

ON THE OCCURRENCE OF HUMAN REMAINS IN A BONE CAVE AT CATTEDOWN.

BY R. N. WORTH, F.G.S.

(Read at Plympton, July, 1887.)

A STATEMENT by Colonel Hamilton Smith excepted, the accuracy of which has been questioned without definite cause, there is no record of man or of his handiwork from the bone caves of the Plymouth district. Colonel Hamilton Smith asserted that among bones from the Oreston caves he "detected the upper portion of a humerus of man, which was immediately thrown away upon being pointed out to the possessor!" And he added in a note, "This is not the only instance of the kind. Collectors in the plenitude of ignorance and prepossession determined that human bones were of no consequence."*

The facts I have to lay before the Association, touching the discovery of the remains of several human beings in a bone cave at Cattedown, are some evidence that this accomplished naturalist was not likely to have been mistaken.

The limestone quarries at Cattedown have been worked for ages. There is documentary proof that lime was supplied from Plymouth throughout a wide district of South Devon more than five centuries ago, and the stone was used as a local building material long before that. So far as Cattedown itself is concerned, a period of exceptional activity set in some ninety years since; and the cliffs were worked back from Cattewater at various points to some distance inland. In spots these operations were then abandoned; in others they have continued to the present day. One of the localities where excavation ceased became the site of Messrs. Hill's shipbuilding yard, recently acquired by Messrs. Burnard, Lack, and Alger for the extension of their Manure Works adjoining. The firm have made great changes on their waterside frontage in Cattewater by the construction of

* *Nat. Hist. Human Species* (1848), pp. 95-96.

wharves; and in connection with these operations they have partially reworked the old quarry at the back of the shipwrights' yard, at a lower level, the foot of the new face being twelve to fifteen feet beneath the level of the old floor, part of which was long adapted and used as a garden.

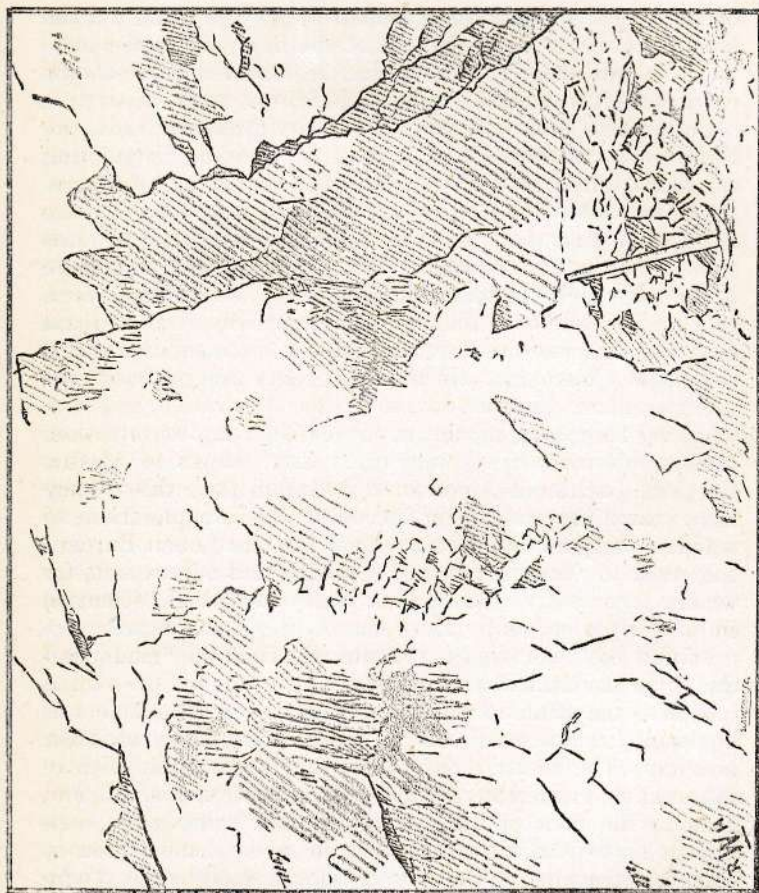
The quarry, in the first instance, was worked to a depth of sixty feet below the original surface of the hill; and the old floor was partly covered next the cliff by a "spoil-bank" of earth and small stones, which was removed as the work proceeded. This formed a talus at the bottom of the quarry.

Soon after excavation commenced, in autumn of 1886, the men broke through the east wall of a fissure containing earth and small stones, and ere long found a few bones, of which they took no notice. Subsequently more were discovered, and the attention of Mr. Robert Burnard was called to them. Shortly after this I was told of the find by Mr. J. C. Inglis, C.E., under whom the works have been executed. The bones then found were bovine and of little note, but the possibility of their having successors led me to call on Mr. Burnard. He at once kindly promised that all care should be exercised in the further excavation, and that whatever turned up should be put aside for my examination. I have, however, to express my hearty thanks to Messrs. Burnard, Lack, and Alger for much more than this. They have spared neither trouble nor outlay in the explorations to which circumstances afterwards led; and Mr. Robert Burnard has given the work a personal attention and supervision, for which I cannot be too grateful, and for which scientific enquiry is under great obligations.

