

ON SOME SILURIAN FOSSILS FOUND ON THE PENTLAND HILLS. 375

Burn appears to be a plant, like *Stigmaria* or *Sigillaria*, with either rootlets or leaf scars marked all over its surface. If this be correct, it would be an important addition to the fossils of the Silurian period, as nothing but what is referable to seaweeds has hitherto been described from this formation. When going over the Silurian patch at Habbie's Howe with Mr Wilson and Mr Etheridge, we picked up a specimen of a graptolite at a scar near the house at the top of the Logan Lea reservoir, which turned out to be *Graptolithus colonus*, thus adding another locality, leaving only one from which fossils have not been got, viz., the Silurian patch at the north end of Black Hill. Besides *Graptolithus colonus*, Mr Wilson, Mr Lapworth, and myself, discovered on another visit *G. priodon*, *Retiolites Geinitziannus*, and another, making in all four graptolites from this locality. Salter, in his appendix to the Geological Memoir, mentions that although no fossils have been found in this locality, it would be a good place to look for graptolites, and his suggestion has thus been realised. I have also detected other two organisms in this locality: one a *Dictyonema*, a form, according to Murchison, nearly allied to *Fenestella*; and a plant, like a calamite, about 4 inches broad. Another plant-like impression I found at Harehill, about a mile farther north-west, with small oval-shaped leaflets, very small, but very distinct. The remaining organisms to which I shall call your attention to-night as new to this district are two brachiopods, which have been identified by our distinguished countryman and honorary fellow, Mr Davidson, the greatest authority on the Brachiopoda, as *Discina striata* and *D. rugata*, both found in the North Esk section, making in all twenty-eight well-determined brachiopods from our Pentland Silurians; so that now we are able to catalogue over 100 well-determined species, making our own district the richest Silurian district in Scotland.

II. *Note on the Graptolites discovered by Mr John Henderson in the Silurian Shales of Habbie's Howe, Pentland Hills.* By CHARLES LAPWORTH, F.G.S.

The graptolites obtained by Mr Henderson from the shaly Silurian beds of Habbie's Howe, and which I have had in my possession for determination, belong at least to three distinct genera.

The most frequent fossil (marked 1 on the pieces of shale exhibited) is a peculiar form, which is usually held to be merely a variety of *Monograptus colonus* (Barrande). It differs from the typical form in several minor respects, such as the shape of the thecae, the direction of the apertural spines, the rate of taper

in the polypary, &c., while its behaviour under compression is very distinct from that of the undoubted *Monograptus colonus*. Nevertheless, these differences are not in themselves of sufficient importance to warrant us in the meantime in considering it as a distinct species, and it may conveniently be classed as a strongly-marked variety of *Monograptus colonus*. To this variety ought, perhaps, to be referred the two so-called species, *Graptolites Griestonensis* of Professor Nicol ("Quart. Journal Geol. Soc.," vol. vi. p. 53), and the *Graptolites vomerinus* of Professor Nicholson ("Monog. Brit. Grapt." p. 53), the figures illustrative of these species representing pretty exactly certain states of compression in this form. *Monograptus colonus* has a great range in the Silurian strata. It is found in the Gala group (Lower Llandov.), and in the Llandovery beds of Thuringia, Bohemia, and the Lake district; in the Wenlock rocks of South Roxburghshire, and in the Wenlock and Lower Ludlow of the typical Siluria.

The variety under notice has been recognised in the Gala group, the Riccarton beds of South Roxburghshire, and the Bannisdale beds of the Lake district (Wenlock, &c.). Some of the specimens collected by Mr Henderson are in capital preservation, and of infinitely greater value for the purpose of study than the thin pyritous films which are all that represent the fossil in the Middle Silurians of the south of Scotland.

Among the graptolites of Habbie's Howe examined by myself in the field, but which seem to be missing from the specimens forwarded, are several very badly preserved fragments, apparently belonging to other species. One resembled *Monograptus priodon* (Bronn), another might have been broken off the compound polypary of *Cyrtograptus Scoticus* (an undescribed species from the Riccarton beds), while one minute fragment certainly belonged to *G. Flemingii* (Salt.), an exceedingly frequent fossil in the Wenlock and Lower Ludlow beds of Kirkcudbright and the Lake district.

The fossils upon the pieces of shale marked 2 are examples of *Retiolites Geinitzianus* (Barr.) This is a common Upper Silurian fossil in Western Europe and Britain. It is not uncommon in the Llandovery beds of the Gala group, and has already been detected in the Silurian of the Pentlands near the North Esk reservoir by Messrs Brown and Henderson as early as 1866.

The peculiar fenestrated fossil marked 3 is probably a specimen of *Dictyonema* (*Gorgonia* or *Fenestella*) *assimilis* (Lonsdale sp.) It will be found figured in pl. xv. figs. 27, 28 of "The Silurian System." It is possibly identical also with the *Gorgonia* (*Dictyonema*) *regularis* of Col. Portlock (Geol. Report, Londonderry, pl. xxi.) It is a common fossil in the Wenlock beds of Siluria, and has been met with in the Llandovery beds, as well as in the Middle Silurian beds (Gala group) of the South of Scotland.

On the whole, it may be asserted with safety that the researches of Mr Henderson have furnished us with six distinct species of graptolites from the shales of Habbie's Howe, viz., *Monograptus colonus*, *M. priodon*, *M. Scoticus*, *M. Flemingii*, *Retiolites Geinitzianus*, and *Dictyonema assimilis*. The general facies of this group shews at a glance that the containing beds are of Upper Silurian age. The absence of *Monograptus Sedgwickii*, *M. Nilssoni*, and other peculiar Llandovery forms, forbid us to place the beds in that formation; while the certain presence of *Monograptus priodon* and *Cyrtograptus Scoticus*, which are unknown in the Ludlow, equally forbid us to assign them to that formation. They must, therefore, be considered as of Wenlock age. This result is in perfect harmony with that deducible from their stratigraphical position, and from the fact of their great lithological resemblance to the neighbouring beds of the Esk reservoir, which are certainly of Wenlock age.

III. *On the Silurian Rocks of the South of Scotland. Part III.—Wenlock and Ludlow Rocks.* By D. J. BROWN, Councillor.

*Upper Silurian Rocks.*—We come now to the upper division of this great Silurian formation, the Wenlock and Ludlow beds of Murchison. Rocks belonging to the Wenlock division have been long known to exist on the shore at Kirkcudbright Bay. They were first described by Mr J. Carrick Moore. Messrs Lapworth and Wilson have since found these same beds further along the same line of strike, as far as the centre of the Cheviot Hills. These rocks, Mr Lapworth says, belong to the Wenlock and Lower Ludlow, but from the list of fossils he has given, they do not appear to reach so high as the Ludlow series. In some recent investigations more species of graptolites have been found in the Silurian shales that occur at Habbie's Howe.\* These graptolites are *G. Flemingii*, *G. colonus*, *G. priodon*. These are also described as occurring in the Upper Silurian rocks of the Cheviot Hills, which seems to identify them with the lower rocks of Habbie's Howe in the Pentland Hills.

*The Upper Silurian Rocks of the Pentlands.*—These rocks, from their richness in fossils, have probably been for their extent better investigated than any other belonging to this formation. From the first discovery of fossils in them by Mr Charles Maclaren, there have been a number of papers published on them.†

\* See papers by Mr Henderson and Mr Lapworth, pp. 373 and 375.

† Memoirs of the Geological Survey, Sheet 32. Pamphlet by Mr George Haswell. Papers by Messrs Henderson and Brown, published in the Transactions