PLAN OF BALLYCUMMISK MINE, CO. CORK.

SCALE - 1 INCH = 115 ½ FATHOMS.

REFERENCE.

- A . SKIP SHAFT.
- B . WHIM ENGINE.
- C . PUMPING ENGINE.
- D . WEST SHAFT.
- E . STAMPING ENGINE.

Vincent Brooks Day & Son lith.

(To illustrate Mr Samuel Hyde's paper in the May N^o)

SECTION OF BALLYCUMMISK MINE, CO. CORK.

SCALE. 1 INCH = 52 FATHOMS.

SECTION FROM BANTRY BAY TO ROARING-WATER BAY.

(To illustrate Mr Samuel Hydes paper in the May No)

Vincent Brooks Day & Son, lith.

(To illustrate M^r Samuel Hyde's paper in the May No)

THE GEOLOGICAL MAGAZINE.

No. LXXII.—JUNE, 1870.

ORIGINAL ARTICLES.

I.—ON THE OCCURRENCE OF ELEPHANT-REMAINS IN IRELAND.

By Professor ROBERT HARKNESS, F.R.S., F.G.S.¹

THE earliest discovery of Elephant-remains in the British Isles appears to have been made in Ireland, and is recorded in the xxixth volume of the Philosophical Transactions.

This discovery was made about the year 1715, "in digging the foundation of a mill, near the side of a small brook that parts the counties of Cavan and Monaghan," at Maghery, eight miles from Belturbat. Here four molar-teeth of an elephant were found, two of which were of a large and two of a small size. A portion of a lower jaw, containing one of these teeth, was also met with; likewise a part of the skull, which fell to pieces on exposure to the atmosphere; and some other bones of the skeleton.

The account of the discovery of these bones is given by Mr. Francis Neville, who states that they were found at the depth of about four feet from the surface of the ground, and their mode of occurrence is described as follows:—"The bed on which it lay (referring to the locality) had been laid with ferns,—with that sort of rushes here called sprits,—and with bushes intermixed, and nutshells. Under this was a stiff, blue clay, in which the teeth and bones were found; above this was, first, a mixture of yellow clay, and sand much of the same colour; under that, a fine white sandy clay, which was next the bed; the bed was for the most part a foot thick, and in some places thicker, with moisture clean through it; it lay close, and cut like turf, and would divide into flakes, thicker or thinner at pleasure; and in every layer the seed of rushes was as fresh as if new pulled, so that it was in height of seed-time that these bones were laid there. The branches of the fern, in every layer as we opened them, were very distinguishable, as were the seeds of the rushes and the tops of boughs. The whole matter smelt very sour as it was dug; and tracing it I found it 34 feet long, and about 20 or 22 feet broad."

¹ In the exploration of the ossiferous breccia, referred to in this communication, the author received great assistance from Dr. A. Leith Adams, F.L.S., F.G.S., 22nd Regt., to whom geologists are so much indebted for the knowledge they possess of the fauna of the caves of Malta. It was owing to his labours that the additional remains of Elephants and other animals were obtained from the Shandon breccia.

This description of the circumstances under which these Elephant-bones and teeth were found at Maghery leads to the inference that an old and small lacustrine deposit was the source from whence they were obtained.

Concerning the teeth it is stated that "the two large ones are of equal weight, $2\frac{3}{4}$ lbs. each; the two small teeth are 6 ounces each; but some of them are wasted, and some roots that enter the jaw are broken off."

These teeth are described by Dr. Thomas Molyneux, who regarded them as "the four grinding teeth in the lower jaw of an elephant," and he enters into a somewhat detailed description concerning them. They are figured, and contrasted with the grinding surfaces of molars of the African elephant in the volume of the Phil. Trans. above alluded to.

The figures of these teeth from Maghery appear to represent a form of enamel plate, which is more nearly allied to *Elephas antiquus* than to *E. primigenius*, the greatest breadth being in the middle, and possessing the somewhat lozenge-shaped outline which is characteristic of *E. antiquus*.

There is another reference to the discovery of Elephant-remains in Ireland.¹ It is stated that "some years ago was dug up, within a mile of Whitechurch, the rib of an elephant, which was no doubt such (*vide* Plate the last, fig. 2), it agreeing with the description of that animal in De Moulins and Blair." A sketch of this rib taken from the plate referred to is here annexed.

The rib above alluded to is regarded as belonging to a whale by Dr. Oldham,² and it certainly possesses much of a Cetacean aspect. The locality, Whitechurch, mentioned by Smith as affording this bone, is about six miles west of Dungarvan. From some information which we recently obtained it would appear that, about fifteen years ago, a considerable quantity of large bones were discovered in a cave near Whitechurch. These were said to consist of leg bones, which were described to us as being almost as thick as a man's body; also teeth, said to be six times larger than those of a horse; and a skull was mentioned, which was represented as having "four horns projecting from it." Most of these bones were probably those of elephants; and the skull with the four horns that of a reindeer, with portions of the brow antlers and the main shaft preserved.