It was not long before a fresh discovery was made, and this time bovine and caprine were accompanied by human remains—fragments of a skull, a lower jaw, and a number of phalanges; but there was no distinct evidence of their position. The material had now been cleared sufficiently to reveal a considerable fissure running north and south, and open to the floor of the old quarry, the roof having been broken in by the former quarrymen, and whatever vacant space existed filled with portions of the spoil-heap. There was nothing to suggest, but at the same time there was nothing absolutely to disprove the suggestion, if made, that the remains, whether ancient or comparatively recent, had been thrown into the fissure during the former working. True, they were found at the lowest point of the excavation, and were not associated with the distinctive "spoil." Still they might have slipped downward during the digging. All

that could be done therefore was to keep a careful watch for more definite indications; and these were not long delayed.

An examination of the cavern, for such it proved to have been—an irregular tunnel with stalactites and stalagmites—showed that there was no difficulty, when the face of its



contents was once fairly cleared, in distinguishing between the recent filling of the spoil-bank, and the older deposits. The exploration of the northern end—the eastern wall having been removed for some thirty feet—was first undertaken. The section here showed the upper part of the fissure to be filled with portions of the spoil-bank, which was a

mixture of earth and small stones, the former predominating. Beneath this was the upper section of the bone-bearing deposit, which consisted almost wholly of large stones with a little earth and clay, the stones being such as quarrymen would have utilised had they come in their way, and the division between the two being perfectly distinct. The sketch on the previous page, from a photograph kindly taken by Mr. David Roy of this end of the fissure after the loose "spoil" was cleared, shows exactly the character of the cavern, and what its general appearance must have been before it was originally broken into by the quarrymen; for the presence of the modern *débris* was of course a proof that we were dealing with what had been a closed cave.

As excavation proceeded the ossiferous deposit became more productive, increasing in thickness by rising towards the end of the fissure, and becoming infiltrated by stalagmite until it assumed the character of an open stalagmitic-breccia of large eroded stones, between which there were frequent cavities containing quantities of bones. There seemed no reasonable doubt that the bulk of these stones, at any rate, had fallen from the roof.

When the greater portion of this ossiferous filling had been removed down to the lower quarry level, it was found that the fissure narrowed upwards at its termination into a mere flue; that the stalagmitic-breccia remaining in the end was too compact to be dealt with by ordinary methods; and that upon it were the remains of a stalagmitic floor, partially broken, apparently by the fall of heavy blocks. The breccia, in addition to becoming more consolidated, had increased in thickness by the gradual northward rise, from the first appearance of a stalagmitic character, from two to four feet.

Under the direction of Mr. Robert Burnard a hole was bored in the rock at the back of this mass to blast it out, and was charged and fired in my presence on the 29th of April last. A great many bones were then exposed to view, coated with or imbedded in stalagmite, but mostly fragmentary. The stalagmitic floor was found to have varied in thickness from an inch to a foot, and while the walls of the fissure were for the most part coated with stalactite (which at one point had cemented a mass of stones firmly to the side), the rock immediately beneath the inner edge of the floor was perfectly clear. The breccia therefore was, at least in part, of older date than the stalactite, as well as the stalagmite, with which it was associated; while the copious flow of stalactitic matter on all accessible portions of the

walls was another proof that after the bones had been deposited the cavern had remained a cavity. The integrity of the stalagmitic-breccia was clear.*

Immediately after the blast I myself took out from what had been the heart of the stalagmitic mass, portions of a human skull, and a human molar tooth with a fragment of jaw attached, associated with remains of the hyæna, wolf, red and roe-deer. Other fragments of the skull were subsequently found imbedded in the stalagmite.

When the whole of this stalagmitic-breccia had been removed to the quarry level, which left, as was afterwards found, a small quantity beneath at the inner end of the fissure, a trench was dug two feet deep at the entrance of the northern chamber, and the material removed to this depth right away to the back. The outer part of this section was wholly distinct in character from the stalagmitic-breccia, consisting of small angular stones and chocolate-coloured clay—a “cave-earth”—so tightly compacted as to resemble concrete. Hence it obtained the casual name of the “concrete-floor.” This character was retained nearly to the end, where it in part gave place to the more open breccia infiltrated with stalagmite. A stalagmitic deposit on the same level next the eastern side consisted, however, wholly of a close granular stalagmite, with angular fragments of stone. This gradually thickened and broadened northward, and eventually occupied the extreme northern end of the fissure to the lowest point excavated.

The concrete floor, while it still retained its distinctive feature, yielded chiefly small fragments of bones and teeth. As it was explored northward there were more bones and fewer teeth, and the open stalagmitic-breccia in the end in character and productiveness was precisely similar to the breccia (of which it formed a part) above. The close granular stalagmite was less productive at the level, and in depth became barren.

