

The extinct genus, *Halitherium*, which has been found in the Miocene of Darmstadt, France and Italy, and recently in the Crag, links the *Dugong* and the *Manatee*, and looks, in fact, like the ancestral form of all the Sirenia. The remains of Cetacea are very abundant in the Crag, the most perfect series being that of the Brussels Museum. One of the commonest fossils is that known as the ear-bone—the auditory bulla of the tympanic bone. This bone is completely ankylosed in adult man and most mammals, but only loosely so in the Cetacea. It is denser and harder than any ivory. The whales are divided into two very distinct classes the whalebone whales and the toothed whales. All these ear-bones belong to the former class. The ziphoid whales, now rare, were abundant in the Crag. The upper jaw is toothless, forming the characteristic hard, bony snout. The genus *Squalodon* is only represented by a few teeth. Though allied to the grampus, it was more generalised in structure than any existing cetacean.

EXCURSION TO LEICESTERSHIRE.

WHIT-MONDAY, MAY 21ST, 1877, AND FOLLOWING DAY.

Directors—WILLIAM J. HARRISON, ESQ., F.G.S. (Curator of the Town Museum, Leicester), REV. T. G. BONNEY, M.A., F.G.S., and REV. E. HILL, M.A., F.G.S.

(*Report by* Mr. WM. J. HARRISON, F.G.S.)

FIRST DAY.—THE LIAS AND OOLITES OF EAST LEICESTERSHIRE.

The London detachment left St. Pancras by the 8.30 a.m. train, arriving at Market Harborough at 10.48 a.m. Here the party at once proceeded to examine the sections exposed in the brick-yards close to the station. Here the junction of the Lower and Middle Lias is exposed, showing—

1. Soil 2 to 3 ft.
2. Upper Lias Clay, with *Ammonites communis*,
and *Belemnites compressus* 3 ft.
3. Brownish band of ironstone 9 in.
4. Soft irony sandy bed, containing great numbers
of *Ammonites serpentinus*, *A. bifrons*, *A.*
Holandrei, and *Belemnites compressus* . . 2 ft.

5. Bluish Clays 9 ft.
6. The Marlstone Rock-bed, a micaceous ferruginous sandstone, with *Ammonites margaritatus*, *Belemnites paxillosus*, *Cardium truncatum*, and *Avicula novemcostæ* 15 in.
7. Clay 3 ft.
8. Band of "Skerry," with ironstone nodules, containing specular iron, and *Avicula cygnipes* 6 in.
9. Brown Clay 3 ft.
10. Bluish Clays 8 ft.
11. "Skerry " 1 ft.
12. Clay 3 ft.

Most of the above-named fossils were obtained by the party, who then entered carriages which were in waiting, and proceeded eastwards, along the valley of the River Welland to Medbourne, a village situated in a valley between the two Oolitic outliers of Slawston Hill and Neville Holt. Dismounting at the foot of the latter eminence, the party passed along the cutting in course of construction for the Midland Railway's new line from Melton Mowbray to Medbourne. It was the great object of the day's work to examine the fine sections exhibited along the line, and we may at once state that every facility was afforded for this purpose by the kindness of the engineers in charge, and Messrs. Logan and Hemingway, the contractors. The cutting at the west foot of Neville Holt Hill displayed an admirable and fresh section of a fault, running E. and W., and throwing down the beds on the north some 10 or 12 feet, so as to bring the blue clays and *Serpentinus* beds of the Upper Lias on a level with the Marlstone Rock-bed on the south. At the south end of the cutting the Fish and Insect limestones of the Upper Lias were noted, with the Paper-shales above them. *Ammonites annulatus* was very numerous here.

In consequence of the wet state of the ground, the party ascended the hill directly from the western side, instead of walking round to the south. Passing over a long slope of Upper Lias clay, the junction with the Northampton Sand was found to be marked by numerous springs. This latter bed, also known as the Lower Estuarine Series, forms here the very base of the Inferior Oolite. It is finely shown in the ironstone quarries on the southern brow of the hill, which were largely worked for a short time, furnaces being

also erected close to. The ore was not, however, found sufficiently rich to pay, and the quarries were closed in 1875. The Northampton Sand is here about 20 ft. thick. The upper portion is brown, friable, and marked by dark-brown bands, often concentric, which are very rich in iron. Lower down it passes into a hard ferruginous sandstone, the blocks being usually blue-hearted. Several fine specimens of *Terebratula sub-maxillata* were found here, with *Rhynchonella cynocephala*, an *Ostrea*, and *Pecten lens*. Fragments of wood are common, and in patches of whitish sands many plant markings were visible. Returning from this point, the party passed along a narrow cutting, in which, and in the neighbouring allotments, thin fissile limestones were seen, representing the Collyweston Slate. On the very top of Neville Holt, quarries were examined in the Lincolnshire Oolite Limestone, not very fossiliferous here, but full of corals.

