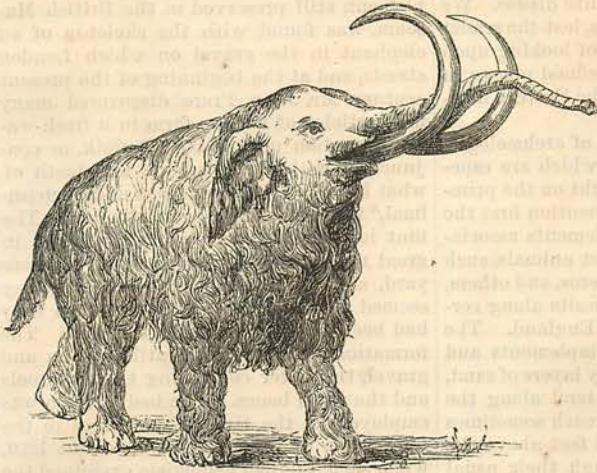


## THE STONE AGE IN EUROPE.

By CHARLES RAU.



THE MAMMOTH.

## 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 every where 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of copper and tin, the latter metal usually forming about one-tenth of the composition; and bronze again was finally superseded by *iron*, the most important of all metals, and the great lever of civilization.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 unacquaint-

ed 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 had no 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 archaeological 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 Mencheourt, 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 Pic-

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

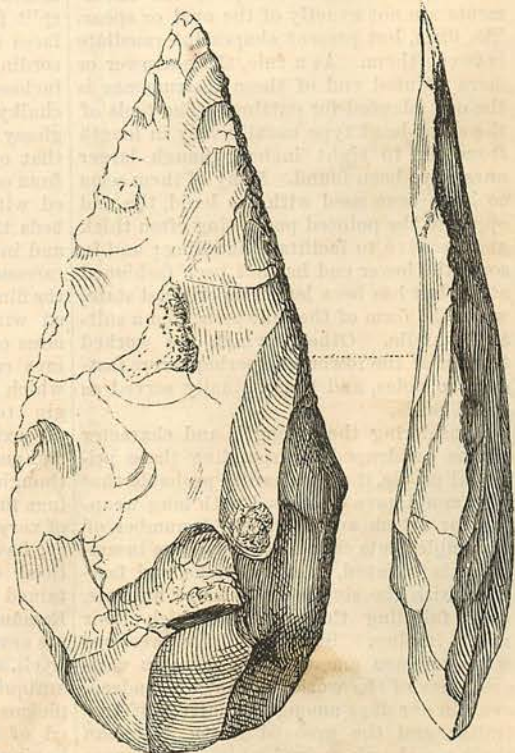
2. Calcareous loam, buff-colored, resembling loess, for the most part unstratified, in some places with slight traces of stratification, containing fresh-water and land shells, with bones of elephants, etc.; thickness about fifteen feet.

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.

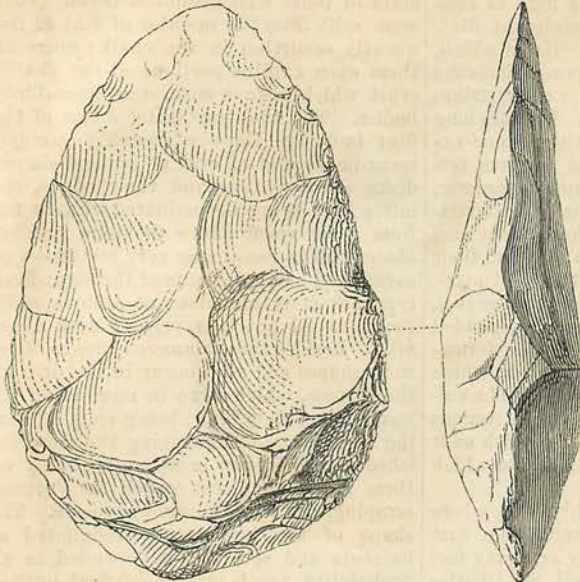
This third layer rests immediately upon the chalk. The mixture of fluviatile and marine shells observed in it proves, according to Lyell, that the sea sometimes gained upon the river, whether at high tides or when the fresh-water was less in quantity during the dry season, and sometimes, perhaps, when 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 to-



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



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

gether 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.

