

THE STONE AGE IN EUROPE.

By CHARLES RAU.



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

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 paper; 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 Southwestern 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 described in a former article, but in some cases 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 mentioned in a previous article, 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 *Reliquia Aquitanica*, 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 Madeleine*, *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. Develop-

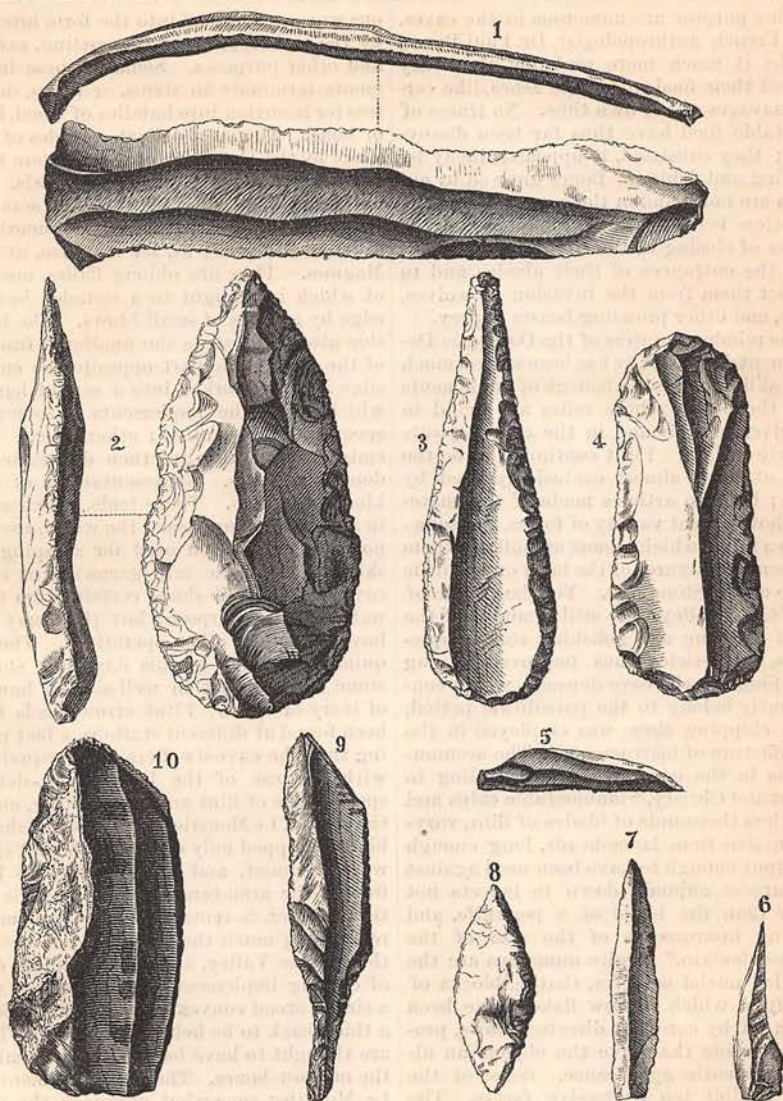
ments of such character are not the result of a few centuries, and hence a far greater length of time must be allowed for their realization. The people of whom we are about to treat have been called *cave-men*, or *troglodytes*, because they selected caves as their abodes whenever they could avail themselves 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 archaeologists.* 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. Remains of the mammoth and of the other extinct quadrupeds, with which the reader has been made acquainted in the preceding articles, 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 Cromagnon. 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, 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 pro-

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



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 (Laurerie Basse and Les Eyzies). 6, 7. Piercing implements (Laurerie Basse). 8. Arrow-head (Laurerie Haute). 10. Nucleus, or core (Les Eyzies).

cedure 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 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

* 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.

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 cave-men'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

* This practice prevailed among several North American tribes who were unacquainted with the manufacture of pottery. The Assiniboins, for instance, cooked their game in its own hide. Having taken off the skin,

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.

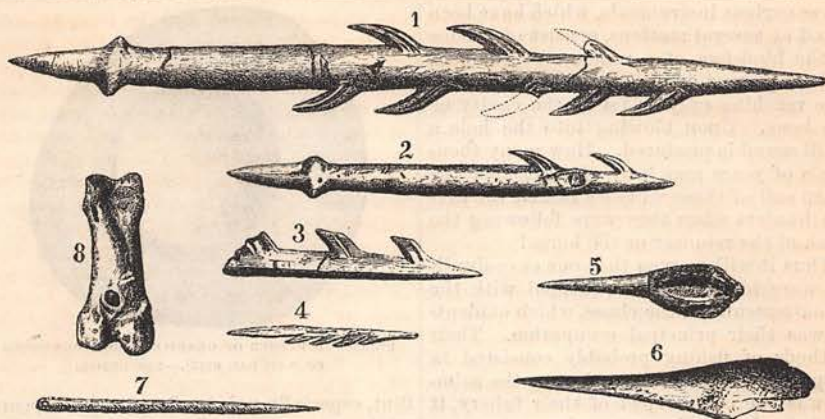
The reindeer hunters of the Dordogne Department displayed, as has been stated, much more skill in the manufacture of implements than the people whose relics are found in the river gravels and in the cave deposits of earliest date. Flint continued to be the kind of stone almost exclusively used by them; 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 vari-

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.

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

ous 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 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 Esquimaux 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.

The implements of horn and bone, which evince still greater 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 rel-



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 (Langerie Basse).

ics 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 to aid in fixing the implement in the shaft; it appears probable, too, that the knobs served for the attachment of a line which was connected with the shaft, the whole forming a harpoon with a loosely fastened head. When the fish was struck, the head became detached from the pole, which, being connected with the head by the line, served now as a float to indicate where the fish went. Harpoons of this description are still in use among the Esquimaux and several fishing tribes of our Northwest Coast. The barbs, it will further be seen, are provided with

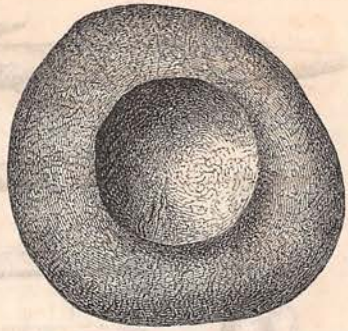
incisions or grooves, supposed by some to have served for the reception of poison, an opinion which we can not share, knowing that the arrow-shafts of many Indian tribes, such as the Sioux, Blackfeet, and others, exhibit longitudinal grooves, intended to facilitate the flowing of the wounded animal's blood. With a similar view the troglodytes 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 evidently 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 Esquimaux, 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 flint 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



