and

swans, are often met. The great penguin or auk (*Alca impennis*), supposed to be now entirely extinct, and the capercailzie, or mountain cock (*Tetrao urogallus*), a bird no longer found in Denmark, though still inhabiting the forests of Germany, deserve special mention. The last-named bird feeds in spring chiefly on the buds of the pine, a kind of tree not growing naturally at present in Denmark, but very common during the Stone Age, as has been ascertained by the examination of Danish peat bogs. Thus it would seem that the disappearance of the pine from Denmark caused the capercailzie to leave that country. Bones of the domestic fowl, the stork, sparrow, and swallow, are totally wanting in the kitchen-middens. The mammals that have there left their remains are the stag, roe, wild boar, urus, beaver, seal, wolf, fox, lynx, wild cat, marten, otter, hedgehog, water-rat, and dog. Next to the mollusks, the stag, roe, and wild boar evidently constituted the principal food of the coast people. The dog, which is represented by a small race, was their only domesticated animal, but also eaten by them in the fashion of our Indians, who keep dogs as companions, and use them as food, especially on solemn occasions. The urus, it will be remembered, has become extinct, and the beaver no longer inhabits Denmark. No bones of the hare have been found in the kitchen-middens, perhaps for the reason that those ancient people were prevented by superstitious motives, like the Laplanders of our day, from eating that animal. The reindeer and elk are thus far missing in the refuse-heaps, though their bones have been discovered among other remains of the Stone Age in Denmark. The marrow-bones of the ruminants and wild boars are broken or split for extracting their contents, and they often exhibit the cuts produced by flint implements. When the bones were thrown away, the dogs made a second meal of them, eating the smaller ones, especially bird-bones, and gnawing off the soft portions from those of larger size. Professor Steenstrup has made interesting experiments to

elucidate that fact. Locking up some dogs, and restricting them to a bone diet, he ascertained that all the bones rejected by the dogs were the same that are present in the kitchen-middens, while the bones or portions of bones devoured by them are correspondingly missing there.



IMPLEMENTS FROM THE KJÖKKENMÖDDING AT MEILGAARD.

1. Pierced hammer or adze of stag horn (one-third of natural size). 2. Flint flake (half size). 3. Shell-mound axe (half size).

Rude hearths consisting of a kind of pavement of pebbles, not exceeding the size of a man's fist, have been discovered in the refuse-heaps. These fire-places are more or less circular, only a few feet in diameter, and surrounded with charcoal and ashes. The coast people manufactured a kind of very primitive pottery, fragments of which are found commingled with the shells. Their vessels were formed by hand, the potter's wheel being then, and probably much later, an apparatus unknown in Europe. The clay is always mixed with coarse sand, produced by the trituration of stones, and evidently added for the purpose of preventing the cracking of the vessels while in the fire. This device was well known to the aborigines of this country, who mixed the clay with gross-grained sand, but often employed pounded shells in its

stead. The Kjökkenmöddings have yielded a number of awls, chisels, and other tools made of horn and bone, and in great abundance chipped flint implements, such as flakes, piercers, sling-stones, spear-heads, and axes of a peculiar shape, and therefore called "shell-mound axes." Yet nearly all these objects are of rude workmanship, and in no way comparable to the excellent weapons and tools occurring, as will be seen hereafter, so frequently in other parts of Denmark. It would be doubtful, therefore, whether the kitchen-middens belong to the neolithic or to an earlier period, if it were not for the fact that, together with the many uncouth articles, a few well-finished arrow and spear heads, and even some polished implements, have been found. The manufacture of articles of this better class required much labor, and the people who have left the kitchen-middens as their memorials doubtless took care not to lose them among the refuse, while they paid less attention to the rude implements, which could be replaced by new ones without much trouble. The fauna of the kitchen-middens, moreover, is not that of paleolithic times, being composed of animals still living in Europe, excepting the urus, which, as we have seen, became extinct during the historical period. The great auk, a bird incapable of flying, being provided with mere apologies for wings, is said to have been totally exterminated everywhere by man, though it is not altogether improbable that it still survives in lonely localities beyond the reach of human cruelty.* Under these circumstances, we may be justified in referring for the present the Kjökkenmöddings to the early part of the neolithic period.

The coast people certainly led a very rude life, being unacquainted with agriculture, and compelled to subsist entirely on the spoils of the sea and the forest. It is not quite certain

* Specimens of this bird are still preserved in ornithological collections. According to Professor Vogt, the great auk was found in Iceland, its last retreat, until the year 1842, after which it became extinct.

whether they inhabited the sea-board only in summer or during the whole year, though the character of the bones and antlers, which belong to animals of different ages, would favor the view that they lived there through successive seasons. Notwithstanding their savage state, they were certainly free from the practice of cannibalism, no human bones having been found among the refuse. It is not known how they disposed of their dead, and hence no human remains that can with certainty be ascribed to the coast people are extant. From some Danish tumuli, however, skulls have been obtained which are supposed to belong to the age of the kitchen-middens. These skulls are of small size and round, like those of the Laplanders, but differing from them by a more retreating forehead and very prominent ridges above the eyes.

Kitchen-middens have been discovered in other parts of Europe, though nowhere in such number and so well characterized as in Denmark; and we may further state that they are not confined to Europe, but occur also along the coasts of other continents. In America, for instance, similar artificial shell deposits are frequent, and have been observed from Newfoundland to Tierra del Fuego, and on various points of the Pacific shore. Coast tribes, deriving their subsistence chiefly from the sea, necessarily will leave everywhere the tokens of their presence. But we must hasten to pass over to another subject.

Alonzo de Ojeda, a Spanish nobleman, who had been a companion of Columbus on his second expedition, undertook in 1499 independently a voyage for the purpose of exploring the northern coast of South America. He was accompanied by the Florentine Amerigo Vespucci, who has left an account of this voyage, from which we quote the following passage, in the words of Washington Irving: "Proceeding along the coast, they arrived at a vast deep gulf, resembling a tranquil lake, entering which, they beheld on the eastern side a village, the construction of which

struck them with surprise. It consisted of twenty large houses, shaped like bells, and built on piles driven into the bottom of the lake, which in this part was limpid and of but little depth. Each house was provided with a draw-bridge and with canoes, by which the communication was carried on. From this resemblance to the Italian city, Ojeda gave the bay the name of the Gulf of Venice, and it is called at the present day Venezuela, or Little Venice. The Indian name was Coquibacoa." We can well imagine the surprise of the adventuresome voyager, whose baptismal name is perpetuated in that of our vast continent, at beholding this curious Indian village built on piles in the water; yet he certainly did not dream that the remains of similarly constructed habitations of men who lived tens of centuries ago lay hidden in the bosom of Swiss and Italian lakes. In fact, no one thought of lacustrine settlements until the year 1854, when their traces were first recognized in the Lake of Zürich, though the existence of piles in the lakes of Switzerland was well known to fishermen, whose nets often had been caught and damaged by them. There had also occasionally been found in the mud of the lakes pieces of wrought deer horn, fragments of clay vessels, and objects of stone and bronze, which were looked at with great curiosity, and elicited all sorts of comments, until finally the children took hold of them and used them as toys. In the winter months of 1854, the water in the Swiss lakes sunk much below its ordinary level, laying bare large tracts of land along their shores, and thus affording the people of the neighborhood a rare chance for adding to their lands by building walls near the water's edge. So it happened at Meilen, on the Lake of Zürich. Some persons, desirous of enlarging their gardens, erected squares of walls far into the bed of the lake, raising the area within the walls with loam, which was dug from the denuded lake bottom. During these labors the workmen came upon a layer of black mold, from which they extracted pieces of a rude kind of pot-

tery, articles of stone, bone, and horn; also hazel-nuts and other vegetable remains. As the work progressed there appeared numerous wooden posts, from eight to twelve inches thick, which were standing in rows only a foot or a foot and a half apart from each other, and so soft that the spade cut through them with great ease. The teacher of the place collected the various objects found in the black layer, and notified the Antiquarian Society of Zürich of their discovery. Some members of that society, among them its president, Dr. Ferdinand Keller, proceeded without delay to Meilen, in order to inspect the relics and the place where they had been exhumed; and Dr. Keller, being an antiquary of note, and well acquainted with prehistoric manufactures, recognized the various articles at once as axes, chisels, whetstones, net-sinkers, grain-crushers, parts of weapons, and cooking-vessels of the ancient inhabitants of this locality. The relics, it was ascertained, were most abundant in the immediate neighborhood of the piles, while they became less frequent, and finally disappeared, at a greater distance from them, a fact indicative of a connection between the piles and the antique objects of human workmanship; and Dr. Keller, summing up his observations, concluded that the piles had served as the supports of platforms on which the ancient people erected their dwellings, thus living above the surface of the water, and at some distance from the shore, with which they communicated by means of a narrow bridge. To Dr. Keller, therefore, belongs the merit of having first pointed out the true character of lacustrine remains, and of having inaugurated a series of discoveries hardly surpassed in importance by any yet made in the domain of prehistoric archæology. It was now remembered that, in times not long past, fishermen had lived in cabins built in the Limmat, a small river issuing from the Lake of Zürich. The works of modern travelers were found to contain accounts of certain Asiatic and Polynesian islanders who still inhabit buildings erected on piles in the water, thus perpetuating a

custom prevailing in times beyond record and tradition in the lake regions of Switzerland; and a passage in Herodotus, relating to the Pæonians, a tribe who dwelt, 520 years before the Christian era, on Lake Prasias, in Thrace (modern Roumelia), was now often quoted as illustrative of the ancient Helvetian mode of life. According to the historian just mentioned, the Pæonians lived upon the lake in dwellings erected on platforms which were supported by piles and connected with the land by narrow bridges. They were polygamists, and a law directed that for each wife three piles should be added to the structure. There was a hut for every family, with a trap-door giving access to the lake beneath. The small children were tied by the foot with a string, lest they should fall into the water. The lake-people fed their horses and other beasts with fish, of which there was an astonishing abundance in the lake.

When the results of Dr. Keller's investigations became known by his writings, a general search for similar memorials of former times was made in the many lakes of the republic, and such unexpected success rewarded the efforts of the explorers that up to this date, twenty years after the discovery at Meilen, the existence of more than two hundred lake settlements in Switzerland and a part of Germany bordering on the Lake of Constance has been ascertained. In these researches the fishermen, who knew well the shallow places of the lakes where piles occurred, proved excellent guides. Remains of ancient lacustrine settlements, it should be stated, are by no means confined to Switzerland and a small portion of Southern Germany, but also have been discovered in the Lombardian lakes, in Savoy, Mecklenburg, Bavaria, Austria, and Prussia, and in several districts of France, even at the foot of the Pyrenees. Hence it is evident that the habit of erecting dwellings in lakes was at one period widely spread over Europe. Nowhere, however, have these remains been found in greater number than in Switzerland, a country abounding in

lakes which naturally invited to such aquatic colonies. In fact, the shore-lines of most of the Helvetian lakes are marked with the traces of these ancient habitations. We mention in this connection the lakes of Neuchâtel, Geneva, Constance, Bienne, Morat, Zug, Zürich, Sempach, Pfäffikon (canton of Zürich), Moosseedorf (near Berne), Nussbaumen (canton of Thurgau), Inkwyl (near Soleure), and Wauwyl (canton of Lucerne). In the Lake of Neuchâtel forty-six settlements have been counted; in the Lake of Constance, thirty-two; in that of Geneva, twenty-four; in the Lake of Bienne, twenty-one, etc.; and their number is constantly increasing by the discovery of hitherto unknown sites.

The oldest lake settlements date back to the neolithic period, when, as the reader knows, only implements of chipped and polished stone, of bone, horn, and wood, were in use. The pile-work at the bank of Lake Pfäffikon, near Robenhausen, for instance, has not yielded any articles of bronze; and at Meilen only a bronze celt (or hatchet) and a bracelet of the same alloy were found, which seems to indicate that this colony still flourished at the time when bronze was introduced. There are many other lake settlements in which, among hundreds of articles of stone, horn, bone, or wood, not the slightest trace of metal has occurred. These stations of the pure Stone Age are chiefly found in Eastern Switzerland. Most of those in the western lakes of the Helvetian republic have furnished articles both of stone and of bronze, the latter of great variety and exquisite workmanship;* and in some stations tools and weapons of iron, thought to be Gallic in character, and even coins and other objects of Roman origin, have come to light. It thus appears that these lacustrine colonies existed for a very long period, which was characterized

* They chiefly consist of leaf-shaped swords, daggers, celts, spear and arrow heads, knives, sickles, fish-hooks, pins, rings, and bracelets.

by remarkable changes in the condition of man, whose progress, whatever its causes may have been, can be traced in an uninterrupted line. Though some of the settlements are supposed to have been abandoned toward the beginning of the Christian era, it is notable that they are not mentioned by Cæsar, who had become acquainted with the Helvetians by his wars, nor by Pliny, an author noted for his propensity to dwell on details. No account, no tradition, alludes to these peculiar structures.

"At first glance," says Professor Desor,* "the idea may seem strange, if not absurd, that men should have established themselves on the water instead of pitching their tents or building their cabins on *terra firma;* but closer reflection will enable us to comprehend that at the origin of the lacustrine period, at an epoch when the soil of Switzerland was covered with forests and the borders of the lakes probably occupied by marshes, these lacustrine abodes may have offered to their inhabitants a more secure asylum against the ambush of enemies and the attack of savage animals."