In the stalagmitic-breccia remains of deer were peculiarly abundant; and human bones, comprising the remains of complete skeletons, were chiefly associated with those of red-deer, roe-deer, hyæna, wolf, and fox.

In the concrete-floor remains of hog were so prominent as to be characteristic. Here human teeth were chiefly mingled with those of hog, hyæna, wolf, and badger.

At the very end of the fissure, seven feet below the stalagmitic floor, and at the deepest point in the stalagmitic-breccia

* The stalactitic coating of the walls of the cavity, and the stones cemented to its side, are indicated on the left of the sketch.

at which bones were then found, there lay portions of a human upper and lower jaw.

The concrete-floor was carefully examined *in situ* by the man who removed it, and every recognised fragment of bone was put aside for my examination. The stuff was afterwards examined on a table under the direction of Mr. Robert Burnard. That gentleman also washed and picked over, with the aid of a magnifying-glass, some of its looser and finer components, finding a quantity of bones and teeth of the shrew, water-vole, and mole. The same results attended some of my own examinations of the clayey matter washed off from the bones; and in the stalagmitic-breccia there were, in addition to the water-vole and mole, bones and teeth of the bank- and field-vole and bat.

A further sinking and excavation at the entrance of the northern chamber below the concrete-floor produced at first few results. The material was still angular stones and clay, but not so compact; and as hardly a trace of bones or teeth appeared, the search here was abandoned for the time.

Mr. R. Burnard then determined to trace the fissure as far as possible towards Cattewater. When he commenced excavation, the section standing southward appeared to indicate that the entrance of the cavern lay in that direction, not far from the sea level. The filling was much looser, and consisted largely of the material of the spoil-bank. A few bones and teeth of ox and sheep or goat were found near the level of the quarry floor, but nothing of consequence; and the chief fact ascertained was that the southern chamber terminated in a mere joint crevice. As the bottom, however, had not been reached, the whole of the material in this chamber was removed to a depth of nine feet, when it practically closed in, but with little further result. This filling was more stony and clayey, but not compact—quite distinct from the “spoil,” and a genuine “cave-earth;” and though the walls of the fissure were coated with stalactite, no stalagmite was seen. With the exception of the fragment of a human humerus and some human teeth, only bones of ox and hog were found in the lower excavation; and these in small quantity.

The filling in the intermediate part of the fissure connecting the two chambers was next dug out to a depth of two feet, where it narrowed to a mere crack, and with somewhat better fortune—remains of ox, deer, wolf, hyæna, and man being found, with a coprolite. Fragments of what had

the appearance of being coprolitic matter had been noticed in the breccia, but nothing clearly identifiable.

A return was then made to the entrance of the northern chamber, and sinking resumed, this time with important issues. The cavity at this point was found to be filled with material generally resembling that of the concrete-floor, which was indeed only its upper and more consolidated portion. The extreme end of the chamber, as already noted, was occupied by a dense mass of granular stalagmite, and this was constant to the lowest depth reached.

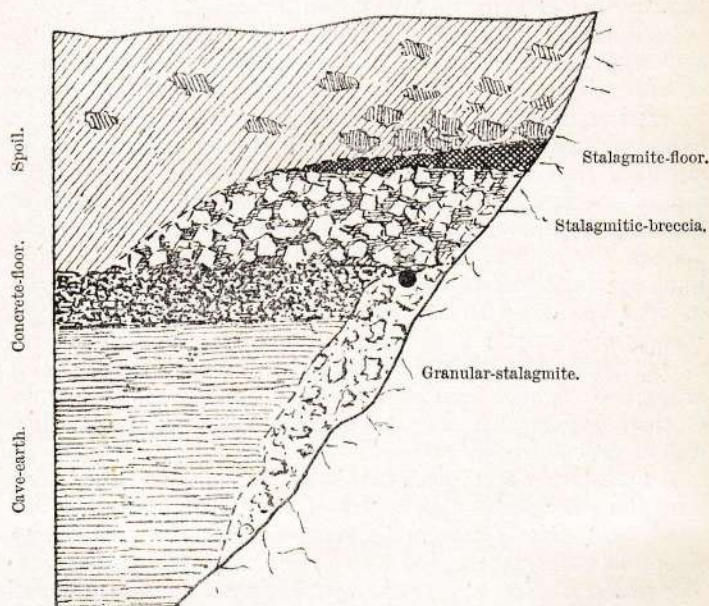
The fissure here was found to open into what at first appeared a lower chamber. It did not narrow so rapidly or so much as elsewhere, and at a depth of four feet began to expand, eventually widening on the east, where the rock overhung, to a width of eight feet. What seemed a lower chamber was in reality a continuation of the upper on the dip of the strata. This was then excavated to a depth of fifteen feet below the quarry floor, without reaching the bottom. Southward it was found to be closed, save for the jointing; but that an open crevice continued to the sea was evident from the fact that at spring tides the water found its way into the excavation. (There are caverns, not far distant, at Bear's Head, with tidal well holes.) The total depth of material excavated from the top of the fissure to the bottom of this chamber was twenty-seven feet, and of this twenty was more or less ossiferous.