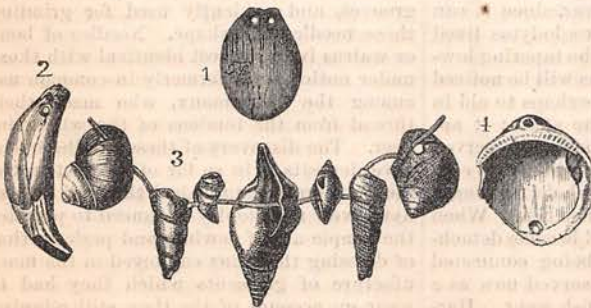
HOLLOWED PEBBLE OF GRANITE (ABOUT ONE-THIRD OF NATURAL SIZE).—LES EYZIES.

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.

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

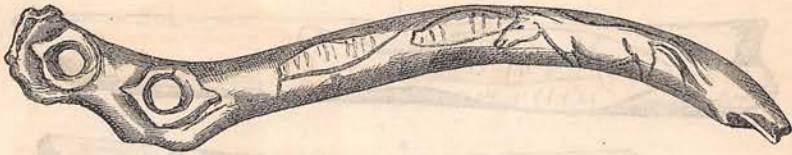
referable to a part of the dress, or, what appears to us most probable, to some covering for guarding the left wrist and fore-arm against the severe rebound of the bowstring, similar contrivances being in vogue among the aboriginal archers of this country.

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 hun-



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).



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

dred 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.

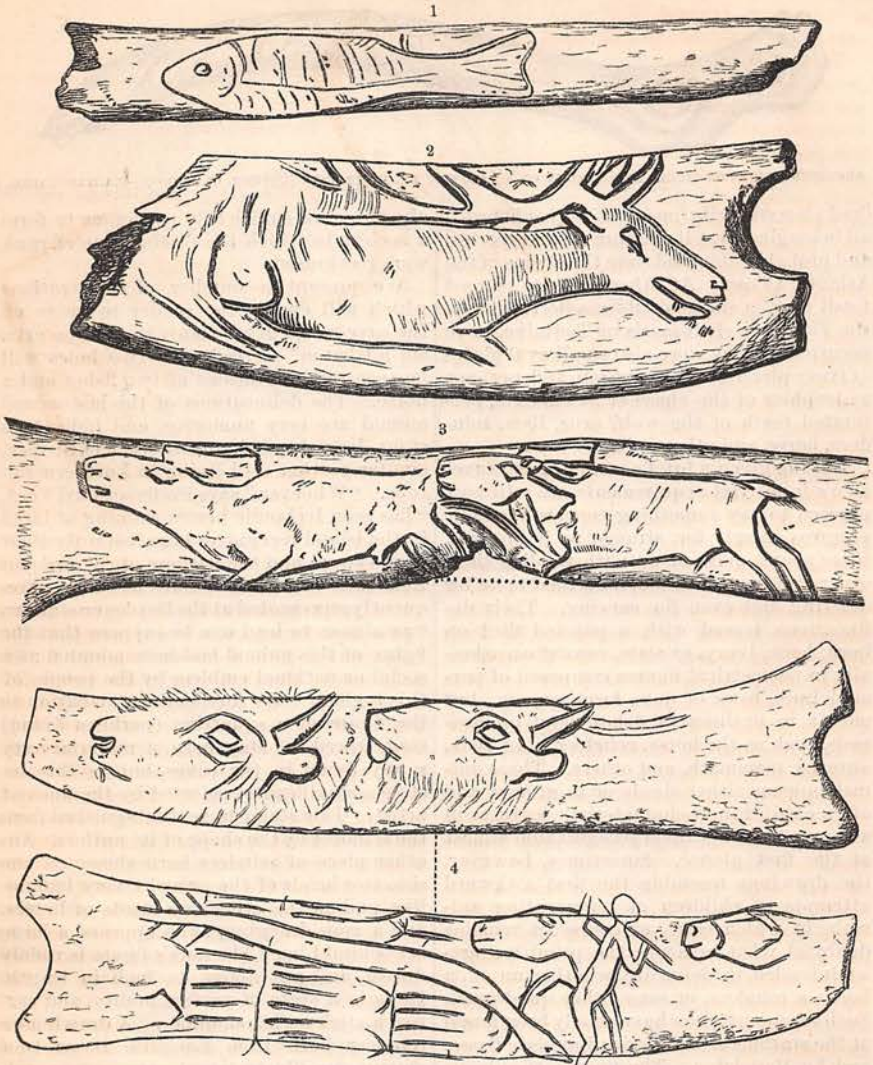
Having given a brief account of the cave-men's industrial acquirements, we will now proceed to say something concerning their progress in *art*; for, strange as it appears, these people evinced, notwithstanding their otherwise low condition, a decided taste for drawing and even for carving. Their delineations, 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 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 given 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 *Reliquie Aquitanica* 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.

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.

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 speci-



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.)

men* 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 cease in view of such tangible evidence:

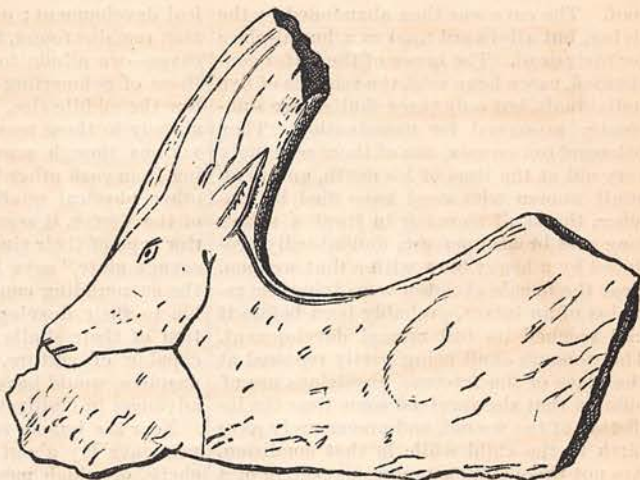
* See illustration at the beginning of this paper.

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."

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 Esquimaux, 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 article.