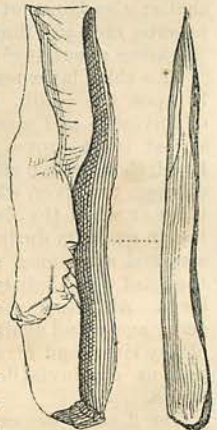
Considering the strength and character of the quadrupeds surrounding these primeval people, it seems hardly probable that they could have dispensed with long weapons for attack and defense. A number of the implements called hatchets were inserted, it is believed, in cleft sticks, and fastened with the 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.

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. Archaeologists therefore divide the European Stone Age into a period of chipped and one of ground stone, or, technically speaking, into a *palæolithic* (old-stone) and a *neolithic* (new-stone) peri-

od. 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 siliceous sands have a polished, glossy appearance, altogether different from that of newly broken flint; others, taken from ochrous 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



FLINT FLAKE FROM MONTIERS, AMIENS (HALF SIZE).

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 both were deposited at the same period.

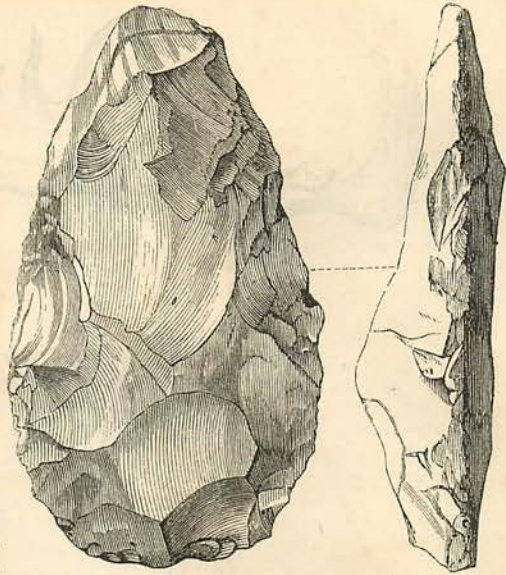
Though we have already attempted to indicate some of the probable uses to which the flint tools were applied, it must not be inferred that people in as low a state as the drift men were particularly choice in the employment of their scanty utensils, which, on the contrary, as we may suppose, had to serve 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, notwithstanding 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 petrification, *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



COSCINOPORA  
GLOBULARIS  
(NATURAL SIZE).

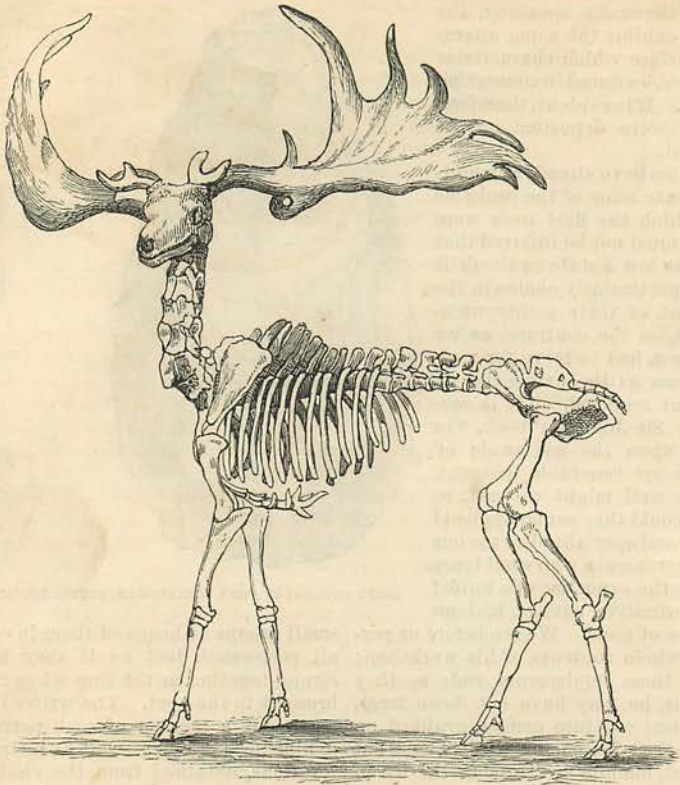


DRIFT IMPLEMENT FROM IOKLINGHAM, SUFFOLK (HALF SIZE).

