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PROCEEDINGS
OF
THE GEOLOGICAL SOCIETY.

FEBRUARY 26, 1862.

SPECIAL GENERAL MEETING.

It was Resolved that the Annual Contribution to be paid by both Resident and Non-resident Fellows elected after the 1st of March next shall be Two Pounds Two Shillings per annum: the Composition for future Annual Contributions being Twenty-one Pounds.

ORDINARY GENERAL MEETING.

George Charlton, Esq., Mining Engineer, Dukinfield, near Manchester, and Julius Schvarcz, Ph.D., Stuhlweissenburg, Hungary, were elected Fellows.

The following communications were read:—

1. *On the DRIFT containing RECENT SHELLS, in the neighbourhood of WOLVERHAMPTON.* By the Rev. WILLIAM LISTER, F.G.S.

(Abridged.)

THESE drift-deposits lie for the most part upon a nearly level surface of Lower Keuper Sandstone, overlooked eastward by a range of low Bunter and Permian hills, of which Show Hill and Bushbury Hill are the chief. Other exposures are upon Permian sandstone in the town of Wolverhampton, and upon the Coal-measures of the district adjoining. Bushbury Hill is chiefly remarkable for the number of travelled blocks of granite and greenstone lying around its north-

western base—the side lying most open to bygone arctic and glacial influences. No boulder-clay nor drifted material of other kind is associated with these blocks upon the hills in this immediate neighbourhood. The drift at three localities, viz., Bushbury Junction, Oxley Manor, and Wobaston Big Meadow, had probably a parallelism in time of deposition and agency of formation; though I cannot satisfy myself whether to regard them as the remains of a low terrace-line skirting the valley, or as the result of undercurrents, relaying the derived material in banks parallel with its strike. In the exposure of this drift at Bushbury Junction, where it is an apparently unstratified bed of clay and sand, with an admixture of both rounded pebbles and angular flints, I have met with the following marine shells, which have been kindly determined for me by Mr. J. Gwyn Jeffreys, F.G.S.:—*Nassa reticulata*, *Turritella communis*, *Purpura lapillus*, *Littorina squalida*, *Astarte arctica*, *Cardium edule*, *Tellina solidula*, and *Cyprina Islandica*.

Rolled shells and other fossils derived from Liassic rocks accompany these, such as *Gryphææ*, *Ammonites*, *Cardiniæ*, and *Belemnites*. I have also met with a fragment of Downton Sandstone (Upper Silurian), bearing a cast of *Rhynchonella*, together with pieces of coal, having rounded edges and striæ upon their surfaces, and of unfossilized wood similarly rounded.

At the exposure of this drift at Oxley Manor, half a mile N.W. of Bushbury, its physical character was that of a clay-bed resting upon sand. The following shells were met with in the clay, though the condition of all the imbedded remains was more fragmentary than at the first-named place:—*Cardium echinatum*, *Tapes virginea*, *Venus striata*, *Modiola modiolus*, and *Turritella communis*. In connexion with his determination of these and the before-mentioned species from Bushbury Junction, Mr. Jeffreys has favoured me with the following note:—

“All of these shells are much rolled and broken, and they appear to have been cast up by the tide on a pebbly beach. They indicate also the former presence of a gradually shelving tract of sand below the beach seawards, as well as of an intermediate belt of loose stones or shingle in the littoral zone. It is possible that these shells may have been carried off with the pebbles from a beach in the Arctic regions by an iceberg, which, after traversing a considerable distance in a glacial sea, may have stranded or melted, and deposited its load in the spot where the shells and pebbles have now been found. The present data are, however, insufficient to enable me to form any opinion on this point. All the species now inhabit the Arctic Sea. Two of them, *Astarte arctica* and *Littorina squalida*, are not found living in our seas; but all the rest are common British species. The period of this deposit in Staffordshire, whether original or derivative, may have been coeval with that of the Kelsey Hill formation, which has been lately described by Mr. Prestwich in the ‘Quarterly Journal of the Geological Society*.’ Eight species enumerated in his paper also occur in the deposit under notice, which in its turn possesses four

* Vol. xvii. p. 446.

(*Astarte arctica*, *Cardium echinatum*, *Modiola modiolus*, and *Tapes virginea*) wanting in the Kelsey Hill catalogue. The *Cyrena*, or *Corbicula*, is absent.”

