

THE CATTEDOWN BONE CAVE.

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

(Read 20th October, 1887.)

THE bone caves of the Plymouth district must always occupy a leading place in the history of cave research in England, for the bone-bearing fissure discovered by Mr. Whidbey, in 1816, in the Breakwater Quarries at Oreston, was the first cavern made the subject of definite scientific investigation in this country. It is the more needful to insist upon this fact, because no one would rise from a perusal of the general cavern literature of England with a clear idea of its importance. Every writer upon bone caves has, perhaps not unnaturally, shown a most paternal regard for the reputation of his own child or children; and the example seems too good to be ignored. Not, of course, that I had anything to do with cavern exploration carried out more than threescore and ten years ago; but the fact remains, that all who were concerned in the investigation of our local cavern phenomena for more than a generation were either members of, or in some way connected with, this Institution; and that as a society we have every reason to be proud of the work they did. It is quite true that for a while this special form of scientific enquiry appears to have been neglected here, but discoveries seem then to have been few and comparatively unimportant; and since an active interest has been revived, during the past ten years, "find" has followed "find," culminating in the unprecedented discovery at Cattedown.

There is no need to recapitulate the history of local cavern research. So far as I know, that story is fully told, and every available reference given, in the paper on the "Bone Caves of the Plymouth District," read before this Society on the 29th February, 1879;¹ and in the supplementary paper "On an Ossiferous Fissure

¹ *Trans. Plym. Inst.* vii. 87-117.

in the Battery Hill, Stonehouse," read October 9th, 1879.² These papers brought together all the information that could be gathered from various writers who had treated on the subject; from the collections of the local bones deposited in various museums; and embodied also the results of my own investigations. To them, and as illustrating them, to the contents of our Museum, I must refer those who wish a fuller view of "cave hunting" as it affects this neighbourhood. It will be sufficient now to say that ossiferous fissures or caverns are recorded from Oreston in 1816, 1820, 1822-3, 1843, 1858-9, and 1878-9, with an uncertain year between 1823 and 1843; by Oreston understanding generally the quarries south of Cattewater from Turnchapel to Pomphlett. That there have been at least three finds on the Hoe—one uncertain, and the others about 1838 and 1844. That Stonehouse has also had at least three—about 1835, in 1865, and in 1879-80. That there was one at Mount Wise in 1861. And that the quarries at Cattedown are known to have yielded bones on more than two occasions previous to the present discovery—one of them, a find in Deadman's Bay some years ago, coming to my knowledge long since the reading of the papers cited.

The opinion expressed by me in 1879, that few years had passed during the previous forty "without some fossil bones occurring in the Oreston quarries," has been greatly strengthened by subsequent experience. Taking the whole range of the Plymouth limestone, I am convinced that if all the "finds" had been recorded, we should probably treble the number of instances now known, though the quantity found would in most cases have been small.

One of the leading points of criticism on my original lecture was my inclusion of man in the local cavern fauna. I ventured to suggest that if "the earlier investigators of our bone caves had been true to the claims of science, the question of the antiquity of man would not have been left to be settled by the present generation." And I adduced instances in which those early investigators shut their eyes to the evidence of man's presence; and others where they went further, and destroyed it.³

² *Trans. Plym. Inst.* vii. 504-507.

³ *Op. cit.* *Trans. Plym. Inst.* vii. 99, 100.

My friend, Mr. Pengelly, commenting on the paper,⁴ expressed a doubt whether proof of the presence of man in the bone caves first investigated would really have advanced the acceptance of a belief in the high antiquity of the human race; and I am quite ready to admit that I may have under-rated the non-receptivity of new ideas in the average individual. Still, the point would have been forced to the front if there had been no concealment or destruction of evidence; and I held, and hold, that this alone must have been a gain.

Be that as it may, it was perfectly clear to my mind that there was no ground for doubting the deliberate statement of our late distinguished member, Colonel Hamilton Smith, on which I founded my inclusion of man in the Oreston fauna—that he had himself seen a human bone from an Oreston cave, which was thrown away directly he pointed out its character. The actual assertion was, 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.”⁵

The present discovery of the remains, not of one, but of several human beings in a bone cave at Cattedown, are some evidence that this accomplished naturalist was not likely to have been mistaken, and my reliance on his authority not so very venturesome after all. It is to me as great a satisfaction to claim for Colonel Hamilton Smith the honour, which undoubtedly belongs to him, of being the first scientific authority to accept man as a member of the English cave fauna, as it is to myself personally to be able to lay before not only this Society, but the scientific world, the most satisfactory and complete physical evidence extant of the human contingent of our Western cavern fauna, in their own proper persons. Not that the interest of the Cattedown cave is by any means confined to the relics of man; but that our ancient cave men have, as we shall see, put themselves at last upon record in such an emphatic manner as to compel recognition by the most sceptical, and to relegate the remainder controversy to side-issues of easy disposal.

⁴ *Trans. Devon. Assoc.* xvii. 426 *et seq.*

⁵ *Nat. Hist. Human Species* (1848), 95, 96.

The limestone quarries at Cattedown have been worked for ages, but a period of exceptional activity set in some ninety years since; and at various points the cliffs were worked back from Cattewater 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. Messrs. Burnard and Alger have constructed extensive wharves on their waterside frontage in Cattewater; and in connection with this have partially reworked the old quarry at the back of the ship-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 used as a garden.

This quarry, in the first instance, was wrought to a depth of sixty feet below the original surface of the hill; and the old floor was partly overlaid next the cliff by a spoil-bank of earth and small stones, which formed a talus.

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 heed. Subsequently more were discovered, and then the attention of Mr. Robert Burnard was called to them. These bones were bovine and of little note; but Mr. Inglis having told me of the circumstance, 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. We have, however, to express our hearty thanks for very much more than this. The firm 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 we cannot be too grateful.