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 petrifications, 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 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 ac-



SKELETON OF GIGANTIC IRISH DEER.

count 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.

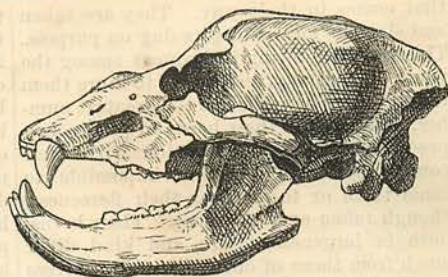
**THE MAMMOTH** (*Elephas primigenius*).—An elephant of huge size, with enormous tusks, much more curved than those of existing species. The remains of this animal, which became extinct in Europe at so early a period that not the slightest tradition of its former existence has survived, are found in 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 South Carolina. 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 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, who traveled in that direction, 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 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 the twenty-eight caudal vertebrae 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 trod 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 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. Other species of elephants, among them the *Elephas antiquus*, existed during the drift time, but their remains occur less frequently than those of the mammoth.

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



SKULL OF CAVE-BEAR.

body, but so short-legged that its belly must have nearly touched the ground. It 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.

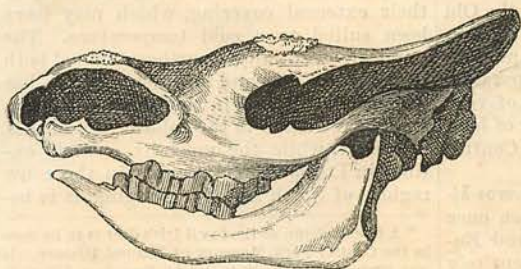
THE HIPPOPOTAMUS.—Probably represented by several species during the drift. One of them, the *Hippopotamus major*, was not uncommon.

THE CAVE-BEAR (*Ursus spelæus*).—The remains of this animal, 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 and Spain. The cave-bear, 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 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, perhaps more properly called cave-tiger (*Felis spelæa*).—An extinct animal, superior in size and strength to any of the present species of lions and tigers.

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



SKULL OF WOOLLY-HAIRED RHINOCEROS.

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 *Nibelungen Lied* 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 England, 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. The aurochs seems to have existed in Europe long before the arrival of the mammoth and the woolly rhinoceros. Remains are found in England, France, Germany, Switzerland, and Denmark. Pliny and Seneca speak of it as existing in the great forests of Germany, but Caesar gives no account of the animal, which is, however, mentioned, by the side of the urus, in the *Nibelungen Lied*, 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** (*Oribos 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 very 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 mys-

terious animal mentioned as the *schelch* in the *Nibelungen Lied* 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 underlying the peat. The Irish deer seems to have lived in Europe as early as the tertiary period. 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 mammals, 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.

The climate of Europe, as we already observed, must have been more rigorous at that period than at present. Yet the cavellion, hyena, hippopotamus, elephant, rhinoceros, etc., would seem to indicate a warm rather than a cold climate. In order to anticipate this objection, which is likely to suggest itself to the reader, we will repeat 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 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. 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 be-

\* A fine skeleton of the fossil Irish deer is to be seen in the Central Park Museum of Natural History. It was presented to the museum by Professor Albert S. Bickmore.



lieved, 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.

All these facts, to which others of similar purport could be added if it were deemed necessary, are indicative of a rigorous temperature during 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 effected 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. This remarkable change constituted an epoch of extremely long duration, until at length the glaciers melted, and a milder temperature was gradually restored. 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. Many curious phenomena, such as the transportation of boulders and the formation of loess, are connected with this so-called *Glacial Period*,\*

\* Some geologists believe in two glacial epochs separated by a period of milder temperature. Mr. James Geikie has published in the course of this year (1874) a work entitled *The Great Ice Age, and its Relation to the Antiquity of Man*, in which he advances views differing from those held by many other geologists. He is of opinion that certain animals whose remains occur commingled in river gravels and cave deposits can not have been contemporary inhabitants of the same

an exposition of which 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 produced 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; for though the tool and bone bearing gravels so often mentioned in these pages probably were not deposited during the glacial period, but somewhat later, it is evident that its after-effect was then still keenly operating.