A noteworthy fact about this part of the northern chamber was, that while the upper part of its southern portion was filled with closely-compacted cave-earth, there was a considerable space unoccupied next its eastern or undercut side. The reason of this was however perfectly plain. The material gradually falling from above had formed a talus, the upper part of the slope of which had closed the opening before the space below was filled. The free face of this talus was covered with a thin coat of stalagmite, and at nearly the lowest depth reached in the southern end of the chamber there were slight remains of a partial stalagmitic floor.

The material of the lower filling varied somewhat in character, but still presented the characters of a regular series. At the bottom of the chamber there were small stones and chocolate-coloured clay. Immediately above this the stones were larger, and with less earthy matter; and there were portions where the stones were larger still, which were practically free from earth. The access and recess of the

tidal waters may perhaps be credited with some of these results, and some may be attributed to percolation from above. The longer axes of the stones followed the slope of the talus.

Northward this deposit gave place to the mass of granular stalagmite, which filled the end of the fissure to an ascertained depth of fifteen feet, underlying the bone-breccia which had proved so rich, but except in its upper portions being itself all but barren. Nor was the quantity of bones found in the lower part of the northern chamber at all



large. Moreover, they were as a rule thinly scattered throughout the deposit, except in one spot, which yielded the remains of hares, rabbits, smaller rodents, and birds. This suggested that when the main opening to the lower part of the chamber had been closed, there still remained an aperture through which relics of small animals might have found their way, after access was barred to the larger. The most important fact elicited by the examination of this part of the cave was the association of bones and teeth of man, not only with hyæna, wolf, fox, deer, ox, and hog, but with the lion and the rhinoceros. The ancient character of the cavern fauna was emphasized. The accompanying section

CATTEDOWN CAVE

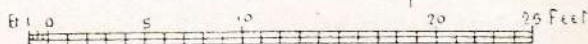
PLAN OF NORTH CHAMBER

PLAN OF SOUTH CHAMBER

LONGITUDINAL SECTIONS


TRANSVERSE SECTIONS

Old Quarry Level.



SCALE.

RHW del.

of the chamber at its northern end will indicate the sequence of deposits. The  shows where the lowest human *skull* was found. Bones and teeth occurred at the lowest point reached.

When completely explored, it was thus found that the cavern consisted of a gallery, running north and south, essentially with the natural jointing of the rock, with a chamber at each end, the total length being fifty-four feet. At the point first opened into, on the east, it had a breadth of four to five feet, and its walls were approximately perpendicular. At its northern end it expanded, near the level of the quarry floor, into a chamber, overhanging on the east; while its western wall still remained practically perpendicular.

This chamber again narrowed to its termination, which was formed by a narrow face of rock sloping southward, and contracted so rapidly above as to give the impression that the original height of the gallery did not much exceed the dozen feet of rock which remained unworked on its western side, at the modern quarry level. But its total height must have been much more than double this, reckoning from the deepest point excavated. The length of this chamber was twenty feet, and its greatest width eight.

The southern chamber was twenty feet in length, more regular in shape, and did not exceed five feet in greatest width. There was no evidence what its height might have been; but its depth below the quarry-floor was not more than nine feet. From the fact that the connecting fissure, or gallery proper, narrowed so rapidly downwards, the lower parts of the two chambers were separated from each other by nearly twenty feet of rock.

The general character and details of the cavern are given in the accompanying plan and sections, drawn to scale from precise measurements, by my son, Mr. R. H. Worth. The plan of the north chamber is taken on the plane A B; and that of the southern on the plane E F (the datum in each case being shown by O—O, which represents the modern floor level); and the longitudinal and cross sections at the points marked. The contour of the lower portions of the chambers is shown by dotted lines. The open part at the southern end of the connecting fissure shows a forking passage, not yet explored. Probably the southern end of the cave is 150 yards from the original shore; and, as we have seen, the lower parts are beneath the level of high-water springs.

The natural entrance to this gallery and its chambers was

evidently from above, and apparently near the northern end. There is no reason to doubt that the cave had formed the descending branch of a large cavern or series of caverns. (Several traces yet remain in the hill above; and Mr. F. Hill tells me that a very large cavern was exposed and destroyed almost immediately to the south, when his father made a patent slip.) The access would be by one of those pits or wells on the upper floor, which are so common in limestone caves. There was direct evidence that the fissure had not extended to the surface. The character of the stalactites and stalagmites made it clear that it had originally a roof; and it was equally evident, from the position occupied by the spoil-heap, that it must have been to a large extent empty when broken into. The very considerable stalagmitic infiltration at the northern end of the cavern points also to the existence of a considerable superincumbent mass of rock.

