

observations, and making for him those remarkable geological sketches of landscape for which the "Silurian system" and "Siluria" are so well known to geologists. It ought to be remembered, that many of the fossils from which the true age of the secondary rocks of Sutherland and the Western Isles was made out were collected by her. Throughout her long life she maintained a warm interest in all that related to the progress of science, and in all that might promote the happiness of those by whom science is cultivated. To Sir Roderick Murchison himself this Society, like all other geologists in this country, owes a debt of gratitude for the unequalled contributions which he has made to Scottish geology. We are also specially indebted to him for repeated acts of kindness; and it seems fitting, therefore, that the recent melancholy event should not pass away without some expression of sympathy with him, and of regret at the loss of one who, both by her own exertions and through the labours of her husband, has been so intimately associated with the history of geology in Scotland.

The following Gentleman was elected an Ordinary Fellow of the Society:—

ROBERT SMALL, Assistant Inspector of Schools, Edinburgh.

The following Communications were read:—

- I. *On the Silurian Rocks of the Pentland Hills.* By MESSRS JOHN HENDERSON and D. J. BROWN. (Illustrated with Map and two Detailed Sections,—Plate VIII.) Communicated by JOHN HENDERSON. PART II.

On the 21st February 1867, we had the pleasure of laying before the Society the result of our labours in this locality during the summer of 1866;* and, as our conclusions differed somewhat from those of other observers, it may not be considered out of place to give a short *résumé* of our last paper, the better to connect the conclusions we then arrived at with those which we now propose to lay before you as the results of our farther investigations in the district.

Line of Section No. 1 (general and detailed) on Plate.—It may be remembered that our former paper treated, for the most part, of that patch of the Silurian crossed by the North Esk, from near its source at the foot of the East Cairn Hills, to some distance below the reservoir, and that we gave it as our opinion that this section (Section No. 1 on Plate) comprised nearly all the lowest beds of the Silurian formation found in the Pentland Hills.

* See Trans. Edin. Geol. Soc. vol. i. part i. p. 23.

Starting from Carlops, and taking our course up the North Esk, we pass over a vast thickness of coarse conglomerates and gritty sandstones (the "Upper Old Red Sandstone" of the Geological Survey), dipping to the south-east at angles from 30° to 60° , and continuing for nearly a mile; and although we are ascending the bed of the stream, we are actually descending in the series, until we come upon the Silurian rocks, dipping at high angles to the north-west. The order is now reversed, so that the further you go up the stream from this point the higher you ascend in the series. The lowest bed of the Silurian in this section which has yielded fossils occurs in a small scaur, at "A," line of Section No. 1, below the embankment of the reservoir. Here we found *Retiolites Geinitzianus*, *Graptolithus priodon*, and *Athyris compressa*; and in nearly the same line of strike, on the east side of the Gutterford Burn, marked A1 on the Map, we also found *Athyris compressa*, along with some conchiferous shells in a bad state of preservation. In this burn, too, we found several specimens of reticulated markings, apparently the same as those described by Mr Salter as *Dictyocaris Ramsayi*. In our course up the Esk, along the reservoir, we pass through a vast thickness of greenish, grey, and chocolate coloured shales of a fine-grained texture, with occasional beds of a gritty character. These shales can be traced in nearly a continuous series for a quarter of a mile above the reservoir, dipping at angles from 60° to vertical, and have as yet yielded only one fossil, *Bellerophon dilatatus*, a specimen of which was found in a scaur at "B," line of Section No. 1, near where the upper portion of the North Esk* enters the reservoir. This species is eminently characteristic of the Wenlock limestone.

Above this series of shales lie some thick-bedded, hard, gritty sandstones and conglomerates ("C," line of Section No. 1). These rocks form a striking contrast to those already mentioned; and we may here refer for a description of them, together with relative illustration, to the second edition, p. 212, of that classic work, "The Geology of Fife and the Lothians," by our late respected president, Charles Maclaren, F.R.S.E., in which he fully describes this particular rock and its relation to the lithological structure of the whole of the vertical strata in the Pentland Hills. Since Mr Maclaren published his section,† the rock here has been quarried for building purposes, and is now seen to consist of hard, gritty, and conglomeritic sandstones, lying in the same vertical position as those beds in immediate contact with them, showing that the jointed appearance presented by the rock penetrates to no great depth, but is only the result of weathering. We are here taught a lesson of great importance,

* The "Deerhope" of the Geological Survey.