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



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

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 European 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 *Reliquie Aquitanicae*. The contents of the cave formed various layers, containing 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 *tibia*, 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 phys-

ical 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."

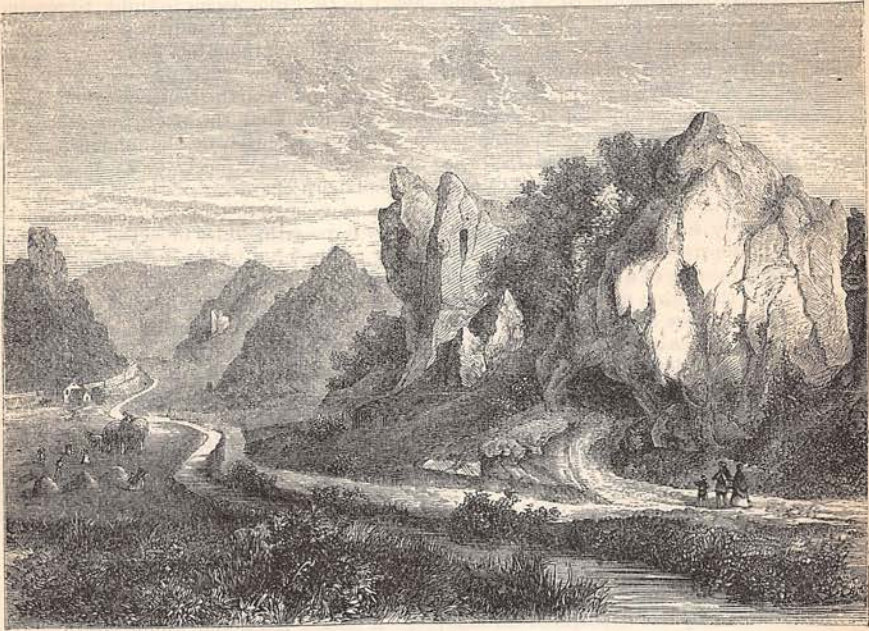
Near the human remains in the Cro-Magnon cave lay about three hundred marine shells, of which mention was made, a few oval plates of ivory, perforated for suspension, several drilled teeth of animals, worked antlers of the reindeer, chipped flints, and a large block of gneiss, split and presenting a 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, therefore, may be considered as having 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 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 articles.

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.

THE STONE AGE IN EUROPE.

By CHARLES RAU.



ENTRANCE TO THE HOHEFELS CAVE, WÜRTEMBERG.

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 article 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.

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 highroads, and in the course of labors of similar nature. But these discoveries merely proved

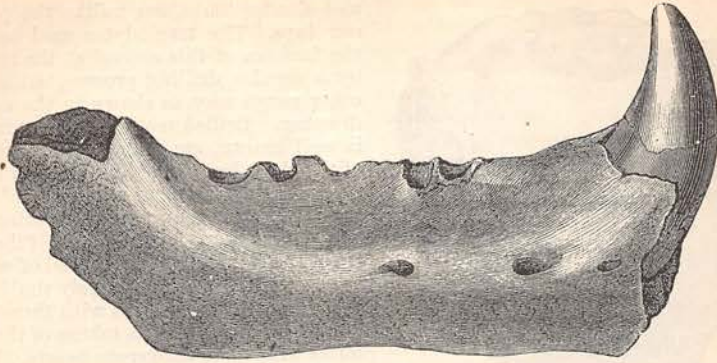
that the animal lived at one time in the north of Germany, and had no reference to its co-existence with man.* Of late years, however, several stations, analogous to those of France, have been discovered in Württemberg, and have been explored and described by Dr. Oscar Fraas, of Stuttgart.

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 article. 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 deposit, 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 enough, 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."

* Casar'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.

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 Württemberg 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 cave-men 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



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

objects wrought by man. We will give some account of the remarkable cave in the Hohlefels, or "hollow rock," in the 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 Württemberg. 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 was under the impression of examining one of those ancient dens of bears so frequent in Germany, and flattered himself with the hope of finding soon 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 became now 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 mould 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

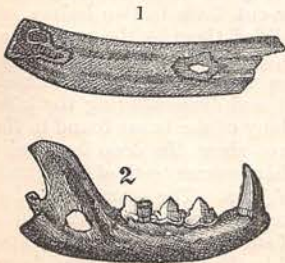


REINDEER SKULL TRANSFORMED INTO A VESSEL (NEARLY HALF SIZE).—HOHLEFELS CAVE.

the fact that corresponding tools have 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



AMULETS FROM THE HOHLEFELS CAVE (HALF SIZE).

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

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 other 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 oth-

er 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-cat. The first-named carnivore became extinct in Württemberg 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 Caesar, 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, evidently 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 arti-

cles 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.

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, mould, 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 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 Württemberg. 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

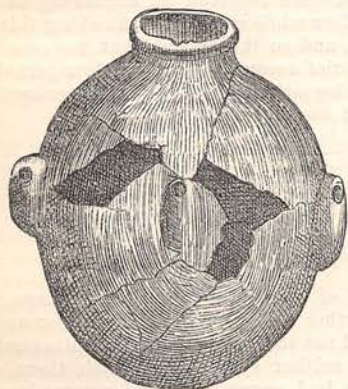
which lay among chipped implements of flint.

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 article. 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 older 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 article. 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. As far as we know, nothing has been discovered that would indicate an artistic tendency, excepting an unintelligible drawing on a piece of reindeer horn, and two small exceedingly rude statuettes representing squatting human figures without arms, all found in a cave called Trou Magrite. These people subsisted, it seems, entirely by the chase, the horse, reindeer, chamois, goat, ox, boar, brown bear, fox, hare, 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 frag-



RESTORED EARTHEN VESSEL.—FROM THE TROU DU FRONTAL.

ments 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.

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, horse, and Alpine hare, these animals were chiefly hunted by the Swiss cave-men; for, though the classification of the bones and teeth is not yet completed, the presence of at least four hundred and thirty hares has been ascertained, while the reindeer remains thus far point to two hundred and fifty individuals. The fauna of this locality further comprises the stag, elk, 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. Cave-bear and cave-hyena seem to be wanting. 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 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.