A review of the whole facts enables us to distinguish between, at least, two distinct series of deposits. The open stalagmitic-breccia above; and the concrete-floor with its ordinary cave-earth continuation below. The conditions under which the remains occurred in each were widely different. Those of the concrete-floor and underlying cave-earth were generally casual in occurrence, had all the appearance of gradual accumulation, and, save in the case of smaller mammals and birds, yielded nothing approaching to a complete skeleton: though there was evidence that portions of bodies, at least, had been deposited intact; *e.g.* in the association, in the lowest part of the northern chamber, of a human humerus and ulna, and the occurrence of bones of lion and rhinoceros, most probably of the same individuals. In the stalagmitic-breccia, on the contrary, the remains were chiefly of what had been complete skeletons. Again, while deer predominated in the breccia, and hog was specially plentiful in the concrete-floor, the breccia abounded in remains of young animals, while those of the cave-earth were chiefly of mature.

But the most marked differentiation was the fact that the remains of the stalagmitic-breccia were those of bodies which must have found their way thither for the most part intact. Many of the bones were too fragmentary to allow of the recovery of complete skeletons; but there was very good proof that in the majority of cases such skeletons had been present. Bones of individuals were found in such intimate association as wholly to forbid the supposition that they had been moved since the flesh and integuments had decayed. From

one cavity, around which the stones had been gradually cemented, I took out bones and fragments representing practically the entire frame of a deer. A mass of small bones, huddled together in a nodule of clay, proved to be the phalanges of a wolf, and with them were the teeth of the same animal. In several instances both human and infra-human upper and lower jaws were found effectively in contact. In short, there was the clearest testimony that the members of this part of the ancient charnel had been contemporaneous in life, as well as associated in death; and that so far as the stalagmitic-breccia was concerned, they had met one common fate.

When we speculate upon the manner in which the remains of the stalagmitic-breccia found their way into the cavern, one hypothesis may at once be discarded. The cavity was a true cave, and not an open fissure, into which the animals might have fallen from the surface. Again, the bulk of the remains were those of animals which have nothing to do with caves, and whose bodies must have been brought there by some agency external to themselves.

There remain three ways in which their presence may be accounted for. They may have been carried or dragged into the cavern by man; or by some of the associated carnivora; or they may have been washed thither by water.

Now man would never have taken the trouble to drag beasts of chase into a subterranean larder, and throw them in a heap with carcases of beasts of prey and the bodies of his own kith and kin: nor would he have conducted interments under such conditions.

The hyænas were the only associated carnivora capable of dragging in the bodies: but had they done so, they must have either voluntarily abandoned their intended feast, or have in some way been prevented from reaping the reward of their industry. They never left fairly complete skeletons behind them. Moreover, if we admit that they dragged in the oxen and deer, we must also hold that they treated the human bodies in the same manner!

There is certainly evidence that the cavern was a haunt of carnivora at the time of the deposition of the breccia. Several days before any remains of the hyæna were found, the condition of some of the fragmentary bones, which appeared to bear marks of gnawing, led me to suspect the proximity of that animal. And this, together with the presence of the lower jaw of a very young hyæna cub, which had not completed the cutting of its first set of teeth, and which cannot

have gone far from the place of its birth, together with the existence of a small quantity of coprolite, may be held I think to show that a portion of the cavern at any rate was a hyæna den.

It will be observed that I assume the same date and cause of deposit for all the remains in the stalagmitic-breccia. There was absolutely no difference in occurrence or condition between the human and the other bones; nor was there any trace of such intentional deposit of the former as must have accompanied the rudest act of burial; nor any matter of human handiwork, with the doubtful exception of three splinters of deer-horn. There had been a common fate for one and all. At the same time there was also slight but unmistakeable testimony that the presence of man, like that of the hyæna, was not wholly accidental. In the centre of the mass of the stalagmite of the breccia loosened by the blast, and afterwards broken, were a few fragments of charcoal. They were wholly enclosed in the stalagmite, and had all the appearance of being embers of a burnt-out fire. Minute fragments of charcoal were also found in the concrete-floor, and still more in the cave-earth, at a depth of eight feet below. Hence it seems a reasonable conclusion that man as well as the hyæna must have been at least an occasional dweller in the cave.

By elimination we are brought to my third suggestion, that water was the agent of deposit. No fact was ascertained that militated against this view. The confused manner in which the bodies had been thrown together, and piled up at the end of the fissure, at once suggested a sudden rush of water as the origin of the contents of the stalagmitic-breccia. Those of the concrete-floor and cave-earth presented nothing of a cataclysmal character, and were probably due to the action, over a lengthened period, of waters occasionally finding their way from the upper reaches of the cavern to the lower. The manner in which the remains were distributed through this deposit, and their generally fragmentary character, all pointed to gradual and casual occurrence. At the same time the evident association of some of the bones rendered it clear that in their case at any rate there had been no re-deposition.