† Geology of Fife and Lothians, 2d ed. p. 212, fig. 66.

viz., that grits and conglomerates, having the same lithological characters as those of the Old Red Sandstone, are met with in the Silurian formation. The beds at "C" contain a number of fossils, but the rock requires to be thoroughly weathered before good specimens can be obtained. These beds gradually lose their gritty character, and pass into a greenish, marly shale, marked "D" on our Map, and Section No. 1, abounding in fossils of the Wenlock type, such as *Orthis*, *Strophomena*, *Leptaena*, and others. It was, in fact, mainly from the fossils in these beds that we came to the conclusion that the equivalent to the Wenlock series* occurred in the Pentland Hills. Since the first part of our paper was read, this opinion has been fully supported by Mr Thomas Davidson, F.R.S., in his work, "On the Upper Silurian Brachiopoda of the Pentland Hills," published by the Geological Society of Glasgow (1868).

To our former paper we appended a list† of all the fossils found in the Upper Silurian beds of the Pentland Hills, so far as identified. Since that time several new forms have been found, and others, included in the list then published, have been renamed from better specimens. The new forms of Brachiopoda are *Lingula Lewisii*, a form common to both Wenlock and Ludlow, and *Strophomena Hendersoni*, a new species. Two species have been altered—*Discina rugata* has now been identified as *Orbiculoidea Forbesii*, a form exclusively Wenlock, and *Chonetes lata*, as *Chonetes striatella*. Of Trilobites several species have been found, but only one has been identified, viz., *Acidaspis Brightii*, a form which has not as yet been found higher than the Wenlock. These forms were all found in the beds at "D," line of Section No. 1, and it is these beds which have yielded the greater number of the fossils found in the Pentland Hills. The beds at "D" become finer in their texture as they rise in the series, until we come to a point at "E," where a small burn runs into the Esk (see Map), about 200 feet above the base of the *grit beds*, and here they pass into a soft mudstone, weathering with the concretionary structure peculiar to these rocks. These concretions are full of fossils, both in the condition of *casts* and *impressions* of numerous genera and species, *Leptaena transversalis* being most abundant. We may remark, in passing, that this curious concretionary form assumed by some rocks when *weathering* has puzzled many geologists, and the subject has already occupied the attention of the Society this session.‡ A few feet above these the beds gradually lose their fossiliferous character, and the few forms we have picked up differ

* See part i. p. 29, of this volume.

† Ibid. pp. 31 to 33.

‡ See "Notice on certain Concretions found in the Upper Silurian Rocks of Denbighshire," by D. W. Roberts, M.B., C.M., p. 253 of this volume.

essentially from those belonging to the beds below. This we consider the close of the Wenlock formation.

We now pass over a considerable thickness of olive and bluish coloured shales at "F," weathering into large concretions, containing few fossils in the lower beds, but in the upper beds abundance of the now famous organism, *Orthoceras Maclarenii*,* along with *Pterinea retroflexa*, and a *Spirifera* finely striated;† and immediately above this point, we found at "G" a specimen of *Lingula lata*, a form characterising the Lower Ludlow. Passing up the beds to "H," on detailed Section and Map, we come upon several thin fossiliferous bands of a dark brown colour, containing numerous fossils of various genera and species, among which we recognised *Slimonia acuminata*, *Entomis tuberosa*, *Cythere umbonata*,‡ a species of *Encrinurus* was found, along with several other forms of crustacea. *Spirifera crispa* was also found, with many, we may almost say thousands, of a new species of *Rhynchonella*, viz., *R. Pentlandica* (G. C. Haswell). A few feet above this the beds "I" assume a bright yellow colour, and these again pass conformably into beds of a pale red appearance, and of a gritty nature,—the "Lower Old Red Sandstone" of the Geological Survey. These, alternating with shales and conglomerates, may be traced up the Esk (Deerhope) in the direction of the "Bore Stane" (see Map) for several hundred feet, where they disappear under the superficial accumulations at the base of East Cairn Hill. They can also be observed in the burn which comes down from the west and joins the Esk at "H." We traced them in this burn for nearly a thousand feet, where they are succeeded by a bank of weathered shale "K;" and, although we did not find the rock at this point *in situ*, we have no doubt that shales of equal character with those at "H" may be found here. We searched these red conglomerates and shales at the various points already mentioned, particularly at their lower junction, a little above where the two burns meet ("H," line of Section No. 1 on Map), without finding any fossils; but at a place about six hundred yards from this, in the line of strike, on the Deerhope Rig, "J" on Map, we opened a section and found the yellow and red beds of the very same nature and colour as those at "I." From those at "J" we collected some fossils in a fair state of preservation, *Entomis tuberosa*, *Platyschisma simulans*, and fragments of an Orthoceratite, being of the number. The most important fact was the occurrence of the red beds at this spot "J" on Map.

