stages, the river Esk here forming a cliff, "The Lover's Loup," on its right bank, after having formed a cliff on its left bank (also with an earth-covered slope opposite it) a little higher up the stream. Allowance is made in the diagram for the gradual degradation of the land-surface by subaerial erosive agencies, and ordinary denudation.

III. *On the Remains of Pterygotus, and other Crustaceans from the Upper Silurian Series of the Pentland Hills.* By R. Etheridge, Junior, F.G.S., Councillor.

The remains of *Pterygoti* appear to have been first found in the Upper Silurian beds of the Pentland Hills, during the time the Geological Survey were engaged surveying that district. This discovery was recorded by the late Mr Salter in the "Survey Memoir on the Edinburgh District," and consisted of the serrate base of one of the great swimming feet of *Slimonia* (*Pterygotus*) *acuminata*, Salter, obtained by the collector, Mr Gibbs, at Deerhope Quarry.*

The next record is that of the late Mr G. C. Haswell, who obtained from near the Bavelaw Reservoir, six body segments and part of the bilobed telson of *Pterygotus bilobus*, Salter;† Mr Haswell also states that he found the serrate base of one of the jaw-feet of a species apparently allied to the form mentioned by Mr Salter, but smaller. These are, so far as I can ascertain, the only published records of *Pterygoti* remains from the Pentland Hills.

Lately, Mr Henderson has drawn my attention to some fragmentary specimens in his collection, which are without doubt portions of a *Pterygotus*, probably of some size, judging from the size of the fragments. These he has kindly permitted me to exhibit, and offer the following remarks on.

The first specimen is only a fragment of some part of the exoskeleton, but on one of the edges is visible the characteristic semicircular plicæ which is the common ornament of the genus.

The second specimen is likewise a fragment, but is of interest, because it shows a punctate structure somewhat similar to that seen on the carapace of the Old Red Sandstone species, *P. anglicus*, Agassiz.

The third specimen is, I think, without doubt a portion of the central lobe of the thoracic plate or "operculum" (the conjoined epistoma and labrum of Huxley and Salter) of a somewhat peculiar form.

Mr Woodward, speaking of the operculum of *P. bilobus*, re-

*. Mem. Geo. Survey, No. 32, Scotland, App. p. 137.

† Sil. Formation, Pentland Hills, p. 36, pl. 2, fig. 20.

ON REMAINS OF PTERYGOTUS AND OTHER CRUSTACEANS. 315

marks that the "normal position of this plate is upon the ventral surface of the body, covering the under surface of the first two thoracic somites; it was attached along its anterior border to the posterior margin of the head. . . . It consists of a median appendage and two lateral alæ. These alæ, which are sculptured upon their outer and under side, are equal in length to the first two thoracic segments, and in breadth correspond exactly with the segments which they overlie. They are united in the median line by a narrow central lobe (rounded or pointed at its free distal end), hastate at its proximal end, which is directed forwards."* Mr Woodward informs me that there were probably three of these central lobes underlying one another, attached to each operculum. It becomes probable, therefore, that this specimen is one or other of these inner thin portions of the central lobe of the operculum. In form it does not altogether correspond with any of the published figures of the median opercular lobe, being too much expanded at its free distal end, where it is marked with three sets of short grooves, one in the centre, and one at each side of the expanded extremity.

The operculum covered the gills and ovaries of *Pterygotus*, and Mr Woodward is inclined to believe that its inner median appendages were perhaps branchigerous.

The fourth and last specimen consists of a rounded disc-shaped body with a number of small circular impressions, which there cannot be much doubt are the casts of *Parka decipiens*, Fleming, now regarded as the egg-packets of *Pterygotus*, &c.†

Of *Phyllopodous crustacea*, the only hitherto recorded forms from the Pentlands is that described by Mr Salter under the name of *Dictyocaris Ramsayi*. Up to the present time, however, so far as I know, the figure of this species given in the "Geological Survey Memoir of the Edinburgh District"‡ is the most perfect that has been discovered, and that is only a portion of the carapace.

In the Upper Silurian series of Lesmahagow an allied form, *Ceratiocaris*, is very plentiful; but until Messrs Brown and Henderson commenced collecting, I do not think any remains of the latter had been found in the Pentland Hills. Two specimens are in Mr Henderson's collection, which are undoubtedly telson spires of a *Phyllopod*. From the prevalence of the *Dictyocaris* it might be contended that it would be better to refer these tail spines to that form; but as we are unacquainted with the segments and appendages of that genus, except from Mr Salter's hypothetical restoration,§ I think it better for the

* Mono. Brit. Fos. Crust. 1866, p. 61.

† Page, Advanced Text Book, 3d edition, 1861, p. 181. ‡ Plate 2, fig. 20.

§ Loc. cit. fig. 20 a; also Annals and Mag. Nat. Hist. 3d series, 1860, vol. v. p. 162, figs. 1-4.

present to refer the specimens in question to *Ceratiocaris*, especially as such spines are known to occur in the latter. They were originally termed by M'Coy *Leptocheles*.

Regarding *Dictyocaris*, I have nothing new to add, beyond that one of our members, Mr Wilson, has discovered a new locality for it, viz., the Monk's Burn. Here Messrs Henderson, Wilson, and myself collected a number of specimens from an olive sandy shale, but all too fragmentary to throw any further light on the structure or form of the genus.

The specimens described are from the neighbourhood of the North Esk Reservoir, Pentland Hills.

Mr Isaac Bayley Balfour, B.Sc., Edinburgh University, communicated a notice to the Society of several *Sigillariae* which had recently been uncovered near Sheffield, and which he had inspected.

The following Gentleman was elected a Fellow of the Society:—

RAMSAY H. TRAQUAIR, M.D., late Professor of Zoology in the Royal College of Science, Dublin, and recently appointed Keeper of the Natural History Collections in the Museum of Science and Art, Edinburgh.

Thursday, 29th January, 1874.

G. H. MUNRO BINNING HOME, Esq. of Argaty, in the Chair.

The following Communications were read:—

- I. *On the Silurian Rocks of the South of Scotland. Part II.—Llandoverry Rocks.* By D. J. BROWN, Councillor.

Preliminary Remarks.—In the first part of this paper on the Silurian Rocks of the South of Scotland,* beginning at what has generally been considered the axial and lowest beds of the formation, I described the series up to the top of the Gala group of beds, and between the Gala and Moffat rocks. I gave what I considered good reasons for my opinion there stated, that the Gala or Caradoc series of beds were lying *unconformably* on the Moffat series. This opinion I first announced in Section C. at the British Association Meeting held at Edinburgh in 1871, and the abstract of the paper is published in the "British Association's Proceedings" for that year. The fact that a line of unconformability occurs between these formations

* See page 227 of this volume.