Thursday, 30th January 1873.

D. MILNE HOME, Esq. of Milnegraden, LL.D., Vice-President,
in the Chair.

The following Communications were read :—

- I. *On some of the less common Bathgate Fossils.* By JAMES
LINN, Parish Schoolmaster, Livingstone, Mid-Calder.

The limestone of the Bathgate Hills abounds with fossils, and these are for the most part in a remarkably fine state of preservation. When wholly enclosed in the limestone, they always retain their perfect form, that is, if they have been embedded entire, though their external markings are not always to be seen. These markings are there, but the fine coral or other debris that had filled up the shell in many cases separates more readily from that shell than the shell does from the matrix in which it is enclosed; hence we have what are called casts of fossils. From the cast it is often difficult to determine the species; by a little careful chipping, however, one sometimes succeeds in getting a fragment showing the external markings. When the fossils lie at the top of any of the divisions of the limestone, and have been only in part embedded in it, they are seldom entire, at times distorted besides, especially the larger ones. Those that occur in the thin shale partings between the massive layers of limestone are almost always flattened and imperfect.

In many parts in the west of Scotland, Mr Young, in his work on that district, states that it is mainly in the shales that the fossils are to be found, and few in the pure limestones. In the Bathgate Hill, on the other hand, the fossils are most numerous and finest in the limestone. A few miles to the south, however, where the limestone becomes thinner, less what may be called coralline and more encrinital, the usual Bathgate fossils become fewer, and the shales abound with beautiful fossils.

There are very few fossils that are found in the corresponding limestones in other parts of Scotland at least, that are not to be found at Bathgate, and every year some shell, tooth, or coral turns up new to the district. To get such new specimens now requires patient and rather hard work. In order to get the smaller species, one must break up the limestone blocks into fragments, carefully examining every chip. In this way it has been that many of the best things have been got at Bathgate, and this must be more than ever the case now that the limestone is less extensively worked, and the old rubbish-heaps well searched, especially those near Bathgate. The North and South

Silver-mine Quarries are in the meantime abandoned, and by the sliding down of the boulder clay overlying the one, and by the crumbling away of the soft shales overlying the other, the limestone is almost hidden already. One of the shales in the North Mine Quarry abounds with palate teeth, but it is no longer accessible, nor can one now see such fine examples of glaciated surfaces as used to be seen when some square yards of the surface of the hard limestone had been "tirred." The South Mine Quarry was more remarkable for its magnificent masses of *Lithodendron regium* and *Lithodendron junceum*.

In this quarry—the South Mine—in October 1869, Mr Caruthers and myself were successful in saving a huge cephalopod. The quarrymen had just blasted a mass of limestone in which had been embedded a fine specimen of the *Actinoceros giganteum* of M'Coy—the *Orthoceras giganteum* of Sowerby. The shell was, of course, broken to pieces, but we managed to get the greater part of it, and to fit the pieces together. The top part we searched for in vain, probably it was not thrown out with the rest, and still remains in the solid rock. There is also wanting a little bit of the last chamber. Only one side of the specimen was complete all the length—the last chamber, and the three or four next to it, had been enclosed in the limestone only about half way round, and all the part exposed had decayed away either in the black mud that had been deposited on the limestone, or before such shale had been laid down. The upper part of the shell had been wholly embedded in the limestone, and so was quite entire. The part which I have is 3 feet in length, the diameter of the last chamber 9 inches, and of the topmost one 4 inches. M'Coy speaks of this fossil as common in the red limestone of Castle Espie, in County Down, and says it sometimes attains a length of 4 feet, imperfect at each end. In the continuation of the limestone southwards at Blackburn, about three miles from where my specimen was got, I have seen two specimens, both large, but the larger of the two little more than half the size of the South Mine one.

Another interesting specimen is the *Bellerophon Dumontii*. It was found in the North Mine Quarry. Casts of what I take to be several species of *Bellerophon* are very frequent, but this one has got the external surface and markings rather well preserved. Mr Young speaks of it as rare in the west of Scotland, and this is the only certain specimen I have met with in twelve years. Some of the numerous casts may be of this species.

Euomphalus crotalostomus Mr Young has not in his list, but not very long ago he told me a specimen had just been found by Mr Craig in the Ayrshire limestone. This is the only one, so far as I know, that has been found in the Bathgate district. M'Coy describes this species, and says it is occasionally found a

foot in diameter. Though this be a crushed specimen, the "transverse irregular lines of growth" are very well seen on it, and also traces of the "expanded margins," which give a bell-shaped appearance to the mouth, whence the specific name *crotalostomus*.

The *Cyrtoceras rugosum* is a most beautiful fossil. In the limestone at Bathgate I have as yet found only casts, but in the shales in the west end of the parish of Livingstone, at Blackburn, fragments with the external markings finely shown have been found by Mr Conchie of Fauldhouse.

The *Conocardium aliforme* of Sowerby is a rare shell at Bathgate. I have found now three specimens, one of which I spoiled in trying to chip it out of the limestone. Dr Grossart found one about a year ago, making the fourth specimen I know to have been found there. It is given as rare in the west of Scotland, and is in fragments in the shale. The other species, *armatum*, given as very rare in the west, has not, so far as I know, been found at Bathgate yet.

A pretty little shell is the *Cypricardia acuticarinata* of Armstrong. It is a rare shell in the west. The one I have here is the only one I have seen at Bathgate. It is but an incomplete cast.

Three of the varieties of *Terebratula* are found at Bathgate,—the variety *hastata*, occasionally of considerable size, but never, so far as I have seen, so large as in the limestones and shales of England and Ireland. The beautiful variety *sacculus* is always of small size. The rarest of the three, very rare also in the west of Scotland, attains the largest size in Bathgate. This is the variety *vesicularis* of De Koninck.