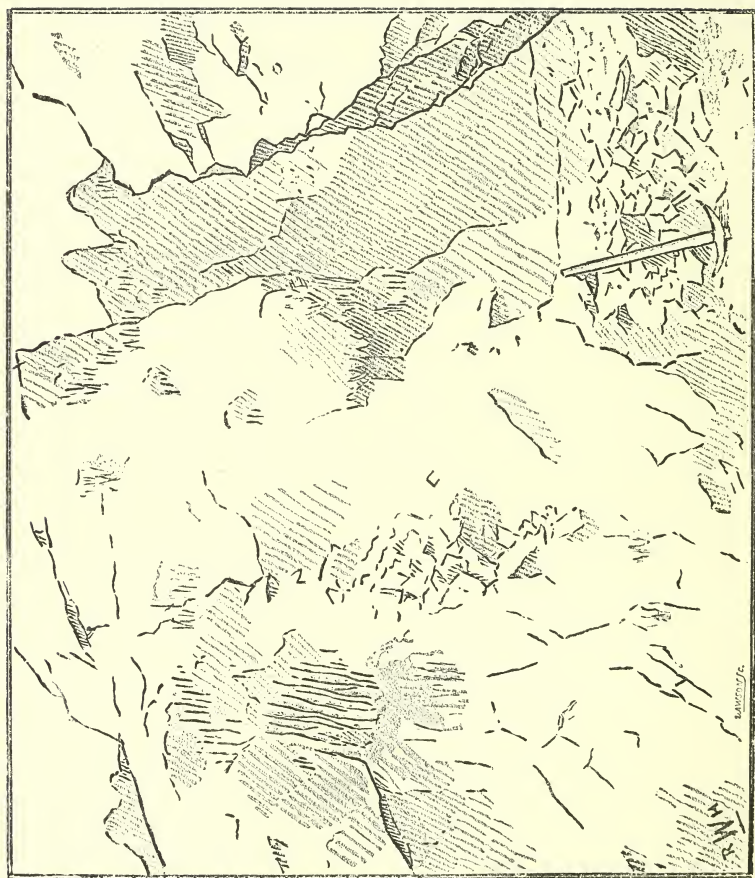
It was not long before a fresh discovery was made, and this time bovine and caprine were accompanied by human remains—fragments of a skull, a lower jaw, and a number of phalanges; but there was no distinct evidence of their position. The material had now been cleared sufficiently to reveal a considerable 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 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; but as they might have slipped downward during the digging, all that could be done was to keep a careful watch for more definite indications.

An examination of the cavern, for such it proved to have been—an irregular tunnel with a chamber at each end—showed that there was no difficulty, when the face of the contents was once fairly cleared, in distinguishing between the recent filling 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 deposits being perfectly distinct.

As excavation proceeded the bone-bearing deposit became more productive. Moreover, it increased in thickness by rising towards the end of the fissure, and became 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 was no reasonable doubt that the bulk of these stones had fallen from the roof.

When the greater portion of this filling had been removed down to the modern 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 had increased in thickness by the gradual northward rise, from the first appearance of a stalagmitic character, from two to four feet.



SKETCH OF CATTEDOWN CAVE.

The sketch annexed, from a photograph by Mr. D. Roy, shows this northern chamber with the loose material removed and the stalagmitic-breccia exposed.

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, 1887. 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 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 the remains of the hyæna, wolf, red-deer, and roe-deer. Other fragments of the skull were subsequently found imbedded in the stalagmite.

When this 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 to 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.” In the end this in part gave place to the more open breccia, infiltrated with stalagmite. A small portion on the same level next the eastern side consisted, however, of a close granular stalagmite, with angular fragments of stone; and this gradually thickened and broadened northward, and eventually occupied the extreme northern end of the fissure almost to the lowest point excavated.

The concrete-floor yielded chiefly small fragments of bones and teeth. 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 above. The close granular stalagmitic-breccia 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 hyæna, wolf, boar, and badger.

At the very end of the fissure, seven feet below the stalagmitic floor, and at the deepest point in the breccia 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 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 breccia there were, in addition to the water-vole and mole, bones and teeth of the bank- and field-vole and bat.

Mr. Burnard then determined to trace the fissure towards Cattenwater. When he commenced excavation, the section 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 the chamber was removed to a depth of nine feet, where it closed in to a joint; 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 stalagnite was seen. With the exception of a fragment of a human humerus and some 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.

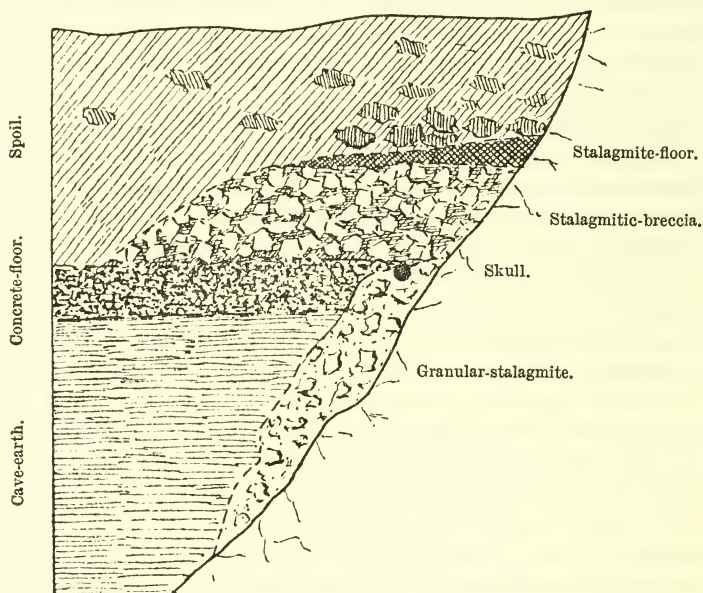
A return was then made to the entrance of the northern chamber, and sinking resumed, this time with important issues, in material generally resembling that of the concrete-floor, which was indeed only its upper and more consolidated portion.

The fissure was quickly 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. Instead of a lower chamber, it 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. 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 were more or less ossiferous.

A noteworthy fact about this 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 perfectly plain. The material gradually falling from above had formed a talus, the upper part of the slope of which had closed the aperture 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, but still presented the character of a regular series. At the bottom of the chamber there were small stones and chocolate-coloured clay. Immediately above the stones were larger, and with less earthy matter; and there were portions where the stones were larger still, and practically free from earth. The longer axes of the stones followed the slope of the talus.