The following remarks, of course, relate exclusively to the pile buildings of the Stone Age, those of later periods not coming within the scope of the subject treated in these pages. Lacustrine dwellings were built in shallow places, and in no case very far from the shore, simply because the greater depth of the water farther in the lake rendered the erection of those structures difficult, if not impossible. The upright piles were mostly whole stems of trees growing in the neighborhood (oak, beech, fir, pine, ash, or birch), usually from four to eight inches in diameter, and sharpened at the lower end either by fire or the stone hatchet. Heavy wooden mallets, a number of which have been found, doubtless served to drive them into the bottom of the lake. The

* Author of an excellent work on the lacustrine constructions of the Lake of Neuchâtel.

piles were evidently placed according to a regularly arranged plan, but in most cases it is impossible to make out the order of their distribution. "They appear above the lake bottom," says Keller, "like the remains of a forest snapped off by a storm or destroyed by an avalanche." Upon these piles, brought to a level several feet above the water, and strengthened by cross-timbers, rested the platform, often merely composed of unbarked stems lying parallel one to another, but sometimes consisting of boards two inches thick, which were fastened with wooden pegs into the frame-work, thus forming an even and solid floor. The number of piles, of course, varied according to the extent of the settlements, some of which may have been enlarged from time to time, when the increasing population rendered the erection of new huts necessary. The lacustrine colony near the German village of Wangen, on the Untersee, the north-western expanse of the Lake of Constance, contained from forty to fifty thousand posts, and formed a parallelogram seven hundred paces long and one hundred and twenty broad; but in other lake villages —at Robenhausen, for instance—probably twice as many piles were required. When the bottom of the lake was rocky, or afforded no sufficient hold to the stakes, stones were heaped up between and around them, in order to consolidate the erection. These stones had to be brought in boats, consisting of hollowed trees, to the designed spot; indeed, a boat filled with stones is still to be seen near St. Peter's Island in the Lake of Bienne, where it sunk to the bottom, perhaps in consequence of being overloaded. The outer rows of piles were sometimes interwoven with a kind of wattle-work, made of twigs, for the purpose of preventing the splashing of the water under the platform, or, perhaps, for protecting the piles from being injured by floating wood. A narrow bridge, likewise a pile-construction, connected the settlement with the shore. Remains of such bridges, from twenty to several hundred feet long, actually have been discov-

ered. The huts erected on the platforms, it has been ascertained, were mostly of a rectangular shape, and consisted of a wooden frame-work wattled with rods or twigs, and covered both inside and outside with a bed of clay from two to three inches thick.* The roofs, as it seems, were made of bark, straw, or rushes, the remains of which often have been found in a carbonized state. A plaster of clay mixed with gravel was spread on the floor of the hut to fill the chinks, and a rude hearth, composed of several slabs of sandstone, occupied the middle of each cabin. Some of the buildings were of comparatively large dimensions, measuring twenty-seven by fifteen or more feet, though apparently forming only one room, above which there may have been a garret. Their size has been ascertained by the presence of single planks standing on edge, which inclosed the floor, doubtless for the purpose of keeping off the wet. The cabins probably stood in rows close together, considering that space must have been much valued on account of the great labor which the construction of the platforms required.

Some dwellings were not erected on piles, but on a kind of fascine-work formed by layers of sticks and stems of trees, stones, and loam, built up from the bottom of the lake until the foundation was high enough to receive the platform. Many upright piles are found in these substructures, but they only served to give them steadiness. The fascine-dwellings occur in small lakes, not being suitable for large ones, where they would have been liable to injury by the waves during violent storms.†

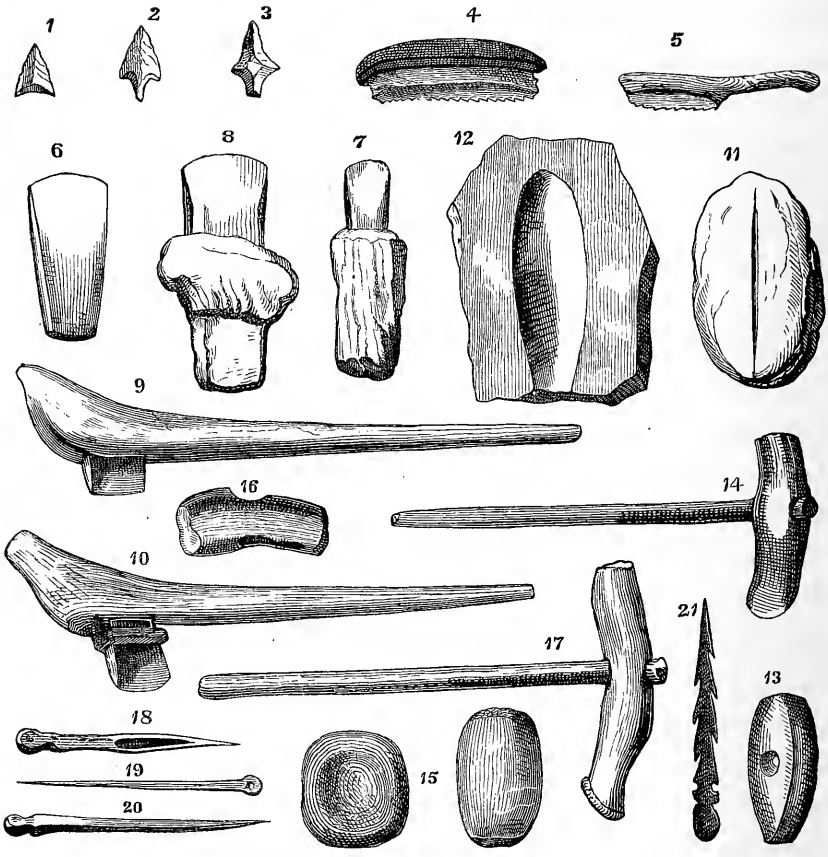
During the long occupation of the lacustrine villages many objects, no doubt, fell accidentally into the water; while immense

* The upright timbers of the huts, it appears, consisted of long piles projecting above the level of the platform. Hence it would follow that a village was laid out in "lots" at the outset according to a preconceived plan.

† These fascine-works bear some resemblance to the Irish *crannoges* described by Sir W. R. Wilde.

quantities of refuse, such as the bones of the consumed animals and broken clay vessels, were intentionally thrown over the platforms, and, as we may assume, through the interstices of the stems or planks forming them. These heterogeneous accumulations of things became imbedded in the mud, forming what are now—ages afterward—called the archæological strata or relic-beds, upon which for the last twenty years the dredging implements of antiquaries have operated, and brought to light the evidences of a most curious long-forgotten phase of human existence. In a number of cases the bulk of these relic-beds has been swelled by the ruin of the villages themselves, some of which, there can be no doubt, were consumed by fire. These conflagrations can not have taken place in consequence of hostile attacks, because human skeletons are exceedingly scarce in the pile-works, and therefore must be ascribed to accidental ignitions, which were likely to befall wooden straw-roofed huts, each of them provided with an open hearth, probably blazing most of the time. When such calamities happened, many articles fell into the water in a charred state, and were preserved to our days, owing to the almost indestructible nature of carbonized substances. Several Swiss lakes have much decreased in extent, and their ancient shores are fringed with formations of peat, which now inclose in some instances the remains of lacustrine villages formerly surrounded by water. Such is the case at Moosseedorf, near Berne, at Wauwyl, in the canton of Lucerne, and at Robenhausen, on Lake Pfäffikon, where the owner of the celebrated pile-work, Mr. Jacob Messikommer, has been successfully engaged for years in extracting relics of the early lacustrine period from peat and moor ground.

The builders of the pile-works, it must be admitted, were an intelligent and industrious people, who applied to the utmost the scanty means which their primitive state of civilization offered them. They pursued hunting and fishing, but devoted themselves also to agriculture and the raising of cattle; they were



LACUSTRINE RELICS OF STONE, HORN, AND BONE.*

1, 2, 3. Flint arrow-heads. 4, 5. Flint saws in wooden handles (Meilen and Moosseedorf). 6. Stone celt. 7. Stone chisel in stag horn socket (Meilen). 8. Stone celt in stag horn socket, squared for insertion into a wooden club (Meilen). 9. Wooden club with a stone celt fixed in it (Robenhausen). 10. Club of ash wood with a stag horn socket and stone celt (Robenhausen). 11. Rolled stone, showing the cut made with a flint saw. 12. Sandstone for grinding celts (Meilen). 13. Drilled stone axe (Meilen). 14. Drilled stone axe (Estavayer, Lake of Neuchâtel). 15. Two grain-crushers (Meilen). 16. Hammer of stag horn (Estavayer). 17. Hoe (?) of stag horn, handle added (Robenhausen). 18, 19, 20. Piercing implements of bone (Meilen). 21. Harpoon-head of stag horn, 6½ inches long (Wauwyl).

* Our drawings of lacustrine relics are almost exclusively taken from a little work by J. Staub, entitled "Die Pfahlbauten in den Schweizer-Seen," in which the size of the delineated objects is not indicated. The same drawings are contained, on a larger scale, in the English translation of Dr. Keller's work, which is before us; but even there the size is not always given. The reader, it is hoped, will supply that want by his imagination.

skillful workers in stone, horn, bone, and wood, practiced pottery to a great extent, and produced very creditable tissues, employing a loom of simple construction. The various occupations of the lake-men, and the fact of their living in close communities, indicate no small degree of social order, which necessitated the submission to the decrees of chiefs or a majority of the people. These lake-dwellers certainly were in all respects above the rude prehistoric populations thus far introduced to the reader. Let us now throw a hasty glance at their manufactures.

Articles of flint can not be said to abound in the pile-works, for the reason that this material is found sparingly in Switzerland, where it occurs, moreover, only in small masses not fit to be made into large implements like those found in Denmark and other Northern countries. The flint used by the lake-men came from the Swiss Jura, from France and Germany, and thus probably possessed the character of a ware which had to be obtained by barter. Yet they made good arrow and spear heads, scrapers, saws, and various cutting and piercing tools of this material. Their arrow-heads are rather small, usually from an inch and a quarter to an inch and a half in length, and lozenge-shaped or triangular, those of the latter kind being often provided with projections or stems at the base to facilitate insertion in the shaft. Some are slightly barbed. Flint saws, mostly two or three inches long, occur more frequently, because these implements were indispensable in the preparation of articles of wood, horn, and bone, and even of stone tools, as will be seen. Some of the saws still retain their wooden handles, into which they were cemented with asphaltum, a substance also employed for fastening arrow-heads in their shafts. We give drawings of two handled saws, remarking, however, that the real objects are not so regularly serrated as the illustrations indicate. The artist, knowing that he was representing saws, drew a little on his imagination. The principal implements of the lake-men were the ground celts or wedge-shaped hatchets,

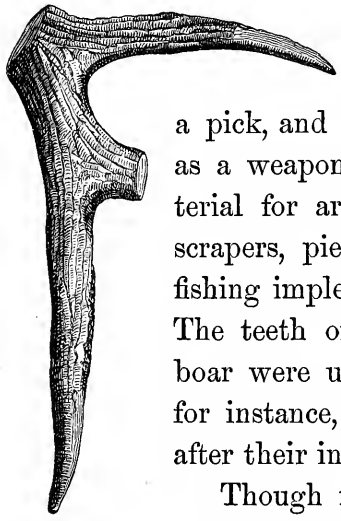
not made of flint, but of serpentine, diorite, syenite, and other kinds of stone possessing a sufficient degree of toughness. Large numbers of these implements have been found in the settlements of the Stone Age, and they are not wanting in those of later times, when bronze was already in use. They vary in length from one inch to eight inches, and doubtless served, according to their size and weight, for many purposes—as weapons of war and the chase, for cutting wood, horn, and bone, dismembering and skinning animals, and in various other ways. Many of them may have been used immediately with the hand; but others, which represented small chisels and cutting tools, were set in pieces of deer horn, hollowed on one side to receive the stone blade, which, being thus hafted, could be handled with greater convenience. A few complete axes, blade and shaft united, have been found, two of them at Robenhausen, representations of which are given. One of these weapons shows the stone blade directly inserted into the thick end of a wooden club; the other consists of a blade held by a socket of stag horn, which is worked into a square form at the upper end, to fit into a corresponding cavity of the wooden shaft. Such weapons resemble much the war-clubs, or *casse-têtes*, of the North American Indians. The squared sockets of deer horn occur in great number in some of the ancient settlements; but the blades belonging to them are wanting in most cases, while the shafts nearly always have been consumed by decay. The manufacture of the stone celts must have required much time and patient labor, as shown by a number of commenced or more or less finished specimens, which illustrate the work in its various stages of progress. After having chosen a rolled stone of the proper kind and size, the workman cut a groove across it, sometimes half an inch in depth, by means of a flint saw applied with sand and water, after which he split the stone into two pieces, each furnishing the material for a celt, provided the crack had gone in the right direction. If no further

sawing was required, these pieces probably were rough-hewn with another stone, and afterward ground into the proper shape on a slab of hard sandstone. The polishing and grinding of the cutting edges were done on a still harder stone.

At Meilen and other lacustrine stations there have been met celts apparently made of nephrite, a kind of hard green stone not known to occur in Europe, but found in Egypt, in China and other parts of Asia. These implements are supposed by some to have been introduced by way of barter from those remote regions, while others incline to the opinion that the material of which they consist was obtained from nearer localities yet to be discovered. A sort of trade or traffic doubtless existed in Europe in the earliest times; but it remains doubtful for the present whether the lake-dwellers of Switzerland were thus provided with celts of nephrite from distant countries. Those who ascribe the lacustrine settlements to new-comers from abroad conjecture that they imported these implements, or the material of which they are made. Various lake-villages of the Stone Age have furnished well-shaped stone axes pierced for the insertion of handles. We give drawings of two specimens, one of them provided with a handle, which, we are bound to state, is an addition of the artist, who wanted to restore the implement to its original complete state. Among other lacustrine articles of stone are to be mentioned hammers of a cubical form with rounded edges, and grain-crushers about the size of a fist, and worked into the shape of an orange or a ball, with depressions on four sides. These grain-crushers were used in connection with other flat or more or less concave stones.

Most varied were the uses which the lake-men made of the horns, bones, and teeth of animals. The horns of the stag were made into the celt sockets already described; stout pieces of this material, perforated with holes for holding wooden handles, served, according to the manner in which their ends were fashioned, as

hammers, hatchets, or hoes; and the antler was sometimes converted into a club by the removal of the prongs, excepting that near the brow. Such an implement resembled a pick, and could be used with great effect either as a weapon or a hoe.* Bones furnished the material for arrow and spear heads, poniards, chisels, scrapers, piercers, needles with or without eyes, fishing implements, and various other kinds of tools. The teeth of the bear and the tusks of the wild boar were utilized for similar purposes, the latter, for instance, to serve as cutting or scraping tools after their inner curve had been ground to an edge.



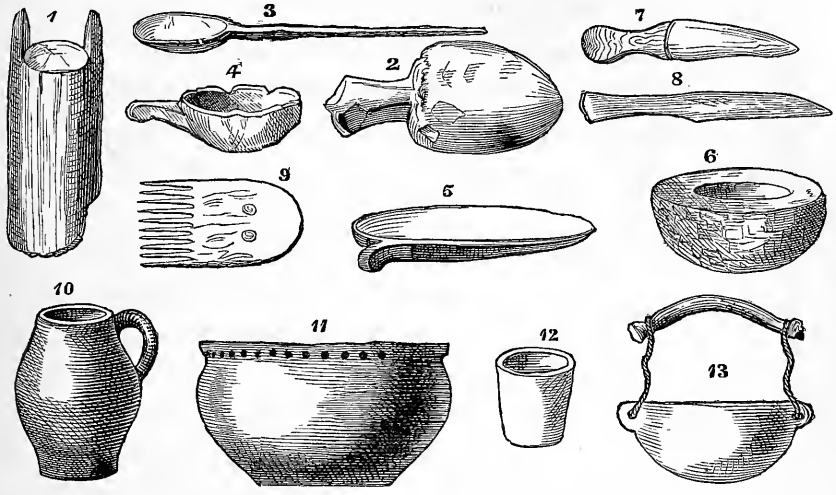
PICK-SHAPED IMPLEMENT OF STAG HORN (20 INCHES LONG). — LAKE OF NEUCHÂTEL.

