Memoirs of the Geological Survey.

EXPLANATORY MEMOIR

TO ACCOMPANY

SHEET 34 OF THE MAPS

OF THE

GEOLOGICAL SURVEY OF IRELAND,

BY

JOSEPH NOLAN, M.R.I.A., &c.,

WITH

PALÆONTOLOGICAL NOTES BY W. H. BAILY, F.G.S.

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NOTICE.

The following memoir by Mr. Nolan is of great interest, not only because of the variety of rocks and formations contained in the district, but also on account of the clear manner in which their lithological peculiarities and stratigraphical relations have been determined in the field and described by the author. Among other subjects suggested by this memoir it is an interesting circumstance, that while the Old Red Sandstone of the area has the same general strike as that of the middle of Scotland, it also possesses the peculiarity of contemporaneous volcanic eruptions and lava-flows comparable to the volcanic rocks that belong to the same general age in the Old Red Sandstone area of the Ochil Hills.

ANDREW C. RAMSAY,
Director-General.

The district described in this memoir was geologically surveyed by Mr. Nolan, the author, during the years 1875–76, and inspected by myself on several occasions. It is peculiarly interesting to petrographers for the variety it affords of Metamorphic and Plutonic rocks, and it lies on the borders of that great tract of metamorphosed Lower Silurian beds which occupy the largest portions of Derry and Donegal. The assemblage of Lower Silurian fossils—originally described by the late General Portlock, —from the Pomeroy beds, is unusually large, and has been carefully tabulated and described by Mr. Baily.

EDWARD HULL,
Director of the Geological Survey of Ireland.

19th December, 1878.

THE

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The observations made in the course of the Geological Survey are entered, in the first instance, on the Maps of the Ordnance Townland Survey, which are on the scale of six inches to the mile. By means of marks, writing, and colours, the nature, extent, direction, and geological formation of all portions of rock visible at the surface are laid down on these maps, which are preserved as data maps and geological records in the office in Dublin.

The results of the Survey are published by means of coloured copies of the one-inch map of the Ordnance Survey, accompanied by printed Explanatory Memoirs.

Longitudinal sections, on the scale of six inches to the mile, and vertical sections of coal-pits, &c., on the scale of forty feet to the inch, are also published, and in preparation.

Condensed memoirs on particular districts will also eventually appear.

The heights mentioned in these explanations are all taken from the Ordnance Maps.

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LIST OF ILLUSTRATIONS.

EXPLANATORY MEMOIR

TO ACCOMPANY

SHEET 34

OF THE MAPS OF THE

GEOLOGICAL SURVEY OF IRELAND.

Introduction.

The area included within the limits of this sheet of the Geological Map of Ireland lies entirely within the County Tyrone, and comprises most of the country between the important towns of Omagh and Dungannon. Within the district are the small towns of Beragh and Sixmilecross to the west, Carrickmore and Pomeroy to the north, Donaghmore and Castlecaulfield to the east, and Ballygawley at the extreme south, a small portion of the town lying within the limits of the adjoining map. The Ulster branch of the Great Northern Railway traverses the district in an irregular east and west direction.

This tract of country has been described more than thirty years ago, by the late General (then Captain) Portlock, F.R.S., F.G.S., &c., in his "Geological Report on Londonderry and Parts of Tyrone," &c., and is included in his Geological Map.

Chapter I.

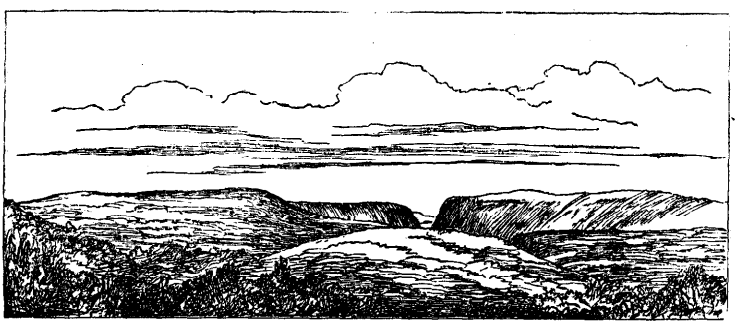
Physical Geography and Geology.

The northern part of this district is of an elevated character, and is occupied by metamorphic and igneous rocks, covered generally with a thin gravelly drift under an envelope of mountain peat or bog, the sombre tint of which gives the landscape a barren and dreary aspect.

Occasionally the rocks rise into hills of moderate height, of which the chief are Craigballyharky, 771 feet; Caragrim, 710 feet; Cregganconroe, 993 feet, and Scalp, 859 feet. These hills are apparently due, not to uplifting or other disturbing action, but in some cases to the harder and more crystalline character of the rocks which compose them, so that they were less affected by denudation than the districts around, while in other cases they may be simply due to the denuding agents having commenced to act on original trifling inequalities in the surface, producing during long ages of secular waste depressions and valleys, while the intervening portions were thus, by being left comparatively untouched, converted into hills.

South of this metamorphic rock country the greater part of the district is occupied by sandstones and conglomerates of Old Red Sandstone age, except a comparatively small tract of Silurian rocks at Pomeroy. The features of this part of the country differ very much from that just described, and consist chiefly of high peat-covered tablelands, more or less undulating, and occasionally swelling into gently sloping hills, some of which attain an altitude of over 1,000 feet. These tablelands are intersected in every direction by numerous deep-winding valleys and ravines, which sometimes present very bold and striking characters. Since the formation of the older of those valleys and ravines the physical geography of the district appears to have undergone considerable alteration, so that it is not unusual to find a ridge of hill cut through by a deep ravine, the denuding agents having operated in a direction at right angles to that of the original valley. Bernisk Glen, some four miles south of Carrickmore, is a remarkable illustration of this.

Fig. 2.



Bernisk Glen, from Carrickmore.

In the eastern part of this Old Red Sandstone country the hills of Altmore and Cappagh are the most remarkable objects. These, as well as a considerable tract to the east, west, and southwest, are composed of a purplish felstone, due to contemporaneous flows of sub-aqueous lava. Their present elevation is doubtless due to the same causes which have produced hills in the metamorphic rock country, being harder than the coarse disintegrating conglomerates that surround them, they were better able to resist atmospheric and other denuding agencies.

East and south of the Old Red Sandstone tableland, the southern margin of which forms a striking and conspicuous feature, the country is occupied by deposits of the Carboniferous period consisting of sandstones and quartzose conglomerates at the base, and beds of limestone with occasional interstratified sandstones and shales over them. There are no marked or peculiar characters to distinguish this part of the country, and the rocks are for the most part concealed under a thick mantle of drift, boulder clay, or sandy and gravelly deposits, the former making a gently undulating to hilly country, and the latter either occurring as flat-topped hills, or those remarkable tortuous ridges called eskers.

The main watershed of this district extends from north to south,

dividing it into two nearly equal portions. No river of considerable size traverses either of these basins, but that to the west contains the head waters of the Camowen, which, after its confluence with the smaller river of Drumragh at Omagh, is called the Strule, and flows northward under the names of the Mourne and Foyle to Londonderry, where it enters the sea. In the district east of the watershed are a number of small streams which drain into Lough Neagh.

CHAPTER II.

Formations or Groups of Rocks entering into the Structure of the District.

Superficial deposits.

	Colour on Map.
Drift—Boulder clay, sands, and gravels.	*Engraved dots.*
Peat bog and alluvium.	*Burnt Sienna.*

AQUEOUS ROCKS.

Carboniferous Series.	d^3 Yoredale beds,	*Light Indian ink and Prussian blue.*
	$d^{2'''}$ Upper limestone,	*Prussian blue.*
	$d^{2''}$ Middle or "Calp" do.	*Lighter tint of same, with wash of Indian ink, dotted with chrome where sandstones occur.*
	d^2 Lower do.	*Prussian blue, light tint.*
	d^1 Lower Carboniferous Sandstone.	*Prussian blue and Indian ink, dotted with chrome.*
	c Old Red Sandstone	*Indian Red.*
Lower Silurian Rocks.	b^2 Bala beds.	*Light purple.*

IGNEOUS AND METAMORPHIC ROCKS.

B. Basalt, Melaphyre, and Dolerite.	*Burnt carmine (deep tint).*
F. Felstone (contemporaneous).	*Orange chrome and carmine, light tint.*
μ. and ν. Schist and Gneiss.	*Light crimson lake.*
Δ Hornblendic and Pyroxenic metamorphic rocks.	*Burnt carmine, light tint.*
Hy. Hypersthene Rocks.	*Same, dotted with white.*
E. Quartziferous Porphyry (Elvanite).	*Deep carmine.*
S. and SG. Syenite and Syenitic Granite.	*Orange chrome and carmine.*
G. Granite.	*Carmine.*

IGNEOUS AND METAMORPHIC ROCKS

(Probably of Lower Silurian age).

