Memoirs of the Geological Survey.

EXPLANATORY MEMOIR

TO ACCOMPANY

SHEET 54, AND THE SOUTH-WEST PORTION OF 42 OF THE MAPS

OF THE

GEOLOGICAL SURVEY OF IRELAND,

INCLUDING THE

COUNTRY AROUND EASKY, DROMORE WEST, AND COOLANEY,

IN THE COUNTIES OF SLIGO AND MAYO.

BY

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AND

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WITH

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

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PREFACE.

THE Map described in this Memoir was geologically surveyed by the Authors, Messrs. Symes and Kilroe, during the years 1876–7, and contains the northern extremity of that remarkable ridge of granitoid and schistose rocks, which separates the Carboniferous district of North Mayo and the borders of Sligo into two portions, and is known by the general name of the Ox Mountains. The district is remarkable for the enormous covering of peat—which ascends from the plains into some of the highest elevations.

EDWARD HULL,
Director of the Geological Survey of Ireland.

23rd July, 1880.

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 explanations.

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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EXPLANATORY MEMOIR

TO ACCOMPANY

SHEET 54, AND THE SOUTH-WEST PORTION OF 42 OF THE MAPS

OF THE

GEOLOGICAL SURVEY OF IRELAND.

CHAPTER I.

Physical Geography.

The district about to be described lies almost altogether in the County Sligo: a very small portion of Sheet 54, on the S.W. margin, being in the County Mayo. The only places of importance are the small towns of Easky and Coolaney, and the now thriving village of Dromore West.

From the south of the district, the chain of the Slieve Gamph and Ox Mountains, which extends into the country to the S.W., makes its appearance, and running in a continued N.E. direction for some miles, it suddenly changes its course to that of East, and passes out of the district in that direction. The highest points in this chain are Knockacrea (1760), Cloonacool (1685), and Easky Lough mountain (1332). Separated from this chain, and to the north of Ballysadare Bay, which is on the extreme east of Sheet 54, is the isolated hill of Knocknarea (1078), composed of Carboniferous Limestone, while on the southern margin of the sheet is Knockna-shee, also of that formation.

The district is drained by numerous small rivers, which to the north of the Ox Mountains flow more or less in a parallel direction into Sligo Bay, which is the northern boundary of the country under description: the only river of importance flowing to the north is the Easky river, which takes its rise in Easky Lough, 607 feet above the sea, and lying in the heart of the Ox Mountains. On the southern slopes of the Ox Mountains we also have numerous small streams; those to the west amalgamating, and forming the head waters of the river Moy, which flows in a southerly direction, and passes by Ballina (Sheet 64); the small streams to the S.E. also join and make up the head waters of the Ballysadare river, which passes by Coolaney.

The axis of elevation along which the chain known as the Ox Mountains was raised, was probably subsequent to the deposition of the Carboniferous Limestone series. This is very well exemplified in Sheet 54, as in the southern portion of the district we have the strike of the sedimentary rocks parallel to the axis of the metamorphic hills, and the dip of the beds steadily away from the high ground. The Limestone series to the north of the range is not so well shown, as there it is thrown down to the north by

a great fault, which runs east and west for a considerable distance; the evidence of which in the west of the district is altogether lost, owing to the ground being covered by a large accumulation of drift, alluvial deposit, and peat.

Chapter II.

Formations and Groups of Rocks entering into the structure of the District.

Aqueous Rocks.

Name.		Colour on Map.
Recent and Post-Glacial.	Blown Sand when forming dunes,	*Uncoloured.*
	Alluvium and Bog,	*Pale Sepia.*
Post-Pliocene.	Drift sand, gravel, and boulder clay,	*Engraved dots.*
Lower Carboniferous Series.	$d^{2'''}$ Upper Limestone,	*Prussian blue, dark.*
	$d^{2''}$ "Calp" or Middle Limestone,	*Indigo.*
	$d^{2'}$ Lower Limestone,	*Prussian blue, light.*
	d^{1} Lower Carboniferous Sandstone,	*Prussian blue and Indian ink, with yellow dots.*

Metamorphic Rocks (Lower Silurian ?)

μ.	Mica schist,	*Pale pink.*
μq.	Micaceous quartzite,	*Pale pink washed with yellow.*
Δ.	Hornblende rock,	*Burnt carmine.*

Igneous Rocks.

G.	Granite intrusive,	*Carmine.*
B.	Dolerite,	*Burnt Rose Lake.*

Aqueous Rocks.

Lower Carboniferous Sandstone.—The road from Dromore West to Sligo passes for about two miles over an anticlinal of this subdivision, and good sections are to be met with both on the shore and in the numerous small brooks in the low ground.