Northward this deposit passed into the mass of granular stalagmitic-breccia, which filled the end of the fissure to an ascertained depth of fifteen feet, underlying the bone-breccia which had proved so rich, but, save in its upper portions, being itself all but barren. Nor was the quantity of bones found in the lower part of the northern chamber large. Moreover, they were, as a rule, thinly scattered, except in one spot, which yielded the remains of hares, rabbits, smaller rodents, and birds. This fact 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 order of the deposits in the northern chamber is shown in the section opposite.

When completely explored, it was seen that the cavern consisted of a gallery, running north and south on the natural jointing of the rock, with a chamber at each end, the total length being fifty-four feet. At the point first opened, 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 it contracted so rapidly above as to give the impression that originally the gallery did not rise much above the dozen feet of rock which remained unworked on its western side, at the modern quarry level. But the total height, taking the results of the excavation into account, must have been much more than double this. 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 width. Its depth below the quarry floor was not more than nine feet. From the fact that the connecting fissure, or gallery proper, narrowed rapidly downwards, the lower parts of the two chambers were separated from each other by nearly twenty feet of rock.

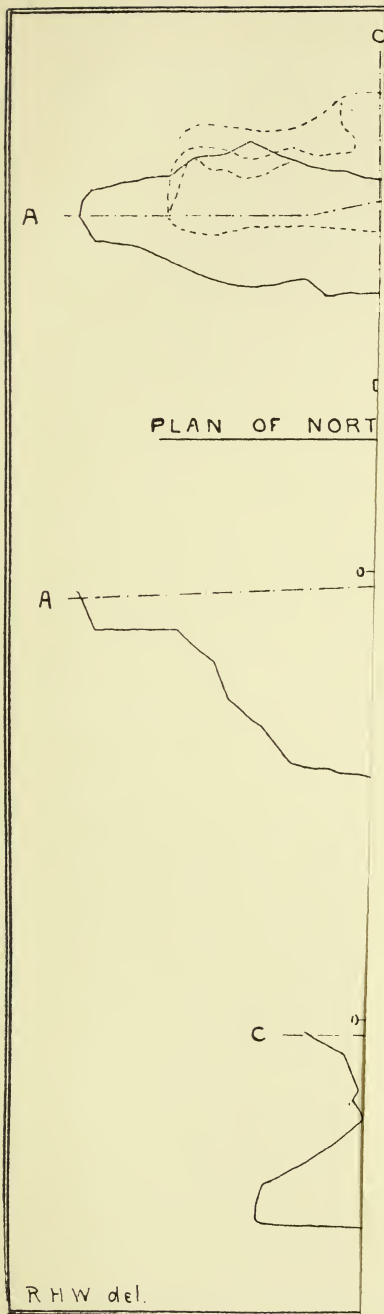
The natural entrance to this gallery and its chambers was evidently from above, and apparently near the northern end. There is no reason to doubt that the cave formed the descending branch of a large cavern or series of caverns, of which several traces remained in the hill above. There was direct evidence 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 first broken into. The very considerable stalagmitic infiltra-

tion at the northern end of the cavern points also to the existence of a considerable superincumbent mass of rock.

The details of the cavern are exactly set forth in the accompanying plan and sections, drawn to scale from careful measurements by my son Mr. R. H. Worth. The datum is 17.70 above Ordnance.

A review of the whole facts enables us to distinguish between, at least, two distinct series of deposits: the open stalagmitic-breccia above; the concrete-floor with its ordinary cave-earth continuation below. The conditions of the remains 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. 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, and those of the cave-earth were chiefly of mature.

But the most marked differentiation was the fact that the remains of the breccia were those of animals 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 in the majority of cases that 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. 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 had met one common fate.



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CATTEDOWN CAVE

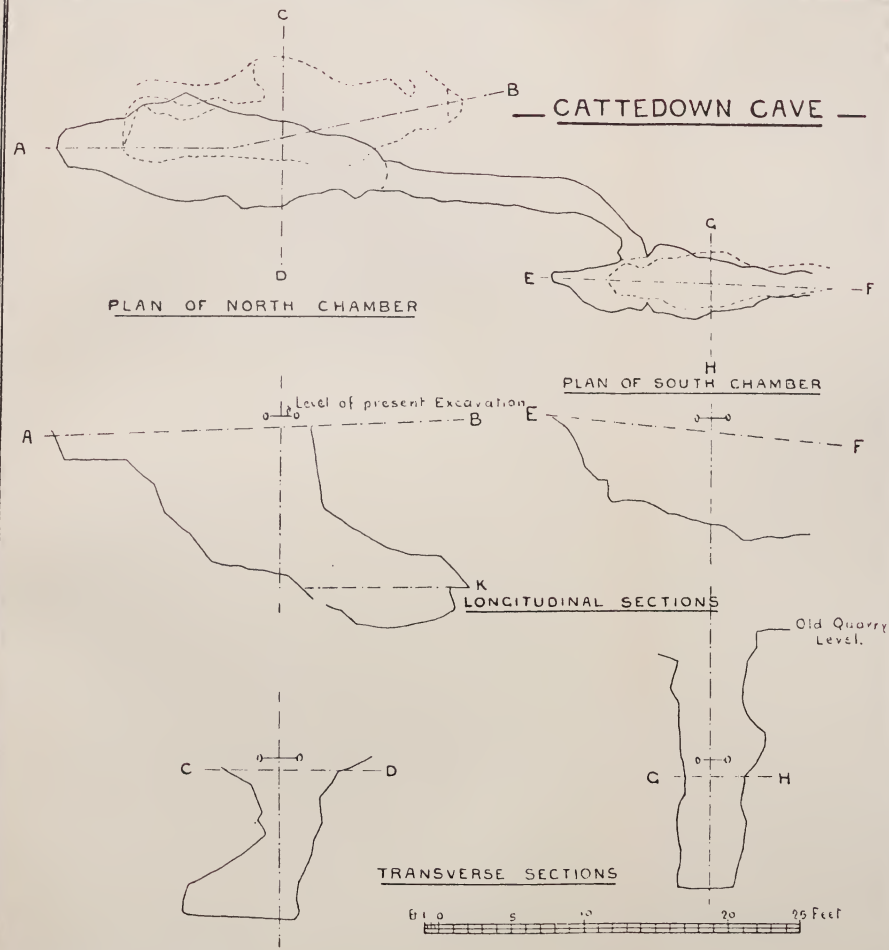
PLAN OF NORTH CHAMBER

PLAN OF SOUTH CHAMBER

LONGITUDINAL SECTIONS

TRANSVERSE SECTIONS

SCALE.