Neither in Peter's Hill Quarries nor in the North and South Mine Quarries can encrinites be said to be plentiful. They are very much more so in the long-abandoned Sunnyside Quarries, where I found, in 1863, a specimen showing the calyx a good deal crushed and broken, with several of the fingers in a very entire state, and on one of them are still to be seen some of the *tentacula*. It is very rare to find calyx, fingers, and *tentacula* in position as in this specimen. The species seems to be the same as that of which part of one of the fingers and some of the ossicula are figured by Ure. It has been named by Austin *Platierinus trigintidactylus*, and by M'Coy *Platycrinus triacontadactylus*. Portions of the fingers and single joints are common enough among the limestones and shales in different parts of the country.

In Peter's Hill Quarry are found, in considerable numbers, finely-preserved single palate teeth of at least three species of *Petalodus*, and of two or three species of *Cochliodus*; most plentiful is the beautiful *Cochliodus magnus*. In the autumn of last year I added a new specimen to my list—the *Psammodus porosus*.

The piece I have got is but a portion of a tooth, just about a half. This is a rare fossil in the west, and seems equally so in Bathgate.*

In the Bathgate limestones the two species of *Alveolites*, namely *septosa* and *depressa*, can hardly be said to be rare. The *depressa* is given as rare in the west of Scotland, the *septosa* common. The tubes of the *depressa* are very minute, and have the transverse septa at equal distances; whereas in the *septosa* the tubes are much larger, and the septa at irregular distances. The *Alveolites septosa*, besides being found in large irregular masses in the limestone, is frequently found growing on shells such as the *Productus giganteus*, fine examples of which are occasionally found.

In the autumn of 1871, Dr Grossart, Mr Young, and myself had a hard day's work together breaking up some of the blocks of Peter's Hill limestone. A most successful day's work it turned out to have been. Besides good specimens of many of the more common fossils, we found some new to the district, and one of them forms a new genus.

One of the finest we found was a most beautiful coral—the *Fistulipora minor* of M'Coy. In Mr Young's list it is given as rare in the west. He describes it as occurring in small globular masses, and just so is it found in the Bathgate limestone. The structure is so very fine that little can be made of it without the help of a very strong magnifying power.

The fourth specimen of *Conocardium* was got that day.

But most interesting of all was a band of the limestone, about 4 feet from the top, abounding in *Entomostraca* of several species, some of them of considerable size, others very small. Many good specimens were carried off. Dr Grossart immediately sent off some of the pieces to Rupert Jones to get the species determined. The result came only in the end of last week, so on Monday morning I had an exulting letter from Dr Grossart; and in the evening one from Mr Young.

The one forming the new genus has been named *Cypridinella superciliosa* by Jones and Kirkby. It is the most plentiful of the *Cypridinoidæ* found in that band of limestone; but, though so plentiful, it is difficult to get good specimens out of the rock, for the chipping is liable to cause the finely granular structure to fly off. The others are the *Cypridella Edwardsiana*, *Cyprella annulata*, and *Cyprella chrysaloidea*. These three are rare compared with the *Cypridinella superciliosa*, but are not new like it, having been figured by De Koninck from the Belgian Coal-fields.

Such are a few of the rarer Bathgate fossils. I had hoped to

* Since writing the above, I have seen another found by Mr Beveridge, manager of Drumcross Coal Works, in the West Kirkton Quarry; and since that one was found, he tells me has found about half-a-dozen more in the same place.

have been able during the present session to lay before the Society a tolerably complete list of the fossils hitherto found in the western parts of the counties of Edinburgh and Linlithgow, but find I must have some more time yet. Perhaps by next session I shall have got my plant-remains and corals named and arranged, for these are the chief hindrance.

II. *On the Evidence of the Existence of an Old River Course previous to the deposition of the Boulder Clay, at the Water of Leith, above Colinton.* By JOHN HENDERSON, Curator of the Museum.

The condition of the surface of Scotland immediately preceding the deposition of the boulder clay is very little known, nor can much be expected, when we consider the circumstances under which the boulder clay was deposited. That the boulder clay is mostly made up from the rock upon which it rests is evident from an examination of our own neighbourhood. To the north and west of Edinburgh the underlying rocks consist of soft black shales and grey sandstones. Overlying these, in many places we find a great thickness of hard bluish sandy clay, full of boulders of grey sandstone and greenstone; while in the southern district, where reddish sandstones and shales prevail, the boulder clay so closely resembles in colour the rocks upon which it rests, that it is often difficult to distinguish the clay from the shales upon which it lies. But a large number of the boulders in the clay offer an exception to this rule, many of them being derived from rocks lying at a considerable distance to the west of where they are found. The boulder clay in this respect presents a curious anomaly to ordinary sedimentary deposits, more especially to those of river or oceanic currents, which generally deposit the larger stones first, and carry the finer sediment farthest; whereas in the case of the boulder clay, the finer sediment has scarcely been removed from the parent rock, while the larger blocks have been transported in many instances to a great distance. The action which produced the boulder clay might be compared to that of some great plough that went tearing into the solid rocks, carrying along the larger blocks, and parting with them as it moved onwards under some enormous pressure, making the mass so compact that it is sometimes more difficult to cut into than the solid rocks beneath. Even small stones are with difficulty got out of it, and when taken out the finest markings on the stone are found impressed upon the clay. It will be readily seen, from the amount of erosion the rocks lying immediately beneath the boulder clay have been subjected to, that we can expect to gather very little information about the condition of the surface of the country before the deposition of the boulder clay, and it