By referring to the map of the Geological Survey, it will be seen that these beds have been cut off, in a triangular form, several hundred feet to the north of this point "J," and termed

* Named after our late distinguished president, Charles Maclaren, F.R.S.E.

† Species undetermined.

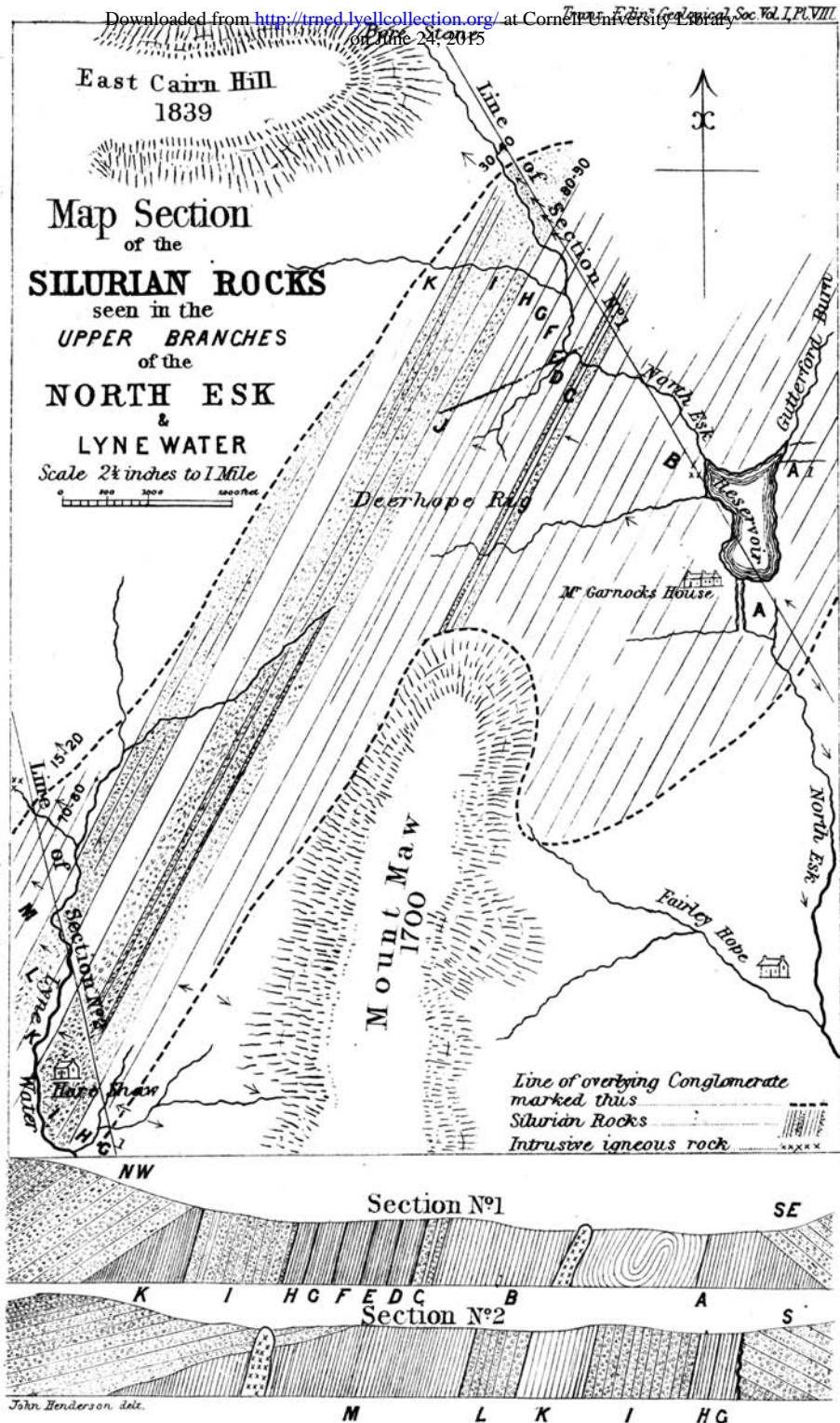
‡ Syn.—*Ceratiocaris umbonatus* (Salt.) Sedgwick and M'Coy, Pal. Foss., Salter's App. A. p. ii.