These as mentioned in the preceding chapter occupy most of the northern part of this district. The principal rock appears to be composed of a plagioclase felspar, usually labradorite, with hornblende or pyroxene, both minerals being frequently associated in the same mass. In some places quartz is present, disseminated in very small grains, scarcely perceptible even with the lens, at other

places it increases in size and quantity, converting the rock into syenite. This great development of quartz is best. seen in the hills north of Pomeroy called Craigballyharky, Caragrim, and Bardahessiagh. At their bases the quartz is observed scattered in minute grains through the hornblendic rocks, which exhibit here every degree of texture from compact to highly crystalline, but as we ascend it rapidly increases to great crystals which weather in warty excrescences, giving to the rock, as Portlock remarks, "a peculiar mechanical aspect." In many parts of these hills this coarse syenite is replaced by the apparently quartzless hornblendic rock with such abruptness as to lead one to believe at first sight that the former was intrusive; but closer examination shows that they are essentially portions of the same mass, merely differing in the very variable quantity of silica present in different parts. This remarkable variation in the proportion of silica is well exemplified in many places, particularly near the summit of Craigballyharky, where a most remarkable transition from coarse syenite to hornblende rock was observed.

In this district too, at Bardahessiagh, is a very peculiar rock apparently composed of quartz and magnetic iron. In it Professor O'Reilly detected a small crystal apparently of sapphire. Though not an iron ore, it is sufficiently remarkable to be noticed, and its position on the map is shown by the symbol indicating iron.

About four miles west of Craigballyharky is the rugged hill of Cregganconroe, also formed of the pyroxenic rocks.* These in many parts are largely crystalline, and some hypersthene occurs, in other places quartz appears, changing it into syenite, which by the addition of mica is further converted into syenitic granite. In the flat bog north of the hill is a hummock, consisting of plagioclase felspar, quartz and hornblende, with talc and a little hypersthene.

Associated with these rocks is an extensive tract of granite, forming the southern part of Cregganconroe, and the chief portion of the hill to the E.N.E. called the Murnells, but as it is in great part an intrusive rock of Old Red Sandstone age, its description will be given subsequently when treating of that formation.

West of Cregganconroe the bald rocky hill called "The Scalp" is also composed of pyroxenic rocks. The augitic variety is here the more prevalent, and is sometimes developed in large crystals of hypersthene, glittering with the semi-metallic lustre so characteristic of that mineral. It also contains serpentine and arsenical pyrites. This locality is to be found on the eastern side of the hill, and is marked on the map with white dots.

Another famous locality for hypersthene lies about two miles to the south, at the picturesquely wooded Glebe of Athenree, adjacent to Carrickmore railway station. Portlock describes it as "dark green or blackish-grey in colour, and having a strong semi-metallic lustre. It passes into a greyish green diallage, and

* I use the term "pyroxenic" to include either hornblendic or augitic rocks, or both when mingled as in this district.

with a greenish felspar forms the very beautiful diallage rock of this locality." Professor O'Reilly, who kindly examined a specimen for me, describes it as a typical hypersthenite consisting of labradorite and hypersthene with some hornblende. The term "diallage" he believes to be a misleading one, that so-called mineral being merely a form due to the union of hornblende and augite.*

In the stream that traverses the prettily-wooded glen in the south part of this glebe a very interesting section was observed. The hornblendic rocks are close, compact, and are associated with a fine-grained granitic rock, consisting of an intimate mixture of silica and felspar, with silvery-looking scales of lepidolite. It might be described as a fine-grained granite, but from the closeness of its texture and angular weathering it more resembles the elvanites, to which class it may perhaps be more properly referred. It is again met with at two localities to the E.N.E. in the little ravines which open on the north side of the glen or valley of Tremoge. From this circumstance one is at first inclined to regard it as an intrusive dyke; this, however, is not borne out by further examination, for in many places it may be seen to pass gradually into the hornblendic rock.

North-west of Athenree is the elevated district of Carrickmore or Termon Rock, also composed of the pyroxenic rocks, which exhibit every variety of texture from coarsely-crystalline to fine-grained and compact. This latter form is most conspicuous at the western end of the village, where it has all the appearance of a baked slate, though no definite structure could be traced; but at the distance of half a mile to the north-west foliation is pretty clearly seen, suggesting the original sedimentary character of the rock. In this district much epidote occurs as a pale yellowish green mineral, filling up cracks and fissures, and serpentine is generally disseminated. In one place, close to the Omagh road, half a mile west of Carrickmore, this mineral is very largely developed, ramifying in veins through the rock, giving it much the look of the celebrated Connemara marble. This locality is marked on the map with the Greek letter indicating serpentine.

North of this part of the district is the mass of granite before referred to, north and west of which the country to the limits of the map, is chiefly occupied by the same kind of green basic rocks. In many places here, however, the pyroxenic mineral appears to be absent, or at least not discernible by the lens, and the rock seems to pass into a green basic felstone, but these variations are too irregular to render possible any division on the map. At the west, near the boundary of the mica-schist, there is an apparent tendency to foliation, as if they were but a modified though more highly altered variety of the schists. However, at their junction, seen in a stream a little north of the limits of this map, no gradual passage was observed. This is a question which must remain open till more of the district to the north be examined.

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* Cotta appears to hold similar views regarding this mineral. See "Rocks Classified and Described," page 19.

Associated with these green basic rocks, is a remarkable granitoidal quartziferous porphyry or elvanite. It is very different from that which occurs at Athenree and Tremoge, being a coarse aggregate of reddish or pink-coloured orthoclase, with usually light yellowish or green plagioclase, quartz in large, prominent, and often well-formed crystals, and numerous hexagonal plates of green potash mica. A section through this rock may be seen in the stream at Mullanmore Bridge, north of the granitic tract, and again at a mile west of that place, where it is intimately associated with the green basic rocks; but it is more largely crystalline in a boss on the roadside, one mile north of this, and a little west of Copney. Here it is coarsely granular and micaceous, and might be called a granite but that the base is felsitic.

Farther west, this coarse elvanite crops out in many places, and attains its greatest development at Drumnakilly, as may be seen on the map. In the stream east and north-east of the Parsonage an excellent section may be seen. The elvanite is here associated with the dark green basic rock, and looks as if it were intrusive, though, as before remarked, it appears in other places to pass into it with such imperceptible gradation as to lead one to regard it as the result of metamorphic rather than of direct igneous action. Its general appearance much resembles the coarse quartziferous porphyry of Kilbride, County Galway, represented on Sheets 94 and 95 of the Maps of the Geological Survey, and described in the accompanying memoir. This latter is, however, unquestionably an intrusive rock.

The green basic rock associated with the elvanite in the stream near Drumnakilly is compact, chloritic, and serpentinous, with much iron pyrites disseminated. In some places it is vesicular, the cavities being subsequently filled with calcite and chalcedony. Hornblende sometimes occurs, but the prevailing character is felspathic. The rocks that appear between this place and the junction with the mica schist to the north-west are of the same character. They seem to suggest a passage from the coarsely crystalline pyroxenic rocks, such as those of Carrickmore, to the highly acidic porphyries and syenites that occur so plentifully over the whole district.

Sedimentary Rocks.

Lower Silurian Beds.

These occupy a small tract at Pomeroy, and have long been celebrated for the remarkable yield of fossils obtained from them. Details concerning these will be found in the proper chapter, but some of the more important sections may be here pointed out. They are chiefly found in the neighbourhood of the hamlet called Slatequarry, in the stream south of which are fossiliferous thin-bedded green slates, and a little to the south-east, in the stream and quarry adjoining, is another locality which has yielded trilobites and other characteristic fossils. Perhaps the best known and most famous places are those to the north-west of Slatequarry, in the townland of Bardahessiagh. Fossils occur here in great abundance in slates and flaggy sandstones; even the walls and ditches around fields abound with fossiliferous blocks.

In the stream that flows north of Pomeroy House another section through these rocks may be seen—here they are very much twisted and contorted, and some fossils were found; and farther north-west they were observed in many places, and are traversed by a small dyke of felstone, as may be seen on the map.