When we speculate upon the manner in which the remains of the breccia found their way into the cavern, one hypothesis may at once be discarded. The cavity was 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 naturally to do with caves, and whose bodies must have been brought there by some agency external to themselves.

There are 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 the bodies in; but had they done so, they must have voluntarily abandoned their intended feast, or have been prevented from reaping the reward of their industry. They never willingly left fairly complete skeletons behind them. Moreover, if we admit that they dragged in the oxen and deer, we must 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 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.

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. There was no trace of such intentional deposit of the former as must have accompanied the rudest act of burial. There was no matter of human handiwork, with the doubtful exception of

three splinters of deer horn. There had been a common end for one and all. At the same time there was unmistakable 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 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.

The concrete-floor and cave-earth, on the contrary, 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, and their generally fragmentary character, all pointed to gradual and casual occurrence. At the same time the evident association of some of the bones here also 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 continuous stream had flowed into or through the cavern from a distance. The most careful search revealed no single fragment of stone (with one exception, noted hereafter) foreign to the immediate neighbourhood. A few fragments of slate apart, all were limestone.

All that was required to produce the concrete-floor and cave-earth was, then, 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 higher parts of the cavern.

The remains of the stalagmitic-breccia are as readily accounted for by a sudden rush of waters, bearing with it the bodies of drowned animals, pouring into the cave, 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.

The 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.

Before I proceed with a more detailed description of the components of the find, it may be desirable to meet some possible objections to my inferences of the antiquity of the remains, at least of the human. I have hitherto rather assumed this antiquity, than advanced categorical proof, though no step has been taken in the presentation of the case without evidence being given. I may be asked, "What evidence have you, after all, that the human remains are of equal age with those of the rhinoceros, the lion, and the hyæna—the three locally pre-historic members of the cavern fauna? May not the two sets of remains—the human and the earlier infra-human—have been associated subsequently to the original deposition of the latter? May there not be some fault in the method of investigation? Have not the investigators been deceived?"

These queries, I think, cover the whole ground of possible objection.

It has been said that the only way of obtaining absolutely satisfactory evidence from the exploration of a cavern deposit is to keep it under lock and key, and I frankly admit that in the present case nothing of the kind was done. Short of building a house over the fissure, the thing was impossible. But the cave was on enclosed premises, not accessible readily to the general public. Moreover, it was sealed by nature far more effectually than it could have been by any human lock.

Let us for a moment recapitulate the facts. We have a deposit of stalagmitic-breccia, containing not merely detached bones, but the remains of complete skeletons of various animals—deer, wolf, hyæna, and man, the principal. The association of these bones is such as to make it perfectly clear that they were deposited where found while still covered with the integuments; that is, soon

after death. They were therefore contemporaneous ; and thus we have the Cattedown man brought back, at any rate, to the era of the English hyæna. For proof that the facts were so, there are the statements of Mr. Robert Burnard and myself, that we removed many of the remains ourselves ; nay, that when the solid portion of the breccia was blasted out we were the first to examine it, and before anyone else had touched it took out not only portions of the human skeleton, but found traces of human occupation in the shape of fragments of charcoal embedded in the heart of masses of stalagmite then broken.

But we do not stop here. In the cave-earth beneath this stalagmitic-breccia, and therefore anterior to it—sealed up and inaccessible until the breccia was removed, and certainly not more recent than the era of the English hyæna—we have the remains, not merely of the hyæna, but of the rhinoceros and the cave lion, and again of man. We have thus double proof—the stalagmitic-breccia gives us evidence of the association of man with the hyæna ; the cave-earth of his association with the hyæna, rhinoceros, and lion. Is it possible then seriously to question either the integrity of the deposits when they were first opened by Mr. Burnard and myself ; or the conclusion that the human remains found are those of men and women and children who were contemporary in this country with the mammoth and rhinoceros, the lion and the hyæna ?

But for the stalagmitic seal of the breccia, which dates itself hyænnine, it might have been argued that the cave-earth was an ancient redeposit, and not necessarily contemporary. Such an objection might have been raised by a determined opponent of a hasty turn of mind. But I should have been content even in that case to argue that the presence in the cave-earth in proximity, of both humeri of what no reasonable man could question to be the same lion, and of an associated humerus and ulna of the same human subject, indicated that here also deposition took place, at least in these cases, before final integumental decay.

Something also may be held to turn on the physical condition of the bones—a point in its degree of much interest, though its importance is apt to be exaggerated. Many had been broken into minute and unidentifiable fragments. Of the remainder the bulk were light and adherent to the tongue ;

but while some were so friable as to crumble at the touch if dry, or to fall into a kind of paste if wet—and to require great care in drying—others again were fairly solid, and some really dense and hard. These differences existed between bones lying close together, parts of the same finds, and in some instances of the same animal; and it will easily be understood that bones exposed to the air continuously would be in a very different condition from others enclosed in stalagmite, or in a dense mass of clay permeated with animal matter.

Such differences were recognized from the very first by the investigators of cave deposits. Mr. W. Martyn, in 1809, stated, in his “Attempt to Establish a Knowledge of Extraneous Fossils on Scientific Principles,” that fossil bones often retained “a portion both of the gelatine and phosphoric acid in their composition, particularly in their interior parts, the surface only having undergone a privation or loss of these principles.” Dr. Buckland observed that there was less animal matter in the bones of Oreston than in those of Kirkdale.