“Lower Old Red Sandstone,” and we naturally concluded that the officers of the Survey had made a mistake in cutting off the red beds in this manner; and further, we considered that these beds probably extended in their line of strike into the valley of the Lynn Water,* and that a number of beds in this district, coloured Silurian in the maps both of Maclaren and the Survey, must overlie these red beds. With the view of testing the correctness of these opinions, we examined the valley of the Lynn Water in the summer of 1867.

Line of Section No. 2 (general and detailed) on Plate.—The district which we examined, and through which the Lyne Water flows, is a wide and irregular valley, extending from between the East and West Cairn Hills to the foot of the Cairn Muir, about two miles above West Linton, and forming the most northerly part of Peeblesshire. It is separated from the valley of the North Esk, with which it runs parallel, by a long ridge of hill named Mount Maw, of which the highest point reaches 1700 feet (see Map).

Starting from Mr Garnock's house at the North Esk reservoir (see Map) we took a south-west cut across the shoulder of this hill, intending to catch the lowest Silurian beds visible in the Lyne Water. We found “Mount Maw” composed of Silurian shales, capped with nearly horizontal beds of conglomerate. Crossing over into the valley of the Lyne Water, and still keeping the same south-westerly direction, we came upon a small burn which joins the Lyne Water a little below the herd's house at Hareshaw (see line of Section No. 2 on Map), at the foot of the portion coloured Silurian in the Survey's map. Following the course of this burn down the hill to near its junction with Lyne Water, we came upon the Silurian shales of the same colour, and containing a number of the same fossils, as those beds marked “H” in our North Esk section (see line of Section No. 1 on Map). The burn runs nearly along the strike of these beds for a short distance, till it joins the Lyne Water below Hareshaw. In this burn some beautiful sections occur, where the junction of the nearly vertical Silurian and the unconformable conglomerates are well displayed. In some places the conglomerates can be seen lying above the Silurian with a nearly horizontal line of junction. But one place at this point especially attracts attention (see “G1” on Map, line of Section No. 2, and “G” on detailed Section No. 2). The Silurian rocks present a vertical face to the unconformable conglomerates, and from this face these rocks dip at high angles to the north-west, while against it the conglomerates are piled up to the height of thirty feet, dipping at low angles to the south-east. We give a

* See part i. p. 30 of this volume.



detailed section of this (No. 2), which will the better explain its nature. It seems as if the Silurian had stood up in the water as an abrupt cliff, and the conglomerates had been piled up against it.