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. There too were met specimens of prehistoric art in the shape of representations of animals drawn on reindeer horn or on plates of brown coal, and even carvings are not wanting. Among them a drawing of a zebra-like animal traced on horn, and a bone sculpture supposed to

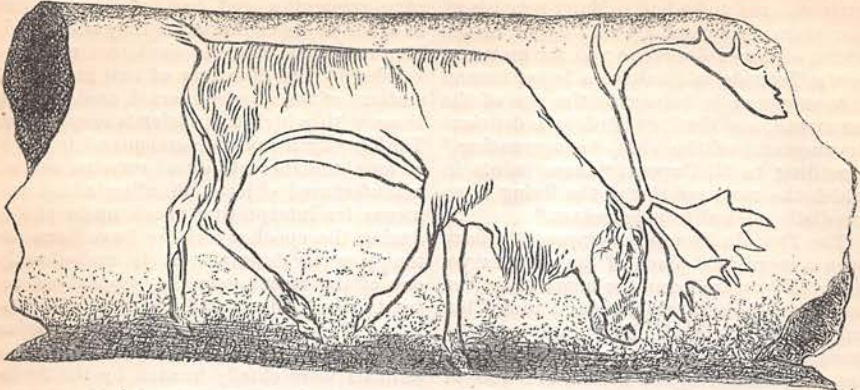


FIGURE OF A BROWSING REINDEER ENGRAVED ON REINDEER HORN (NATURAL SIZE).—FROM THAYNGEN, SWITZERLAND.

be an imitation of a bovine, are mentioned. But the most notable object of this class discovered in the Thayngen cave is a delineation on a broad 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 consideration. We received an engraving of the reindeer while engaged in finishing this article, and so it happens that we conclude our brief account of the reindeer period by drawing attention to the best specimen of art it has furnished.

GARTH:*

A Nobel.

BY JULIAN HAWTHORNE.

CHAPTER III.

KNIGHT-ERRANTRY.

WHILE Garth is thus idly engaged, with no prospect for an hour or two to come of doing any thing of more active interest than to apply brush to canvas, we can hardly be better occupied than in casting a historic fishing line into the deep lake of the past, and catching a few stray facts regarding the young artist's childish vicissitudes.

Captain Brian Urmson, the Revolutionary warrior, had nearly reached his seventieth year when Garth began the world. Since the loss of his daughter Eve, some ten or twelve years previous, the captain had led a sombre life. But when his favorite son, Cuthbert, returned from his travels and settled at Urmhurst, his gloom lightened; nor did Cuthbert's speedy marriage with Parson Graeme's daughter check this improvement. The departure to Europe of Golightly, the

child of the captain's second marriage, was a further relief, for the grim soldier understood not the young man's aesthetic tendencies, neither sympathized with them, and there had never been real companionship between these two. When, finally, sweet young Mrs. Urmson began to grow indolent and inactive, when her husband consulted her lightest wish with anxious solicitude, and when a strange female appeared in the house with noiseless foot and undisputed sway, the captain became as cheerful an old gentleman as any in the county. He would sit for hours in his oaken arm-chair beneath the shadow of the porch, his stern face softened ever and anon with a smile, or, catching sight of Mrs. Urmson moving languidly and dreamily about, he would hasten up with rugged gallantry, begging her to lean on his arm or permit him to support her to a seat. At other times he would draw Cuthbert and the strange female mysteriously aside, and question them in hoarse whispers as to how soon they might expect—and would it not, ten to one, be a girl—a little girl, like Eve, Cuthbert—like my little Eve

* Entered according to Act of Congress, in the year 1875, by JULIAN HAWTHORNE, in the office of the Librarian of Congress, at Washington.

And the sinewy hand of England,
With a continent hung balanced
From the griping giant fingers.

X.

Slideth toward the Mississippi
From the tops of Alleghanies
And the peaks of Rocky Mountains
Not a rill that doth not tremble;
All the springs that feed the Great Lakes
Quiver in their leafy coverts.
Arctic mosses ask the prairies,
And the prairies ask the tropics,
And the reindeer ask the bison,
And the bison ask the Gulf birds;
Blue Ontario asketh Erie,
Huge Superior asketh Huron—
Which of two will be their master;
And Niagara now listens.
From the icy spur of Asia
To the Cuban shore of spices,
From the shivering Greenland lichens
To the Mexic groves of orange,
From the pole beneath the North Star
To the palms beneath Orion,
From the palms beneath Orion
To the snows beneath the South Cross,
Far vast future crystallizeth,
With a hemisphere at hazard,
As Wolfe hears, "They fly! they fly!"
From the cold sea to the hot sea
Faileth France with Romish fashions,
Shackled printing,* voteless tenants,
Scanty schools, and Caste as ruler;
Triumphs England with Caste waning,
Sleepless printing, voting freeholds,
Thick-sown schools, and open Bible.
These the Mississippi drinketh;
Winneth these unborn Nevada;
These now greeteth the Pacific
From the iceberg to the palm-tree.
Sing, Yosemite's tall cedars;
Shout, far-soaring St. Elias;
Listen, Santee and Savannah;
Pause, Niagara, and listen :



WOLFE.

Strideth on a step colossal,
And the Path's end findeth not yet;
What at last our God performeth,
From the first our God intendeth.
All the past was predetermined;
All to come is now fore-ordered.
See, accomplishing is God's plan,
But the end of it is not yet;
And we know not what He will do,
But we know that He now knoweth.
On a finger of God's right hand
Stands the world's soft-spinning axle,
And His eye-beams swathe its whirled zones.
Through the starry, soundless spaces
Strideth on His step colossal;
Moves the earth upon His finger,
But His eye-beams go before it.

DOUBLE VISTA ISLAND, LAKE GEORGE. JOSEPH COOK.

THE STONE AGE IN EUROPE.

By CHARLES RAU.

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 sever-

ity and given place to a 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 no longer trod the soil of 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

* "There was not one printing-press in either Canada or Louisiana."—BANCROFT, *History of the United States*, iv., 458.



IDEAL REPRESENTATION OF A SWISS LAKE-VILLAGE.

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 articles, 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 article. 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, inasmuch that flint-chipping may be said to have assumed in this period almost the char-

acter 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.