So Mr. Clift, reporting on Mr. Whidbey’s find of 1822 (*Phil. Trans.*) at Oreston, noted that there was “a considerable difference in various specimens . . . that the loss of animal matter, and consequent decay or decomposition of fossil bones, depends very much upon the nature of the soil in which they are deposited;” and that bones of the mastodon from Ohio, and the bear from Gaylenreuth, retained their animal matter so as to keep their form when deprived of their earth by means of muriatic acid.

Analyses by Mr. Brande of rhinoceros remains found at Oreston in 1816, gave .02 of animal matter only for a bone, and .06 with water and loss for a tooth; but he remarked that he had never met with fossil bones so purely earthy. Analyses by him—of a rhinoceros tooth found at Brentford gave .04 of animal matter and water; of the tibia of a hippopotamus found at the same place, .05 of animal matter solely; while the rib of a fish from the Lyme Regis Lias contained .03. Vast as is the time, therefore, which divides us from the era of the Lias, even it has not been long enough—if time were all—to get rid of the distinctly organic constituents of the fish of the Liassic sea.

In their natural state the organic constituents of bones may be put on an average at a third, varying in the human subject from 1 to 1.6 to 1. to 2.3. In the femur of an ox Heintz gives the

animal matter at 30·58, in a sheep at 26·54; and in a human forearm at 31·11. We find the whole question of the proportion of animal matter in fossil bones summed up in *Ure* as follows: "The quantity of organic matter in fossil bones varies considerably; in some cases it is found in as large a quantity as in fresh bones, while in others it is altogether wanting. Carbonate of lime generally occurs in far larger quantity in fossil than in recent bones."

With these observations I give an analysis of a deer bone from the Cattedown breccia, very kindly made for me by Mr. Henry S. Billing, F.I.C., F.C.S.

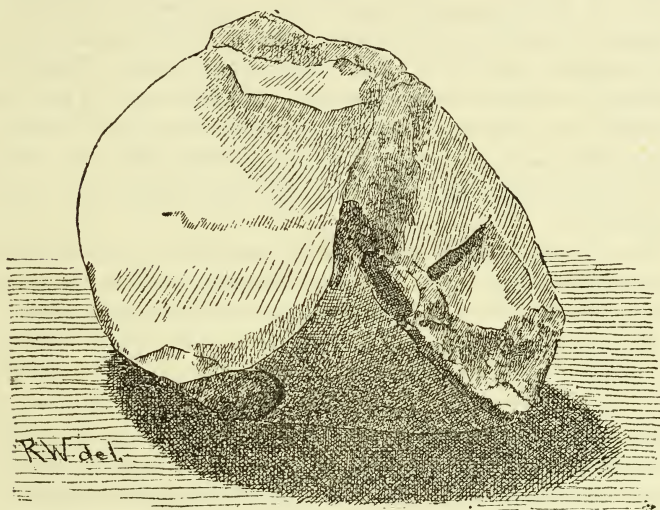
FOSSIL VERTEBRA OF DEER.						Per cent.
Ash	.	.	.	.	.	89·06
Organic matter	.	.	.	.	.	10·94
Insoluble matter	.	.	.	.	.	2·56
Phosphate of lime	.	.	.	.	.	69·43
Phosphate of magnesia	.	.	.	.	.	·71
Carbonate of lime	.	.	.	.	.	11·36

Of human handiwork there is but one certain illustration; though it is quite possible, as already hinted, that some splinters of horn found in the breccia may be artificial. On them, however, I lay no stress. The certain example is a nodule of flint, already referred to as being the only piece of foreign stone found in the course of the excavations. This nodule is white and porcellaneous in general aspect—a natural flint pebble, about a third of the mass of which has been broken off longitudinally, and a portion of one end slantwise. Flakes have been struck from it, and it also suggests a probable use as a hammer-stone, at all events in a casual way. There is no ground for doubt that the flaking is artificial; and I am glad to have the high authority of Mr. A. W. Franks, F.R.S., F.S.A., of the British Museum and Christy Collection, in support of that view. The extreme length of the nodule is $4\frac{5}{8}$ inches, its extreme breadth $2\frac{3}{4}$, and its depth $2\frac{1}{4}$ inches. Originally it must have approached 6 inches in length, and 4 in depth, and have been of a flattened ovoid or discoid shape. It is partially encrusted with stalagmite. Its present appearance is shown in the annexed sketch by the finder, my son, which gives both the broken faces, and indicates the flaking on the larger.

The fauna of the cave comprises at least thirty-three species, including 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 various birds.

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 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; 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 in association with this also were the remains of the hare, rabbit, and dog.

Those who are acquainted with the characters of an ancient cavern fauna, will recognise that there are in this list three animals which are not usually considered to be consistent with high antiquity, to which if any of the remains assigned to the goat should belong to the sheep, we should have to add that animal also. The three are the long-fronted ox (*bos longifrons*), the so-called "Keltic shorthorn" the dog, and the rabbit. Now it is noteworthy that the remains of neither of these were found in such positions as to render their presence or absence of the

smallest importance to the argument. The bones of *bos longifrons* occurred in the loose upper deposit, which may have been part of the spoil, but neither in the cave-earth nor the breccia; and their purpose seemed to have been served when they had called attention to the possibility of further discoveries. They cannot be excluded from the list of the cavern fauna, but their relative scientific importance here is of the slightest. The rabbit and dog *are* associated with the cave-earth; but it is in connection with that part of the lower northern chamber which remained unfilled, and which, as I have said, might have been accessible to the bodies of small mammals long after it was closed to the larger. Besides, it is only recently that the wild rabbit has ceased to live at Cattedown; and we all know the capacity of that animal for finding its way into obscure recesses. Mr. Hill has told me that it used to be a favourite amusement of himself and his brothers, to put their tame rabbits into the crevices of the cliff at the back of the shipbuilding yard, and wait until they returned from their explorations.

In no instance then was there an association of ancient and modern fauna, save of an accidental character; and the evidence of the stalagmitic-breccia, and of the cave-earth proper, is intact.