South of this part of the district to the town of Pomeroy there is much drift, and little rock is seen, but green fossiliferous slates are found close to the railway, half a mile from Pomeroy station. Similar beds are met with in the stream to the east near Tanderagee, and also to the south. In the latter place the slates are interbedded with flaggy sandstones and conglomerates. Some of these are very coarse, and, where they occur at Gortavoy Bridge, near the Old Red Sandstone area, might easily be taken for rocks of that formation, as many of the contained fragments are of a similar character. On tracing them further, however, their geological age is established beyond all doubt, as they are seen interstratified with the thin flaggy green sandstones and slates similar to those just described.

Close to the railway this series of beds is traversed by a thin dyke of basalt, as may be seen by the map. This rock is described by Gen. Portlock as a "dense basaltiform greenstone; its joints thinly coated with carbonate of lime, which also occurs occasionally imbedded in small amygdaloidal cavities."*

Old Red Sandstone.

This formation, occupying by far the largest portion of the area contained within the limits of the map, lies south of the Silurian and metamorphic rock country just described, and is the north-eastern part of the tract of Old Red Sandstone that extends from this to the eastern shore of Lough Erne. It consists of coarse reddish to purple sandstones, usually micaceous, overlaid towards the central and southern parts by conglomerates. These latter are often of a massive character, some of the contained blocks being over a foot in diameter. They are chiefly grits, schist, quartzite, and purple felstone, the latter yielding the most numerous fragments, and apparently derived from certain felstones in the vicinity which will be afterwards described. Sulphate of barytes was observed in many parts, though never in sufficient quantity to prove useful. It was noticed in the vicinity of Ballygawley, in the stream east of Greenhill or Ballygawley demesne; at Eshbane, half a mile south-west of the hill, where a branching vein, four inches wide, occurs in the conglomerate at the right bank of the river; and at Glenbeg, four miles S.S.E. of Pomeroy, in the sandstones close to the purple felstone.

We may here describe a line of section taken across these rocks from north to south as being fully illustrative of the whole series. Commencing at the north we find in the immediate vicinity of the granitic and metamorphic rocks, near Carrickmore, alternations of red micaceous sandstones and coarse grit, metamorphosed at their junction with the granite into quartzite.

*Geological Report on Londonderry, &c., p. 523.

South of this much of the country is covered by an extensive peat bog, nor is any rock seen till we reach the vicinity of the road from Dungannon to Omagh. There are exposures of a purple felstone which will be afterwards described; and on the opposite side of the railway and alluvial flat some fine-grained purple sandstones appear. These beds are best seen at the little waterfall a quarter of a mile to the east of the felstone boundary, and again still farther east, in the stream between the Pound and Altanagh bridges. This latter section deserves special mention as exhibiting the passage from fine-grained purple micaceous sandstones into the coarse conglomerates that make up the greater part of the Old Red formation in this area. At the Pound bridge the former rocks were seen; as we ascend the stream they become coarser and occasionally pebbly, passing ultimately into the conglomerate. In this section two basalt dykes occur, and are represented on the map.

The district south of this is of an elevated character, having, as before remarked, the general appearance of a tableland cut up by numerous valleys and ravines. Of these latter the two more remarkable are Bernisk glen and Baraglen, both of which display admirable sections through these rocks. In Baraglen we have the purple sandstones overlaid to the south by conglomerates; these latter are much better exhibited in Bernisk glen. There they are of a massive character, containing blocks of considerable size. Their chief characteristic is the immense preponderance of felstone pebbles and boulders over the other ingredients of the rock, the conglomerate in some parts seeming to be mainly made up of them.

South of this, in the vicinity of the Cloghfin river, similar rocks crop out in many places, and in a quarry at Shean Bridge the sandstones show that confused and irregular lamination called false bedding.*

The wild country to the south is mostly covered with peat and gravel deposits, and rocks are seldom met with. They occur, however, in the narrow valleys and ravines near Ballygawley House, and are perfectly similar to those before described. As may be seen by the map, these rocks all dip northwards, so that the basal conglomerates of the Lower Carboniferous series rest with a considerable degree of unconformability upon them. As such a break, indicating as it does a long lapse of geological time, is not of usual occurrence between the Old Red Sandstone and Carboniferous formations, it seems highly probable that the Old Red Sandstone of this district belongs to the lower division of that formation, a view which is, I believe, justified by observations made in neighbouring districts.

Igneous Rocks of Old Red Sandstone Age.

Granite.

Three tracts of this rock occur in the district, one north-west of Pomeroy extending for nearly three miles, with an average width of nearly one mile; another near Carrickmore, and the third north of the town of Beragh, near the western limits of the map. All

* This may be frequently observed among recent sands and gravels. See the remarkable drift section at Ballybrack, near Dublin, for a good example of the kind.

these granites are of similar character, and indeed most probably portions of the same mass. They are generally very quartzose, with pink felspar (orthoclase), and usually a light green waxy felspar, that seems to be oligoclase, with plates of white, black, and green mica, also chlorite and talc, which in some places predominate and almost replace the mica. Carbonate of lime is often present, and in one locality, at Limehill, north-west of Pomeroy, it attains an extraordinary development. Here the quartz and mica almost disappear, and the rock is chiefly composed of felspar and carbonate of lime, which latter forms so large a proportion of the entire mass of the rock that it has been burned for agricultural purposes. The occurrence of this mineral is no doubt due to infiltration, Carboniferous rocks having probably extended over all this part of the country, as appears from the patches that remain in adjoining districts, but this does not explain how the replacement of some of the essential minerals of the granite was effected. As in the district now described we have but a comparatively small portion of the metamorphic rock area to examine, we must only trust that when the survey of the whole is completed we may be in a position to throw some light upon this and other interesting problems.*

The intrusion of this granite through the Old Red Sandstone is clearly proved in a stream section at Aghnagreggan Bridge, west of Carrickmore. At a little north of the bridge the unaltered sandstones appear, while higher up there are grits, the portions in contact with the granite being vitrified and converted into quartzites. That this intrusion took place during the Old Red Sandstone period itself cannot be proved in this immediate locality, but at Carndaisy, near Moneymore, in the district to the north-west (sheet 27), there is sufficient evidence on this point, as the granite is overlaid by beds of lower Carboniferous sandstone, which are mostly made up of its *debris*. The latter tract of granite is isolated like those which occur in this district, but there can be little doubt that, like them, it is a portion of the same mass.

Although we have thus proved that portions of this granite have been intrusive, yet there is every reason to believe that other parts are of metamorphic rather than of irruptive origin. In many places they are seen to graduate into the coarse quartzose elvanite before described; an excellent section illustrating which may be seen in the small stream valley north of Mullanmore Bridge, one mile and a half north of Carrickmore. Here, at the bridge, granite is met with; a little farther on, in a cliff, a granitic rock is observed, which it is impossible to refer either to the granite or the quartzose elvanite, while still higher up, the rock is decidedly of the latter character. At all those places it has the same general appearance of a coarse quartzose rock, with abundance of pink and grey felspar and greenish mica, except that towards the south the base is siliceous, while to the north it becomes felspathic. Similar observations may be made in a quarry close to the road side, half a mile

*Part of this granite is a handsome porphyritic rock, and would make a useful and ornamental building stone. The best locality is at Seefinn, within three miles distance of Beragh Station, on the Great Northern Railway.

to the east, while in other parts of the district, as before remarked, it is impossible to separate the quartzose elvanite from the associated green metamorphic rocks. From all these considerations it would appear that the agencies which metamorphosed the rocks acted on different portions with much varying degrees of intensity; or perhaps older metamorphic rocks may have been subjected to further metamorphism, resulting in complete fusion, and the consequent production of granitic and other eruptive rocks. Some such explanation is required to account for the phenomena of this remarkable district.*

Felstone.

There are three tracts of this rock in the district, one near Sixmilecross, a second, and by far the largest, at Altmore, south of Pomeroy, and the third at Ballygawley, to the south. Of these felstones the two latter at least were certainly old lava-flows, which were poured out on the bottom of an extensive lake or inland sea, during the Old Red Sandstone period. Of that which occurs at Sixmilecross we have no evidence to show whether it was contemporaneous or intrusive, though, as will be seen hereafter, there are some reasons for believing that it may have been of the latter character. It is probably about half a square mile in extent, and the rock where observed is found to be a basic felstone of compact texture and purple colour occasionally containing crystals of light pink felspar.†

The second and most important locality is that at Altmore, extending from the hill called the Sentry Box to Crosscavanagh, a distance of four miles, from whence it has a south-westerly direction for three miles, to the vicinity of Esker Hill. This peculiar form is due to the low anticlinal and synclinal curves into which the beds in this part of the district are thrown, so that the felstone which forms the northern branch is identical with that to the south-west. This rock is of the same purple colour as that at Sixmilecross, but contains in many places prisms of hornblende, and has cavities filled with calcite or other secondary mineral, also nests of chlorite. From the thickness observed here it is most probable that there are several flows; but from the absence of anything like a connected section it would be impossible to distinguish them. In some places too the surface was observed to be ashy or tuffaceous, but any well-marked deposits of this kind were not found. This might be the case were the rocks better exposed, but even then we should expect them to be limited, the action of the waves scattering the scoriæ and such like loose accompaniments of subaqueous lavas, and depositing them in localities more or less distant according to their specific gravities, and the influence of tidal and other currents.‡

* See Geological Survey "Explanation to accompany sheet 70" for a description of a granite of metamorphic origin becoming intrusive in some places.