Though most of the wooden articles have perished in consequence of decay, many of them that have been preserved in water and peat still remain to show how extensively wood was employed by the lake-dwellers. They consist of handles and shafts for implements, maces resembling that with which Hercules usually is represented, mallets, bows, threshing-flails, ladles, dippers, bowls, tubs, and boats made of a single trunk, besides knife-shaped tools, floats for nets, combs, and some other articles of unknown use.† The hollowing of bowls, tubs, and boats, undoubtedly, was chiefly done by means of fire; while the stone tools, the marks of which are still visible, served for removing the charred portions. In this manner the aborigines of North America hollowed their canoes and wooden mortars. Mr. Messikommer found at Roben-

* Professor Desor has in his collection a skull pierced with a round hole in the hinder part of the left parietal, which, he thinks, may well have been made with a club of this description.

† We should have added primitive "racks" for suspending utensils, apparel, etc., formed of young trees from which the branches are cut off at some distance from their junction with the stem.

hausen a boat with rounded ends, twelve feet long, two and a half feet wide, and five inches deep. A number of such lacustrine "dug-outs," some of them much larger than that just mentioned, are still in existence, and similar ones are even now occasionally to be seen on the lakes of Eastern Switzerland.



LACUSTRINE MANUFACTURES OF WOOD AND CLAY.

1. Upper portion of a pile, cut out for receiving a cross-beam (Robenhausen). 2. Mallet of oak wood (Niederwyl). 3, 4, 5. Domestic utensils of maple wood (Robenhausen). 6. Bowl of oak wood, showing the marks of the stone hatchet (Robenhausen). 7, 8. Knife-shaped implements of yew wood (Robenhausen and Wauwyl). 9. Comb of yew wood (Moosseedorf). 10, 11, 12, 13. Pottery (Robenhausen and Meilen).

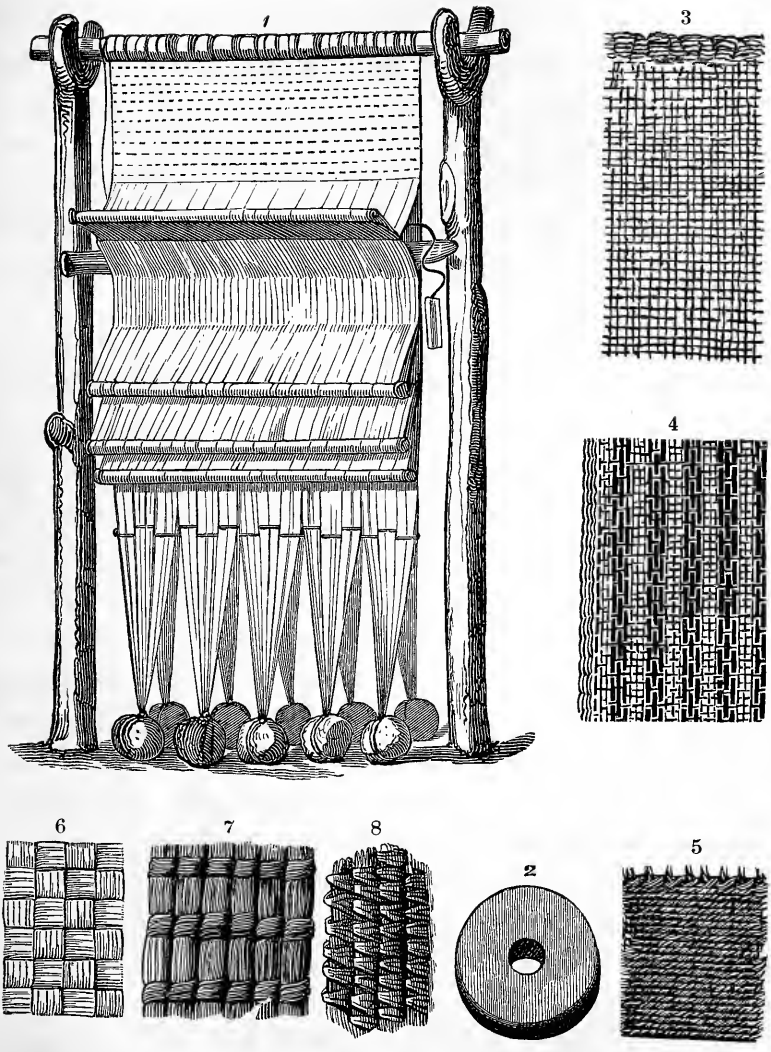
The domestic wooden utensils of the lake-dwellers much resemble corresponding objects manufactured at the present day, as the reader will perceive by examining our illustrations. That pottery was extensively made even in the lake-settlements of earliest date, is proved by the great number of sherds scattered over their sites. Entire vessels, it may be imagined, are rarely met; but the curve and shape of the fragments often suffice for determining their original forms. The material is mostly unpurified clay mixed with coarse gravel, pounded granite, or charcoal; and the vessels are all hand-made, of rude appearance, and slightly baked, probably in an open fire. Notwithstanding these im-

perfections, attempts at decoration are not wanting, some of the vessels being encircled by knobs below the rim, or showing rows of impressions made with the finger or some blunt tool. In other cases lines are traced either with an implement or by pressing a cord on the soft clay. Most of the pottery has a blackish appearance, perhaps owing to a coating with graphite.* There is evidence that vessels of large size were used for storing grain, apples, and other provisions. We give drawings of four clay vessels from Robenhausen and Meilen, which will convey some idea of early lacustrine pottery.

It has been mentioned that, in consequence of the destruction of certain lake-villages by fire, many objects fell into the water in a charred state, and were preserved to our days in consequence of their carbonization. Not the least interesting among these specimens are the twisted, plaited, and woven manufactures which were found at various stations, but especially at Robenhausen and Wangen. A kind of short flax was cultivated by the lake-men, and used most extensively in the fabrication not only of thread, cordage, and nets for fishing, and probably for hunting, but also of different sorts of linen cloth, some with inwoven patterns, a fact proving that they employed some kind of loom.† Mr. Paur, of Zürich, a manufacturer of ribbon, has constructed a loom supposed to resemble that of the lake-dwellers, by which he is able to reproduce their different kinds of textile fabrics. We give a drawing of this restored loom, yet without deeming it improbable that an apparatus of simpler construction was employed

* There are in the writer's collection many fragments of lacustrine pottery, and some entire vessels, which the most practiced eye can hardly distinguish from the ceramic productions of the North American Indians. Material, shape, and ornamentation are almost identical.

† The writer has among his lacustrine relics flax in the shape of seed-pods, seeds, fibres and tow, and further thread, strings, and numerous plaited and woven fabrics, all found at Robenhausen. Hemp, it appears, was not grown during the lacustrine period.



WOVEN AND PLAITED FABRICS OF THE LAKE-MEN.

1. Restored lacustrine loom. 2. Spindle-whorl of sandstone (half size: Auvernier, Lake of Neuchâtel). 3, 4. Tissues of flax. 5. Compact cloth, undecided whether plaited or woven. 6. Mat of bast. 7. Mat of flax strands. 8. Mat of willow twigs and straw. The woven and plaited articles here figured were obtained at Robenhausen and Wangen.

by the lake-men.* Conical objects of clay, thought to have served as stretchers in the process of weaving, often occur; and numerous spindle-whorls, either of stone or of clay, are indicative of the common practice of spinning.† The lake-people doubtless dressed to a great extent in woven garments, but we may assume that they also employed the prepared skins of animals for this purpose; indeed, fragments of leather have been found, though sparingly, at Robenhausen.

During the early lacustrine period, hunting still furnished in no small degree the means of subsistence, as shown by the large number of bones of wild animals found on the sites of the ancient lake villages. Professor Rütimeyer, of Basle, has carefully investigated the fauna of those times, which, on the whole, corresponds with that of our days, though certain species of animals now no longer to be found in Switzerland then flourished in that country. The urus and aurochs, or bison, were hunted by the lake-men, or perhaps caught by them in pitfalls. The elk, an animal not known to have lived in Switzerland during historical times, still roamed through the woods; but the reindeer had migrated to the north in search of a colder climate, no remains of it having been discovered in any of the pile-works. It is hardly necessary to repeat that the mammoth, rhinoceros, cave-bear, lion, and hyena had accomplished their term of existence long before the lacustrine era. The stag and wild boar, both no longer living in Switzerland, were much hunted by the lake-dwellers, and their bones indicate animals of very large size. Another species of

* The Pima Indians of the Gila River, for instance, make very good and really ornamental tissues, employing a loom that consists only of a few sticks, which they carry about in a small bundle. The loom of the ancient Mexicans was far less complicated than that constructed by Mr. Paur, and yet the inhabitants wove cotton cloth which excited the admiration of the Spanish conquerors.

† Spindle-whorls of clay belong more particularly to the lacustrine stations of the Bronze Age.

wild hog, differing from the wild boar proper, and called the "marsh hog" by Rütimeyer, is represented by numerous remains in the pile-works. Bones of the roe-deer are far less abundant than those of the stag. Among the carnivores may be mentioned the brown bear, wolf, and fox, the last-named of which occurs frequently in the settlements of the Stone Age, and was eaten by the lake-men: a fact proved by the condition of its bones, which are broken, and exhibit the marks of stone instruments, like those of the other animals serving as food. The hare, it seems, formed no article of diet among these people, owing, perhaps, to the same prejudice which caused, as we have seen, the men of the Danish Kjökkenmöddings to abstain from its flesh. The lake-dwellers possessed a species of domestic dog of middle size, which they seem to have much valued, if the fact that it was not used as food, unless in cases of extreme need, warrants such a conclusion. The bones and skulls of these faithful companions of man are generally not broken, like those of other animals, but nearly always occur in an entire state in the lacustrine accumulations. Remains of the horse are exceedingly scarce in the settlements of the Stone Age: but two kinds of tame cattle were common during that period, one of them small, and called the "marsh cow" by Professor Rütimeyer; the second species, of larger size, is supposed by this author to have descended from the urus. The other domesticated animals were goats and sheep, and, during the later division of the lacustrine Stone Age, two kinds of hogs, derived, according to Rütimeyer, from the wild species already mentioned. It has been ascertained beyond doubt that the tamed animals were brought for shelter to the lake villages, where they were kept in stalls distributed between the huts. No traces of domestic fowl have been discovered in the lake settlements; nor of the cat, which, moreover, could easily be dispensed with, since those people, as it seems, were not plagued by rats and mice: the only bone of a mouse thus far found belongs to a wild species

that never enters the dwellings of man.* The birds, amphibians, and fishes which have left their traces in the deposits around the piles pertain to the present fauna of Switzerland, and therefore need not be specialized. That wild ducks, geese, swans, water-hens, grouse, and other species of the feathered tribe were objects of hunting, is demonstrated by their discovered remains. The lake-people evidently practiced fishing with good success. They caught the various kinds of fish abounding in their lakes, especially pike of large size, either in nets, remains of which have been found at several stations, or with the line; and it is probable, too, that the methods of shooting and spearing fish were in vogue among them. There have been found fish-hooks made of boars' tusks, and other implements consisting of small rods of bone, pointed at both ends and notched in the middle for the attachment of a fishing-line. When these pointed rods were baited and swallowed, they could not easily be disgorged by the fish, which thus became the prey of man. According to Keller, this primitive device is still resorted to in Switzerland for catching wild ducks.

Owing to causes known to the reader, carbonized vegetable remains have been preserved in great abundance and variety, to assist, as it were, in elucidating the mode of life of those ancient lake-villagers. They undoubtedly raised barley, wheat, and millet, several kinds of each of these cereals having been found in the lacustrine deposits. Some of these species of grain were cultivated in Egypt, and therefore are believed to have found their way from that country to Switzerland. Rye was not known to the colonists, and oats not before bronze had come into use. Barley and wheat appear either in grains, sometimes in considerable quantities, or, more rarely, still retain the shape of ears; and even

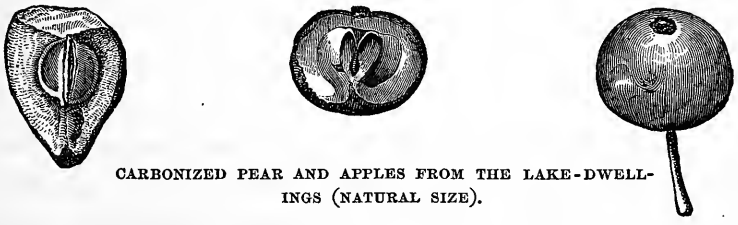
* If certain records are to be credited, the domestic cat of Europe was introduced from Egypt about a thousand years ago.

carbonized wheat bread, in which the bran and the imperfectly crushed grains can be distinctly seen, has been found at Robenhausen and Wangen. This unleavened prehistoric bread, which is very coarse and compact, occurs mostly in fragments, but sometimes in the form of small roundish cakes about an inch or an inch and a half thick, and was doubtless baked by placing the dough on hot stones, and covering it over with glowing ashes. Millet was employed in a similar manner for making bread. It is probable, however, that the lake-people consumed their farinaceous food chiefly in the shape of porridge.

Carbonized apples of small size, identical with those growing wild in the woods of Switzerland, have been found abundantly, and in a tolerable state of preservation. Mr. Messikommer discovered on one occasion more than three hundred of them lying close together. They are often cut in halves, more rarely in three or four parts, and were evidently dried for consumption during winter. Whether a larger kind of apple, found at Robenhausen, was cultivated, or a wild-growing species, remains undecided. Professor Oswald Heer, of Zürich, who has published an interesting work on lacustrine vegetable remains, inclines to the former view. Wild pears were treated in the same manner; but they are far less common than apples, which must have formed a much-sought article of diet. Among other vegetable remains accumulated in the lake mud may be mentioned hazel-nuts and beech-nuts, both in great plenty; also water-chestnuts, which doubtless were collected and eaten by the lake-men, as they are in Upper Italy at this day. Their present occurrence in Switzerland appears to be restricted to a tarn in the canton of Lucerne. There have further been found abundantly the stones of sloes, bird-cherries, and wild plums, and seeds of the raspberry, blackberry, and strawberry, showing that these fruits of the forest were used as food. According to Dr. Keller, the lake-colonists of the Stone Age drew their sustenance chiefly from the

vegetable kingdom. Their animal food evidently was acquired by hunting rather than by the breeding of cattle, considering that in the accumulations around the piles the bones of wild animals outnumber those of the domestic species.* Milk, we may assume, formed an important article of their diet.