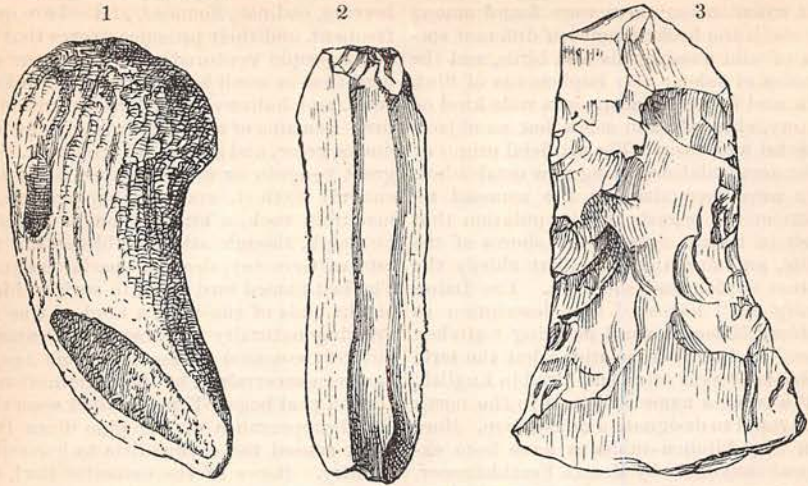
On the indented coasts of the Danish islands of Seeland, Fünen, Møen, and Samsøe, and along the fjords of the peninsula of Jütland, there occur, mostly in the immediate neighborhood of the sea, considerable accumulations of shells, which were formerly supposed to have been deposited by the sea at a time 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 fur-

ther 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 northeast 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, supposed to be now entirely extinct, and the capercaillie, or mountain cock, 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 capercaillie 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 left there 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.

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



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).

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, 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 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 Danish tumuli, however, skulls have been obtained which are supposed to belong to the age of the kitchen-middens. These skulls are generally of small size and round, like those of the Laplanders, but differing

* 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.

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 every where the tokens of their presence. But we must hasten to pass over to another subject.

Alonso 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 adventurous traveler, 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 had sometimes 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 sank much be-

low 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 mould, from which they extracted pieces of a rude kind of pottery, 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 archaeology. 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 pol-

ished 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 metal 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 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 articles. 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

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

† Author of an excellent work on the lacustrine constructions of the lake of Neuchâtel.

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 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, consisting in many cases merely of unbarked stems lying parallel one to another, but sometimes 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 northwestern 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. In cases 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 discovered. 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

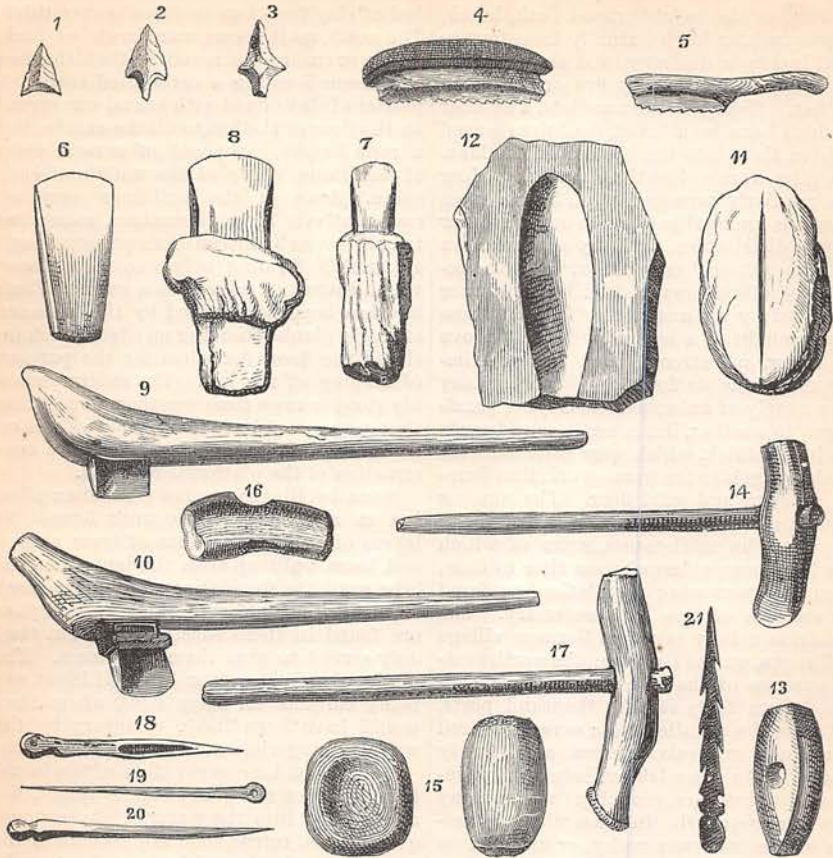
bed of clay from two to three inches thick. The roofs, as it seems, were made of bark, straw, or rushes, the remains of which often have been found in a carbonized state. A plaster of clay mixed with gravel was spread on the floor of the hut to fill the chinks, and a rude hearth, composed of several 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 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 archaeological 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

* 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.



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 (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, $6\frac{1}{2}$ inches long (Wauwyl).

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 former 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 cel-

ebrated 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 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

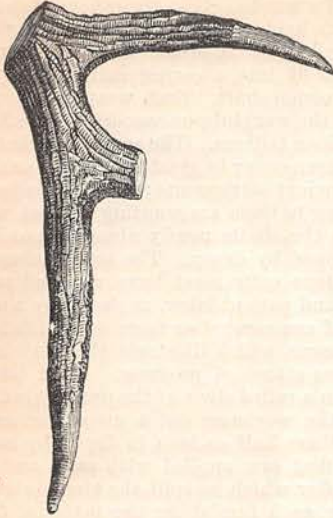
* Our drawings of lacustrine relics are almost exclusively taken from a little work by J. Staub, entitled *Die Pfahlbauten in den Schweizer-Seen*, in which the size of the delineated objects is not indicated. The same drawings are contained, on a larger scale, in the English translation of Dr. Keller's 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.

the decrees of chiefs or a majority of the people. These lake-dwellers certainly were far 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 five to six quarters of an inch 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 as 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.