† These felstones answer Cotta's description of porphyrite.

‡ A late writer in "Nature" calls attention to the prevalence of volcanic fragments over the floor of the ocean. Those of a pumiceous character would of course float for a long time till thoroughly saturated and in this way the lighter parts of a lava flow might be carried to great distances from their source.

The third tract of this felstone is found in the southern part of the district, two miles north-west of Ballygawley. Its composition is identical with that at Altmore, of which, indeed, it is more probably a portion than a separate and distinct flow. Very little rock is seen in the intervening country, but from the direction of the dips in the conglomerates of the vicinity it is not improbable that the felstone was here bent into a depressed anticlinal curve, the upper part of which has been denuded away, and in this manner this tract of felstone has been dissevered.

It has been stated in a preceding page that the coarse Old Red Conglomerate is largely made up of felstone pebbles and boulders apparently derived from these rocks. As most of the conglomerate in the district directly overlies the Altmore and Ballygawley felstones this appears to be highly probable, but conglomerates with felstone pebbles are also found under them. The tract of felstone at Sixmilecross doubtless underlies all these conglomerates, but is separated from them by a considerable thickness of sandstones and shales in which no felstone pebbles were observed. From this it would appear either that it was a subaqueous lava flow which was never subsequently elevated into land so as to furnish materials for derivative formations, or that it was intrusive through the sandstones, and gave rise to contemporaneous lava flows from the waste of which the lowest beds of conglomerate were formed.

It is not improbable either that there were other tracts of felstone which have since been removed by denudation, the present area occupied by the Old Red Conglomerate being but a small part of that which must originally have existed.*

Melaphyre.

A tract of this rock, as may be seen on the map, occurs at the western margin of the district, and continues into the adjacent one (sheet 33). It is a dense compact rock, varying from grey or blue to a purple colour, and is in some parts vesicular, the cavities being usually filled with white and pink calcite. This variety may be seen in a boss at the road side, a few yards west of Recarson N. School; also in a few places to the south, near Edenderry Meetinghouse. A little north of the latter is a large quarry from which the rock has been taken for road metalling. Here it is much less vesicular, of a deep purple colour, and containing well-formed crystals, having a bronze lustre, which Professor Hull believes to be augite. Chlorite also occurs in some places filling up joints, also barytes.

The aspect of this rock is certainly volcanic, but there is nothing to show whether it was intrusive or contemporaneous. In one respect there is a marked difference between it and the con-

*There seems to be a great resemblance between the Old Red Sandstone and its associated rocks just described in this district to those of the same period in the West of Scotland, as appears by the maps and sections of the Geological Survey. The beds there are also of the lower division of the formation, and consist in some places of conglomerates made of felstone (porphyrite) pebbles. Contemporaneous felstones, some of which have tuffuse accompaniments, also occur.

temporaneous felspathic lava flows just described, namely, the complete absence of any fragments of it in the associated sandstones. As before stated with respect to the felstone at Sixmilecross, this circumstance is not incompatible with its being a contemporaneous lava flow, a consideration which is further strengthened from the vesicular nature of the rock. This latter character, however, has been sometimes observed in old volcanic necks, so that this may possibly have been one. If so, it is not improbable that it was erupted at the close of the disturbances which produced the felstones, a circumstance which from analogy we might expect, seeing that in many cases basaltic lava flows follow a long period of eruption of others of a felspathic character.*

Lower Carboniferous Sandstone.

An irregular strip of this formation, as may be seen on the map, bounds the Old Red Sandstone district on the east and south-east, and has a thickness of about 1,500 feet. The beds are conglomerates, sometimes rather coarse, and at first sight not easily discernable from those of the Old Red period, purplish and yellowish sandstones, with friable micaceous sandstones and some shales. To the north, rocks of this series are first met with at Tullyreavy Wood and in the stream south of Tullyreavy House, where soft purple sandstones occur. They are again seen at half a mile to the south, in the stream that flows by Tullydonnell Chapel. The lowest rocks here are purple conglomeritic sandstones, overlaid by finer-grained purple or reddish sandstones, with shale partings of a vivid green colour.†

Farther south similar rocks are met with in a railway section and adjacent stream where they are traversed by a fault.

South-west from this, at Crosscavanagh purplish comglomerates and sandstones were observed to be overlaid by yellow sand stones, some of which are hard enough for building purposes, while others are soft and friable, with sandy shales. A similar section occurs about a mile south of Reclain, where the Lower Carboniferous beds rest comformably on those of the Old Red Sandstone. Both conglomerates are of the same purple colour and contain pebbles of about the same size, so that their discrimination is a matter of some difficulty, and would indeed be all but impossible to one unacquainted with the peculiar characteristics of the respective formations in this district. From observations thus obtained the Old Red Conglomerate may be recognized by the prevalence of pebbles of purple felstone, while the apparently similar conglomerates resting on them contain the white and pink quartz pebbles so characteristic of that formation.

These rocks come to the surface again in many places to the south, particularly in the glens north and south-west of Killeeshil Church, at Farriter Bridge, and at other localities in the vicinity, as may be seen on reference to the map.

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* See for example of this in a paper "On a Geological Tour Through the Siebengebirge, &c." Jour. R.G.S.I., Vol. IV., Part III.

† These green shale partings are also very prevalent in some sandstones of the Old Red formation, particularly near the Copper Mine at Cappagh.

To the west of this part of the district, at Glenmore, the Lower Carboniferous rocks occupy a shallow bay in the Old Red Sandstone, and in a stream section half a mile west of that glen they are seen to rest unconformably on the Old Red conglomerate. This unconformability has been before referred to, and accounted for, when treating of the Old Red Sandstone.

South of the tongue of Old Red Sandstone that bounds the southern part of the little bay just described, the Carboniferous sandstones are again seen, and occupy a narrow strip to the south-west, bounding the limestone. Here the stream sections, &c., expose rocks in many places, as indicated by the arrows on the map, but as they in no way differ from those before described, there is no occasion to refer to them any further. It will be noticed that the unconformability to the Old Red Sandstone still continues, the beds of that formation, dipping northwards, while those of the Carboniferous dip towards the south.

Carboniferous Limestone Series.

1. *Lower Limestone.*—These rocks have just been referred to as occupying the country about Ballygawley, and they also extend over the greater part of the eastern portion of this district. In the neighbourhood of Ballygawley they were noticed in several quarries, streams, &c. They are thin-bedded, light grey limestones, often earthy or impure, with shales, but in some places there are thicker beds of crystalline limestone. Fossils abound in most of these localities.

The limestone which occupies the eastern portion of the sheet is so thickly covered with drift that it could only be observed at a few localities. In a stream section north-east of "The Rock" the lowest beds seem to be represented by sandstones interstratified with limestones, but in a quarry a little to the east, purer limestones are found. South of this, in the vicinity of Keeran's Cross-roads, are rocks which Mr. Hardman has described as "thin, blue, close-grained, splintery limestone (? hydraulic), with earthy brown compact limestone, and thin, light brown, earthy, hydraulic limestone, non-effervescing." Close by are "light grey arenaceous limestones," while at a short distance to the south of the "Cross-roads" are similar limestones, with "bluish calcareous shales."

South of Tullyaran are shales and earthy limestones containing "bitter spar," and north of Glasmullagh are "hard, compact, grey limestones," overlying grey and yellow sandstones.

In several places on and near the railway, west of Donaghmore, we meet the same alternations of crystalline with arenaceous and flaggy limestones and shales, and again, at a mile west of Mullygruen Lough, where they are highly fossiliferous.

A little isolated boss of very fossiliferous dolomitic limestone occurs in a bog one mile and a half north-west of Castlecaulfield, and similar beds, but not dolomitic, are met with to the south, close to the northern boundary of Parkanaur Demesne. At the village of Castlecaulfield are extensive quarries in "solid grey limestone, containing some beds of an earthy micaceous sandy

character," while others are "flaggy arenaceous limestones, with thin shales."