Further, the active causes of the formation of both deposits were immediately local. No stream had flowed into or through the cavern from a distance. The most careful search revealed no single fragment of stone (with one exception) foreign to the immediate neighbourhood. A few fragments of slate apart, all were limestone.

The exception it is true was a very important one, but not in this connection. It consists of a nodule of flint, white and porcellanous in general aspect, found by my son in the cave-earth of the northern chamber, $4\frac{5}{8}$ inches in extreme length, $2\frac{3}{4}$ in total breadth. It is a natural flint pebble, about a third of the mass of which has been broken off longitudinally, and a portion of one end slantwise. It has the appearance of a pebble from which flakes have been struck, and which has been used as a hammer stone.

It appears to me then that all that was required to produce the concrete-floor and cave-earth, was the occasional falling and washing by the internal drainage of the cavern in rainy weather, of earth and stones and fragmentary animal remains from the upper reaches.

The remains of the stalagmitic-breccia can as readily be accounted for by a sudden rush of waters pouring into the cave, bearing with it the bodies of drowned animals, and carrying before it whatever occupants the place may have had—certainly the hyæna among the number. Nor does it require any great stretch of imagination to believe the bulk of its human remains to be those of occupants also—since they indicate just such differences of age and sex as would be likely to exist in an ancient troglodytal family.

This last point, however, is purely a speculation which neither adds to, nor takes from, the value of the discovery. What we have to congratulate ourselves upon is the additional light thrown upon the human members of the cave-fauna of Devon, who have before never put themselves in evidence in such a manner in their own proper persons.

The scientific world is also to be congratulated that the discovery was made upon the property of gentlemen who appreciated its importance, and at their own expense carried out the works necessary for its elucidation. Our heartiest thanks are due to Messrs. Burnard, Lack, and Alger for their interest and liberality; and to Mr. Robert Burnard in particular for his ceaseless supervision, and his determination that whatever was needed to be done should be done, and that thoroughly. To Mr. Tweedy and Mr. Roy I am greatly indebted for photographs of the cave and some of its contents; to Mr. Davies, F.G.S., late of the British Museum, for very kindly naming a number of the infra-human bones; and to Mr. G. Jackson, F.R.C.S., for his valued assistance in dealing with the relics of man. The assistance given by my son in the preparation of the plan and sections has already been noted.

The human remains found are those of a number of individuals—at least fifteen—of both sexes, and ranging from childhood to old age. No single skeleton was complete; but every bone in the human frame, so far as I know, was represented. The most perfect portions were skulls and jaws, and bones of the extremities—the smaller especially. In this, as in other respects, the aspect of the human remains precisely resembled that of those of the lower animals with which they were associated.

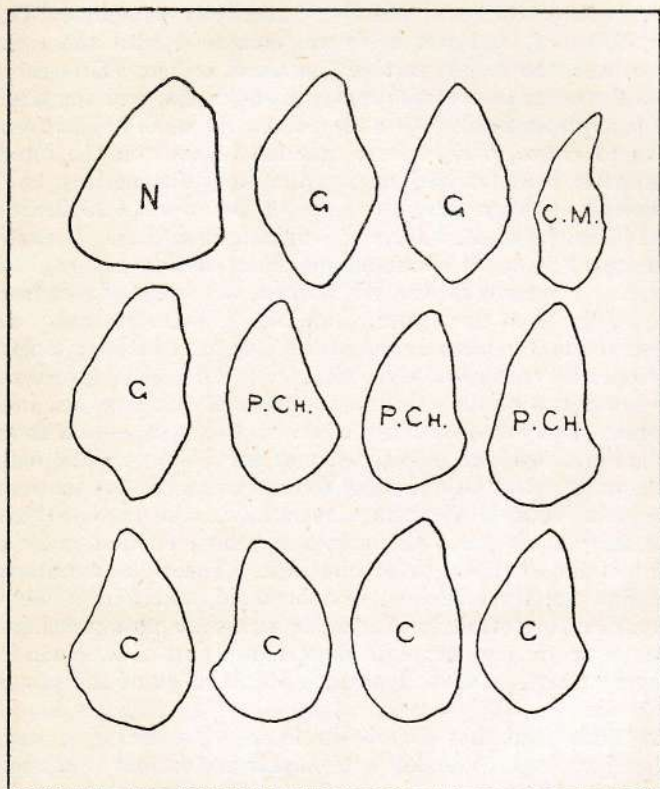
The most perfect long bones are the humeri. The biggest is 11.75 inches in length; the smallest 11.2 inches, and this bone is very slender and perforated between the condyles. There is no perfect femur or tibia; but the biggest femur was probably between 15 and 16 inches in length, and the longest tibia 14 inches.