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

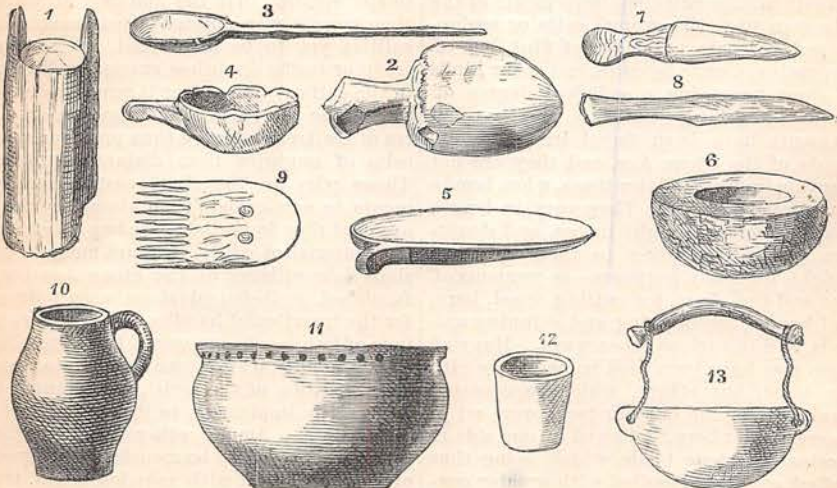
Most varied were the uses which the lake-men made of the horns, bones, and teeth of animals. The horns of the stag were made into the celt sockets already described; stout pieces of this material, perforated with holes for holding wooden handles, served, according to the manner in which their ends were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

ther 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.

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 Robenhausen a boat with rounded ends, twelve feet long,

* 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.



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).

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.

The domestic wooden utensils of the lake-dwellers resemble much 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 imperfections, 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-

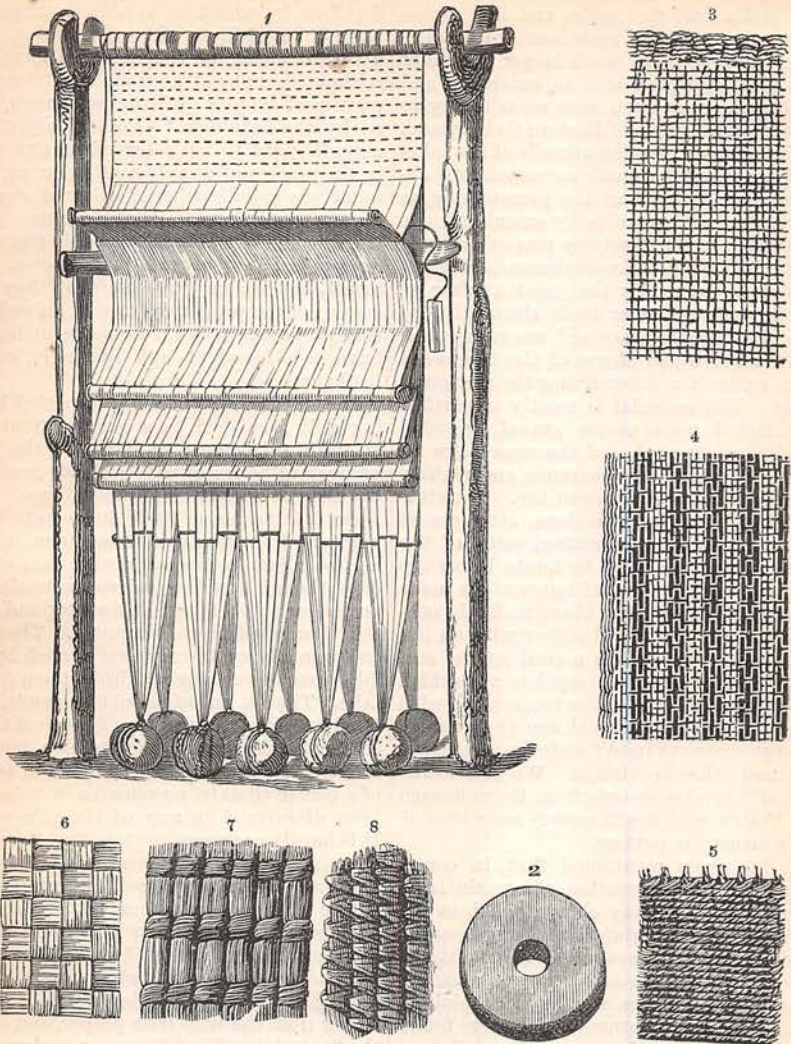
dwellers, by which he is able to reproduce their different kinds of textile fabrics. We give a drawing of this restored loom, yet without deeming it improbable that an apparatus of simpler construction was employed by the lake-men.* Conical objects of clay, thought to have served as stretchers in the 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 to a great extent 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 Rüttimeyer, 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 still 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 state that the mammoth, rhinoceros, cave-bear, lion, and hyena had vanished from the soil of Europe 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 wild hog, differing from the wild boar proper, and called the "marsh hog" by Rüttimeyer, 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 peo-

* There are in the writer's collection many fragments of lacustrine pottery, and some entire vessels, which the most practiced eye hardly can 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, tow, thread, strings, and of numerous plaited and woven fabrics, all found at Robenhausen. Hemp, it appears, was not grown during the lacustrine period.

* 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.



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.

ple, 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 settle-

ments 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 Rüttimeyer; 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 Rüttimeyer, 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 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

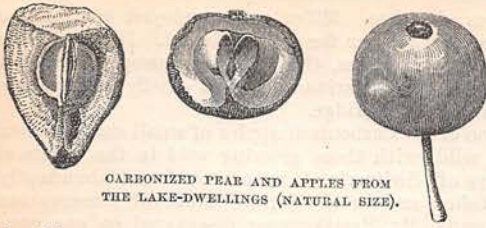
ashes. Millet was employed in a similar manner for making bread. It is probable, however, that the lake-people consumed their farinaceous food chiefly in the shape of porridge.

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

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

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



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

for his son or 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 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 clew 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.

AN APPLE OF SODOM.

A LITTLE wild rose, as blushing, as trembling, as dewy, as shy, was Emily Rivers; and just as sweet as one, thought her cousin Lawrence.