The quantity of bones found in all was not less than a cartload; but only a small proportion of these, comparatively, was available for scientific purposes. Many were locked up in stalagmite; a great number were simple fragments; and of those that were clearly identifiable the smaller portion only were fairly perfect. Under these circumstances the Institution is all the more indebted to Messrs. Burnard, Lack, and Alger, that they should have placed the entire collection for selection at its disposal. With a few unimportant exceptions the whole of the human remains are now in our Museum, and every non-duplicated example also, with a large quantity of the stalagmitic-breccia.

It is not easy to take a satisfactory census of the animals whose remains were found in this ancient charnel; but among the larger deer and man preponderated; the hog and the various bovine species coming next; followed by the wolf, hyæna, fox, and badger. Of the cave-lion, rhinoceros, and polecat, so far as I am aware, these were only single representatives. The smaller mammals might be counted by the hundred; of the larger there were at least seventy or eighty individuals.

The following Table gives a view of the details of the Cattedown fauna, in comparison with the other leading ossiferous caverns of Devon, setting forth their individual characteristics, and totalling their results.

	Cattedown.	Stonehouse.	Oreston.	Yealmpton.	Brixham.	Kent's Cavern.
Man . . .	+	.	+	.	.	+
Elephant	+	+	+	+
Rhinoceros .	+	+	+	+	+	+
Hippopotamus	.	.	??	.	.	?
Cave Lion . .	+	.	+	.	+	+
Cat	+	.	.	.	+
Brown Bear	+	+
Grizzly Bear .	.	+	+	+	+	+
Cave Bear	+	.	+	+
Hyæna . . .	+	+	+	+	+	+
Machairodus	+
Lynx	?
Wolf . . .	+	+	+	+	.	+
Fox . . .	+	+	+	+	+	+
Dog . . .	+	+	.	.	.	+
Canis isatis	?
Glutton	+	.	+
Weasel . . .	+	.	+	+	+	+
Stoat	+ A.H.	.
Polecat . . .	+	.	.	.	+	.
Hedgehog . .	+
Shrew . . .	+	.	.	.	+	+
Horse	+	+	+	.	+
Ass	+	.	.	.
Aurochs . . .	+	?	+	.	.	+
Urus . . .	+	+	+	OX	+	+
Bos longifrons	+	+	+	.	+	+
Irish Elk	?	.	.	+
Reindeer . .	.	+	.	.	+	+
Red Deer . .	+	+	+	+	+	+
Roe Deer . .	+	?	.	.	+	+
Hog . . .	+	+	+	+	.	+
Sheep or Goat	+	+	+	+	+	+
Badger . . .	+	.	.	.	+ A.H.	+
Beaver	+
Hare . . .	+	+	+	.	+	+
Rabbit . . .	+	.	.	+	+	+
Seal	+
Cave Pika	+	+
Mole . . .	+
Black Rat . .	+	+
Mouse . . .	+	.	rodent	+	.	+
Water Vole . .	+	.	+	+	+	+
Bank Vole . .	+	.	.	.	?	+
Field Vole . .	+	.	.	.	?	+
Bats . . .	+	.	.	+	.	+
Birds . . .	+	.	+	+	+ A.H.	+

This table has so far as possible been compiled from what may be called official documents, and includes, as far as I am aware, all the mammals whose remains have been reported from the various caves. The different finds at Oreston, Yealmpton, and at Brixham are grouped together; those of the Ash Hole in the latter place, where they are additional to the Windmill Hill, being distinguished by the letters *a h*. When there has been no distinct specific identification the common name of the genus only is given, as *ox* or *rodent*. Notes of interrogation indicate doubt. The occurrence of hippopotamus at Oreston is reported by Mr. J. C. Bellamy; for Kent's Hole it is given by Professor Owen; and Mr. Northmore gave the Museum of the Plymouth Institution portions of a jaw so identified, which, he said, came thence. Mr. Pengelly is more than doubtful of the presence of remains of this animal in Devon. The rhinoceros remains of Oreston include both the tichorhine and leptorhine species. Those of Kent's Cavern and Stonehouse are tichorhine, and so, I believe, are those of Cattedown. The hedgehog is of very rare occurrence in cave deposits, and has never been found in caverns in Devon before. The mole also is now reported apparently for the first time from our Devon caves. The bats include the common and the horse-shoe bat; and there are apparently four species of birds, of the size respectively of a swan, goose, fowl, and pigeon. This list thus gives us a certain total of 33 species from the Cattedown cave—29 of mammals, and 4 of birds. The only cave—not merely in Devon, but, so far as I am aware, in the kingdom—that is known to have been more specifically productive is Kent's Hole, with 37 certain species, and 3 doubtful, besides birds. The Brixham caves give a similar total of 26 species. The Yealmpton of 21, and the Oreston of 27; in these two cases including birds and doubtfuls. If, however, we set the Plymouth cave fauna generally against that of Torbay—Cattedown, Oreston, and Stonehouse against Kent's Hole and Brixham—the oldest cavern centre of England proves numerically as rich as its rival, even though it lacks *machairodus*; and the great find of human remains at Cattedown will serve as an excellent make-weight in that particular.

A glance at the table will show that 24 of the mammals enumerated are common both to Cattedown and Kent's Hole; that 5 are reported from Cattedown, and not in Kent's Hole; and

that 16 occur in Kent's Hole, and not at Cattedown (including doubtfuls). The great peculiarity in Cattedown is the absence of the elephant, bear, and horse, each of which has been liberally represented at Oreston and elsewhere in the vicinity. The special distinction of Kent's Hole, on the other hand, is the exclusive possession of *machairodus*, *lynx cervaria*, *canis isatis*, beaver, and seal, found nowhere else in the county, and there only in such small quantity that some such remains may very well have been overlooked in earlier explorations elsewhere. The hippopotamus, if claimable, Kent's Hole may have to share with Oreston; the wild cat it shares with Stonehouse; the glutton with Yealmpton; the reindeer with Brixham and Stonehouse; the elk probably with Oreston; the pika with Brixham. As its exclusive property, Cattedown claims the hedgehog and the mole.