The most interesting point concerning the tibiae is their markedly platynemic character. The diameters of four of the most perfect are $1\frac{5}{8}$ by $\frac{1}{4}$, $1\frac{3}{8}$ by $\frac{1}{8}$, $1\frac{5}{8}$ by $\frac{1}{8}$, and $1\frac{4}{8}$ by $\frac{1}{8}$. One from the lowest part of the cave-earth was 1 inch by $\frac{3}{8}$. The marked extent to which they display the peculiar flattening of the shin so characteristic of priscan races, is best seen, however, in the accompanying sketch, which contrasts sections of four of the Cattedown tibiae with a normal tibia and platynemic tibiae from Cro-Magnon, Gibraltar, and Perthi Chwareu in North Wales, copied from Mr. Boyd Dawkins's *Cave Hunting*. It will be seen that there is the closest resemblance between the Devon and the Welsh tibiae.

But likeness does not stop here. The longest of the Perthi Chwareu adult tibiae is bigger than the longest of the Cattedown; and the least of the Cattedown is shorter than the smallest of the Welsh. Mr. Busk, whose remarks on the Perthi Chwareu bones are embodied in *Cave Hunting*, assigns these remains to a race of low stature, ranging from 4 feet 10 inches to 5 feet 6 inches. Lowness of stature is also a characteristic of the Cattedown folk. The data are imperfect, but assuming the usual proportions, from the dimensions of humeri and femurs, four calculations work out to 4 ft. $9\frac{1}{4}$ in., 4 ft. $9\frac{1}{2}$ in., 4 ft. $9\frac{3}{4}$ in., and 5 ft. $0\frac{1}{4}$ in. respectively. And this is at any rate sufficient to indicate that we are dealing with a short race. Some of the bones appear to show considerable relative strength; others are decidedly feeble, but probably this is due to the exaggerated sexual difference of frame of early times.



Neither of the skulls could be removed intact. The most perfect were more or less embedded in stalagmite, and others were partially crushed when found. Two, however, are facially almost perfect, and one of these retains the frontal bone. Some of the detached pieces of skull are well characterized, especially the occipital bones. Parietal bones



N., Normal; G., Gibraltar; C.M., Cro-Magnon; P.CH., Perthi Chwareu;
C., Cattedown.

are also intact. Several of the skulls were exceptionally thick; others again are very thin.

So far as I am able to judge of the shape and proportions of the crania, they are neither dolichocephalic nor brachycephalic, but of the middle type—orthocephalic. They are also essentially orthognathous, and some of the lower jaws have prominent chins. The accompanying illustration from

Mr. Tweedy's photograph indicates the characters better than mere verbal description. It is itself a Meissenbach photographic reproduction, and is therefore absolutely exact.

I append a list of the most interesting features of the human relics:

1. Skull, with left side of face intact, the frontal bones over both orbits; and the right maxillary detached. The jaw, forehead, and left orbit are complete, with the right brow, and the lower part of the nasal orifice. This came from the outer part of the stalagmitic-breccia, and the teeth are partly encrusted with stalagmite. Extreme height from teeth to crown, 6·25 inches; extreme breadth on the interzygomatic line (arrived at by doubling the perfect half) 5 inches; between the outer rims of the orbits 4·25 inches. Breadth of orbit, 1·63 inches; height, 1·25 inches. Breadth of nose at base, ·81 inch; height from base to suture, 1·96 inches. The brow is strongly marked, the forehead receding. The height from the upper rim of the orbit to the crown as preserved is 3 inches; length of the face, 2·64 inches; length of upper lip to edge of alveolus, 1·06 inches. Distance from the lower rim of the orbit to the edge of the alveolus, 1·64 inches. The left maxillary contains five teeth—the three molars and two bicuspid (wholly or partially encrusted with stalagmite), with the sockets of the canine and of two incisors. The first bicuspid displays a remarkable abnormal feature. The fang has pierced the jaw, and grown outside it for a third of its total length of one inch. The right maxillary contains the three molars, first bicuspid, and four sockets. The molars are strongly tubercular and show no appreciable signs of wear; and the skull is evidently that of a person in early maturity. The full breadth at the back of the jaw is 2·5 inches.

2. Skull (the first found—in loose, outer breccia), with upper jaw intact; the left orbit, nasal orifice, and a portion of the right orbit. Of the frontal bone the brow only remains. The breadth over nasal suture does not seem to have exceeded 4·5 inches; length of face, 2·5 inches. Breadth of orbit, 1·44 inches; height, 1·38 inches. Height of nose, 1·7 inches; breadth, ·96 inches. The orbit lies rather low; the distance between its lower rim and the edge of the alveolus being 1·56 inches, and having the appearance of being still less. Length of upper lip to edge of alveolus, 1·125 inches.

The jaw is 2·25 inches in breadth at the back, and

contains ten teeth, much worn, not flattened, but sloping from within outwards. Those wanting are the canines and incisors. The skull is that of a person of mature years, probably a woman.