Indeed, Lawrence idealized her a trifle; for when he came back from his long stay in the East, where he had seen few but the swarthy women of the meridian, Emily dawned upon him, as fair and pure and delicate as any spirit of the sky. Her very shyness lent her an air of reserve that made one feel as though she were something the least in the world remote. She carried her pretty head like a young fawn, alert, listening, ready to fly; and there was a fascination, a piquancy, in this reserve that tempted the young man to break its barrier, and make the maidenly thoughts and fancies his own. Still he was not sure that he had any right to the indulgence of such a temptation. Not sure? He was very sure that he had no right at all. It had been understood ever since there had been any understanding about him whatever, and he had acquiesced in the understanding, that he was one of the particular members of the family who were not to indulge themselves in that way. There had been too much indulgence in that race—it had brought them

to poverty—and Lawrence had been set apart for a rich wife from the day when the elders began to assort the portions: so decidedly set apart that it was generally determined Valeria Gueltan should fall to his lot, probably because she was, in a distant manner, within the family circle, and because at her majority she became a sufficient heiress to satisfy even the family desire for money. As for love—"Love goes where it's sent," said Aunt Paget. "It's all nonsense to think of letting such a trifle interfere with serious matters. Mr. Paget and I never pretended any especial love for each other, but we got along very well, and when he died he left me comfortable, which I shouldn't have been if I had married poor Mark Eldon, as I wanted to do. Though, to be sure, Mark— But there!" continued Aunt Paget: "when two people find other things to their mind, it's perfectly easy to accommodate their emotions to their circumstances. Nothing's wanting but the will. Lawrence can interest Valeria easily—has done so already by his letters and his pictures. Yes, she's half in love with him now; and he'd be a very singular person if he didn't feel tenderly toward the one by whose means all his comforts come!"

THE STONE AGE IN EUROPE.

By CHARLES RAU.



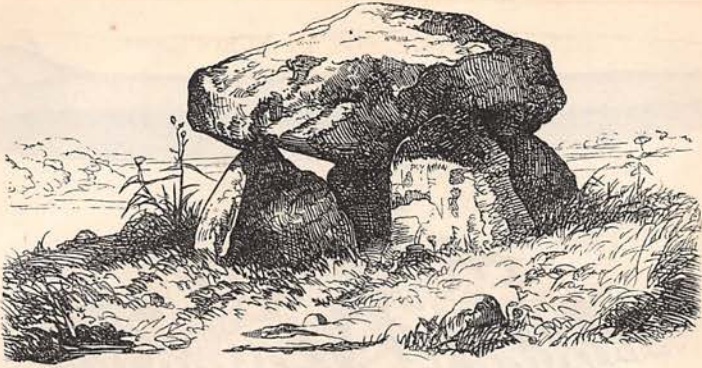
TUMULUS OF THE STONE AGE.—ISLAND OF MÖEN, DENMARK.

VI.—NEOLITHIC IMPLEMENTS.

IN the present closing article 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 anteceding 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 cretaceous 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, no less than 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 Kjökkenmøddings (described in the preceding article), 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 was 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



DANISH CROMLECH.

and undesirable incidents. 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 articles.*

Structures composed of huge bowlders or fragments of rocks supporting a large capstone 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

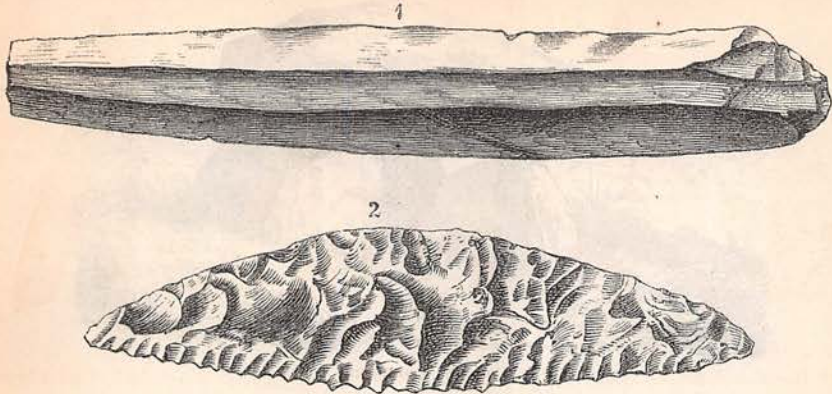
they can not all be referred exclusively to the Stone Age, and some may not mark places of sepulture, but represent monuments built in honor of distinguished individuals or in commemoration of important events.*

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 contracted 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

* 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).

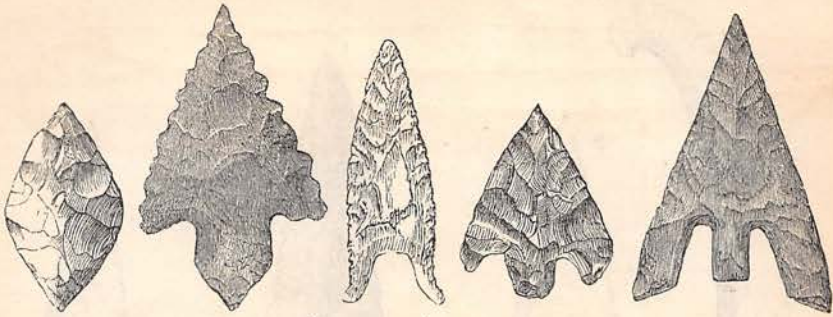
and more inches long, but rarely more than an inch broad, and terminate often in a point. The under face, produced by the blow which detached the flake from the block, always presents a single fracture, while the upper side shows two or three (but seldom more) facets, resulting from the preceding removal 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 work-shops 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 article of this series ("The Troglodytes"), we need not say more about them in this place.

The neolithic period is characterized by a great variety of 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. 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 con-

* The illustrations of neolithic implements in this article 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.



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

nect the stone point more firmly with the shaft.* The Swiss lake-men, 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 archaeologist 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 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 any where 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.

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, hardly can 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 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

* 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.



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).

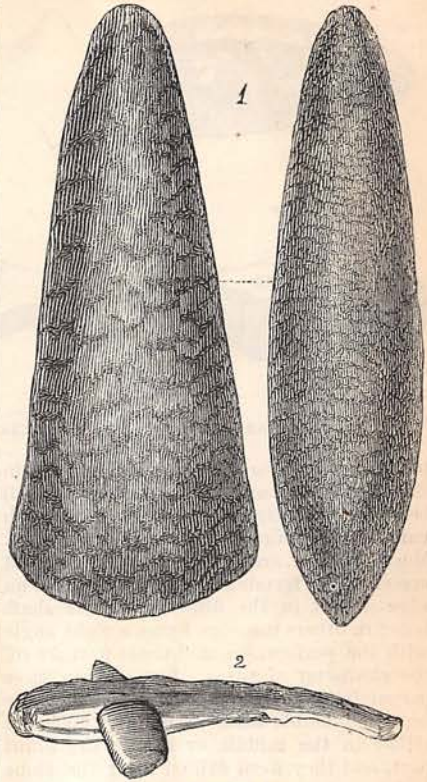
use for which they were designed. As in arrow-heads, their lower end is often worked into a projection or tang for fitting them in the cleft end of the shaft. Yet many of the specimens of this class may have been inserted in short handles, and used as daggers or cutting tools.