Surrounded by an animal world such as we have described, under an inclement sky, 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. Archaeologists are accustomed to infer the social state of prehistoric populations from the productions of their mechanical skill; and here we behold 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,

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, tiger, 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 be adopted.

\* 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.

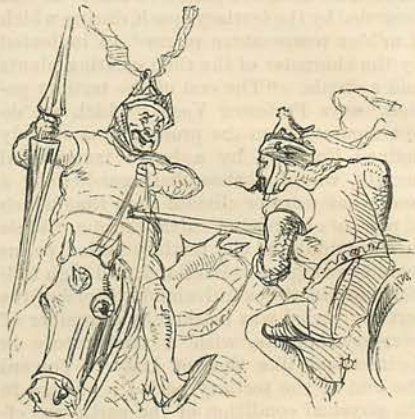
was adduced as a ground for their disappearance. At length, however, M. Boucher de Perthes succeeded in finding, at Moulin-Quignon, near Abbeville, a human lower jaw of peculiar shape, which he extracted himself from the stratum immediately above the chalk. The jaw is of the same dark bluish color that 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 1863 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 centimeters, 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."

## AMERICAN HUMOR.

BY THE HON. S. S. COX.



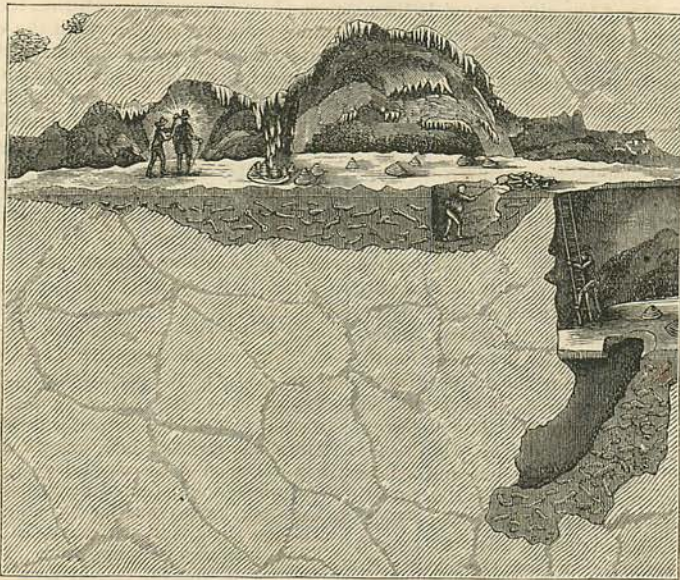
**H**UMOR in its literal meaning is moisture. Its derived sense is different; but while it is now a less sluggish element than moisture, we still associate with humor some of its old relations. In old times physicians reckoned several kinds of moisture in the human body—phlegm, blood, cholera, and melancholy. They found one vein particularly made for a laugh to run in, the blood of which being stirred, the man laughed, even if he felt like crying, whether he would or no. Tasso describes in his serious epic, *Jerusalem Delivered*, the death of the knight Ardonio, who, at the taking of Jerusalem, was slain by a Persian lance, which

"Pierced him through the vein  
Where Laughter has her fountain and her seat,  
So that (a dreadful bane)  
He laughed for pain, and laughed himself to death."

The temper of the mind seemed to the old doctors to change as one or the other of these kinds of moisture predominated. Thus the mind received its prevailing tone. As the current of moisture changed from time to time, humor began to mean the *present* disposition of the man. His characteristic peculiarities seemed to depend on these mercurial influences of the body; and as men

## THE STONE AGE IN EUROPE.

By CHARLES RAU.



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

## 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 article. 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 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 cen-

turies 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, inasmuch 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 valleys. 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, relics left by the 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 versa*, 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."