The discovery of these bones recently at Whitechurch would tend to render it probable that the rib alluded to by Smith was that of an elephant, notwithstanding the Cetacean-like outline as figured in the plate before alluded to. Unfortunately, these bones have all disap-

¹ Smith's Ancient and Present State of the County and City of Waterford, MDCCXLVI., page 81.

² Journal of the Dublin Geol. Soc., vol. iii., page 70.

peared, some of them having been carried away by rag-and-bone collectors.

The next discovery of Elephant-remains in Ireland was made in 1859. This was also in the county of Waterford, in the neighbourhood of Dungarvan.¹

The locality which afforded these remains is a place called Shandon, about half-a-mile north-west of Dungarvan. They were discovered in working a limestone quarry for road material. Mr. Brennan, who is resident in Dungarvan, first brought these remains under the notice of naturalists, his attention having been directed to them in consequence of "a workman exhibiting a large bone as that of an antediluvian giant in the town of Dungarvan.

Many bones were obtained from Shandon by Mr. Brennan, and are now in the Museum of the Royal Dublin Society; a few are, however, in his possession still. The bones in the Museum of the Royal Dublin Society have been recognized by Dr. Alex. Carte, as appertaining to the "mammoth, cave-bear, brown bear, reindeer, horse, and hare, with a small portion of the humerus of a bird, as yet undetermined."

With reference to the circumstances under which the bones of the mammals at Shandon occur, it would seem, at first sight, that they had been derived from an ordinary ossiferous cave, but this, however, is not absolutely correct. On visiting the spot we were informed by a workman, who had wrought in the limestone quarry from whence these remains were obtained, that the bones occurred in the solid rock. The quarry has for some years been abandoned, and we were told that there was no chance of finding any more specimens.

On carefully looking along the surface of an exposed mass of breccia, forming a portion of the face of the old quarry, fragments of bone were recognizable in it; and further investigation proved that bones, and portions of bone, are still to be met with in considerable abundance in the breccia, about the horizon where they can be seen on the face of the quarry.

The Carboniferous Limestone of the old quarry at Shandon dips towards the south-west, at an angle of about 10° , and no boulder-clay is seen upon the surface of the limestones, which here overlays the bone bearing breccia. The face of the quarry at the spot where bones are seen in the breccia has the following arrangement from above downwards:—First, about 18 feet of regular limestone, intersected by a great number of closely approximating joints, which afford easy access for the surface water into the lower portions of the rock, is seen. Beneath this mass of regular limestone, breccias occur, irregular in thickness, but averaging about five feet, above which are open spaces separating the breccias from the superior limestone. These breccias have resulted from the falling down of masses of limestone rock into hollows which had been formed by the agency of water. In some cases these breccias lie upon a limestone floor; in other instances the fragments have wedged themselves together before reaching the

¹ Journal of the Royal Dublin Society, vol. ii.

floor. In some spots some of the fragments have fallen upon the floor, but others, which have subsequently become detached from the roof, did not reach this position, but have become jammed together, and form the roof of caves. This was the case at the spot where the osseous fragments were found, for, on clearing away some rubbish which had been here accumulated, a cave, about two feet high, was found, having a brecciated roof about five feet in thickness. This brecciated roof was cemented together by stalagmitic matter.

The floor of this cave was in part also a breccia, united together by crystalline carbonate of lime. This latter was much more abundant in the floor than in the roof; and the angular fragments which it cemented together were not usually found in contact with each other. It was in this lower breccia and stalagmite that the bones were found.

At this spot the layer of breccia and stalagmite was about two feet in depth; but its thickness is extremely irregular, as near the western side of the opening of the cave it is not more than six inches in depth, and in some spots it dissappears altogether. The bones occur in the upper part of this layer, forming the floor of the cave, rarely at a greater depth than four inches, and sometimes they are even nearer the surface of the floor. This stalagmitic breccia rests upon a mass of solid stalagmite, which is here about eighteen inches thick; and beneath this stalagmite another cave is seen. This cave, was, however, so blocked up by masses of rock that an entrance could not be made into it with the means which we had at our disposal.

The stalagmitic breccia which yielded the bones was difficult to work. This, however, resulted from the confined space which was available for working in rather than the hardness of the rock itself.

That bones occur in it abundantly is shown by the circumstance that, in an area of little more than a square yard, we obtained from it five Elephant's vertebrae, one of which retained its spinous and transverse processes nearly perfect. Portions of five Elephants ribs were also found. Besides these, fragments of the metacarpal and metatarsal bones of the reindeer were also met with; and a small fragment of a rib apparently belonging to the same animal. In some instances these bones were imbedded solely in the stalagmite, but more frequently a thin layer of fine clay separated them from the enveloping hard matrix.

The bones occurring in the stalagmitic breccia are in a more or less broken condition; the fractures, however, seem all to have been made since the bones were brought into the cavern. The surfaces of the fractures are generally very sharp, and the broken pieces are frequently in juxtaposition. In the case of the metacarpal and metatarsal bones of the reindeer, before referred to, these afford some interesting evidence as to the cause which has produced the fractures in these bones. The fragments possess all the features of such bones as are now regarded as having been split by man for the purpose of obtaining the marrow which they afford.