The section along the shore from a point about a mile to the N.E. of Dromore West, and extending eastward for about two miles, points out the various features, as well as the manifold changes that occur in these beds, represented as they are over such a small area.

The probable thickness, measured from Doonagh at its junction with the Lower Limestone, to the top of the anticlinal, is not more than 230 feet.

As in the "Explanations to accompany Sheet 64, &c.," it was pointed out that the junction beds between the Lower Limestone and the Calciferous series were of an oolitic type, so in this district we have similar beds, but not attaining anything like the thickness of their representatives in the west. In this district the bed of oolitic limestone is only four feet thick, but is a well-

marked feature; underneath it we have compact brown sandstones, arenaceous limestones with quartz grains, impure black fossiliferous limestones, sandstones and shales dovetailing into one another, and ripple-marked sandstones. Some of these beds are worked for flags,* especially in the townlands of Doonbeakin and Ballyglass, S.E. of Dromore West.

In the S.E. portion of Sheet 54 this member assumes a small degree of importance. Entering as a narrow band on the south, it thins out before reaching Coolaney, and may be considered a series of shore beds filling up the unevennesses of the denuded schists, to form a level floor for the next higher member. No good sections are visible, but the few limited ones met with show the rock to consist of conglomerate and pale brown pebbly sandstone, which graduates upward into Lower Limestone, by an inascertainable thickness of transition strata, consisting of highly calcareous sandstone and arenaceous limestone. These enter the Sheet from the south in a narrow band, and connect the grits below with the limestone above, along the course of their junction toward the E. margin.

Lower Limestone.—Along the northern portion of the district this formation is well developed, and covers an extensive area in a series of rolls, and repetitions by small faults.

Generally speaking, it is of the usual type, being devoid of crystallization, and having the light grey colour characteristic of Upper Limestone. Good sections can be seen along the shore line from W. to E. of the district, omitting the small portion N.E. of Dromore West, which, as described before, is of the Lower Carboniferous Sandstone. Tolerably good sections are also met with in the numerous brooks and rivers which run northerly from the hills.

The characteristic thin bedded limestones and shales occurring towards the basal beds can be well observed, and the frequency of zones of immense fossils, more particularly *Zaphrentis cylindrica* and *Productus giganteus*, forms a striking resemblance to the same formation in other districts. The higher we ascend in the beds the more compact they are found, and there is also a tendency for the beds to thicken, and shales to be absent. This is the case at Red Hill, about a mile south of Skreen, where the limestones are uncommonly like Upper Limestones, from the frequency of chert, and the soundness and colour of the stone. Those at Red Hill are, no doubt, the highest beds of the Lower Limestone in the north of the district, and were it not for the absence of any beds which could be classed under the "Calp" series, the lithological characters would entitle them to be placed among the Upper Limestones. One bed in Red Hill has a peculiar columnar or basaltiform prismatic structure, with small prisms of quartz crystallized on the surface, exactly resembling *Lithostrotion basaltiforme*, but entirely devoid of any organic remains.

* These flags are hard, compact, and durable, and have a rather even surface. Some of the flags are 4 inches thick, and 6 feet square. Six flags have been taken out of 15 inches of stuff, and the price ranges at the quarry from one penny to two pence per square foot.

To the S.E. of the district the lowest beds may be seen at various points along the courses of the Owenboy and the Moy after leaving the mountains, when they run parallel to the mountain ranges, selecting the outcrop of these strata, because yielding most easily to denudation. The latter river flows by Cornaleck, near the Sheet line, where the arenaceous limestone is well seen—gray, coarse-grained, in massive beds. The former river after its exit from the mountains turns N.Eastward along their foot; and at the turn, as well as at Knockadoo, in the river bed, the passage into pure blue limestone may be well traced. This rock lies directly on the quartzites E. of Coolaney, and forms the slope downward to the river bed, a feature traceable for a distance of a few miles eastward.

Next follows a pure compact blue limestone with few fossils—chiefly Mollusks and Encrinites—ranging eastward by Rathbarn Church towards Collooney. The limestone is in a large measure covered by drift; the upper limit is in consequence of this indeterminable, and is inserted according to the form of the ground. The exposures are few, and are found, as a rule, near the middle of the outcrop.