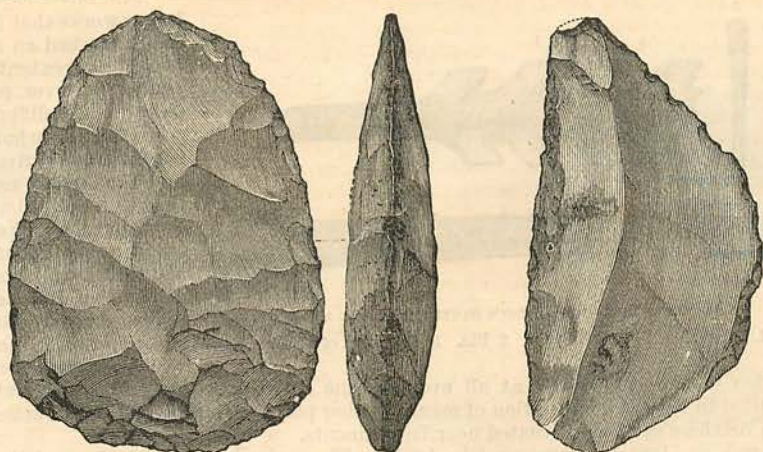
Among cave explorers the late Dr. Schmerling, of Liège, occupies a prominent rank. After having devoted many years to a careful examination of the caves in the valley of the Meuse and its tributaries, he published in 1833 the results of his investigations, but unfortunately died before his merits were 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 incrustated with an unbroken stalagmitic covering, under which the bones of extinct and living animals and those of man oc-

curred 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, hedge-hog, 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 Liège, has attracted much attention on the part of anatomists, 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 article.

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



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

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.

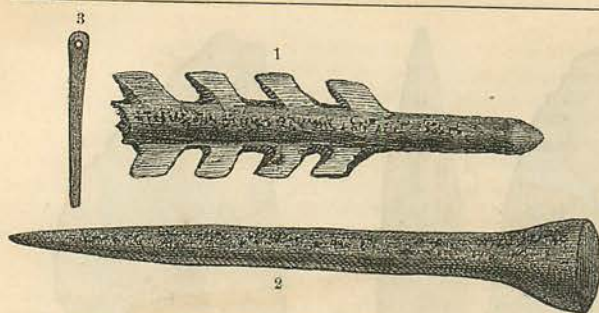
About the same time, when Dr. Schmerling was carrying on his explorations of Belgian caves, the Rev. J. MacEnery, of the Catholic clergy, found in Kent's cavern, near Torquay, Devonshire, in the red loam below the stalagmitic covering, not only bones of the mammoth, woolly rhinoceros, and other extinct quadrupeds, but also a number of flint tools, some of which resembled 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 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. Penzance and Vivian.

There occurs *above* the thick and almost continuous stalagmitic floor of Kent's cavern a black mould, in which numerous rel-

ics, 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 scrapers;\* 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.

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. 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 accu-

\* This class of implements will be described in another article.



BONE IMPLEMENTS FROM KENT'S CAVERN (NATURAL SIZE).

1. Fragment of harpoon-head. 2. Pin. 3. Fragment of needle.

mulation 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 conducted 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

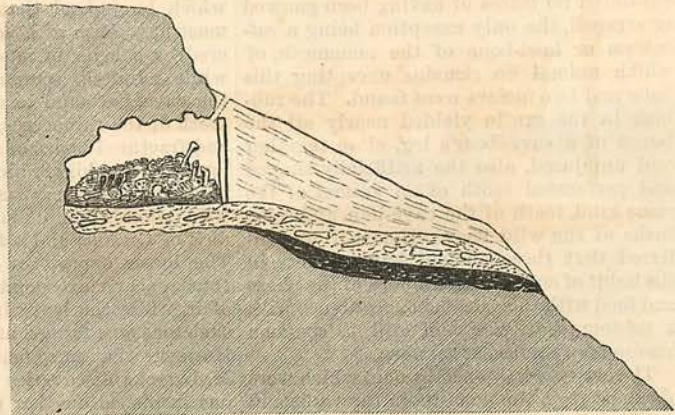
larger works that has already reached an almost bewildering extent. The results, however, present only local differences, while, on the whole, the conclusions arrived at are the same, namely, that in times antecedent any historical record or tradition tribes of savage men lived in certain districts of Europe contemporaneously with various species of animals which have either be-

come entirely 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 disintomb 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 striae 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, differing in many respects from those of the later or neolithic phase 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.

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



SECTION OF THE GROTTA OF AURIGNAC.

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 ter-

race 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 hearthstones, 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.