A lacustrine village must have presented a curious but not unpleasing sight, when, on a fine day, the poor and industrious colonists were gathered on the platform, and engaged in their various occupations. We may imagine groups of women busily turning the spindle and gossiping—in what language it would be interesting to know. Other females are at work forming vessels of clay, to be burned on the shore, or perhaps knitting nets or preparing garments. Lacustrine urchins abandon themselves to juvenile frolics, just like civilized children, while here and there a veteran, too old for fatiguing exertions, is busied in whittling some domestic utensil or in fashioning a weapon for his son or



CARBONIZED PEAR AND APPLES FROM THE LAKE-DWELLINGS (NATURAL SIZE).

grandson. When evening draws near, smoke begins to rise from the huts, where the women are baking and cooking, for the men who have been hunting in the woods will soon return, armed with spear and bow, and loaded with the game killed by them. Those who have spent the day in fishing guide their boats homeward; field laborers, returning from the cultivated patches along the shore, are seen to wend their way toward the bridge, driving

* In the lacustrine stations of the Bronze Age, however, the remains of tamed animals prevail, a fact which unmistakably indicates an advance in civilization.

before them the lowing cattle, which were permitted to graze on the land during day-time, and are now to be stabled for the night among the huts, safe from the attacks of wolf and bear.

The interesting question to what race of man the early pile-works are to be referred has been discussed, but, as the reader may imagine, without leading to any thing like a result. It is not known in what manner the lake-colonists disposed of their dead, no burial-places having thus far been discovered in the neighborhood of their settlements. Human remains, moreover, are very scarce in the lacustrine relic-beds of the Stone Age, and mostly belong to children, who, it appears, had perished by drowning. A fragmentary skull found at Meilen, and described by Professor His, of Basle, "is allied to the cranial forms now prevalent in German Switzerland." Notwithstanding various computations, no one knows how far back the origin of the lake-dwellings can be dated. The presence of Roman coins, pottery, and tiles in a few settlements of the Iron Age gives us some clue as to the epoch when the lacustrine period approached its termination; but we are absolutely in the dark in regard to the beginning and duration of the lake-colonies belonging to the earliest times, during which the use of metal was yet unknown in Switzerland.

Our condensed account relates, as we stated at the outset, only to the settlements of the Stone Age. The gradual introduction of far more serviceable implements of bronze, as may be imagined, brought about a great change for the better in the mode of existence of the lake-people, yet without modifying in a marked degree the character of their aquatic dwellings. Though we should like to follow these remarkable developments, we must abstain from that attempt, and confine our further remarks to the Stone Age proper.

TUMULUS OF THE STONE AGE.—ISLAND OF MÖEN, DENMARK.

CHAPTER VI.

NEOLITHIC IMPLEMENTS.

In the present closing chapter we purpose to treat chiefly of those productions of the European Stone Age which, from their perfection and finish, are illustrative of the highest mechanical skill developed during that remote period, and consequently include the types characteristic of the later neolithic stage immediately antecedent to the introduction of utensils and weapons of bronze. Such stone implements of superior workmanship are particularly numerous in Denmark, the Scandinavian peninsula, and that part of Germany which is washed by the Baltic Sea; but they also occur, as may be imagined, more or less abundantly in Great Britain and Ireland, in France, and the countries of the European continent in general. The Baltic districts just mentioned are very rich in flint, and this circumstance doubtless contributed in no small degree to the proficiency which their ancient inhabitants had acquired in the art of fashioning that material. The Prussian island of Rügen, for instance, which abounds in cre-

taceous flint, and has furnished a great number of neolithic implements, must have been a manufacturing place of importance in ancient times, perhaps a prehistoric Sheffield or Solingen on a small scale. In order to give the reader some idea of the frequency of stone implements within the narrow limits of the Danish kingdom, we will state that the celebrated museum of Copenhagen contained, ten years ago, exclusive of duplicates and broken specimens, as many as 4840 articles of neolithic type, among them 1070 flint axes and wedges, 953 chisels, 250 poniards, 656 lance-heads, 205 half-moon-shaped implements, 746 pierced axes, etc. To these should be added 3678 rough stone implements from the Kjökkenmöddings (described in the preceding chapter), and 280 objects of horn and bone. Generally speaking, the collections of Denmark are thought to contain about 30,000 articles of stone, and nearly every archæological museum of Europe counts among its specimens a series of these much-sought Danish relics, not to mention those in the hands of private individuals. Rude stone tools of paleolithic types, such as have been found with the remains of extinct quadrupeds in the river gravels and ancient cave deposits of Western Europe, appear to be wanting in Denmark and the other Northern countries of which mention has been made. Their absence, if well established, would indicate that these districts became inhabited at a later period, and by a race more advanced than the barbarous contemporaries of the mammoth.

The stone implements of which we intend to treat are met on or near the surface of the soil, in marshes and peat bogs, and quite frequently in the tombs of the later Stone Age, where they have been deposited, with other objects of use or ornament, by the side of the departed, as tokens of the affection of relatives and friends, and probably with the crude notion that they might be of service in a future state of existence. Similar funeral customs are still observed by the North American Indians and other

primitive men of modern times, who expect after death something like a continuation of their former physical existence, with all its pleasant features and none of its cares and undesirable incidents.

DANISH CROMLECH.

Weapons, utensils, food-vessels, and trinkets, which are found associated with human remains in Indian graves, were likewise buried, doubtless for the same purpose, with the European of the Stone Age. His tomb, however, bore a more substantial character than that of the red man, being composed of heavy upright stones and others placed horizontally to cover them, the whole forming a rude vault or chamber, which was often inclosed by a tumulus or mound of earth, and reached from without by a passage also constructed of stones. These chambers are sometimes of large dimensions, and the stones forming them of such bulk and weight that it is difficult to imagine by what means they were transported and placed in their proper position by men of very primitive attainments, who can be credited with but little knowledge of mechanics. The larger chambers served as the last abodes to a number of human beings, probably belonging to one family, and the corpses, in order to occupy as little space as possible, usually were deposited in a sitting or contracted posture, surrounded by the objects which their kindred had deemed proper to bury with them. Several classes of stone graves are ascribed

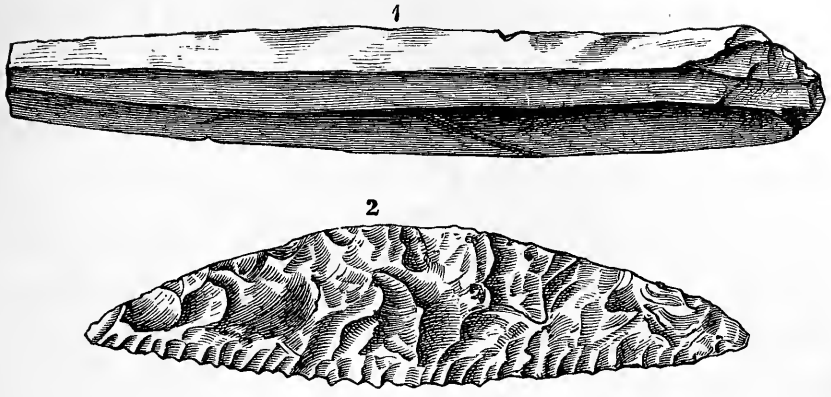
to the epoch under notice; but we are compelled, for the sake of brevity, to allude only in general terms to a subject which in itself would furnish ample material for several chapters.*

Structures composed of huge boulders or fragments of rocks supporting a large cap-stone are frequently met standing entirely exposed on the surface of the soil. Whether they were originally all covered with earth is a mooted question. Such megalithic erections occur under different names—*cromlechs*, *dolmens*, etc.—in various parts of Europe, and more or less analogous structures have been discovered in Syria and Northern Africa. Yet they can not all be referred exclusively to the Stone Age; and some may not mark places of sepulture, but represent monuments built in honor of distinguished individuals or in commemoration of important events.†

During the Bronze Age the practice of burning the dead was prevalent, in consequence of which the funeral monuments appear modified in their character, generally presenting the shape of tumuli inclosing earthen vessels or urns, which contain burned human bones, and often weapons and ornaments of bronze. But the mode of sepulture alone affords not always a sure guidance in determining to what age the burial is to be referred, considering that the two epochs are not separated by a strongly defined line, but by a period of transition which may have been of very long duration in certain districts, giving rise to a merging of funeral customs that renders classification difficult. In the prehistoric Age of Iron, again, inhumation seems to have been the most common method of burial, the bodies being laid down extended at full length, contrary to the rule of depositing them in a con-

* The few observations thus far made, it should be understood, relate more particularly to tombs still existing in Denmark and the neighboring countries.

† It is a remarkable fact that funeral monuments of a kindred character are still erected by certain tribes in India.



DANISH FLINT TOOLS.

1. Flake (natural size). 2. Serrated implement (half size).

tracted posture, which, as we have seen, obtained during the Age of Stone.

In entering upon the subject of neolithic implements, we begin with the simplest form, which is a flake struck off from a block of flint. Such flakes, as the reader knows, were extensively used during paleolithic times in various ways, but especially, it may be assumed, as cutting tools, their sharp edges fitting them well for that purpose. Paleolithic flakes, however, are often very rude, while those of the period now under consideration generally exhibit a more regular shape, and thus indicate the improved skill of the later prehistoric flint-chipper. They are, owing to the conchoidal fracture of flint, more or less curved in the longitudinal direction, from two to six and more inches long, but rarely more than an inch broad, and terminate often in a point. The under face, produced by the blow which detached the flake from the block, always presents a single fracture; while the upper side shows two or three (but seldom more) facets, resulting from the preceding removal of blades. These cutting tools were probably provided with handles, in order to be used with greater efficiency. Prismatic cores or nuclei from which flakes have been dislodged occur frequently in places where these primitive knives were

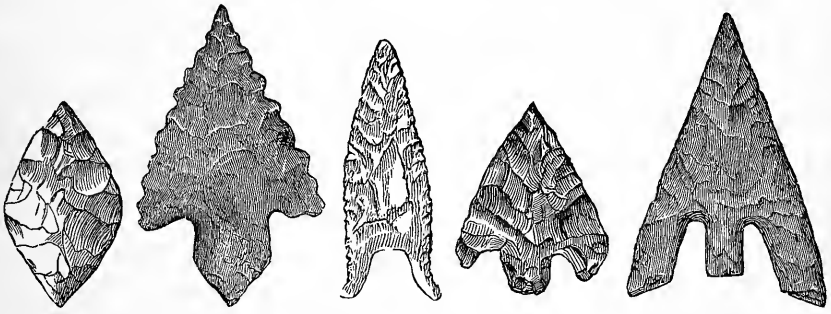
manufactured. Such open-air workshops have been discovered in the island of Rügen and elsewhere. A few cases are recorded in which flint cores were found with the flakes split off from them lying close by, and fitting exactly into the facets upon them. The ancient Mexicans made knives absolutely identical in shape with those from Denmark and other parts of Northern Europe; but instead of flint they employed for this purpose obsidian—a volcanic product that breaks like flint, and occurs abundantly in some parts of their country. According to the early Spanish chroniclers,* the Aztec artisan dislodged the flakes from the obsidian block by pressure, employing a large wooden T-shaped implement, which acted somewhat in the manner of a punch, the cross-piece resting against the chest; and a skillful workman, says Clavigero, in his "History of Mexico," was able to make a hundred of these knives within an hour. It is doubtful whether the fine flint flakes of the Baltic districts were produced in a similar manner, considering that flint will not yield to pressure as easily as the more brittle obsidian.

Among the chipped flint articles of the European North we have to mention certain flat implements somewhat resembling in outline the segment of a circle, or sometimes a half-moon. These tools have been classed as cutting implements and as saws, their edges being occasionally serrated, as in the given drawing. Sir John Lubbock thinks it probable that they were fixed with their convex edges into wooden handles, and then used in cleaning skins. Neolithic scrapers resemble those of the earlier Stone Age, though they are often more regularly chipped; but having represented scrapers, and alluded to their uses in the third chapter of this volume ("The Troglodytes"), we need not say more about them in this place.

The neolithic period is characterized by a great variety of

* Torquemada, Motolinia.

chipped flint arrow-heads, many of which are wrought with admirable skill, and may be classed among the most remarkable relics of antiquity. The simpler forms present the outlines of triangles, leaves, or lozenges; in the more elaborate specimens the part opposite the point terminates in a stem or tang, which facilitated the attachment to the shaft. Some arrow-heads are both stemmed and barbed; others have long barbs, but no stems. In many the converging edges are skillfully serrated or jagged.



FLINT ARROW-HEADS (NATURAL SIZE).—GREAT BRITAIN AND DENMARK.

A glance at our illustrations will be more instructive than any information we could offer.* These arrow-heads are from one to two or three inches long; but it is impossible to determine whether the long specimens are really arrow-heads or the points of javelins, considering that there is no marked difference in their respective forms. The base of the arrow-head, whether straight, indented, or stemmed, is generally worked thin, in order to fit into a slit at the end of the wooden shaft, where it was secured by means of sinews tightly wound around the wood. Some sort of glue or cement, moreover, may have been used to connect the stone point more firmly with the shaft.† The Swiss lake-men,

* The illustrations of neolithic implements in this chapter are taken from Worsaae's "Catalogue of the Antiquities in the Copenhagen Museum," from Evans's "Ancient Stone Implements, etc., of Great Britain," and from other reliable sources.

† The Prairie Indians use both glue and sinews for fastening their arrow-points. They make their glue from the horns and the hoofs of the buffalo.

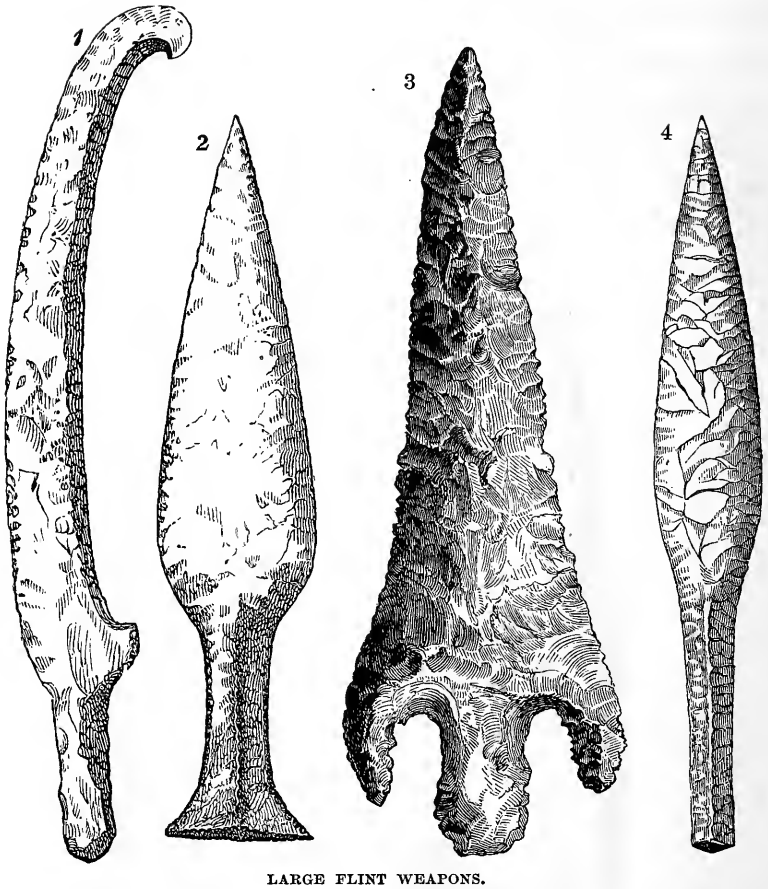
it will be remembered, employed asphaltum for that purpose. Flint arrow-heads evidently were still used in Northern Europe long after bronze had become known. In England, for instance, bronze arrow-heads are extremely scarce, while arrow-heads of flint occur frequently in ancient graves containing weapons and implements of bronze. This fact may be easily accounted for by the costliness of bronze and the abundance of flint, a flint-tipped arrow being, moreover, almost as effective as one provided with a point of bronze.