Half a mile S.E. of Branchfield Ho. light and dark bluish gray compact limestone occurs, sometimes crystalline; fossils are met with at one point, but are unusual, and the beds are thin. A shallow opening is made upon the beds at Shancough, a mile S.W. of Coolaney.* Here the rock is blue, compact, and very barren in fossils; the jointing bears S. 10 E. and W. 25 S., and the bedding occurs as follows:—

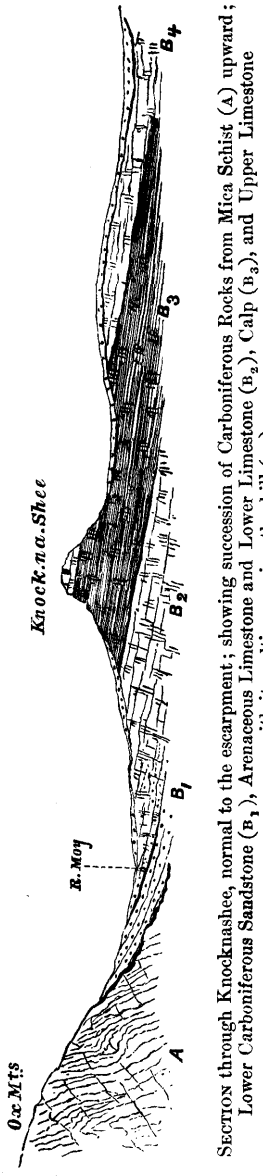
	Feet.	Inches.
Shaley parting,	–	2
Bed,	1	–
Black carbonaceous shale,	–	1
Hard blue fine compact limestone, with a few fossils,	2	6
4 beds according to report,	3	6
Friable black shale,	–	2
Bed,	–	6

The "Calp" Series.—Thin-bedded dark gray earthy limestone, weathering shaley, with occasional fossiliferous beds. The escarpment of Knocknashee consists of this rock, and is a very perfect feature.

Beds of tough light bluish gray crystalline limestone form the cap, and the Lower Limestone crops out at or near the foot, so that the escarpment includes the whole thickness of the Calp series, probably 600 feet. With the exception of an artifical opening in the E. side of the hill, showing thin beds of a dark gray earthy limestone, and seen in a much weathered condition, resembling brown calcareous shale, no good sections occur in the whole area occupied by this member. The rock appears at one other point on the E. side of the hill, and immediately beneath the Upper Limestone cap on the W. side. Dark gray earthy limestone is exposed in the stream flowing N.E. to join that draining Cartron

* Where the stone is systematically burned, and yields a rich lime, sold for 1*s.* 3*d.* per barrel, chiefly for agricultural purposes.

Fig. 1.



SECTION through Knocknashee, normal to the escarpment; showing succession of Carboniferous Rocks from Mica Schist (A) upward; Lower Carboniferous Sandstone (B_1), Arenaceous Limestone and Lower Limestone (B_2), Calp (B_3), and Upper Limestone with its outlier capping the hill (B_4).

Lough; the same stream, entering Killoran, flows over similar rock, with fossiliferous beds, weathering shaley, near the grave-yard; and following its course still further east, for about two miles, to where, after winding south, it turns again north-eastward, and exposes dark grey beds with large *Producti*. In a quarry a quarter of a mile north of the Templehouse Police Barrack, are laid open earthy beds, weathering quite shaley, with *Zaphrentis*, which characterizes the junction of Calp and Upper Limestone in the sheet to the south (65); pure limestone beds occur over the Calp Limestone in this quarry, and belong to the next higher member, so that the boundary is made to pass slightly to the north of the quarry.

The conspicuous hill of Knocknarea (1078), on the N.E. margin of sheet 54, is also more or less composed of this series, but it has a thick capping of Upper Limestone. On the slope of the hill south of Strandhill House, numerous sections were observed of thin-bedded flaggy and shaley limestone, which were quite sufficient to identify them; and were it not that all the low ground about, and to the north of Strandhill, is covered with a coating of drift and sand, it is not improbable that the three divisions of the Carboniferous limestone would be seen in a very short area, as Maguins Island, N.W. of Strandhill House, is composed undoubtedly of Lower Limestone.

Upper Limestone.—The hill of Knocknarea has a capping of probably about 600 or 700 feet of these beds, which lie horizontal; for the most part they are cherty, coarse, gray in colour, and devoid of the highly crystalline texture generally so well observed in Upper Limestone. The boundary between this cap and the underlying beds of the "Calp" series is a marked feature even from a distance, as in the face of the hill the upper beds present steep or precipitous cliffs on three sides, the lower beds having a slope of about 30°. The hill of Knocknashee, on the S.E. margin of the sheet, also has a capping of Upper Lime-

stone, but not nearly so thick as that at Knocknarea; here the beds are coarse, gray, and fossiliferous, and dip to the S.E. at 5°.

No other exposures have been met with in the small area occupied by Upper Limestone in this sheet, but massive blocks of cherty limestone, apparently local, are scattered over the surface, and in the drift about Templehouse, which may afford evidence to the nature of the underlying rocks in that locality.

Metamorphic Rocks.