The third exposure of this line of drift-deposit is a partially stratified mound of sand and gravel, 88 yards long, 38 yards wide, and about 2 yards in height, situated in Wobaston Big Meadow, about a mile and a half north of Bushbury Junction. The long axis of this mound corresponds with the strike of the before-described beds, and with the direction of the valley, which is due N. and S. This deposit has not at present yielded me any shells nor specimens of angular flints. The chief of its derived contents are the following:—pebbles of limestone, slate, quartzite, vein-quartz, black quartz, veined lydian-stone, a fragment of syenite, and a small Silurian coral (*Cyathophyllum Loveni*). The part cut into exhibits the following section:—

	ft.	in.
Vegetable mould	0	6
Pebbles and sand (the pebbles vary in size, are largest at the top of the bed, and become gradually smaller below).....	2	6
Bed of stratified sand, with a few small pebbles ..	1	6

Two other patches of drift, lying at a somewhat higher level, occur in this immediate neighbourhood, and are probably related by coincidence of time and deposition. The first locality is that of Compton Holloway, in the parish of Tettenhall, where clay-deposits are seen to fill up eroded hollows of the Keuper Sandstone on the hill-sides west of the plain. These contain derived fossils from Liassic rocks, similar to those met with at Bushbury. A suite of them has been collected by Henry Hill, Esq., of Dunstall. Many like remains were found some years ago at Wightwick, another point at this higher level. Here, however, the clay contains angular flints, as at Bushbury, and the low hills are covered with scattered drift-pebbles.

In drift-clay, at about the same level, near the Hospital in Wolverhampton, Liassic *Gryphææ* have been met with; and fossils of like age in a similar bed at the New Cemetery. I am indebted to Mr. Henry Beckett, F.G.S., for some notes respecting this easterly extension of the boulder-clay, as also for a notice of other exposures at Penn, from two to three miles south of Wolverhampton. At Upper Penn, the clay yielded pieces of wood and a broken tibia of *Bos*. I am also informed by Mr. George E. Roberts of a considerable extension of these clays, with sandy layers, westerly; for they are well exposed at Acleton, eight miles S.W. of Bushbury, and there abound in *Turritellæ*. A recent exposure in that district is at a spot half a mile north of Badger Hall.

In conclusion, I would call attention to the deep and wide-stretching sand deposit described by Prof. Beete Jukes as lying in immense quantities around West Bromwich and upon the district east of Birmingham*. In the lower part of this sand, which in places

* “The South Staffordshire Coal-field,” p. 325.

attains a thickness of 100 feet, marine shells identical with those found by myself at Bushbury and Oxley Manor have been detected by Mr. Beckett, at Mr. Sparrow's colliery of Portobello. This fact is valuable as a determination of the relative position in which we shall be justified in placing these shell-bearing clays in the drift-deposits of Staffordshire.

2. *On a SPLIT BOULDER in LITTLE CUMBRA, WESTERN ISLES.*

By JAMES SMITH, Esq., F.R.S., F.G.S., of Jordan Hill.

SPLIT erratic blocks are of frequent occurrence in Switzerland. The only explanation of this phenomenon which I have met with is that of M. Charpentier, in his "*Essai sur les Glaciers*." Speaking of the blocks, he says, "*Quelques uns sont fendus, mais la direction des fentes prouve jusques à l'évidence que les ruptures sont le résultat d'une chute et nullement d'un choc horizontal*" (p. 180). M. Charpentier offers no conjecture as to the height from whence the blocks could have fallen; but where there is no superincumbent precipice of rock near, it must have been from one of ice. Indeed, I may say that I obtained proof that such was the case; for upon examining the fragments which lay at the foot of the escarpment of ice which terminates the Glacier of Grindelwald, I observed one which, from the freshness of the fracture, I concluded must have fallen very shortly before my visit, and obviously from the surface of the glacier.

Such blocks occur occasionally in the basin of the Clyde, in situations where there is no adjoining height from which they could have fallen,—a circumstance which I can only account for by supposing the former existence, in the same localities, of ice in the shape of glaciers, icebergs, or coast-ice. I may add that some of the split boulders are also scratched, exhibiting additional proofs of glacial action.

To one of these blocks I wish to call the attention of the Society, on account of the peculiarity of the circumstances of its present position. There is on the west coast of Scotland a well-marked cliff and terrace, indicating an elevation of about forty feet above the present sea-level; and, from the amount of solid rock which has been removed by the washing action of the sea, we may form some conception of the prodigious lapse of time during which the sea-level was stationary at that height.

This is nowhere better seen than in the Islands of Great and Little Cumbra. The larger island is composed of red sandstone, traversed by trap-dykes; the smaller one is composed entirely of trap. The trap of the dykes, from its greater hardness, has been worn away more slowly than the sandstone; hence their projection from the sandstone cliff; hence also the greater breadth of the terrace in Great Cumbra than in that of the trap of the smaller island.

The terrace in Little Cumbra, formed by the wasting action of the sea at right angles with the coast-line, has been subsequently ground down and scratched by a force acting parallel to it and the ancient cliff; and it is upon this that the blocks in question must have fallen.