3. Skull at base of stalagmitic-breccia, four feet from inner end of northern chamber (marked C A). Of this only pieces could be preserved, including:—Fragment of right ramus of lower jaw; with first and second molars, a little worn, two sockets, and remains of two more: external depth of jaw, with teeth, 1.5 inches; without, 1.125 inches. Second fragment of lower jaw with canine. Small fragment of maxillary, also with one tooth. Several small portions of cranium.

4. Calvaria embedded in stalagmite, found in the stalagmitic-breccia after the blast; probably a part of the same skull to which belonged one fragment of lower jaw with two molars, fairly worn, and two fragments of upper with one tooth, taken out by myself immediately after the hole was fired. Marked C B.

5. Portions of upper and lower jaws found in the stalagmitic-breccia on the level of the concrete-floor, at extreme back of northern chamber, seven feet below the stalagmitic floor covering the breccia. The upper jaw is represented by a portion of the right maxillary, containing two molars, two bicuspid, the socket of a canine, and that of one incisor. The lower jaw by a portion of the right ramus, containing the first and second molars, and the socket of the first bicuspid. The second bicuspid was lost during life, and the bone has closed in; the socket of the first rises to a level with the surface of the molars. We have here a very peculiar and interesting feature, and it is not quite clear how it originated. This is a very massive jaw, and the curvature approaches closely to that given for the Australian type in Professor Owen's *Odontography*. The chin was evidently very prominent. The teeth are big and worn. Marked C C.

6. Portion of right maxillary with five teeth. Two fragments of right ramus of mandible with four teeth. These appear to belong to the same individual; the teeth, little worn, are precisely of the same character, and in the same condition.

7. Upper jaw in two portions, with very tubercular teeth, little worn. Right maxillary contains two molars and five sockets; left maxillary (which comprises a portion of the nasal orifice) one molar and six sockets.

8. Upper jaw in three portions. Left maxillary in two pieces with four teeth and three sockets; right maxillary with four teeth and two sockets. Teeth tubercular, unworn.

9. Right maxillary with four teeth and three sockets.

10. Left maxillary (not correspondent to the preceding) with one tooth very much worn, and remains of six sockets.

11. Portion of right maxillary embedded in stalagmite from breccia.

12. Lower jaw, perfect with the exception of right condyle and portion of ramus adjacent. Contains all the sockets, but only two teeth, much worn on an outward slant. The broken fangs of right canine and bicuspid are left in their sockets. Massive angular chin; slanting ramus, 1.75 inches broad; depth at symphysis, 1.25 inches. This was the first jaw found.

13. Lower jaw perfect with exception of the condyles. Contains seven teeth, with both canines; much worn. Inter-angular breadth, 3.5 inches; depth at symphysis, 1.125 inches. Chin somewhat rounded. Corresponds very closely in character with No. 2.

14. Portions of mandible from first right bicuspid to second left molar. Contains four teeth, with sockets of incisors and canines. Jaw thick but not deep.

15. Left ramus of mandible, with condyles and six teeth worn flat, and two sockets; lower front margin absent. Extreme depth from top of condyle, 2.75 inches; extreme breadth of ramus, 1.5 inches. Also portion of right ramus, with one tooth and five sockets; depth at symphysis, 1.18 inches.

16. Germs of two deciduous molars.

17. Upwards of seventy loose teeth, the majority of which cannot be connected with the fragments of jaws enumerated. In the concrete floor twenty-eight were found, representing at least three individuals—one set large, and little worn, including canine 1.06 in length; another much worn; and a third small and much worn. Teeth were found in every part of the cave, in something approaching the same proportion to the remains of other animals. They are chiefly of a massive character, and, however much worn, show hardly a trace of decay.

The jaws give ample room in every instance for the full number of teeth, and in the majority of cases the canines are prominent.

The fauna of the cave comprises at least thirty species, the

following having been identified: man, rhinoceros, lion, hyæna, wolf, fox, dog, badger, weasel, polecat, bison, urus, long-fronted ox, red-deer, roe-deer, hog, goat, hedgehog, common bat, horse-shoe bat, mole, shrew, water-vole, field-vole, bank-vole, hare, rabbit; with birds as yet only partially named.

Of these the remains of man, deer, ox, hyæna, and hog, were found in every part of the cave; while the wolf and fox were absent only from the southern chamber. The mole, shrew, and various voles occurred in the stalagmitic-breccia, the concrete-floor, and the cave-earth. The cave-earth yielded also the lion and the rhinoceros. The badger and weasel were in the concrete-floor and the cave-earth; the hedgehog and common bat in the breccia only; and the polecat and horse-shoe bat in the cave-earth. The goat was only found in the middle and southern part of the gallery. The birds were almost wholly in the cave-earth, and it was in association with this also that remains of the hare, rabbit, and dog were found. The possibility of the later introduction of the remains of some small mammals, into the portion of the lower northern chamber left unfilled, has already been pointed out.