There are some curious superstitions attached to flint arrow-heads in various parts of Europe, as, for instance, in Scotland and Ireland, where the country people call them elf-shots or elf-bolts, believing them to be the missiles of those imaginary beings. They used to wear them, mounted in silver frames, as protections against evil influences. Sir W. R. Wilde states that in the North of Ireland, "when cattle are sick, and the cattle doctor or fairy doctor is sent for, he says the beast has been 'elf-shot,' or stricken by fairy or elfin darts; and forthwith he proceeds to feel the animal all over, and by some legerdemain contrives to find in its skin one or more poisonous weapons, which, with some coins, are then placed in the water which it is given to drink, and a cure is said to be effected." According to Professor Nilsson, the veteran archæologist of Sweden, there is still lingering among the Scandinavian peasantry a belief that flint arrow-heads and stone implements in general are endowed with certain magic powers. Similar superstitions survive in Italy. In some parts of that country the peasants preserve flint arrow-heads in their houses, in order to protect them from the effects of lightning; and in the island of Elba they are mounted in silver and

FLINT ARROW-HEAD MOUNTED IN A SILVER FRAME (NATURAL SIZE). WORN AS A CHARM IN SCOTLAND.

worn as amulets, as in Scotland and Ireland. An arrow-head of flint has been found appended to an Etruscan necklace of gold, apparently as a sort of charm, which seems to show, says Mr. Evans, "that a belief in the supernatural origin of these weapons, and their consequent miraculous powers, is of very ancient date." In this country, where stone arrow-points are probably more numerous than anywhere else, no strange notions in reference to them are entertained by the rural population, their origin and use being so well understood that even the children in country districts, who pick them up in the fields, are fully aware of their being the missiles used, at no remote period, by the aboriginal occupants of the soil. Such, at least, was the writer's personal experience.

The next group of illustrations represents four remarkably fine objects of flint, which will serve to show what degree of perfection in chipping stone had been attained during the neolithic period. The first of them is a sickle-shaped knife terminating in a handle, all made of one piece, and measuring fourteen inches in length. This unique specimen, which is preserved in the Copenhagen Museum, can hardly have been designed for actual use, being very liable to break on account of the brittleness of its material, and for this reason it may be assumed that it served as an attribute or a baton of command. In the next figure we present one of those beautiful Danish daggers which Sir John Lubbock calls "marvels of skill in flint-chipping." The reader will notice the elegant outline of this weapon, and particularly its elaborately wrought prismatic handle. The third specimen, a javelin-head derived from the Isle of Skye, Scotland, and drawn in natural size, is less carefully chipped at the edges, yet of very remarkable shape, its base being expanded to strengthen the curved barbs. The last figure of the group represents again a Danish weapon of superior workmanship, which has been classed as a spear-head, though it is provided with a square handle, and thus resembles a



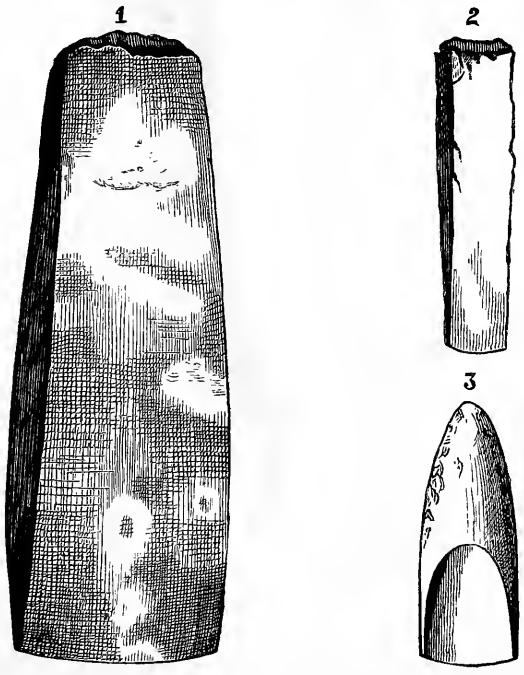
LARGE FLINT WEAPONS.

1. Sickle-shaped knife, one-third of natural size (Denmark). 2. Dagger, one-third of natural size (Denmark). 3. Javelin-head, natural size (Isle of Skye, Scotland). 4. Lance-head, one-third of natural size (Denmark).

dagger or a knife. The armatures of lances generally correspond in shape more or less to those of arrows, and it is only their larger size which indicates the use for which they were designed. As in arrow-heads, their lower end is often worked into a projection or tang for fitting them in the cleft end of the shaft. Yet many of the specimens of this class may have been inserted in short handles, and used as daggers or cutting tools.

The different classes of flint implements thus far treated are generally brought into the proper shape by the simple process of

chipping, and exhibit only exceptionally traces of polish; as, for instance, some of the Danish daggers, and particularly certain Irish spear-heads of a lozenge shape, which were first chipped into form and then ground flat on both faces, while the edges remained in their original state. But the Danish wedge-shaped axes or celts of flint, which next claim our attention, are very



POLISHED FLINT IMPLEMENTS (DENMARK).

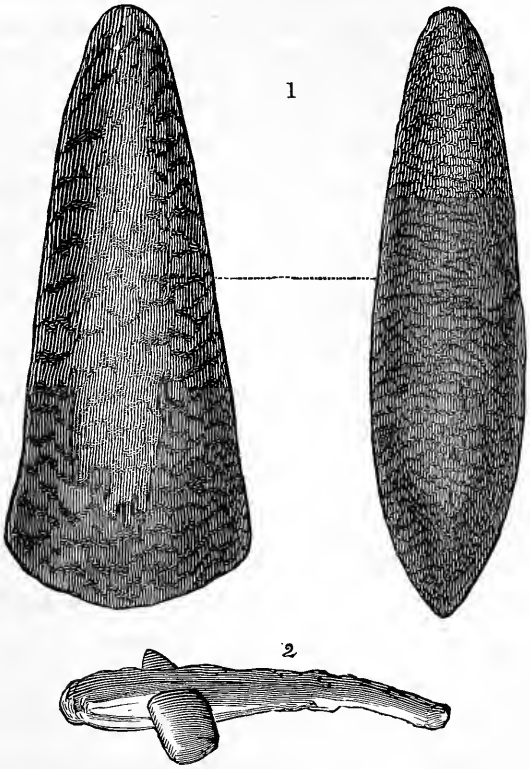
1. Celt, one-third of natural size. 2. Chisel, half size. 3. Gouge, one-fourth of natural size.

often polished, though perhaps quite as frequently left in a chipped or rough-hewn state, yet even then showing in most cases excellent workmanship. It is probable that many of the latter were not intended to be ground. The more carefully prepared flint celts, however, are polished either merely at the edge, or on the two broad faces, or on all sides, and the edge itself, though of tolerable thickness, is usually very sharp and regularly curved. They vary in length from three to fifteen inches, and from one to

four inches in breadth. In connection with the celts must be mentioned various kinds of chisels, with narrow or broad edges, and hollow chisels or gouges, all of which occur either chipped, or partly or entirely polished. The narrow chisels are often square in the cross section, and resemble the cold-chisels employed in our time. Ground celts not made of flint, but of greenstone and other hard and tough materials, are of frequent occurrence in various European countries. The reader will remember that we have referred to them in the preceding chapter while speaking of the stone implements in use among the lake villagers of Switzerland. These celts differ somewhat in shape from the Danish specimens of the same class, being often roundish or elliptic in the cross section, instead of presenting perpendicular sides like many of the Northern flint celts, and they often taper into a rounded butt-end. Not few of them are worked with great symmetry, sharp-edged, and well polished.

Stone celts in general form a numerous class of neolithic relics, and their frequency is indicative of the important part they played in times when metallic implements were yet unknown. Their shape, indeed, rendered them suitable for application in various ways. Some of them probably were used with the hand as chisels and knives, or, in connection with mallets, as wedges for splitting wood; but there can be no doubt that many were fixed into handles to serve as hatchets or axes, or perhaps as adzes. Wood, however, is a very perishable substance, and handles with the stone blades still inserted in them are therefore but rarely met. A few hafted hatchets have been preserved, as the reader knows, in the relic-beds of Swiss pile-works, and two or three others were discovered elsewhere, one of them (here figured) in the County of Monaghan, Ireland. In this instance the club-shaped handle, which apparently consists of pine-wood, is thirteen and a half inches long. "To us, accustomed as we are to the use of metals," says Lubbock, "it seems difficult to believe

that such things were ever made use of; we know, however, that many savages of the present day have no better tools. Yet with axes such as these, and generally with the assistance of fire, they



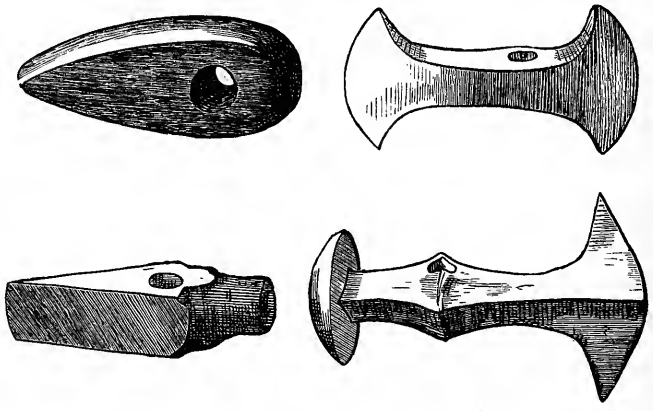
POLISHED STONE CELTS.

1. Greenstone celt, half size (England). 2. Celt in wooden handle (County of Monaghan, Ireland).

will cut down large trees and hollow them out into canoes. The piles used in the Swiss Stone Age lake-habitations were evidently, from the form of the cuts on them, prepared with the help of stone axes; and in the Danish peat bogs several trees have been found with the marks of stone axes and of fire upon them, and in one or two cases stone celts have even been found lying at the side."

The most remarkable neolithic axes are those pierced with a hole for the reception of a handle, and thus approaching in char-

acter corresponding iron implements in use at the present time. Varieties of greenstone frequently form their material, though syenite, basalt, serpentine, and other suitable mineral substances were employed for the same purpose. Pierced axes of flint hardly ever occur, obviously for the reason that the hardness of this kind of stone would have rendered the drilling process too difficult. The axe-heads differ much in size and shape, and in the degree of skill bestowed on their execution. Their length varies



DRILLED STONE AXES (ONE-FOURTH OF NATURAL SIZE).—DENMARK.

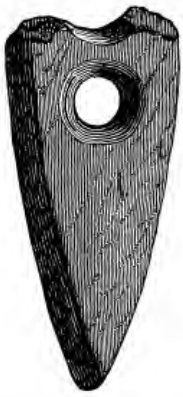
from four to ten and more inches. Most of them are wedge-shaped, blunt at one end, and terminating at the other in an edge placed in the direction of the shaft-hole; in others the edge forms a right angle with the perforation, and these partake of the character of adzes. Some, again, have perpendicular edges at both ends, and may be called double axes. The shaft-holes are either in the middle or nearer the blunt part, and they were drilled after the stone had been ground into the proper shape, as shown by many otherwise finished specimens exhibiting incipient or partly finished perforations. We can not attempt to describe in detail the various shapes of these implements, and refer the reader to our illustrations, which will convey some idea of their appearance. Specimens of rude make may occasionally be seen in

European collections; but most articles of this class are well shaped, and not few of them remarkable for elegance of form and exquisite workmanship. Drilled axes being sometimes met in ancient graves associated with objects of bronze, some archæologists incline to the opinion that they are in general referable to the Age of Bronze. Yet this can not be the case, for though the manufacture of these stone implements probably was continued in times when bronze already had been brought into use, it hardly admits of any doubt that many belong to the Stone Age proper—at any rate, to its later stage. We will only allude to the pierced axes which, as the reader knows, have been found among the relics of Swiss lake settlements pertaining to the Age of Stone. It has been shown, moreover, by experiments made both in Europe and in this country, that stone of considerable hardness can be perforated by means of a wooden stick or a properly shaped piece of horn in conjunction with sharp sand and water.* The highly finished axe-heads ascribed to the Bronze Age may have been drilled and fashioned with the aid of metallic implements.

The edges of pierced axes generally are not sharp, but more or less blunt, and hence it appears probable that they were designed for weapons rather than for tools to be employed in cutting. Yet even as battle-axes they can not have been very efficient, considering that they were liable to break across the shaft-hole after a vigorous blow; and though the manufacturers often endeavored to obviate such accidents by increasing the breadth of the axe at the place of perforation, the halves of axes broken in that part are by no means scarce. The edged fragments, however, sometimes have been rendered serviceable again by a second

* The writer has succeeded in perforating a piece of the hardest diorite, nearly an inch and a half in thickness, by employing a wooden apparatus shaped like a pump-drill. The *modus operandi* is described in the Smithsonian Report for 1868.

perforation, as in the case of the Swedish axe here figured. Many well-wrought axe-heads, on the other hand, are in a perfect state of preservation, and exhibit no trace of use whatever; and such specimens, it may be assumed, were not applied to serious purposes, but served as insignia of rank or weapons of parade. The real war-axe of those times probably was a stone celt firmly set in a wooden handle.



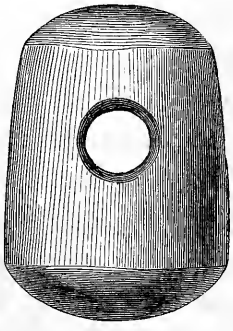
BROKEN AXE WITH NEW SHAFT-HOLE (HALF SIZE). — SWEDEN.

Before proceeding further, we must allude to the curious belief among the uneducated in Europe that the stone celts and axes they happen to discover in the fields have been hurled down from the sky by lightning. This superstition, which now may have yielded in some measure to a better understanding, was but a short time ago universal in Europe; and stone celts, as if by common consent, were, and still are, denominated "thunder-bolts" in most European languages. By that name they are known in Great Britain and Ireland; in French they are called *coins de foudre* or *pierres de tonnerre;* in German, *Donnerkeile;** in Dutch, *donder-beitels;* in Danish, *Tordenkiler* or *Tordensteene;* and corresponding names occur in the languages of the more southern nations of Europe, all tending to show a common belief in their descent from the clouds—a belief which was shared, we must add, even as late as the middle of the seventeenth century, by men of learning, who wrote dissertations to prove that they were the projectiles of lightning. Some *savants* of the same period, on the other hand, had recognized their true character, and endeavored to dispel the misconceptions of their contemporaries. Many are the virtues which superstition attrib-

* Years ago, while collecting Indian relics in the southern counties of Illinois, we had often occasion to notice that the German settlers applied the name *Donnerkeile* to the Indian stone tomahawks and celts plowed up in their fields, though they knew perfectly well the origin of these implements.