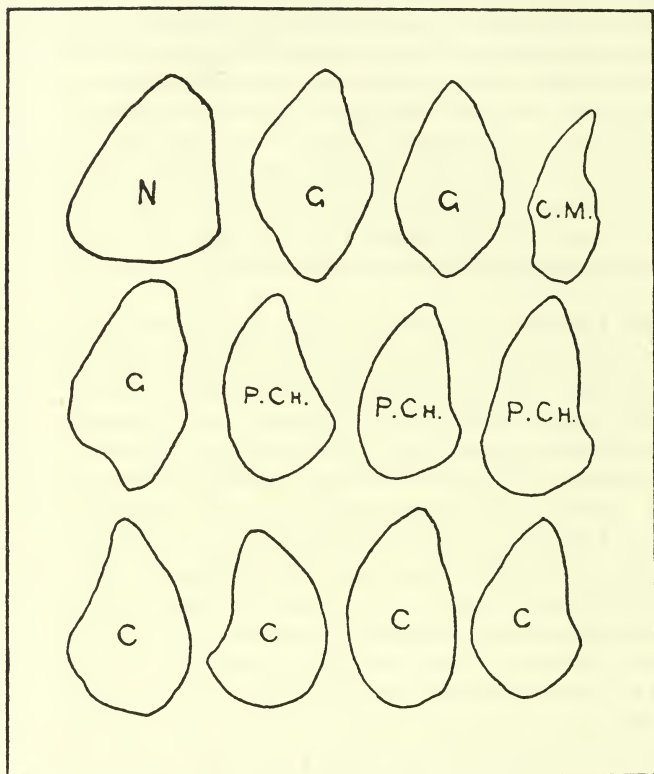
The human remains found are those of a number of individuals—at least fifteen—of both sexes, and ranging from childhood to old age. No single skeleton was complete; but every bone in the human frame, so far as I know, was represented. The most perfect portions were skulls and jaws, and bones of the extremities—the 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, and the longest tibia 14 inches.

The most interesting point concerning the tibiæ is their markedly platynemic or flattened character, in the extent of which they closely resemble platynemic tibiæ from Perthi Chwareu in North Wales.

But likeness does not stop here. The longest of the Perthi Chwareu adult tibiæ is bigger than the longest of the Cattedown; and the least of the Cattedown is shorter than the smallest of the Welsh. Mr. Busk assigned the Perthi Chwareu bones 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

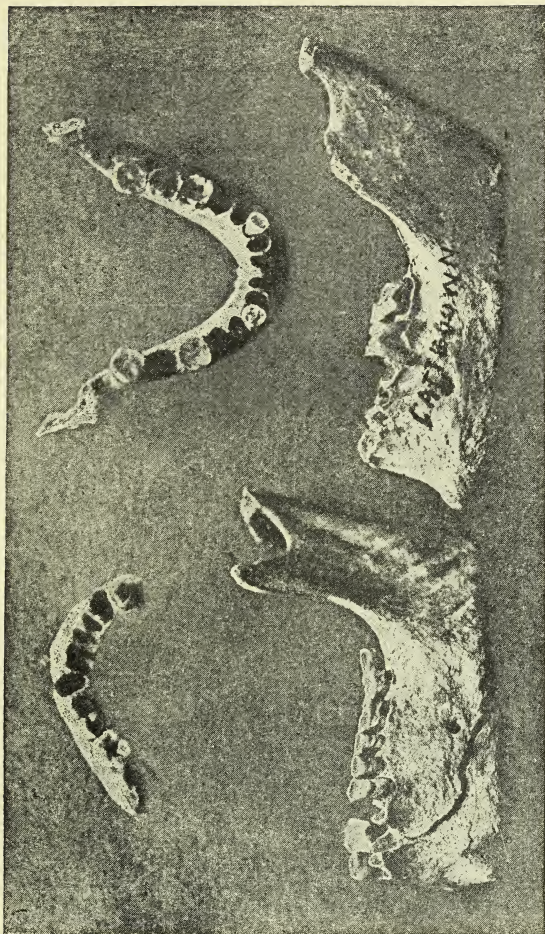
calculations work out to 4 ft. $9\frac{1}{4}$ in., 4 ft. $9\frac{1}{2}$ in., 4 ft. $9\frac{3}{4}$ in., and 5 ft. $0\frac{1}{4}$ in. respectively. And this is, at any rate, sufficient to indicate that we are dealing with a short race. Some of the bones appear to show considerable relative strength; others are



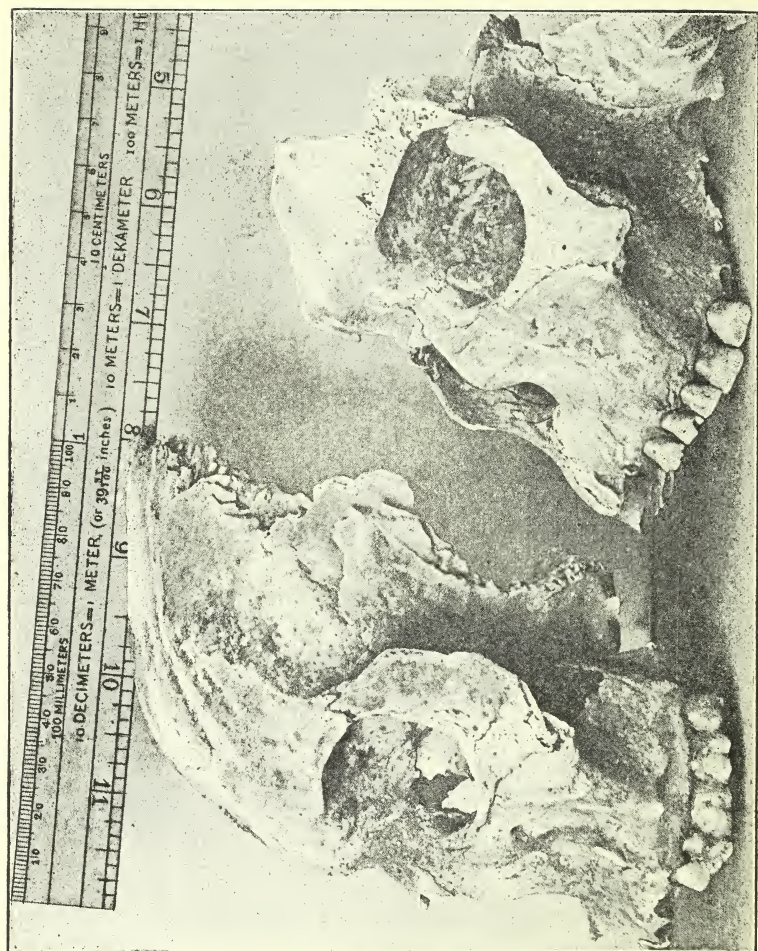
SECTIONS OF TIBIÆ.—N. Normal; G., Gibraltar Caves; C.M., Cro-Magnon man; P.Ch., Perthi Chwareu; C., Cattedown.