The cause of the fracture of the bones which are found in the

stalagmitic breccia at Shandon has been the falling of fragments of limestone from the roof of the cave while the bones lay exposed on the surface of the floor; and subsequently the infiltration of carbonate of lime has consolidated the fallen fragments into the hard breccia in which the animal remains are imbedded.

As concerns the occurrence of mammalian remains in the breccia of Shandon, there are some circumstances in connection with this which lead to the conclusion that neither the transporting agency of water, nor the influence of carnivora, had anything to do with their appearance here. The bones have no traces upon them of the action of such a force as running water, the only evidence of such a force being in the occurrence of the thin film of clay which, in some cases, invests the bones, and this clay has emanated from water from above percolating through the joints of the rock. There is no trace of anything in the form of a rolled pebble in the breccia, the limestone fragments being as sharply angular as when first detached from their parent rock.

With reference to the influence of carnivora the conditions of the bones indicate that such animals had not used the caves as dens. The more cellular portions of the skeleton are as intact as any other part; and there is nothing to show that the bones were broken in such a manner as they exhibit when they are found associated with the remains of the hyæna.

The only carnivora of which the bones are mentioned by Dr. Carte as occurring in the Shandon breccia are the cave-bear and the brown bear, the former being most probably only a very large variety of the latter, a relationship similar to that which the ancient cave-lion had to his modern African representative. Besides these remains of carnivora, alluded to by Dr. Carte, it would appear that the wolf was also a contemporary with the mammoth in Ireland, as Mr. Brennan has in his possession a portion of a large lower jaw of this animal, which was obtained from the Shandon breccia.

The late Dr. Falconer mentions the occurrence of the remains of the wolf with those of the mammoth in connection with the caves of the Gower peninsula. One of these caves, Spritsail Tor, besides yielding the remains of these animals, afforded evidence of a much more extensive fauna than the Shandon breccia. In the case, however, of Spritsail Tor Cave, this seems to have been a hyæna's den, as coprolites of this animal occur in it, and also gnawed bones of *Bos Equus* and *Cervus*.¹

Ireland has hitherto afforded no traces of either the hyæna or the lion. The Pleistocene carnivora of this country were confined to the bear; of which there are, however, no historical records; and the wolf, which was finally extirpated about the year 1710.¹ These two animals seem to have had very little influence in the dragging of the bodies of other mammals into caves; and although we have their bones associated with those of herbivora in the Shandon

¹ Quart. Journ. Geol. Soc., vol. xvi., page 491.

¹ Smith's History of the County of Kerry, page 173.

breccia, this association must be looked upon as resulting from other causes than the predatory habits of the bear or wolf.¹

The occurrence of several vertebræ and ribs of the mammoth in an exceedingly small area in the Shandon breccia, a space little more than a square yard, and also the unworn and ungnawed condition of these bones, lead to the inference that the whole skeleton of a mammoth had been embedded in this substance. Four of the vertebræ were portions of the continuous series of the spinal column; and had circumstances permitted further explorations in the breccia, other bones of this skeleton would doubtless have been discovered.

The body of the animal to which these bones appertained must either have been transported here, or the creature must have died on the spot where its bones occur. With reference to the former case, the agency of water only could have effected this, but every circumstance in connection with these bones is antagonistic to the idea of such a mode of transport. Nothing remains, therefore, but to accept the conclusion that the animal died on the spot where its bones are found. The features which are seen in connection with the limestone of Shandon lend support to the conclusion that mammoths died here. During the time when the breccias were being formed, the limestone exhibited projecting ledges of rock, having beneath them open spaces which would afford shelter for mammoths and other animals; and many wild creatures, at the present time, when they find death approaching, seek for shelters of this kind. Subsequently these rock-shelters of Shandon have undergone great changes, in consequence of the falling of overhanging masses, fragments of which accumulating above the skeletons, enveloped them in the hard substance from whence the bones are now obtained.

II.—ON SOME NEW AND REMARKABLE ECHINODERMS FROM THE BRITISH PALÆOZOIC ROCKS.²

By Professor de KONINCK, M.D., For. Mem. Geol. Soc. Lond.

(PLATE VII.)

DURING one of my last visits to England I had the opportunity of visiting a great number of palæontological collections. Amongst those which afforded me the greatest pleasure, I would specially mention the collections of Mr. Edward Wood, F.G.S., at Richmond, in Yorkshire, and of Mr. John Gray, at Hagley, near Stourbridge.³

These gentlemen, who honour me with their friendship, and who gave me the most hospitable reception that one can possibly wish for,

¹ The abundance of the remains of the *Megaceros Hibernicus* in Ireland may probably be attributed to the absence of the hyæna and the lion from the Pleistocene fauna of this country; and also to the early separation of the country from Great Britain.

² Translated from the Bulletin de l'Académie Royal, Bruxelles, 2nd series, tome xxviii., pp. 67-65. Planche. 1869.

³ Mr. John Gray's very choice collection of Upper Silurian fossils has since been acquired for the British Museum.