Further south the same kind of rocks are seen in many places, particularly in the streams east and west of Donamony Wood, as indicated by the arrows on the map.

"*Calp," or Middle Limestone Series.*—This division is here represented chiefly by sandstones with some earthy limestones and shales. It occupies a small area at the east of the map, and again two smaller portions to the south. Dots are used to indicate those parts where sandstones prevail, the other portions being limestones and shales. These may be seen near Thornhill Glebe, close to the fault line, and are described by Mr. Hardman as "hard, dark blue, earthy limestones."

East and south of Granville are some few outcrops of "blue non-calcareous sandy shale, with soft yellow brown mottled sandstone, with plant remains very abundant." In the tract near Derrygortreavy Glebe House very little rock occurs. At the stream west of the road some thin-bedded, light yellow sandstones appear, and again, further west, at the Oona Water, where they almost directly overlie the lower limestones.

Upper Limestone Series.—These occupy a rather small area at the north-east of the map, and a still smaller portion farther south, near Donaghmore. In the former district they are seen in many places near Tirnaskea and Rockdale, and are usually massive, crystalline limestones, sometimes nodular or concretionary, and stained of a pink colour, probably by oxide of iron.

These rocks in the district to the east (sheet 35) are interstratified with, and often replaced by, sandy beds. Here they are more calcareous, but in one place, about a mile south-west of Tirnaskea House, red sandy, with calcareous, beds occur.

In the locality near Donaghmore, Mr. Hardman has described a very remarkable place at Mullaghmore, where there are "blue, earthy, cherty limestones, with highly fossiliferous black shales."

Yoredale Beds and Millstone Grit.—These formations barely come within the limits of the map south-east of Donaghmore, and their description is given in the explanation of the adjoining map (sheet 35).

Basalt Dykes.

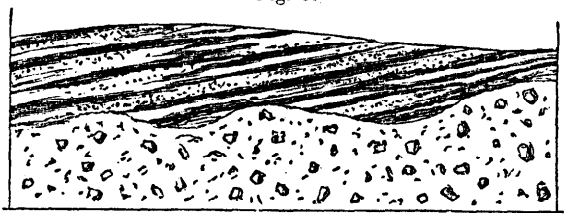
These being of more recent age are next to be described. The largest of them traverses the south-western part of the district, at Eskragh, where its presence is revealed in many quarries that have been opened for road-metalling, for which purpose it is well adapted. It is of a very dark green, almost black colour, and is in many places vesicular, the cavities being filled with calcite, &c. This dyke has an average width of fifteen feet, and seems to extend north-westwards and south-eastwards beyond the limits of this district. Numerous other basalt dykes occur, none of which, however, need any special mention, as they are almost identical in composition and appearance with that just described. It will be noticed that they have a general north-westerly direction, apparently radiating from some source to the south-east. A similar direction in the dykes is prevalent through

a great part of the neighbouring county Armagh, and they appear to converge towards the igneous mass of Slieve Gullion. This fact suggests the supposition that they may be connected with the volcanic disturbances which affected that district, though, if so, it is highly probable that they are of older date than the Tertiary epoch, to which age they are generally referred.

Drift Deposits.

Lower Boulder Clay.—This formation which has the usual character of a stiff, brownish or chocolate-coloured clay with striated blocks of local rocks, is but sparingly represented in this area, except towards the east, in the Carboniferous Limestone district, where it usually forms gently sloping hilly or undulating ground. In some places, stream sections, &c., reveal its presence under the thick mantle of sands and gravels which cover the greater part of this district, a remarkable instance of which may be seen near the Cross-roads, south-west of Eshbane, where these latter rest upon a denuded surface of boulder clay as represented in sketch.

Fig. 3.



Drift Section near Eshbane, showing Interglacial Sand and Gravel resting on denuded surface of Boulder Clay.

Sand and Gravel, Eskers, &c.—Drift deposits of this character as just now remarked cover the greater part of this area; they generally show stratification, and vary in texture from the finest sand to a coarse gravel, containing rounded blocks of considerable size. A section adjoining the railway near Pomeroy station shows these varieties very well. This gravelly drift usually forms flat-topped hills, terraces, or esker ridges. The former sometimes present very striking features, particularly about Pomeroy, in the wild country to the north-west, and over the elevated Old Red Sandstone district to the south. In the neighbourhood of Six-milecross these terraces stretch like bars across the valley south of that village. (See Fig. 4.)

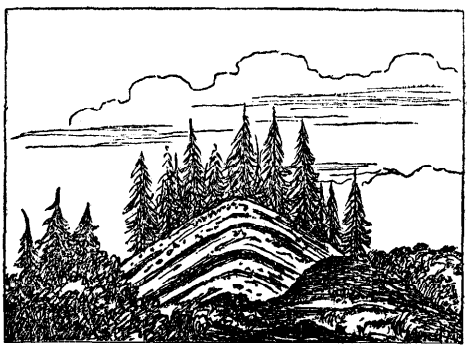
Esker ridges are frequently to be met with, particularly to the west. A very remarkable branching ridge may be seen at Bracky, near Drumnakilly. In some parts of this the sands and gravels are consolidated into a conglomerate, somewhat resembling that which may be noticed at Salthill, Glenismole, and other localities in the vicinity of Dublin.

Another large esker was observed near Clogherny Church, a little west of Beragh, and a still larger one at the south-west part of the district, at Eskreagh, a hamlet which probably derives its name from this circumstance. A section through this esker shows a rude stratification parallel to the sides as represented in sketch.

Fig. 4.

Gravel Terraces south of Sixmilecross.

Fig. 5.



Sketch Section through Esker at Eskreagh.

These eskers are but a modified condition of the terraced and flat-topped hills of sand and gravel into which they are seen to graduate, as at Altanagh bridge, south of Carrickmore, where many examples may be seen.

Erratic blocks.—Resting on the sands and gravels just described, detached blocks, some of great magnitude, occur. These probably represent the third or last stage of glaciation as described by Prof. Hull, and were possibly dropt from floating bergs, or they may be remnants of the boulder clay of that period, traces of which Mr. Hardman has discovered in adjoining districts. To the north-west of Pomeroy, near Lough Lily, the country is thickly strewn with these blocks, some of them of enormous dimensions.

Peat bog and Alluvium.—Numerous peat bogs and river flats occur in the eastern and western parts, particularly to the north-west as may be seen by the map. The hilly ground that composes the central and northern portions is also covered to a great extent with peat over a substratum of gravel, and in many places this peat is of considerable thickness, and is cut for fuel.

Glacial markings, &c.—Owing to the prevalence of superficial accumulations, and the soft and friable nature of the rock in most parts of the district, many glacial markings could not be observed,

those which were noted being found on the harder metamorphic rocks to the north. On the surface of one of these, close to the road, half a mile west of Carrickmore, striæ were observed bearing north-east and south-west, but affording no evidence as to the direction from which the ice came. Again, at Coolnagreana, some two miles south of Lough Macrory, imperfect grooves were also noted having a similar bearing. There is little doubt, however, that the ice came from the south-west, as at Oritor a little north of this map there are *roches moutonnées* that tail in that direction. This movement of the ice being contrary to that observed in many parts of the adjoining counties was due, according to Prof. Hull, to the existence of a great snow field or axis of dispersion which occupied the country immediately south of this area.—See Physical Geology and Geography of Ireland, p. 211, *et seq.*

Chapter III.

Mines, Minerals and Principal Faults.

Cappagh Copper Mine.—In the stream forming the boundary of the townland of Knocknaclogha, north of Cappagh Mountain, a thin lode of copper was discovered, having the same direction as the basaltic dyke and fault which adjoin it. It is thus described by Portlock:—

"*Sulphuret of Copper.*—*Vitreous Copper.*—The copper ore discovered here belongs to this species. The lode is principally composed of massive earthy copper—green, occasionally purer and more compact investing the vitreous copper which is massive and in small crystals forming nodules in the lode. The ore is rich. The visible portion of the lode is small, as it merely projects in a thin crest above the water of a small stream when low."*

A trial has been made here by the Hibernian Mining Company, but the project was abandoned.