decidedly feeble, but probably this is due to the exaggerated sexual differences 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



HUMAN JAWS, CATTEDOWN CAVE.

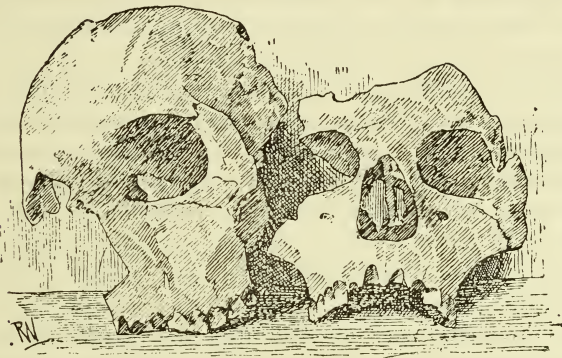


HUMAN SKULLS, CATTEDOWN CAVE.

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

The accompanying Miesenbach plates give profiles of the two skulls, and views of four of the lower jaws. Beneath is a sketch of the skulls—full face.

So far as I am able to judge of the shape and proportions of the crania, they are neither dolichocephalic nor brachycephalic, but of a middle type—orthocephalic. They are also essentially orthognathous, and some of the lower jaws have prominent chins. The teeth are large and singularly free from traces of decay, although in many cases much worn, and the jaws in every instance give ample room for the full number.



Now as to the age of the deposits. I do not of course commit myself to any absolute chronological statement. There are no positive data for this beyond the fact that the existence of the rhinoceros and lion and hyæna in this country is pre-historic. Nor do I intend to found any argument upon such a very variable factor as the growth of stalagmite.

But there is no need to stop here. The conditions of the deposits seem to render a very considerable change of level essential to the carriage of the contents of the breccia by water in flood ; and we cannot separate them from others in the locality. In dealing with the general question in my paper on the "Bone Caves of the Plymouth District" already cited, I re-affirmed a suggestion made in an earlier paper on the Geology of Plymouth,⁶ that the deposits in the caverns at Oreston, and in the fissures on

⁶ *Plym. Inst. Trans.*, v. 475.

the Hoe, generally dated back to a time "when the limestone rocks" enclosing them "were but slightly raised above the waters, and when, therefore, nothing was easier than the introduction into the caverns of bodies of animals swept down the streams, probably in time of flood." I made allowance then, however, for the possibility of some of our bone-caves turning out to be dens; and in fact I almost seem to have forecast this very cave: for I remarked, "if any of the caves were dens, the time range must have been long enough to have placed the cavities so occupied above the general reach of the waters, while the character of the fauna remained unchanged. Nay, it is quite possible that when the deposits originated, some of the caverns into which portions have since found their way, had no adequate surface communication."⁷ The exceptional conditions of the present discovery could hardly have been more carefully provided for.

I also said in 1879, and repeat now, that the period to which these remains belong "was certainly sufficiently remote to allow of the production of a present change of some hundred feet in the relative local positions of land and water, and beyond that of a pause of sufficient duration for the formation of our raised beach, with the time occupied in the continued elevation, and subsequent depression of the submerged forest." That no noteworthy change of level has taken place here in the historic period we know; and the fact that the kitchen-midden on Mount Batten isthmus, which apart from the caves gives us the earliest distinct evidence of man in this locality, has come down partially intact to the present day, shows that since its formation there can have been no material depression; and that our cave men must be very far older than their rude successors of the shore.

The point to remember in dealing with this question of antiquity, is that the Cattedown Cave is not an isolated fact, but part of a series.

So far as the evidence of date is affected by accessory points, it is decidedly in the direction of antiquity. The traces of human handiwork are, it is true, very few; but they are such as are consistent with the earliest men known to us in this country. The very paucity of those traces, it seems to me, is itself an argument in favour of age. The belongings of Neolithic man

⁷ *Op. cit.* vii. 110.

were not only less rude but more numerous than those of his Palæolithic predecessor; and I cannot imagine that Neolithic men and women could have been present in such numbers, without more examples of human handiwork being present with them; and some at least unmistakeable in assignment.

The scientific world is to be congratulated that this 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 also 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; to Mr. G. Jackson, F.R.C.S., for his valued assistance in dealing with the relics of man; and to Mr. Billing, F.C.S., for his analysis of some of the bones. My son, besides preparing the very careful and accurate plan of the cave, has assisted me in various other ways. The lower jaws are reproduced from a photograph by him; and the drawings generally are his also.

In conclusion may I remark that in the Museum at Leeds, attached to a collection of Oreston bones, there is a label which sets forth with regret that no attempt had been made "to explore the caverns [of Oreston] systematically, or under scientific superintendence." I might demur to that statement as it stands, and up to the date covered, if it is to be taken in its full, literal, significance; but I am content to point to the Cattedown Cave and its results, as proof that we are wiser now; and that when we in Plymouth get hold of a good thing in the cave line, we are quite ready and able to deal with it.

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 inch. 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 CA). 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. This may have arisen from the absence of the corresponding teeth in the upper jaw. If natural, it is the strangest feature of the find. 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. Interangular 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 condyle 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 single 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.