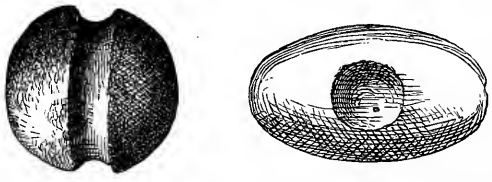
utes to these stone implements. When kept in a house, they protect it from lightning; the water in which a celt has been boiled is a remedy against rheumatism; and sick cattle are cured by drinking water in which a celt has been placed. Celts, further, are believed to alleviate the pains of childbirth; the powder scraped from them is of good effect in various diseases of children, etc. Mr. Evans, after having discussed in an exhaustive manner the superstitions connected with these ancient instruments in Europe as well as in other parts of the Old World, concludes thus: "There are two deductions which may readily be drawn from the facts just stated—first, that in nearly all, if not indeed in all, parts of the globe which are now civilized there was a period when the use of stone implements prevailed; and, secondly, that this period is so remote that what were then the common implements of every-day life have now for centuries been regarded with superstitious reverence, as of being in some sense of celestial origin, and not the work of man's hands."

Stone hammers, which form a less numerous class of perforated instruments, seem to occur chiefly in Great Britain and Ireland. They consist of quartzite, greenstone, and other materials of sufficient hardness, and are in many instances well shaped and carefully finished. A few bear a great resemblance to certain iron hammers in use at the present day, being broad in the perforated part, and terminating in flat faces at both ends. Some are of a cylindrical form, and convex at both extremities; others, again, are egg-shaped. In many cases a quartzite pebble of ovoid form was perforated and used as a hammer-head without further preparation. Among the drilled objects of the neolithic period we further have to mention the stone spindle-whorls, or weights serving as fly-wheels to impart a rotary motion to the spindle,



PERFORATED HAMMER OF QUARTZITE (HALF SIZE). —ENGLAND.

which, as the reader knows, was a utensil employed in Europe at an early time.* The whorls, in their simplest form, are disk-shaped, usually from an inch to an inch and a half in diameter, and pierced in the centre with a small hole, through which the pointed spindle of wood or bone was stuck. The country people in Ireland call them "fairy millstones." They are often made of clay, and sometimes of wood, bone, or ivory, and it is not always easy to determine to what period they belong, since spinning with distaff and spindle is even now practiced in some parts of Europe. In conclusion, we allude to the sink-stones, which are pebbles encircled by a groove or perforated with a hole, and supposed to have served as weights for nets or fishing-lines; and to



SINK-STONE AND HAMMER-STONE (ONE-THIRD OF NATURAL SIZE).—DENMARK.

the so-called hammer-stones, mostly oval quartzite pebbles, with cup-shaped cavities worked into the two broader faces. The last-named tools were not attached to handles, but used with the hand alone, the cavities serving to receive the thumb and middle finger of the operator.

The account of neolithic implements here given comprises but their principal forms, and is only calculated to acquaint the reader in a cursory way with a subject about which volumes have been written in various languages. A more detailed description would exceed the proposed limits of this chapter.

Horn and bone continued to be employed during the later Stone Age as materials for arrow-heads, barbed harpoons, pier-

* A drawing of a spindle-whorl is given in the preceding chapter among the illustrations of lacustrine relics.

cers, hammers, and other weapons or utensils. They were found abundantly, as will be remembered, on the sites of Swiss lake villages, and we may add that they are not wanting in the Northern countries of Europe; but having repeatedly described such implements in preceding chapters, we deem it sufficient merely to allude to them in this place.

The love for personal adornment—common to man in whatever stage of development we may find him—manifests itself in the neolithic period by the presence of a variety of objects of a decorative character, such as teeth of animals and entire shells pierced for suspension, and pendants, beads, and buttons made of stone, jet, shell-matter, bone, and amber. The last-named substance seems to have been held in particular estimation, and occurs often in the shape of ornament in the graves of the North, where it could be easily obtained, owing to the proximity of those coast regions of the North Sea, and especially of the Baltic, from which even in our days amber is chiefly derived. This beautiful resinous material formed a valued article of commerce in very early times, and may then have been more abundant than at present. The amber ornaments consist either of unwrought perforated pieces or of polished beads of different forms and sizes, which were strung together to adorn the necks, and perhaps the limbs, of the ancient people. Some of the amber beads of the North, it should be added, represent diminutive axes, hammers, and celts, exactly shaped like the corresponding stone implements, and probably thus fashioned for some symbolic purpose.

Clay vessels, it appears, were in general use during the neolithic period. They have been met, as will be remembered, abundantly, though mostly in a fragmentary state, in the lake settlements of the Stone Age, and numerous sherds indicative of the extent of their manufacture cover everywhere in Europe the sites once occupied by the people who used polished stone implements. Entire vessels are sometimes found in the sepulchres of those

times, where they have been placed by the side of the dead, probably for holding provisions to serve during their journey to another world. The clay vessels of the period here considered are made without the aid of the potter's wheel,* unglazed, and slightly burned, and the clay is often tempered with sand, small pebbles, crushed stone, or charcoal. In shape and capacity, of course, they vary according to the uses for which they were designed. There are rude vessels with convex bottoms, resembling the pottery still manufactured by uncultivated races, and others

ORNAMENTED DANISH VASE (ONE-THIRD OF NATURAL SIZE).

of more developed forms, which betoken a higher degree of skill in the ceramic art. The Swiss earthenware of the Stone Age, as we have seen, can not be much commended for elegance of outline or high finish; but some of the Danish vessels ascribed to the neolithic period are rather gracefully formed and well made, like the vase represented above. The ornamentation of the Stone

* This simple contrivance, it seems, came into use at a much later time, for even the lacustrine pottery of the Bronze Age is hand-made.

Age pottery chiefly consisted in rows of dots and in parallel and zigzag lines, which were traced or impressed on the wet clay. The primitive potters hardly ever introduced curved lines, and never attempted to engrave the imitation of a plant, an animal, or any natural object whatever on their ware.

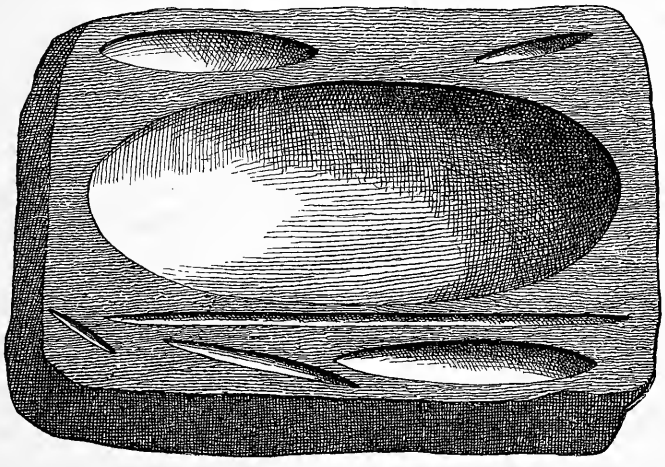
Some of our readers, doubtless, have become aware that certain European stone implements bear a most striking resemblance to corresponding articles of stone left by the aborigines of this country. The similarity, however, is not confined to the manufactures of Europe and North America, but may be traced all over the inhabited globe. The tools and weapons of stone exhibit everywhere nearly the same forms, whether they are found in Japan or at the Cape of Good Hope, in Tierra del Fuego or in Denmark and England. Yet such analogies can not be a matter of surprise; on the contrary, it would be strange if they were wanting, considering that the spur of necessity urged primitive men in all parts of the world and in all ages to resort to the simplest means for meeting the exigencies of life. Their inventive powers, impelled by similar motives, necessarily led them to similar mechanical contrivances. "Some years ago," says Samuel Smiles, in his "Industrial Biography," "there was exhibited at the Crystal Palace [England] a collection of ancient European weapons and implements placed alongside a similar collection of articles brought from the South Seas, and they were in most respects so much alike that it was difficult to believe that they did not belong to the same race and period, instead of being the implements of races sundered by half the globe, and living at periods several thousand years apart. Nearly every weapon in the one collection had its counterpart in the other—the mauls or celts of stone, the spear-heads of flint or jasper, the arrow-heads of flint or bone, and the saws of jagged stone, showing how human ingenuity, under like circumstances, had resorted to like expedients." The resemblance probably would have been greater if the exhibitors,

instead of the South Sea manufactures, had placed those of the North American aborigines along-side the implements fabricated by the ancient Europeans; for the Indian arrow and spear-heads, cutting tools, scrapers, celts, hammer-stones, net-sinkers, etc., are sometimes absolutely identical in shape with those of Europe, insomuch that they can only be distinguished from each other by the difference of the material. This difference is chiefly perceivable in the chipped implements, which, as we have seen, were made in Europe, to a great extent, of cretaceous flint; while in North America, where the real flint does not seem to occur, horn-stone, jasper, common quartz, and other stones of a silicious character, formed the materials of which the aborigines generally manufactured their darts, scrapers, saws, piercers, and cutting tools. The ground celts, however, frequently consist of greenstone both in Europe and in this country, and they are so much alike in shape that a celt found in New Jersey or in Missouri might pass for an English or a German specimen.

The perseverance displayed in the manufacture of such stone implements as we have described should not be underrated. An experienced flint-chipper, it may be assumed, was able to produce his ware in a comparatively short time; but the grinding and polishing of celts and axes and the drilling of the latter must have required an enormous amount of patient, long-continued labor. So much may be deduced from the testimony of observers who witnessed similar performances among modern uncultivated races. The learned Jesuit Lafitau, for instance, who wrote a remarkable work on the North American Indians, among whom he had lived as a missionary, mentions that an Indian sometimes spent his life-time in making a stone tomahawk, yet without entirely finishing it, and that such an implement descended as a precious heir-loom in a family. This statement would appear somewhat exaggerated; but Mr. Alfred Wallace makes a similar observation concerning certain quartz cylinders worn by chiefs on the Rio Negro,

in South America. The perforation of such cylinders, he remarks, is said sometimes to take two men's lives.* But savages are utterly regardless of time, and so were undoubtedly the people of the European Stone Age. It is only civilized man that minds the fleeting hour.

Allusion has been made to the stones on which the lake-men of Switzerland ground and polished their celts and axes. Such grinding-stones are not rare in other countries of Europe, though not generally as characteristic as the stone here figured, which was



GRINDING-STONE.—VARENNE-SAINT-HILAIRE, FRANCE.

discovered in 1860 by M. Leguay at Varenne-Saint-Hilaire, in the Department of the Seine. It is an unwrought sandstone slab thirteen inches thick, thirty-seven inches long, and twenty-one wide, and bearing on its flat surface the cavities and grooves caused by the operation of grinding. Over this slab of sandstone bent the ancient celt-maker, rubbing on it the rough-hewn implement, forward and backward, until by dint of hard labor it

* The process consists in twirling a flexible leaf-shoot of wild plantain between the hands, and thus grinding the hole with the aid of fine sand and water.

slowly and gradually assumed the intended shape; and, after all the toil bestowed upon its production, it was but a wretched substitute for the kindred metallic tool of later times. And yet we would emphatically remind the reader that the period during which man in Europe had to content himself with implements of stone undoubtedly far exceeds in duration the comparatively short epoch characterized by the knowledge of metals, and that the so-called historical age forms but a small fraction of the vast time that has elapsed since man shared the soil of Europe with the extinct species of pachyderms and carnivores.

The question to what race or races the men of neolithic times and of the Stone Age in general belonged is far from being solved, and forms at the present time a standing topic of discussion among the *savants* of Europe. Both the Neanderthal skull and that of the Engis cave present the elongated (or dolichocephalous) cranial formation; and the troglodytes of Southern France, who hunted the reindeer and the horse, likewise belonged to a long-headed race, if the skulls found in the Cro-Magnon cave, and in others to which we have not referred, are to be taken as types. They are considered by some as a people allied to the Eskimos, and we remember having read an article in the London *Saturday Review* in which the absolute identity of the Dordogne cave-men with the Eskimos was advocated. The reader will remember that the kitchen-middens of Denmark have yielded no human remains, but that some skulls obtained from Danish megalithic tumuli, believed to belong to the same age, are small and round (or brachycephalous), and remarkable for overhanging brows, on the whole exhibiting a formation somewhat similar to that observed in the skulls of Laplanders.* Indeed, tribes akin to the Laplanders and Finns

* Professor Virchow, however, who measured, some years ago, in Copenhaen, skulls of Lapps, Finns, and Eskimos, as well as a considerable number of neolithic Stone Age skulls, arrived at a somewhat different conclusion. He considers the Lapps and Finns as brachycephalous and the Greenland Eskimos

are supposed by some ethnologists to have spread in ancient times over the greater part of Europe, until they were gradually dispossessed by immigrants of Celtic and Teutonic stock. In Great Britain, however, tumuli resembling in construction those of Denmark have been found to contain skeletons of a people with skulls so long and narrow as to suggest a resemblance to boats; and Professor Nilsson states that most of the skulls met in the Stone Age graves of the Scandinavian peninsula are also of the elongated form. In the oldest Swiss lake settlements so few human remains have been found that comparatively little is known of the physical characteristics of their builders. The skull of Meilen, about which much has been said, presents a shape intermediate between the long-headed and short-headed types. Dr. Keller, the restorer, as it were, of the pile-works, first ascribed these constructions to a Celtic people; but it appears that he has of late relinquished that view. Thus we meet in Europe at a very early time with variations in the cranial structure of man—a circumstance which can not be surprising, if all probable changes in the population arising from immigrations and intermixing of races during the long prehistoric epoch are taken into consideration; and the effort to fix in these late days the types of primeval man appears like an almost hopeless task. Yet the most distinguished anthropologists of Europe devote all their energies to the solution of that interesting problem. May they succeed!

Our series of sketches contains but a scanty record of what has been done during the last decades toward elucidating the early condition of man in Europe. Avoiding as much as possible the introduction of theories, we have merely selected and presented in proper succession a number of facts particularly suited to illustrate the early phases of human life in Europe. Our

as dolichocephalous, while he discovers in the Danish skulls of the Stone Age a formation lying between both extremes, though with a tendency to brachycephalism.

statements, however, will enable the reader to draw the important conclusion that the earliest known condition of man in Europe, as indicated by the tokens left by him, must have been one of utter barbarism, from which he elevated himself slowly but steadily, during the lapse of ages, to his present superior position.