Principal faults.—A glance at the map will show that this area is traversed by lines of fracture of considerable extent, generally bearing E.N.E. and W.S.W., being doubtless parts of the system of dislocations which, according to Mr. Hardman, have in all probability produced the extensive depression now occupied by Lough Neagh.†

The most northerly of these faults traverses the Carboniferous and Old Red Sandstone formations, and for a great part of its course divides the latter and the Silurian rocks of Pomeroy, from the metamorphic rocks. Evidence of this is afforded in several places, particularly in the little glen or valley of Tremoge, between Carrickmore and Lough Lily, where beds of Old Red Sandstone age strike at right angles to the boundary line of the metamorphic rocks. At Sixmilecross, too, the felstone is abruptly cut off to the south by the same fault.

In the south-western part of the map, a fault may be observed extending from near Donaghmore, southwestwards to the margin of the sheet. In this area the evidence for the fault is not very dis-

*Geological Report on Londonderry, &c., page 745

† See paper "On the Age and Mode of Formation of Lough Neagh." J.R.G.S.I., Vol. IV., Part III.

tinct, but is well shown in that to the east (sheet 35), and still more clearly in that to the south (sheet 46), where beds of Lower Limestone are thrown down against Old Red Sandstone. As this fault cuts out the whole of the Lower Carboniferous Sandstone it has a probable downthrow of about 1,500 feet,* and appears to extend for a considerable distance to the south-west, being identified in the neighbourhood of Fivemiletown.

Several other faults occur, as may be seen by the map, but none of them call for any special mention.

CHAPTER IV.

PALÆONTOLOGICAL NOTES.

LOCALITIES from which FOSSILS were collected.

No. of Locality.	Quarter Sheet of 6-inch Map.	County and Townland.	Situation, Geological Formation, and Sheet of 1-inch Map.
		County of TYRONE.	LOWER SILURIAN.—Caradoc-Bala. SHEET 34.
1	37/2	Moymore, . .	Rocks in stream three quarters of a mile north-west of slate quarry R. C. chapel, about two miles north-east of Pomeroy; dark gray slate.
2	37/2	Bardahessiagh, .	Half a mile north of slate quarry R. C. chapel, and about two and a quarter miles north-east of Pomeroy; gray micaceous shales.
3	37/2	Do. . . .	Rocks in field and debris from old quarry, close to preceding locality; dark gray micaceous flaggy shales.
4	37/4	Tirnaskea, . .	About a quarter of a mile east of Edenvale House, and two miles east of Pomeroy; dark gray argillaceous shales.
5	37/4	Lime Hill, . .	Rocks in stream about one mile west of Edenvale House, and one mile north-east of Pomeroy; dark gray slates.
6	37/4	Tanderagee, . .	Rocks in stream through rabbit warren, a little west of Tanderagee, and one mile south-east of Pomeroy; gray shales.
7	37/4	Killey, . . .	Rocks in stream at Killey Bridge, about three-quarters of a mile south-east of Pomeroy; gray shales.
8	37/4	Cavanakeeran, .	Drift debris close to Railway Station, south of the Town of Pomeroy; gray shales.
			CARBONIFEROUS LIMESTONE.
9	38/4	Skenarget, . .	Quarry a quarter of a mile east of Rockdale House, on Sandholes-road; gray and pinkish compact limestone.
10	46/2	Killyharry, . .	Quarry at Killyharry, one and half miles north-west of Castlecaulfield; compact gray limestone.
11	54/1	Annaghmakeown, .	Quarry at an outlier of limestone in a bog about one and a half miles north-west of Castlecaulfield; dark gray limestone.
12	54/1	Terrenew, . .	Old quarry about half a mile north of Parkanaur demesne, and one mile south-west of Castlecaulfield; gray compact limestone.
13	54/2	Legilly, . . .	Old quarry close to stream, about half a mile north-east of Derrygortrey Glebe House, and two miles south of Castlecaulfield; dark-gray limestone and shale.
14	60/1	Grange, . . .	Quarry on shore of Ballygawley Water, about half a mile north-east of the town; coarse crystalline and dolomitic limestone.

* Mr. Hardman makes a higher calculation as to the throw of this fault in the adjoining district to the north-east (sheet 35), where it cuts out the whole coal measure series.

List of the Fossils collected from the Localities mentioned in the preceding Table.

The numbers opposite each species refer to the places at which they were collected, and the × placed before some of them denote their comparative abundance.

LOWER SILURIAN.—Caradoc—Bala age.

Protozoa.—*Spongida.*

? Cliona antiqua, ... Localities. 4.

Annuloida.—*Echinodermata.*

Glyptocrinus? Localities. 3, 6.
Crinoid stems and joints, . 3, 4, 9.
Palasterina? Localities. 6.

Trilobita.

Ampyx mammillatus, . 8.
„ rostratus, . . 4.
Asaphus gigas, . . 4.
„ radiatus, . . 8.
Calymene brevicapitata, . 4.
Cybele verrucosa, . . 4.
Harpes Dorani, . . 4.
„ Flanagani, . . 3.
Illænus Bowmanni, . . 4.
Lichas Hibernicus, . . 4.
„ laxatus, . . 8.
Phacops truncato-candatus, 8.
Remopleurides Colbii, . 4.
Stygina latifrons, . . 4.
Trinucleus concentricus, . ×× 4, 8.
„ seticornis, . ××× 4, 6, 8.

Mollusca.—*Polyzoa.*

Fenestella assimilis, . 4.
Ptilodictya dichotoma, . 7.

Brachiopoda.

Athyris? sp. indet., . 4.
Discina oblongata, . . 2.
Leptæna sericea, . . 2,3,×× 4,6,8.
„ tenuicincta, . 3, 4.
„ transversalis, . 4.
Orthis biforata, . . 3, 4.
„ calligramma, . 4, 5.
„ porcata, . . 3.
Orthis intercostata, (? testudinaria), . 2, 3, 4, 7.
Rhynchonella borealis, ? . 3, 4, 8.
Strophomena corrugatella, 4.
„ deltoidea? 3.
„ expansa, . ×× 3.
„ grandis, . 2, 3.
„ rhomboidalis, 2, 4.

Lamellibranchiata.

Ambonychia trigona, . 4.
„ undata, . 8.
Ctenodonta obliqua, . 8.
„ transversa, . 2, ××× 4, 6, ×× 8.
Ctenodonta sp. indet., . 4, 8.
Modiolopsis expansa, . 3.
Mytilus cinctus, . . 4.
Orthonota nasuta? . . 4.
„ sp. indet., . 4.

Gasteropoda.

Euomphalus funatus, . 4, 8.
„ sculptus, . ××× 4.
„ sp. indet., . 4.
Holopea concinna, . . 4.
Loxonema sp. indet., . 4.
Murchisonia obscura, . 4. ? 8.
„ turrita, . 4, 6.
„ sp. indet., . 4.
Murchisonia (Pleurotomaria) trochiformis, 4, 8.
Raphistoma elliptica, . 2, 6, 8
„ (Euomphalus) parva, . 7.
Track like markings? molluscan, . . 6.

Nucleobranchiata.

Bellerophon alatus, . . ? 4.
„ bilobatus, . ××× 4, 6.
Bellerophon perturbatus, . ? 6.

Pteropoda.

Conularia elongata, . . 4.
Ecculiomphalus Bucklandi, 4.
Theca reversa, . 4, 8.
„ triangularis, . . 4, ××× 8.

Cephalopoda.

Orthoceras bilineatum, 4, ? 6.
„ elongato-cinctum, 4.
Orthoceras subcostatum, . 8.
„ sp. indet., . 4, 6.

CARBONIFEROUS LIMESTONE.

ACTINOZOA.—*Zoantharia.*

Chætetes tumidus, . . 13.
Lithodendron affinis, . ×× 9, 13.
„ junceum, . 11, 13.
Lithostrotion striatum, . 9.
Zaphrentis? small species, 13.

ECHINODERMATA.

Actinocrinus lævis, . . 13.
Archæocidaris sp. indet.
Crinoid joints, . . 9,10,11,12,13

CRUSTACEA.—*Entomostraca.*

Leperditia Okeni, ... 10, 14.

MOLLUSCA.—*Polyzoa.*

Fenestella antiqua, ... 11, 13.

Brachiopoda.

Athyris planosulcata, . 9, 13.
Chonetes Hardrensis, . 10, ××××
11, 12, 13.
„ papilionacea, . 10, 13.
Crania, large species? n.s., 13.
Orthis resupinata, . . 10, 11, 12, 13.
Productus aculeatus, . 12.
„ fimbriatus, . 10.
„ giganteus, . ××× 13.
Productus pustulatus, . 10.
„ scabriculus, . ×× 13.
„ semireticulatus, 10, 12, 13.
„ spinulosus, . 13.
Rhynchonella pleurodon, . 10, ××××
14.
Spirifera bisulcata, . . 13.
„ lineata, . 13.
„ striata, . . 13.