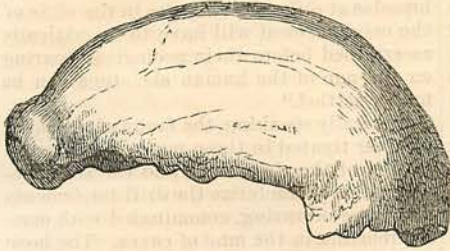
The articles fashioned by man which were obtained from the deposits in the vault and outside of it consisted of numerous flint flakes or knives, sling-stones, chips, a flint core or nucleus from which flakes had been split, and one of those flat round stones with cavities on both sides supposed to have been used in making flint tools. Among other instruments, further, may be mentioned arrow-heads without barbs, made of reindeer's 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

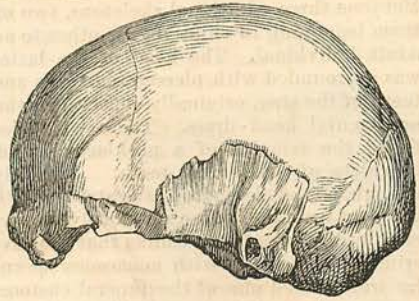
which he judged that the lower deposits must have been of a yellow color, and covered by a layer of much lighter tint; and while minutely searching the crevices of the cave, he found in the darker ground a tooth of the rhinoceros, one of the reindeer, and fractured bones of the cave-bear. The level of 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.

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

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



THE NEANDERTHAL SKULL (SIDE VIEW).



THE ENGIS SKULL (SIDE VIEW).

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 says, they demonstrate the existence of a man whose skull may be said to revert somewhat to the pithecoïd 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 accompanying drawings, 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 our first paper we alluded to human bones found by Messrs. Bertrand and Rebourg 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 surface of the deposit. The attitude of the skeleton, says M. Rivière, was that of repose, 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 spearheads 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 *tibia*, or shin-bones, which are more flattened than in the European of the present time. 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

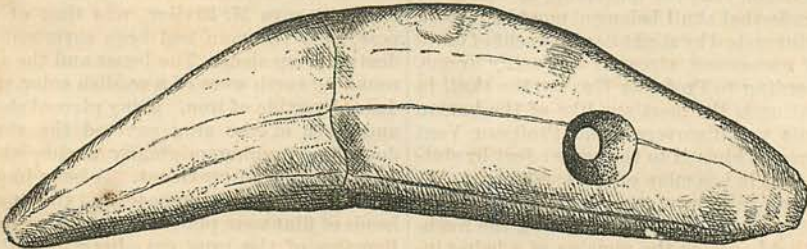
Mentone three additional skeletons, two of them belonging to children, the other to an adult individual. The head of the latter was surrounded with pierced sea-shells and teeth of the stag, originally constituting an ornamental head-dress. There were also found the remains of a necklace and of bracelets 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. 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 ele-

phant, rhinoceros, and cave-bear in subaerial 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 our next article 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 GROTTA NEAR SORDE, ON THE RIVER OLRON, SOUTHERN FRANCE (NATURAL SIZE).

## PSYCHE.

### I.

WHEN trembling Psyche softly crept  
Where her unknown, mysterious Love  
Concealed in shrouding darkness slept,  
And held her lamp the couch above,  
Eager to prove what hidden spell  
Of beauty held her charmed heart,  
To teach her eyes its power as well,  
New sweetness to her life impart,  
And point with fresh delight the keenness of Love's  
dart,

Her dazzled eyes, one moment's space,  
Beneath the trembling golden light,  
Saw all the beauty of that face,  
So fair it made a day of night—  
That glorious shape like sun-lit snow  
Beheld, with sudden glad surprise,  
Then—startled by the lamp-light's glow,  
Flashed into hers those angry eyes,  
And Love had fled for aye back to his native skies.

### II.

Ah, dearest! trying hard to pierce,  
With wistful, questioning blue eyes,  
The secret of the universe,  
That deepest of all mysteries,  
The nature of another's soul,  
And what it hath akin to thine,  
A vision of the unknown whole  
From what thou knowest to divine,  
And by thy love's sweet light to read this heart of  
mine:

Forbear, dear love, to ask to see  
All that my inmost spirit holds,  
For still a velling mystery  
The godlike form of Love infolds;  
And while our pulses beat as one,  
And all my being bends to thine  
As turns the flower to the sun,  
Still leave my heart one hidden shrine,  
Where, sacred and unseen, reposes Love divine.