The different classes of flint implements thus far treated are generally brought into the proper shape by the simple process of flaking, 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 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 article while speaking of the stone implements in use among the lake-villagers of Switzerland.

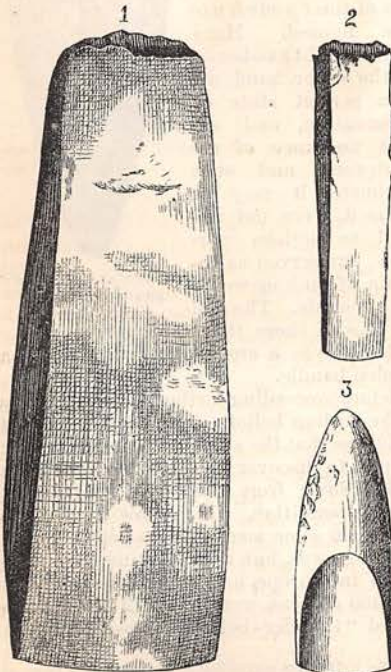
These celts differ somewhat in shape from the Danish specimens of the same class, being often roundish or elliptic in the cross section, instead of presenting perpendicular sides like many of the Northern flint celts, and they often taper into a rounded butt end. Not few of them are worked with great 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



POLISHED STONE CELTS.

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

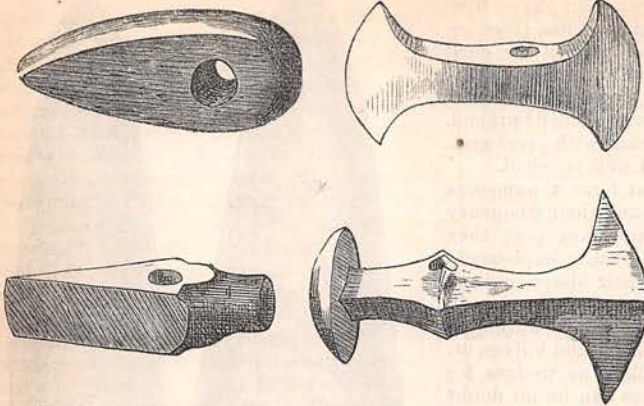


POLISHED FLINT IMPLEMENTS (DENMARK).

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

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 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 character 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



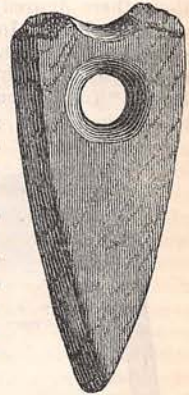
DRILLED STONE AXES (ONE-FOURTH OF NATURAL SIZE).—DENMARK.

too difficult. The axe-heads differ much in size and shape, and in the degree of skill bestowed on their execution. Their length varies 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 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

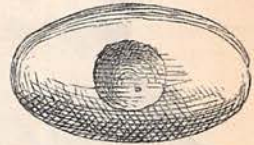
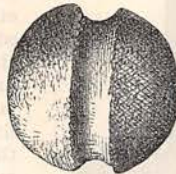
* The writer has succeeded in perforating a piece of the hardest diorite, nearly an inch and a half in thickness, by employing a wooden apparatus shaped like a pump drill. The *modus operandi* is described in the Smithsonian Report for 1868.

languages. By the above name they go in Great Britain and Ireland; in French they are called *coins de foudre* or *pierres de tonnerre*; in German, *Donnerkeile*;* in Dutch, *donderbeitels*; 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 attributes 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 child-birth; 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

* 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.

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, 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;



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

and to 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 article.

Horn and bone continued to be employed during the later Stone Age as materials for arrow-heads, barbed harpoons, piercers, 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 articles, we deem it sufficient merely to allude to them in this place.

The love for personal adornment—common to man in whatever stage of develop-

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

ment 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 in un-

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 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 here represented. The ornamentation of the Stone 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 every where 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

* 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.



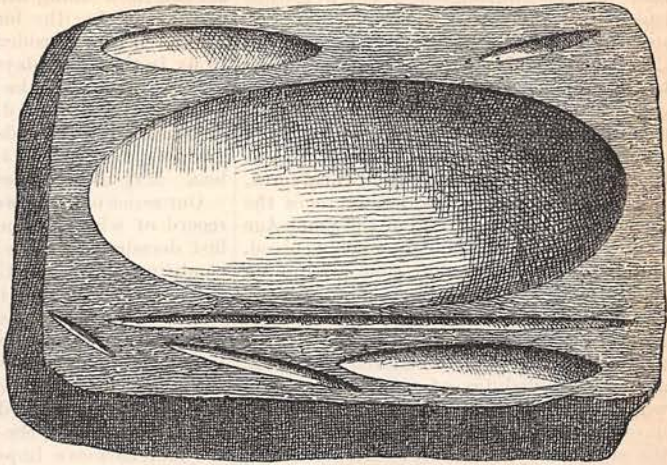
ORNAMENTED DANISH VASE (ONE-THIRD OF NATURAL SIZE).

wrought perforated pieces or in 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 every where in Europe the sites once occupied by the people who used polished stone implements. Entire vessels are sometimes found in the

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 alongside 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, hornstone, jasper, common quartz, and other stones of a siliceous 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



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

American Indians, among whom he had lived as a missionary, mentions that an Indian sometimes spent his lifetime 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 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 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

* 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.

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 Esquimaux, and we remember having read an article in the London *Saturday Review* in which the absolute identity of the Dordogne cave-men with the Esquimaux was advocated. The reader will remember that the kitchen-middens of Denmark have yielded no human remains, but that the 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 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 the 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 articles 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 laid before the reader in proper succession a number of facts particularly suited to illustrate the early phases of human life in Europe. We should have liked to present a fuller array of data, but the limits within which we had to move impeded a more minute treatment of the subject. Our 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 paradisaic 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."