Lamellibranchiata.

Aviculopecten hemisphæricus, 13.
Modiola Macadami?. . 13.
Sanguinolites sp. indet., . 13.

Gasteropoda.

Capulus neritoides, . . 13.
Euomphalus pentangulatus, 13.
Natica plicistria, . . 13.

Nucleobranchiata.

Bellerophon apertus, ... 9, 13.

PISCES.

Chomatoduslinearis (Palatal tooth), . . . 13.
Palæoniscus? (scale), . 11

AMENDED LIST of LOWER SILURIAN FOSSILS from COUNTY TYRONE described and cited by General PORTLOCK in his REPORT on the GEOLOGY of LONDONDERRY, TYRONE, and FERMANAGH (1843), with a few Species determined by Professor M'COY; and some others, in the recent Collection made by the GEOLOGICAL SURVEY in this District.

Species of Portlock's List.	Species adopted.
POLYZOA.—*Spongida.*	
Entobia antiqua, Portl. Rep. p. 360.	Cliona antiqua, Portl. sp.
CÆLENTERATA.—*Zoantharia.*	
Turbinolopsis elongata? Portl. Rep. p. 329,	Cyathophyllum (Petraia) elongata, Phillips.
Turbinolia fibrosa, „ „ „	Favosites fibrosus, Goldf.
And Favosites fibrosa, „ „ 327,	
(Not in Portlock's list), ...	Halysites catenularius, Sil. Foss. of Ireland. (M'Coy), p. 65.
„ „	Heliolites interstincta, Portlock collection, G.S.I.
Graptolitidæ.	
Graptolithus folium, Portl. p. 321, . .	Diplograptus folium, Hisinger.
„ pristis, „ 320, . .	„ pristis, „
„ Sedgwickii, Portl. p. 318, .	Graptolithus Sedgwickii, Portl.
„ convolutus, „ 319, .	
„ distans, „ „ .	
„ sagittarius, „ 320, .	Diplograptus pristis.
„ tenuis, „ 319, .	Graptolithus tenuis, Portl.

Species of Portlock's List.	Species adopted.
Echinodermata.	
Trochocrinites lævis, Portl. p. 345, . .	Glyptocrinus lævis.
Trilobita.	
Amphion pseudo-articulatus, Portl. p. 291, .	Amphion pseudo-articulatus, Portl.
Ampyx Austinii, „ 261, .	Ampyx mammillatus, Sars.
„ mammillatus? „ „ .	
„ Sarsii, „ 260, .	Ampyx rostratus, Sars.
„ rostratus, „ „ .	
Isotelus gigas, Dekay, Portl. p. 295, (planus) Dekay, 295, ...	Asaphus gigas, Dekay.
Isotelus ovatus, Portl. p. 297, . . .	
„ Powisii, „ „ . . .	
„ sclerops? Green, Portl. p. 299, .	
„ laticostatus, M'Coy, . . .	
„ intermedius, „ 299, .	Asaphus radiatus, Salter, Mon. of British Trilob., p. 157. Pal. Soc., 1866.
„ rectifrons, „ 298, .	Asaphus rectifrons, Portl.
„ „ „ .	
Illænus crassiacauda, Portl. p. 301, . .	Illænus Portlockii, Salter, Mon. British Trilob., p 197.
Calymene brevicapitata, Portl. p. 286, .	Calymene brevicapitata, Portl.
„ Blumenbachii Brong., Portl. p. 285,	„ Blumenbachii Brong.
„ pulchella, „ 286,	„ „ „
Amphion gelasinosus, „ 289,	Cheirurus gelasinosus, Portl. sp.
„ multisegmentatus, „ 291,	Encrinurus multisegmentatus, Portl. sp.
Ogygia? rugosa, „ 302,	Cybele verrucosa, Dalm.
Harpes Dorani, „ 267,	Harpes Dorani, Portl.
„ Flanagani, „ 268,	„ Flanagani, Portl.
Illænus centrotus Dalman, Portl. Rep p. 300,	Illænus Bowmanni Salter, Mon. British Trilob., p. 185.
Brontes Hibernicus, Portl. p. 270, . .	Bronteus Hibernicus, Portl.
Nuttainia Hibernica, „ 274, . .	Lichas Hibernicus, „ sp.
Phacops Murchisonii, „ 283, .	Phacops Brongniartii, Portl.
„ tuberculatus, Portl. p. 284, .	
„ truncato-candatus, Portl., . .	Phacops truncato-caudatus, Portl.
Paradoxides bucephali, „ . .	„ „ „
Remopleurides Colbii, Portl. p. 256, .	Remopleurides Colbii, Portl.
„ lateri spinifer, „ . .	
„ dorso spinifer, „ . .	
„ longi capitatus, „ . .	
„ longi costatus, „ . .	
Ceraurus globiceps, Portl. p. 257, . .	Staurocephalus globiceps, Portl. sp.
Asaphus latifrons, „ 292, . .	Stygina latifrons, Portl. s.p.
Trinucleus Caractici, „ 262, .	Trinucleus concentricus, Eaton.
„ elongatus, „ 263, .	
„ radiatus, „ 264, . .	„ seticornis, His.
„ seticornis Hisinger, Portl. p. 263,	„ concentricus.
MOLLUSCA—*Polyzoa.*	
Gorgonia assimilis, Portl. p. 322, . .	Fenestella assimilis, Lonsd.
„ undulata, „ . .	„ undulata, Portl.
? „ regularis, „ 323, . .	„ regularis, „
Ptilodictya dichotoma, „ 339, . .	Ptilodictya dichotoma, Portl.
Brachiopoda.	
(Not in Portlock's list), ...	Atrypa marginalis, Dalman sp., Dav. in Pal., p. 133.
„ „	„ imbricata, Sowerby, Dav. in Pal., p. 135.
Orbicula elongata, Portl. p. 445. . .	Discina oblongata, Dav. in Pal. Soc. p. 66.
„ lævigata? Munster, Portl. p. 445,	
„ sub-rotunda, Portl. p. 445. .	
„ oblongata, M'Coy, . . .	
Producta tenuicincta, M'Coy Sil. Foss. Irel., p. 25, pl. iii, fig. 4.	Leptæna tenuicincta, M'Coy s.p.

Species of Portlock's List.	Species adopted.
Brachiopoda—continued.	
	„ transversalis, Wahlenberg.
Orthis sericea, Portl. p. 450, . . . Leptæna sericea, „ . . .	„ sericea, Sow.
	„ scissa, Salter, Dav. in Pal. p. 325.
Lingula attenuata, Sow., Portl p. 443, .	Lingula attenuata, Sowerby.
„ brevis. „ 445, .	„ brevis, Portl.
„ lata, Sowerby, . .	The eminent authority, Thomas Davidson, Esq., states that the shell described and figured by Portlock under the name of L. lata, from Desertcreat, Tyrone, does not belong to the species described by Sowerby under that designation.
(Not in Portlock's list), ...	Orthis biforata, Schlot. sp.
„ „	„ calligramma, Dalm.
„ „	„ fallax, Salter, Syn. Sil. Foss. of Ireland, pl. v., fig. 3 a-d.
Orthis grandis, Portl. p. 452, pl. xxxii, fig. 25,	„ porcata, M'Coy.
„ intercostata, Portl. p. 454, . .	„ intercostata, Portl.
„ testudinaria, „ 45, . . .	„ testudinaria, Dalm.
(Not in Portlock's list), ...	„ crispa, M'Coy.
	According to Professor M'Coy, it occurs at Bardahessiagh, Co. Tyrone.
(Not in Portlock's list), ...	Rhynchonella borealis? Schl.
„ „	? „ æmula, Salter, Davidson, Brit. Sil. Brach., p. 188.
Orthis corrugata, Portl. p. 450, . . . „ undulata, M'Coy, Syn. Sil. Foss. of Ireland.	Strophomena corrugatella, Davidson.
„ expansa var. concentrica, Portl. p. 452,	„ expansa.
„ grandis, M'Coy, ...	„ grandis, Sow. sp.
(Not in Portlock's list), ...	„ compressa, Sow. sp.
	At Desertcreat and Bardahessiagh, on the authority of Professor M'Coy.
Orthis depressa, Portl. p. 450, . .	Strophomena deltoidea Conr.
(Not in Portlock's list), ...	„ rhomboidalis, Wilckens sp
Lamellibranchiata.	
Inoceramus trigonus, Portl. p. 422, . .	Ambonychia trigona, Portl. sp.
„ vetustus, „ 423, . .	„ undata, Hall.
Uncites gryphus, „ 455, . .	„ gryphus.
Pectunculus ambiguus, „ . . . „ Apjohnni, „ . . .	Ctenodonta ambigua, Portl. sp.
Arca dissimilis, „ 428, . .	„ dissimilis, Portl.
Arca obliqua, Portl. p. 429, . .	Ctenodonta obliqua, Portl.
Nucula? radiata, „ 430, . .	„ radiata.
Arca regularis, „ 427, . .	„ regularis.
Pectunculus semi-truncatus, Portl. p. 429,	„ semi-truncatus, Portl., (prob. transversa).
Arca transversa, „ 428,	„ transversa, Portl.
Modiola expansa, „ 425,	Modiolopsis expansa, „ sp.
„ Brycei, „ 425,	„ expansa? „
„ Nerei, Munster, „ 424,	„ Nerei, Munster.
„ securiformis, „ 425,	„ securiformis, Portl.
Mytilus cinctus, „ 426,	Mytilus cinctus Portl. p. 426.
Gasteropoda.	
Euomphalus parvus, Portl. p. 411, . .	? Raphistoma sp.
(Not in Portlock's list), . . .	Euomphalus funatus, Sow.
? „ sculptus, „ 410, . .	„ sculptus, „
? „ subsulcatus, „ 409, . .	—
Pleurotomaria subrotundata, Portl. p. 414,	Murchisonia subrotundata, Portl. sp.
„ turrita, „ 413,	„ turrita, „
Loxonema obscura, „ 415,	„ obscura, „
Pleurotomaria trochiformis, „ 414,	Pleurotomaria trochiformis, ? Murchisonia.
Schizostoma latifasciatus, „ 412,	Trochonema latifasciata, M'Coy, sp.
Trochus ellipticus, „ 414,	Raphistoma elliptica, Portl. sp.
Not in Portlock's list), . .	Holopea concinna, M'Coy, sp.