From the hill-top a splendid view of the surrounding district was obtained, and Mr. Harrison pointed out that the outlying Oolitic strata which constitute the hill, had been preserved by a fault running east and west along the northern foot, throwing down the beds to the south. To the south and east the view extended over the valley of the Welland to the main outcrop of the Inferior Oolites, which form there a low, yet well-marked range of hills, the northern termination of which is known as the "Cliffe" of Lincolnshire. Northwards and westwards are devious valleys formed by streams cutting through the Marlstone Rock-bed of the Middle Lias. Descending the hill, the carriages were quickly reached, and after refreshing at the "Neville Arms," a start was made northwards, following very nearly the new line of railway. In this way the gradual thickening of the "Rock-bed" was well observed, as the route lay nearly in accordance with its strike.

Time compelled the omission of the Slawston cutting, and passing through Hallaton, the next halt was made at the village of East Norton. A tunnel was being driven through the hills S.E. of the village, the Rock-bed being the floor. In the open cutting north of the tunnel, the Upper Lias Clays were finely exposed for 50 or 60 feet in depth. The portion here seen consists of dark-blue pyritous clays, weathering to a light colour when exposed to the atmosphere, and then containing much selenite, with bands and concentric balls of hydrated peroxide of iron, formed by the decomposition of nodules of iron pyrites. The same beds had been seen by the party, *en passant*, in the brickyard at Moor Hill Lodge, just

before entering East Norton. These unfossiliferous beds rest, in Leicestershire, upon clays full of *Ammonites communis*, and are surmounted by clays with layers of septaria containing *Leda ovum*. At this point the Drift was well seen, overlying the clays. It contained many well-striated boulders, chiefly of Carboniferous Limestone and Millstone Grit, with great numbers of the common Liassic fossil, *Gryphea incurva*. Passing northwards through Lodington, several of the railway bridges in course of construction were examined, the material being the Marlstone Rock-bed. The stone was of a greenish-blue tint, and contained innumerable quantities of two brachiopods, *Terebratula punctata* and *Rhynchonella tetrahedra*. *Belemnites paxillosus*, and *B. clavatus* were also abundant. These fossils usually contained in their interior a mass of crystallized carbonate of lime, and they formed a natural decoration to the stonework.

On reaching Robin-a-Tiptoes Hill (755ft. high), it was found that time did not permit of the ascent being made. This very characteristic flat-topped hill stands on a plateau of Marlstone, the long slope is formed of Upper Lias Clay, and it is capped by Northampton Sand. Whadborough Hill to the north, and Barrow Hill on the east, are similar outliers. The conspicuous conical hill due west is named Colborough, and has a well-wooded summit. Dense woods in this neighbourhood usually mark thick deposits of Boulder Clay, such land being difficult to bring under cultivation. On the west side of Robin-a-Tiptoes a deep railway cutting was examined, which afforded a magnificent section of the Marlstone Rock-bed, here nearly 20 feet thick. It was interesting to note the passage downwards from friable brownish sandstone (due to weathering influences) to blue-hearted masses, and finally beds of dense blue ferruginous sandstone. The iron in the latter exists in the state of carbonate, but under the influence of air and water it becomes changed into the peroxide, which is of a brownish hue. Several good fossils were obtained in this cutting, including *Pecten æquivalvis*, *P. dentatus*, *P. liasianus*, *Pentacrinus lævis*, &c., besides the common ones already mentioned. A large fragment of wood, apparently of a coniferous tree, was also examined with interest.

After partaking of tea in the village of Tilton, a westerly course was taken past Billesdon Coplow—a rounded hummocky mass, which is an outlier of Marlstone, and is celebrated in hunting story—through the village of Billesdon to Leicester. The Bell

Hotel, in Humberstone Gate, had been selected as head-quarters, and here the party found an excellent dinner awaiting them, to which indeed they were prepared to do full justice, as it was nearly 8 p.m., and the day's work had been long and arduous. We have however, omitted to mention one object seen during the day, which, though not strictly geological, attracted much attention. In several of the railway cuttings through the Liassic clays, the party were, enabled to witness the work of the new steam excavating machine, to which the navvies have given the euphonious appellation of "American devil!" It consists of a powerful steam-engine running on lines laid on the bottom of the cutting, and with rails on each side of it for the passage of trucks. In front is a large crane carrying by chains an immense steel bucket, provided with prongs in front, and a movable bottom. This is let down, and then dragged up the whole face of the cutting by the steam-engine, the contents being then dropped into a truck. In excavating soft strata this machine must prove of great utility, doing the work of fifty men.

In the evening it had been intended to examine the Collection in the Town Museum, where Mr. Harrison had also intended to exhibit, by the aid of the oxyhydrogen lantern, a series of views illustrative of the scenery, rocks, and fossils of Leicestershire, but owing to the late arrival of the party this also had to be omitted.

