balthica, again, is "sand, gravel, and mud between tide-marks on every shore." It is "in the main a northern species, but likewise common in many parts of the south of Europe." These two species were obtained from the blue clay which contained the curved variety of *Ostrea*, *Nucula nucleus*, *Littorina littorea*, and other recent shells. This blue clay underlies a brown clay, containing a bed of *Ostrea edulis* and shells which are now to be found on our shores between high and low water-mark, and are characteristic of the littoral zone. We are not, therefore, dealing with clays akin to the Clyde beds, but with a class of clays which indicate the close of the glacial period and the ushering in of a milder climate.

Thursday, 17th March 1870.

GEORGE LYON, Esq., Treasurer, in the Chair.

The following retired Fellow was re-elected in terms of law :—

JOHN R. S. HUNTER, LL.D., Carlisle.

The following Communications were read :—

- I. *On the Probable Cause of the Non-Existence of Deposits between the Permian and the Lower Silurian in the Southern Uplands of Scotland.* By DAVID MARSHALL, C.A.

(Abstract).

The great Silurian district in the south of Scotland, named by Mr Geikie "the southern uplands of Scotland," presents the phenomenon of large patches of red sandstone of Permian age superimposed in a nearly horizontal position on the almost vertical Silurian rocks. This sandstone has been entirely worn away from the hills and extensive valleys by glacial and aqueous action; in other places less exposed to erosive forces patches of it remain; while in many of the narrower glens and gorges, where it has been comparatively protected from erosion, it has been left in masses of great thickness. The enormously lengthened Devonian and Carboniferous epochs which succeeded the upheaval of the underlying rocks have left no trace of their existence in this locality. This gap can only be referred to one of two causes—*first*, either all the Devonian and Carboniferous deposits have been removed by denudation between the period of upheaval and the Permian epoch; or, *secondly*, no Devonian or Carboniferous deposits ever existed in the district. Finding

that there exists no evidence of ice action, which is the great agent in denudation, between the Silurian and Permian epochs, and that even granting great denudation during this period, it is highly improbable that all traces of the intervening deposits would be entirely obliterated had they existed, the author is driven to the hypothesis that no deposits ever existed in the district in question between the Silurian and Permian; and that, during the deposition of the Upper Silurian and Old Red Sandstone in other parts of the globe, the Lower Silurian of the southern uplands were high and dry above the sea. Between this epoch and the Carboniferous, the author conjectures that the Silurian rocks were slowly sinking, until during the Upper Carboniferous period they were once more completely covered by the sea. Then commenced the deposition of the Permian sandstone, which filled all the crevices and hollows, and which may have formed a thick crust over the whole of the underlying rocks. At a later period there ensued a movement in a contrary direction, and a slow horizontal rising took place,—not a violent upheaval like the former one,—but a gradual upward movement, until the old Silurian rocks, with their accumulated crust of sandstone, once more emerged from the sea. Then ensued the glacial epoch, which has left such extensive tokens of its presence, still further wearing down the hills and scooping out the valleys, from which it has been mainly instrumental in removing the deposit of Permian sandstone, leaving it only in narrow gorges and places protected from its action.

II. *On the Budleigh Salterton Pebbles.* By WILLIAM LINFORD, Exeter.* Communicated by GEO. A. PANTON, Hon. Sec.

From the eastern end of Exeter, and looking eastward, a very picturesque ridge of hills may be seen stretching for several miles from south to north, viz., the Knowle and Blackhills, Woodbury Common, Aylesbeare and Rockbeare Hills, and Straightway Head: these may be termed the backbone of the Budleigh Salterton pebble deposit.

In giving a few brief particulars respecting this deposit, it will be desirable to describe the area of country over which it is spread; then the Budleigh Salterton beach; the cliffs there; the pebbles themselves; the fossils found in them, and the source whence they were derived.

The Area of Country, &c.—The pebbles are scattered more or less over a district bordered on the *east* by the river *Otter*, and on the *west* by the rivers *Eze* and *Clyst*, being a width of country varying from 5 to 10 miles; also extending from the coast on the south for 12 or 13 miles north, viz., from the

* Elected an Associate of the Society at next meeting.