Species of Portlock's List.	Species adopted.
Nucleobranchiata.	
Bellerophon alatus, Portl. p. 471, . .	Bellerophon alatus, Portl.
„ bilobatus, Portl. p. 397. . .	„ bilobatus, Sow.
„ elongatus, „ . .	
„ gibbus, „ 398, . .	
Pteropoda.	
Conularia elongata, Portl. p. 393, . .	Conularia elongata.
Ecculiomphalus Bucklandi, Portl. p. 411, .	Ecculiomphalus Bucklandi, Portl.
(Not in Portlock's list,) . . .	Theca reversa, Salt.
Orthoceras triangularis, „ 375, .	Theca triangularis, Portl. sp.
Cephalopoda.	
Orthoceras calamiteum, Portl. p. 365, .	Orthoceras bilineatum, Hall.
„ tubicinella, „ 367, .	
„ breviconicum, „ 373, .	„ breviconicum, Portl.
„ elongato cinctum, Portl. p. 372, .	„ elongato cinctum, Portl.
„ gracile, „ 366, .	„ gracile, Portl.
„ incertum, „ 374, .	„ incertum, „
„ per-annulatum, „ 367. .	„ per-annulatum, Portl.
„ Pomeroense, „ 370, .	„ Pomeroense, „
„ subundulatum, „ 373, .	„ subundulatum, „
„ tenuicinctum, „ 371, .	„ tenuicinctum, „
„ tumidum, „ 373, .	„ tumidum, „
Phragmoceras inæquiseptum, „ 382, .	Cyrtoceras inæquiseptum, „
„ Brateri? „ 383, .	
Lituites cornu-arietis, „ 383, .	Lituites sp.
Gomphoceras sub-pyriforme, „ 381, .	Poterioceras approximatum, M'Coy.
„ sub-fusiforme, „ 38, .	

The Lower Silurian strata near Pomeroy, in Pomeroy and Desertcreat parishes, although of limited area, is of considerable geological interest, from its having yielded so large a number of fossils, especially Trilobites; for an account of these we are indebted to the labours of the geological section of the Ordnance Survey under the late General Portlock, to whose extensive series of figures and descriptions we have only to refer,* very little addition having since been made to our knowledge of the rich Fauna obtained from the Caradoc schists and slates of this district.

In the synopsis of Silurian Fossils of Ireland, by the late Sir Richard Griffiths, with descriptions of the Fossils by Professor M'Coy and Mr. J. W. Salter, a few additional species are described and figured from this district. In Sir R. I. Murchison's appendix to Siluria (1867), and in the excellent monographs on British Silurian Brachiopoda, by Thomas Davidson, Esq., F.R.S., published by the Palæontographical Society, a revision of some of the species have been found necessary; under these circumstances it will be useful to give, as we have done in the preceding table, an amended list of Portlock's species with their present nomenclature.

The original collection made by the Ordnance Survey is at present divided between the Geological Survey in London, Museum of Practical Geology, and this branch of the Survey; this portion being now exhibited in the Royal College of Science with an additional series recently collected by Mr. Richard Clark, of the Geological Survey of Ireland.

WILLIAM HELLIER BAILY.

November, 6th, 1878.

* Report on the Geology of Londonderry, Tyrone, &c. (1843).

INDEX.

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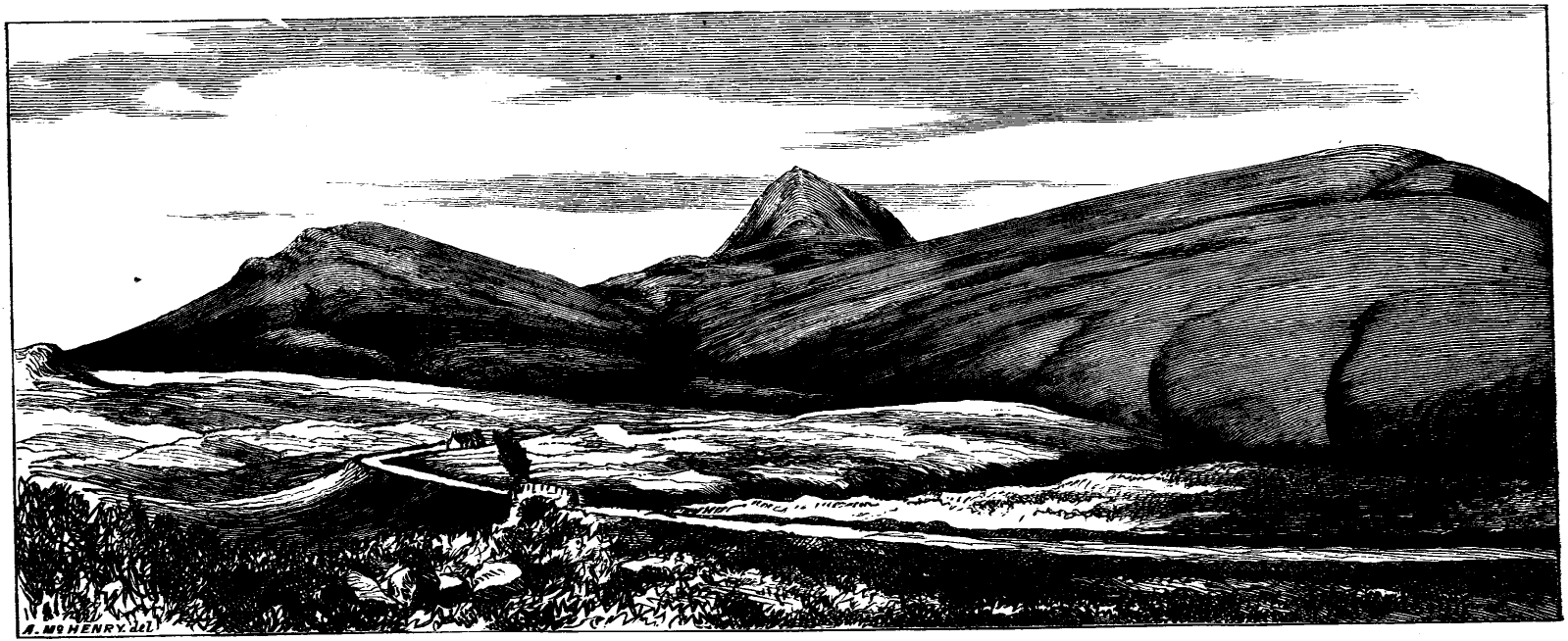
180.—250.—10/78.

FIG. 1. FRONTISPIECE.



Corslieve Mountain (quartzite), as seen from the vicinity of Bangor in Erris.