Primitive man sometimes has been described as a pure and happy being, subsisting without exertion on the spontaneous gifts of nature, and enjoying perfect exemption from all those ills which have fallen to the lot of later "degenerate" mortals. Ovid, among other poets of classical antiquity, draws a charming picture of man's state during the infancy of his existence, calling that period the Golden Age of the world. Such conceptions of primeval perfection are certainly very beautiful, but they appear utterly mythical when measured by the standard of modern science. The European of the Drift Age, who fought with the lion and the bear for the possession of a cave, can not have been a happy and a morally perfect being. The extreme rudeness of his mode of life precludes that possibility: a hunter of the lowest grade, he was among men what the carnivorous beast is among animals. We must assign to him the position of a savage, but of a savage as far below the buffalo-hunting Pawnee as the latter is removed from the cultivated representative of the Caucasian race.

"This," says Carl Vogt, "was the paradisean state of primitive man, as narrated to us by those silent witnesses, the stones and bones. From such a low condition has the human species gradually extricated itself, in a bitter struggle for existence, which it was well able to maintain by being gifted with a larger amount of brain and intelligence than that possessed by the surrounding animal world."

THE END.

VALUABLE & INTERESTING WORKS

FOR PUBLIC AND PRIVATE LIBRARIES,

PUBLISHED BY HARPER & BROTHERS, NEW YORK.

☞ *For a full List of Books suitable for Libraries, see* HARPER & BROTHERS' TRADE-LIST *and* CATALOGUE, *which may be had gratuitously on application to the Publishers personally, or by letter enclosing Ten Cents.*

☞ HARPER & BROTHERS *will send any of the following works by mail, postage prepaid, to any part of the United States, on receipt of the price.*

SCHWEINFURTH'S HEART OF AFRICA. The Heart of Africa: or, Three Years' Travels and Adventures in the Unexplored Regions of the Centre of Africa. From 1868 to 1871. By Dr. GEORG SCHWEINFURTH. Translated by ELLEN E. FREWER. With an Introduction by WINWOOD READE. Illustrated by about 130 Woodcuts from Drawings made by the Author, and with Two Maps. 2 vols., 8vo, Cloth, $8 00.

FLAMMARION'S ATMOSPHERE. The Atmosphere. Translated from the French of CAMILLE FLAMMARION. Edited by JAMES GLAISHER, F.R.S., Superintendent of the Magnetical and Meteorological Department of the Royal Observatory at Greenwich. With 10 Chromo-Lithographs and 86 Woodcuts. 8vo, Cloth, $6 00.

HUDSON'S HISTORY OF JOURNALISM. Journalism in the United States, from 1690 to 1872. By FREDERICK HUDSON. Crown 8vo, Cloth, $5 00.

DR. LIVINGSTONE'S LAST JOURNALS. The Last Journals of David Livingstone, in Central Africa, from 1865 to his Death. Continued by a Narrative of his Last Moments and Sufferings, obtained from his faithful Servants Chuma and Susi. By HORACE WALLER, F.R.G.S., Rector of Twywell, Northampton. With Maps and Illustrations. 8vo, Cloth, $5 00. Popular Edition, $2 50.

SIR SAMUEL BAKER'S ISMAILÏA. Ismailïa: A Narrative of the Expedition to Central Africa for the Suppression of the Slave Trade. Organized by ISMAIL, Khedive of Egypt. By Sir SAMUEL W. BAKER, PASHA, F.R.S., F.R.G.S. With Maps, Portraits, and upward of Fifty full-page Illustrations by ZWECKER and DURAND. 8vo, Cloth, $5 00.

MYERS'S REMAINS OF LOST EMPIRES. Remains of Lost Empires. Sketches of the Ruins of Palmyra, Nineveh, Babylon, and Persepolis, with some Notes on India and the Cashmerian Himalayas. By P. V. N. MYERS, A.M. Illustrations. Crown 8vo, Cloth, $3 50.

EVANGELICAL ALLIANCE CONFERENCE, 1873. History, Essays, Orations, and Other Documents of the Sixth General Conference of the Evangelical Alliance, held in New York, Oct. 2–12, 1873. Edited by Rev. PHILIP SCHAFF, D.D., and Rev. S. IRENÆUS PRIME, D.D. With Portraits of Rev. Messrs. Pronier, Carrasco, and Cook, recently deceased. 8vo, Cloth, nearly 800 pages, $6 00.

VINCENT'S LAND OF THE WHITE ELEPHANT. The Land of the White Elephant: Sights and Scenes in Southeastern Asia. A Personal Narrative of Travel and Adventure in Farther India, embracing the Countries of Burma, Siam, Cambodia, and Cochin-China (1871–2). By FRANK VINCENT, Jr. Magnificently illustrated with Map, Plans, and numerous Woodcuts. Crown 8vo, Cloth, $3 50.

TRISTRAM'S THE LAND OF MOAB. The Result of Travels and Discoveries on the East Side of the Dead Sea and the Jordan. By H. B. TRISTRAM, M.A., LL.D., F.R.S., Master of the Greatham Hospital, and Hon. Canon of Durham. With a Chapter on the Persian Palace of Mashita, by JAS. FERGUSON, F.R.S. With Map and Illustrations. Crown 8vo, Cloth, $2 50.

SANTO DOMINGO, Past and Present; with a Glance at Hayti. By SAMUEL HAZARD. Maps and Illustrations. Crown 8vo, Cloth, $3 50.

SMILES'S HUGUENOTS AFTER THE REVOCATION. The Huguenots in France after the Revocation of the Edict of Nantes: with a Visit to the Country of the Vaudois. By SAMUEL SMILES. Crown 8vo, Cloth, $2 00.

POETS OF THE NINETEENTH CENTURY. The Poets of the Nineteenth Century. Selected and Edited by the Rev. Robert Aris Willmott. With English and American Additions, arranged by Evert A. Duyckinck, Editor of "Cyclopædia of American Literature." Comprising Selections from the Greatest Authors of the Age. Superbly Illustrated with 141 Engravings from Designs by the most Eminent Artists. In elegant small 4to form, printed on Superfine Tinted Paper, richly bound in extra Cloth, Beveled, Gilt Edges, $5 00; Half Calf, $5 50; Full Turkey Morocco, $9 00.

THE REVISION OF THE ENGLISH VERSION OF THE NEW TESTAMENT. With an Introduction by the Rev. P. Schaff, D.D. 618 pp., Crown 8vo, Cloth, $3 00.

This work embraces in one volume:

I. ON A FRESH REVISION OF THE ENGLISH NEW TESTAMENT. By J. B. Lightfoot, D.D., Canon of St. Paul's, and Hulsean Professor of Divinity, Cambridge. Second Edition, Revised. 196 pp.

II. ON THE AUTHORIZED VERSION OF THE NEW TESTAMENT in Connection with some Recent Proposals for its Revision. By Richard Chenevix Trench, D.D., Archbishop of Dublin. 194 pp.

III. CONSIDERATIONS ON THE REVISION OF THE ENGLISH VERSION OF THE NEW TESTAMENT. By J. C. Elligott, D.D., Bishop of Gloucester and Bristol. 178 pp.

NORDHOFF'S CALIFORNIA. California: for Health, Pleasure, and Residence. A Book for Travelers and Settlers. Illustrated. 8vo, Cloth, $2 50.

NORDHOFF'S NORTHERN CALIFORNIA, OREGON, AND THE SANDWICH ISLANDS. Illustrated. 8vo, Cloth, $2 50.

MOTLEY'S DUTCH REPUBLIC. The Rise of the Dutch Republic. By John Lothrop Motley, LL.D., D.C.L. With a Portrait of William of Orange. 3 vols., 8vo, Cloth, $10 50.

MOTLEY'S UNITED NETHERLAND'S. History of the United Netherlands: from the Death of William the Silent to the Twelve Years' Truce—1609. With a full View of the English-Dutch Struggle against Spain, and of the Origin and Destruction of the Spanish Armada. By John Lothrop Motley, LL.D., D.C.L. Portraits. 4 vols., 8vo, Cloth, $14 00.

MOTLEY'S LIFE AND DEATH OF JOHN OF BARNEVELD. Life and Death of John of Barneveld, Advocate of Holland. With a View of the Primary Causes and Movements of "The Thirty Years' War." By John Lothrop Motley, D.C.L. With Illustrations. In Two Volumes. 8vo, Cloth, $7 00.

HAYDN'S DICTIONARY OF DATES, relating to all Ages and Nations. For Universal Reference. Edited by Benjamin Vincent, Assistant Secretary and Keeper of the Library of the Royal Institution of Great Britain; and Revised for the Use of American Readers. 8vo, Cloth, $5 00; Sheep, $6 00.

MACGREGOR'S ROB ROY ON THE JORDAN. The Rob Boy on the Jordan, Nile, Red Sea, and Gennesareth, &c. A Canoe Cruise in Palestine and Egypt, and the Waters of Damascus. By J. Macgregor, M.A. With Maps and Illustrations. Crown 8vo, Cloth, $2 50.

WALLACE'S MALAY ARCHIPELAGO. The Malay Archipelago: the Land of the Orang-Utan and the Bird of Paradise. A Narrative of Travel, 1854–1862. With Studies of Man and Nature. By Alfred Russel Wallace. With Ten Maps and Fifty-one Elegant Illustrations. Crown 8vo, Cloth, $2 50.

WHYMPER'S ALASKA. Travel and Adventure in the Territory of Alaska, formerly Russian America—now Ceded to the United States—and in various other parts of the North Pacific. By Frederick Whymper. With Map and Illustrations. Crown 8vo, Cloth, $2 50.

ORTON'S ANDES AND THE AMAZON. The Andes and the Amazon; or, Across the Continent of South America. By James Orton, M.A., Professor of Natural History in Vassar College, Poughkeepsie, N. Y., and Corresponding Member of the Academy of Natural Sciences, Philadelphia. With a New Map of Equatorial America and numerous Illustrations. Crown 8vo, Cloth, $2 00.

WINCHELL'S SKETCHES OF CREATION. Sketches of Creation: a Popular View of some of the Grand Conclusions of the Sciences in reference to the History of Matter and of Life. Together with a Statement of the Intimations of Science respecting the Primordial Condition and the Ultimate Destiny of the Earth and the Solar System. By Alexander Winchell, LL.D., Professor of Geology, Zoology, and Botany in the University of Michigan, and Director of the State Geological Survey. With Illustrations. 12mo, Cloth, $2 00.

LOSSING'S FIELD-BOOK OF THE REVOLUTION. Pictorial Field-Book of the Revolution; or, Illustrations, by Pen and Pencil, of the History, Biography, Scenery, Relics, and Traditions of the War for Independence. By BENSON J. LOSSING. 2 vols., 8vo, Cloth, $14 00; Sheep, $15 00; Half Calf, $18 00; Full Turkey Morocco, $22 00.

LOSSING'S FIELD-BOOK OF THE WAR OF 1812. Pictorial Field-Book of the War of 1812; or, Illustrations, by Pen and Pencil, of the History, Biography, Scenery, Relics, and Traditions of the Last War for American Independence. By BENSON J. LOSSING. With several hundred Engravings on Wood, by Lossing and Barritt, chiefly from Original Sketches by the Author. 1088 pages, 8vo, Cloth, $7 00; Sheep, $8 50; Half Calf, $10 00.

ALFORD'S GREEK TESTAMENT. The Greek Testament: with a critically revised Text; a Digest of Various Readings; Marginal References to Verbal and Idiomatic Usage; Prolegomena; and a Critical and Exegetical Commentary. For the Use of Theological Students and Ministers. By HENRY ALFORD, D.D., Dean of Canterbury. Vol. I., containing the Four Gospels. 944 pages, 8vo, Cloth, $6 00; Sheep, $6 50.

ABBOTT'S FREDERICK THE GREAT. The History of Frederick the Second, called Frederick the Great. By JOHN S. C. ABBOTT. Elegantly Illustrated. 8vo, Cloth, $5 00.

ABBOTT'S HISTORY OF THE FRENCH REVOLUTION. The French Revolution of 1789, as viewed in the Light of Republican Institutions. By JOHN S. C. ABBOTT. With 100 Engravings. 8vo, Cloth, $5 00.

ABBOTT'S NAPOLEON BONAPARTE. The History of Napoleon Bonaparte. By JOHN S. C. ABBOTT. With Maps, Woodcuts, and Portraits on Steel. 2 vols., 8vo, Cloth, $10 00.

ABBOTT'S NAPOLEON AT ST. HELENA; or, Interesting Anecdotes and Remarkable Conversations of the Emperor during the Five and a Half Years of his Captivity. Collected from the Memorials of Las Casas, O'Meara, Montholon, Antommarchi, and others. By JOHN S. C. ABBOTT. With Illustrations. 8vo, Cloth, $5 00.

ADDISON'S COMPLETE WORKS. The Works of Joseph Addison, embracing the whole of the "Spectator." Complete in 3 vols., 8vo, Cloth, $6 00.

ALCOCK'S JAPAN. The Capital of the Tycoon: a Narrative of a Three Years' Residence in Japan. By Sir RUTHERFORD ALCOCK, K.C.B., Her Majesty's Envoy Extraordinary and Minister Plenipotentiary in Japan. With Maps and Engravings. 2 vols., 12mo, Cloth, $3 50.

ALISON'S HISTORY OF EUROPE. FIRST SERIES: From the Commencement of the French Revolution, in 1789, to the Restoration of the Bourbons, in 1815. [In addition to the Notes on Chapter LXXVI., which correct the errors of the original work concerning the United States, a copious Analytical Index has been appended to this American edition.] SECOND SERIES: From the Fall of Napoleon, in 1815, to the Accession of Louis Napoleon, in 1852. 8 vols., 8vo, Cloth, $16 00.

BALDWIN'S PRE-HISTORIC NATIONS. Pre-Historic Nations; or, Inquiries concerning some of the Great Peoples and Civilizations of Antiquity, and their Probable Relation to a still Older Civilization of the Ethiopians or Cushites of Arabia. By JOHN D. BALDWIN, Member of the American Oriental Society. 12mo, Cloth, $1 75.

BARTH'S NORTH AND CENTRAL AFRICA. Travels and Discoveries in North and Central Africa: being a Journal of an Expedition undertaken under the Auspices of H. B. M.'s Government, in the Years 1849–1855. By HENRY BARTH, Ph.D., D.C.L. Illustrated. 3 vols., 8vo, Cloth, $12 00.

HENRY WARD BEECHER'S SERMONS. Sermons by HENRY WARD BEECHER, Plymouth Church, Brooklyn. Selected from Published and Unpublished Discourses, and Revised by their Author. With Steel Portrait. Complete in 2 vols., 8vo, Cloth, $5 00.

LYMAN BEECHER'S AUTOBIOGRAPHY, &c. Autobiography, Correspondence, &c., of Lyman Beecher, D.D. Edited by his Son, CHARLES BEECHER. With Three Steel Portraits, and Engravings on Wood. In 2 vols., 12mo, Cloth, $5 00.