SECOND DAY.—CHARNWOOD FOREST, THE MONASTERY, AND MOUNTSORREL.

Starting in carriages at 9.30 a.m., the party, which was reinforced by several members of the Burton-on-Trent Natural History Society, drove first to the syenite quarries at Groby. Here the Keuper Marl is seen to dip away on all sides (quaquaversal dip), from the central boss of syenite, which must have formed an island, or shoal, in the Triassic sea. At a point about a mile further on, in Steward's Hay Wood, the Rev. Mr. Bonney and the Rev. E. Hill pointed out an interesting junction of the slates and syenites, clearly proving the latter to be intrusive. Passing the syenite knoll of Markfield, the interesting rocks known as the "Altar Stones" were examined, after which luncheon was partaken of at the Forest Rock Hotel. Not much speech-making was done, but votes of thanks to the Directors, and to the Secretary, Dr. Foulerton, were proposed, carried, and duly responded to.

After luncheon the most interesting region of altered rock, which extends from Green Hill past Peldar Tor, was closely examined. The Rev. E. Hill had served out to each Member an outline map, on which the character, dip, &c., of the rocks in the neighbourhood of Peldar Tor were laid down. The whole ridge appears to be composed of volcanic agglomerates and ashes of varying fineness, having a felspathic base, in which crystals of felspar, often with worn edges, and blebs of quartz are visible. The felspar crystals may possibly have been ejected from volcanic vents in their present state, but the quartz appears to be of subsequent formation. Many of the Members went over the Monastery of St. Bernard, which is situated in the midst of this wild and rocky region, and which belongs to the Cistercian Order. It was built in 1835, from designs furnished by the elder Pugin.

Crossing the anticlinal valley, and leaving Whittle Hill on the left, the road was taken which circles round the north side of Beacon Hill. From this point a ridge stretches to the village of Woodhouse Eaves, along which the party proceeded to walk, while the carriages went round to meet them in the village. A rather awkward brook here intersected the line of route, giving rise to some good "water-jumping." The rocks of the ridge (known as the Hanging Stones of Woodhouse Eaves) were found to be indurated slates, agglomerates, and pebble-beds. In one little quarry, near Pocket Gate, some circular markings were found which gave rise to much discussion. They lie on the bedding-planes, which here coincide with the cleavage, and consist of alternate ridge and furrow. The largest measures twelve inches by ten; in the opinion of Mr. Bonney they are concretionary only. As to the age of the rocks of the Charnwood Forest region, the Directors appeared unanimous in assigning them to the Silurian System. They are coloured as Cambrian by the Geological Survey, whilst by some geologists they are considered to be Laurentian. In the absence of fossil evidence and that afforded by superposition, the question is at best but a balance of probabilities.

Thence driving quickly through Woodhouse and Qworndon, the famous granite quarries at Mountsorrel were reached at 5 p.m., and Mr. Hambly, F.G.S., the courteous Managing Director, kindly showed the way over the works. The working "face" is nearly half a mile in length, and about six hundred men and boys are usually employed. The stone contains pink and

white felspar, bottle-green hornblende, and a little mica. The presence of the latter mineral entitles the rock to be called a hornblendic granite. The face forms a conspicuous object from the Midland Main Line between Barrow and Sileby; but the old windmill which formerly crowned the spot, and was a noted landmark, has lately been removed, owing to the progress of the works. In a side cutting at the northern end the relations of the Red Marl to the granite are admirably seen. The marls here are much ripple-marked, and contain large fragments of granite. The slope of the hill shows the granite well polished and striated—the effect probably of both sea and ice action. *Molybdenite* occurs here, and there is a large basaltic dyke crossing the face, which subsequently seems to have been broken up, as it is in a brecciated and rubbly state. After witnessing the breaking up of some large masses of granite by means of charges of powder and dynamite, the party ascended the hill. On the top there is a very typical felsite dyke, seven or eight inches thick, which cuts sharply through the granite. But a hasty departure had now to be made, and, driving rapidly, Leicester was reached about 7 p.m. Just before entering the town a “learned doctor” was picked up, who had lost the party near the Monastery, and had since been hastening on under the impression that he was left behind!

Thus ended the Whitsuntide Excursion of 1877. On the first day it included about 25 miles, and on the second day about 35 miles of driving and walking. A fair amount of time was allowed for the inspection of every point visited, and when the farewells were said on the platform of Leicester Station, the general verdict was a favourable one.

ORDINARY MEETING, JUNE 1ST, 1877.

WILLIAM CARRUTHERS, Esq., F.R.S., Vice-President, in the Chair.

The following Donations were announced:—

“Abstracts of the Proceedings of the Geological Society,” Nos. 336-337; from the Society.

“Journal of the Society of Arts,” May, 1877; from the Society.

“Transactions of the Manchester Geological Society,” Vol. xiv., Parts 9-10; from the Society,