Leaving this burn, and taking our course up the Lyne Water in a direction nearly across the strike of the beds, we pass for some distance over Silurian shales, manifestly the equivalents of those beds lying beneath the red vertical beds in the North Esk section (line of Section, detailed and general, No. 1) at "H." Of this there can be no reasonable doubt, because immediately above them we come upon beds of grit and conglomerate, extending for nearly 1000 feet up the Lyne Water, the continuation of the uppermost beds seen in the North Esk section (No. 1) at "I." They lie in the same line of strike, and seem to be of the same nature, and nearly of the same extent, as those beds—"the Lower Old Red Sandstone" of the Geological Survey. These beds are overlaid by a series of vertical shales, "K," of various colours, having a hard slaty texture, splitting up into thin flags. In other parts they weather into cuboidal fragments, and in numerous instances closely resemble the beds in the lower part of the North Esk section (No. 1) at "B." These continue for 400 or 500 feet up the Lyne Water, and are succeeded by another series of red sandstone beds at "L" (line of Section No. 2 on Map) of nearly the same thickness; and these, again, are overlaid by several hundred feet of shales, "M," of much the same nature as those at "K." The extent of these we were unable to ascertain, as they pass under the unconformable conglomerates and sandstones of East Cairn Hill.

Taking these upper beds of the Lyne Water from the base of the red beds marked "I," up to where they pass under the sandstones and conglomerates of East Cairn Hill, we have a thickness of at least 2000 feet, which, added to the North Esk series, estimated by the Geological Survey at 3500 feet, gives a total of 5500 feet of Silurian strata seen in a continuous section, from a point a little to the east of the North Esk reservoir, to the upper branch of the Lyne Water.

Throughout the whole of the upper portion of this section in the Lyne Water, namely, from "I" to "M," we have not been able to detect a single organism; but as our time was necessarily limited, and almost wholly spent in examining the sections seen in the different burns, we did not get this part searched very minutely with the view of finding some fossils. Although the nature of the shales is not promising, yet willing hands and a spirit of perseverance may ultimately bring to light fossil evidence which will determine the true position which these beds occupy in the series.

Conclusion.—Until we possess more complete and conclusive evidence of the nature and fossil contents of the beds seen in the

course of the Lyne Water (line of Section No. 2), we cannot do otherwise than believe that they are a part of the Silurian formation, from the fact that they form one unbroken and continuous series, and the upper beds do not differ in lithological character from the undoubted Silurian shales and grits beneath them.

Moreover, we have traced Ludlow fossils into the red beds, held to be "Lower Old Red Sandstone" by the Geological Survey, and neither in these, nor in any of the lower beds, do we find exclusively "Passage Bed" fossils, clearly showing that we have not yet arrived at that series. We hold, therefore, these upper beds in the Lyne Water, which lie above the uppermost fossiliferous beds in the North Esk, to belong to the "Ludlow series," and that none of the vertical beds found in the Pentland Hills belong to the "Old Red Sandstone."

II. *The Fifeshire Gold Diggings of 1852.* By W. LAUDER LINDSAY, M.D., F.R.S.E. Communicated by Mr PANTON, Honorary Secretary.

(*Abstract.*)

The Lomond gold digging mania occurred in May 1852, and lasted about a month. There was a daily average of 300 diggers—at least 5000 to 6000 in all. Many of them were coal and iron miners, who were earning 15s. per week or upwards, and who had thrown up their employment to embark in the alluring lottery of gold seeking. The excitement extended over an area of twenty miles, including the opposite shores of the Forth and Tay. The origin of the mania was the statement of a convict, a native of Kinnesswood, who wrote from Australia to the friends he had in the Kinross-shire village, that he had often seen gold at home at the lime quarries above Kinnesswood, in the Bishop's Hill, similar to what was being dug in Australia. At this particular time the public mind was in a condition of great excitement produced by the brilliant auriferous discoveries in California in 1847, intensified and revived by the no less splendid results of gold digging in Australia in September 1851; added to which, there were certain floating local popular traditions or proverbs which gave a spurious weight or significance to the convict's rash and inconsiderate assertion. The centre of attraction to the Fifeshire diggers—the chief scene of their labours—appears to have been a quarry of carboniferous limestone, known in the district as the "Clattering," or "Clattering Well." This quarry is situated "right above the village," and north-west of Kinnesswood in Kinross-shire, "about a gunshot back from the brow of the Bishop Hill" near its summit. Its locality is on the south base of the West Lomond Hill, overlooking Loch Leven. Superjacent to the limestone, which is richly fossiliferous, is a bed of ochre,