BOSWELL'S JOHNSON. The Life of Samuel Johnson, LL.D. Including a Journey to the Hebrides. By JAMES BOSWELL, Esq. A New Edition, with numerous Additions and Notes. By JOHN WILSON CROKER, LL.D., F.R.S. Portrait of Boswell. 2 vols., 8vo, Cloth, $4 00.

DRAPER'S CIVIL WAR. History of the American Civil War. By JOHN W. DRAPER, M.D., LL.D., Professor of Chemistry and Physiology in the University of New York. In Three Vols. 8vo, Cloth, $3 50 per vol.

DRAPER'S INTELLECTUAL DEVELOPMENT OF EUROPE. A History of the Intellectual Development of Europe. By JOHN W. DRAPER, M.D., LL.D., Professor of Chemistry and Physiology in the University of N. Y. *(New Edition in Press.)*

DRAPER'S AMERICAN CIVIL POLICY. Thoughts on the Future Civil Policy of America. By JOHN W. DRAPER, M.D., LL.D., Professor of Chemistry and Physiology in the University of New York. Crown 8vo, Cloth, $2 00.

DU CHAILLU'S AFRICA. Explorations and Adventures in Equatorial Africa with Accounts of the Manners and Customs of the People, and of the Chase of the Gorilla, the Crocodile, Leopard, Elephant, Hippopotamus, and other Animals. By PAUL B. DU CHAILLU. Numerous Illustrations. 8vo, Cloth, $5 00.

BELLOWS'S OLD WORLD. The Old World in its New Face: Impressions of Europe in 1867–1868. By HENRY W. BELLOWS. 2 vols., 12mo, Cloth, $3 50.

BRODHEAD'S HISTORY OF NEW YORK. History of the State of New York. By JOHN ROMEYN BRODHEAD. 1609–1691. 2 vols. 8vo, Cloth, $3 00 per vol.

BROUGHAM'S AUTOBIOGRAPHY. Life and Times of HENRY, LORD BROUGHAM. Written by Himself. In Three Volumes. 12mo, Cloth, $2 00 per vol.

BULWER'S PROSE WORKS. Miscellaneous Prose Works of Edward Bulwer, Lord Lytton. 2 vols., 12mo, Cloth, $3 50.

BULWER'S HORACE. The Odes and Epodes of Horace. A Metrical Translation into English. With Introduction and Commentaries. By LORD LYTTON. With Latin Text from the Editions of Orelli, Macleane, and Yonge. 12mo, Cloth, $1 75.

BULWER'S KING ARTHUR. A Poem. By EARL LYTTON. New Edition. 12mo, Cloth, $1 75.

BURNS'S LIFE AND WORKS. The Life and Works of Robert Burns. Edited by ROBERT CHAMBERS. 4 vols., 12mo, Cloth, $6 00.

REINDEER, DOGS, AND SNOW-SHOES. A Journal of Siberian Travel and Explorations made in the Years 1865–'67. By RICHARD J. BUSH, late of the Russo-American Telegraph Expedition. Illustrated. Crown 8vo, Cloth, $3 00.

CARLYLE'S FREDERICK THE GREAT. History of Friedrich II., called Frederick the Great. By THOMAS CARLYLE. Portraits, Maps, Plans, &c. 6 vols., 12mo, Cloth, $12 00.

CARLYLE'S FRENCH REVOLUTION. History of the French Revolution. Newly Revised by the Author, with Index, &c. 2 vols., 12mo, Cloth, $3 50.

CARLYLE'S OLIVER CROMWELL. Letters and Speeches of Oliver Cromwell. With Elucidations and Connecting Narrative. 2 vols., 12mo, Cloth, $3 50.

CHALMERS'S POSTHUMOUS WORKS. The Posthumous Works of Dr. Chalmers. Edited by his Son-in-Law, Rev. WILLIAM HANNA, LL.D. Complete in 9 vols., 12mo, Cloth, $13 50.

COLERIDGE'S COMPLETE WORKS. The Complete Works of Samuel Taylor Coleridge. With an Introductory Essay upon his Philosophical and Theological Opinions. Edited by Professor SHEDD. Complete in Seven Vols. With a fine Portrait. Small 8vo, Cloth, $10 50.

DOOLITTLE'S CHINA. Social Life of the Chinese: with some Account of their Religious, Governmental, Educational, and Business Customs and Opinions. With special but not exclusive Reference to Fuhchau. By Rev. JUSTUS DOOLITTLE, Fourteen Years Member of the Fuhchau Mission of the American Board. Illustrated with more than 150 characteristic Engravings on Wood. 1 vol., Cr. 8vo, Cloth, $3 50.

GIBBON'S ROME. History of the Decline and Fall of the Roman Empire. By EDWARD GIBBON. With Notes by Rev. H. H. MILMAN and M. GUIZOT. A new cheap Edition. To which is added a complete Index of the whole Work, and a Portrait of the Author. 6 vols., 12mo, Cloth, $6 00.

HAZEN'S SCHOOL AND ARMY IN GERMANY AND FRANCE. The School and the Army in Germany and France, with a Diary of Siege Life at Versailles. By Brevet Major-General W. B. HAZEN, U.S.A., Colonel Sixth Infantry. Crown 8vo, Cloth, $2 50.

HARPER'S NEW CLASSICAL LIBRARY. Literal Translations.

The following Volumes are now ready. Portraits. 12mo, Cloth, $1 50 each.

CÆSAR.—VIRGIL.—SALLUST.—HORACE.—CICERO'S ORATIONS.—CICERO'S OFFICES, &c.—CICERO ON ORATORY AND ORATORS.—TACITUS (2 vols.).—TERENCE.—SOPHOCLES.—JUVENAL.—XENOPHON.—HOMER'S ILIAD.—HOMER'S ODYSSEY.—HERODOTUS.—DEMOSTHENES.—THUCYDIDES.—ÆSCHYLUS.—EURIPIDES (2 vols.).—LIVY (2 vols.).—PLATO.

DAVIS'S CARTHAGE. Carthage and her Remains: being an Account of the Excavations and Researches on the Site of the Phœnician Metropolis in Africa and other adjacent Places. Conducted under the Auspices of Her Majesty's Government. By Dr. DAVIS, F.R.G.S. Profusely Illustrated with Maps, Woodcuts, Chromo-Lithographs, &c. 8vo, Cloth, $4 00.

EDGEWORTH'S (MISS) NOVELS. With Engravings. 10 vols., 12mo, Cloth, $15 00.

GROTE'S HISTORY OF GREECE. 12 vols., 12mo, Cloth, $18 00.

HELPS'S SPANISH CONQUEST. The Spanish Conquest in America, and its Relation to the History of Slavery and to the Government of Colonies. By ARTHUR HELPS. 4 vols., 12mo, Cloth, $6 00.

HALE'S (MRS.) WOMAN'S RECORD. Woman's Record; or, Biographical Sketches of all Distinguished Women, from the Creation to the Present Time. Arranged in Four Eras, with Selections from Female Writers of each Era. By MRS. SARAH JOSEPHA HALE. Illustrated with more than 200 Portraits. 8vo, Cloth, $5 00.

HALL'S ARCTIC RESEARCHES. Arctic Researches and Life among the Esquimaux: being the Narrative of an Expedition in Search of Sir John Franklin, in the Years 1860, 1861, and 1862. By CHARLES FRANCIS HALL. With Maps and 100 Illustrations. The Illustrations are from Original Drawings by Charles Parsons, Henry L. Stephens, Solomon Eytinge, W. S. L. Jewett, and Granville Perkins, after Sketches by Captain Hall. 8vo, Cloth, $5 00.

HALLAM'S CONSTITUTIONAL HISTORY OF ENGLAND, from the Accession of Henry VII. to the Death of George II. 8vo, Cloth, $2 00.

HALLAM'S LITERATURE. Introduction to the Literature of Europe during the Fifteenth, Sixteenth, and Seventeenth Centuries. By HENRY HALLAM. 2 vols., 8vo, Cloth, $4 00.

HALLAM'S MIDDLE AGES. State of Europe during the Middle Ages. By HENRY HALLAM. 8vo, Cloth, $2 00.

HILDRETH'S HISTORY OF THE UNITED STATES. FIRST SERIES: From the First Settlement of the Country to the Adoption of the Federal Constitution. SECOND SERIES: From the Adoption of the Federal Constitution to the End of the Sixteenth Congress. 6 vols., 8vo, Cloth, $18 00.

HUME'S HISTORY OF ENGLAND. History of England, from the Invasion of Julius Cæsar to the Abdication of James II., 1688. By DAVID HUME. A new Edition, with the Author's last Corrections and Improvements. To which is Prefixed a short Account of his Life, written by Himself. With a Portrait of the Author. 6 vols., 12mo, Cloth, $6 00.

JAY'S WORKS. Complete Works of Rev. William Jay: comprising his Sermons, Family Discourses, Morning and Evening Exercises for every Day in the Year, Family Prayers, &c. Author's enlarged Edition, revised. 3 vols., 8vo, Cloth, $6 00.

JEFFERSON'S DOMESTIC LIFE. The Domestic Life of Thomas Jefferson: compiled from Family Letters and Reminiscences by his Great-Granddaughter, SARAH N. RANDOLPH. With Illustrations. Crown 8vo, Illuminated Cloth, Bevelled Edges, $2 50.

JOHNSON'S COMPLETE WORKS. The Works of Samuel Johnson, LL.D. With an Essay on his Life and Genius, by ARTHUR MURPHY, Esq. Portrait of Johnson. 2 vols., 8vo, Cloth, $4 00.

KINGLAKE'S CRIMEAN WAR. The Invasion of the Crimea, and an Account of its Progress down to the Death of Lord Raglan. By ALEXANDER WILLIAM KINGLAKE. With Maps and Plans. Three Vols. ready. 12mo, Cloth, $2 00 per vol.

KINGSLEY'S WEST INDIES. At Last: A Christmas in the West Indies. By CHARLES KINGSLEY. Illustrated. 12mo, Cloth, $1 50.

KRUMMACHER'S DAVID, KING OF ISRAEL. David, the King of Israel: a Portrait drawn from Bible History and the Book of Psalms. By FREDERICK WILLIAM KRUMMACHER, D.D., Author of "Elijah the Tishbite," &c. Translated under the express Sanction of the Author by the Rev. M. G. EASTON, M.A. With a Letter from Dr. Krummacher to his American Readers, and a Portrait. 12mo, Cloth, $1 75.

LAMB'S COMPLETE WORKS. The Works of Charles Lamb. Comprising his Letters, Poems, Essays of Elia, Essays upon Shakspeare, Hogarth, &c., and a Sketch of his Life, with the Final Memorials, by T. NOON TALFOURD. Portrait. 2 vols., 12mo, Cloth, $3 00.

LIVINGSTONE'S SOUTH AFRICA. Missionary Travels and Researches in South Africa; including a Sketch of Sixteen Years' Residence in the Interior of Africa, and a Journey from the Cape of Good Hope to Loando on the West Coast; thence across the Continent, down the River Zambesi, to the Eastern Ocean. By DAVID LIVINGSTONE, LL.D., D.C.L. With Portrait, Maps by Arrowsmith, and numerous Illustrations. 8vo, Cloth, $4 50.

LIVINGSTONES' ZAMBESI. Narrative of an Expedition to the Zambesi and its Tributaries, and of the Discovery of the Lakes Shirwa and Nyassa. 1858–1864. By DAVID and CHARLES LIVINGSTONE. With Map and Illustrations. 8vo, Cloth, $5 00.

M'CLINTOCK & STRONG'S CYCLOPÆDIA. Cyclopædia of Biblical, Theological, and Ecclesiastical Literature. Prepared by the Rev. JOHN M'CLINTOCK, D.D., and JAMES STRONG, S.T.D. 6 *vols. now ready.* Royal 8vo. Price per vol., Cloth, $5 00; Sheep, $6 00; Half Morocco, $8 00.

MARCY'S ARMY LIFE ON THE BORDER. Thirty Years of Army Life on the Border. Comprising Descriptions of the Indian Nomads of the Plains; Explorations of New Territory; a Trip across the Rocky Mountains in the Winter; Descriptions of the Habits of Different Animals found in the West, and the Methods of Hunting them; with Incidents in the Life of Different Frontier Men, &c., &c. By Brevet Brigadier-General R. B. MARCY, U.S.A., Author of "The Prairie Traveller." With numerous Illustrations. 8vo, Cloth, Beveled Edges, $3 00.

MACAULAY'S HISTORY OF ENGLAND. The History of England from the Accession of James II. By THOMAS BABINGTON MACAULAY. With an Original Portrait of the Author. 5 vols., 8vo, Cloth, $10 00; 12mo, Cloth, $5 00.

MOSHEIM'S ECCLESIASTICAL HISTORY, Ancient and Modern; in which the Rise, Progress, and Variation of Church Power are considered in their Connection with the State of Learning and Philosophy, and the Political History of Europe during that Period. Translated, with Notes, &c., by A. MACLAINE, D.D. A new Edition, continued to 1826, by C. COOTE, LL.D. 2 vols., 8vo, Cloth, $4 00.

NEVIUS'S CHINA. China and the Chinese: a General Description of the Country and its Inhabitants; its Civilization and Form of Government; its Religious and Social Institutions; its Intercourse with other Nations; and its Present Condition and Prospects. By the Rev. JOHN L. NEVIUS, Ten Years a Missionary in China. With a Map and Illustrations. 12mo, Cloth, $1 75.

THE DESERT OF THE EXODUS. Journeys on Foot in the Wilderness of the Forty Years' Wanderings; undertaken in connection with the Ordnance Survey of Sinai and the Palestine Exploration Fund. By E. H. PALMER, M.A., Lord Almoner's Professor of Arabic, and Fellow of St. John's College, Cambridge. With Maps and numerous Illustrations from Photographs and Drawings taken on the spot by the Sinai Survey Expedition and C. F. Tyrwhitt Drake. Crown 8vo, Cloth, $3 00.

OLIPHANT'S CHINA AND JAPAN. Narrative of the Earl of Elgin's Mission to China and Japan, in the Years 1857, '58, '59. By LAURENCE OLIPHANT, Private Secretary to Lord Elgin. Illustrations. 8vo, Cloth, $3 50.

OLIPHANT'S (MRS.) LIFE OF EDWARD IRVING. The Life of Edward Irving, Minister of the National Scotch Church, London. Illustrated by his Journals and Correspondence. By Mrs. OLIPHANT. Portrait. 8vo, Cloth, $3 50.

RAWLINSON'S MANUAL OF ANCIENT HISTORY. A Manual of Ancient History, from the Earliest Times to the Fall of the Western Empire. Comprising the History of Chaldæa, Assyria, Media, Babylonia, Lydia, Phœnicia, Syria, Judæa, Egypt, Carthage, Persia, Greece, Macedonia, Parthia, and Rome. By GEORGE RAWLINSON, M.A., Camden Professor of Ancient History in the University of Oxford. 12mo, Cloth, $2 50.