Mica schists.—Most of the high ground is composed of a mica schist, which varies little in composition over a very large area. To the S.W. of Easky Lough, the hills are composed of soft micaceous schists, which to the observer appear in places to be but slightly metamorphosed, as there are grits which hardly differ from unmetamorphosed rock, and again in places not very distant from these grits we have true micaceous schists, with garnets in them. The general line of foliation here is in a N.E. and S.W. direction, and the bedding which is at a high angle coincides with the foliæ.

To the S.E. of Easky Lough, the schists are similar to those W. of the lough, and the bedding corresponds with the foliæ, which is very irregular, owing to numerous large and small faults, which cannot be traced out in this valley, owing to the enormous quantity of drift material spread over it.

To the north of Easky Lough, in the neighbourhood of King's Mountain and Knockacrea, the schists are of the ordinary gray micaceous type, and are much broken up by faults.

In passing southward from the valley of the Owenboy to the sheet line, there is little variation noticed from the usual composition and gray colour of the schist—consisting of alternating layers of mica and felspar, the former being the dark green variety, and the latter pale or pinkish; but the mica occasionally increases or decreases in proportionate quantity, bands being met with containing very little felspar, others again in which quartz takes the place of mica in alternation with felspar, the combination being a brilliant, almost white, rock. In the small valley collecting the head waters of the Owenboy, patches of true gneiss are met with, and on the east of the gap, through which that river escapes from the mountains, a rock is found with the constituents of gneiss, but, the mica being abundant, it has the aspect of a schist. The rock often assumes a mottled structure, with small concretions of rose-pink felspar (?). Garnets are found, in various stages of decomposition, on the weathered surface of the rock, sometimes wholly gone, leaving only their traces in the form of small hollow nests. This appearance is well seen on the new roadside, half a mile west of Cappagh School House. The foliation of the schists usually corresponds with the original stratification, and is, as a rule, wavy, often contorted, occasionally crumpled; in-filtered quartz is common, sometimes occurring in large white masses.

Passing eastward, the schists are found to change suddenly to quartzite, across fault.

Quartzite.—This rock is peculiar, being neither a typical quartzite nor a true mica schist, the consequence is that the term "micaceous quartzite" has been substituted. Although the general bearing of the foliation of the micaceous quartzites and mica schists coincide, a well marked fault boundary is discernible in a S.E. direction from the low ground west of Skreen.

To the north of Coolaney, this rock is regularly bedded, and often splits into thin flags, according to the direction of the pinkish bands which variegate the section of almost every specimen met with, and which seem to indicate the planes of original stratification.

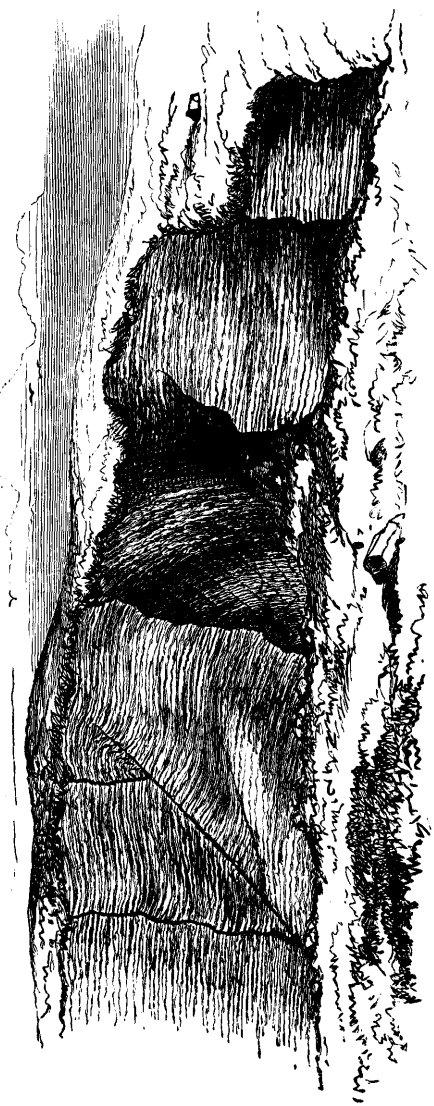


Fig. 2.

Sketch, illustrating the only immediate contact of Hornblende Rock with Mica Schist (crossed patch beneath ⟩), found in the course of the former in Cappagh, a mile N.W. of Carnbanny Lough, on the north-easterly fault; evidence in favour of the supposition that the Hornblende Rock had been intruded amongst the Lower Silurian shales before metamorphosed.

In several instances, however, if not in all, these bands are caused by foliation, for they follow zig-zag directions when there is no indication whatever of disturbance in the bedding; and though metamorphism is evident, the original particles of sand may, in many specimens, be discerned.

Hornblende Rock. — Dark greenish, regularly foliated, heavy, and durable; being much more so than the adjacent schists, it is generally found standing out in bold masses with an almost perpendicular face in each case, due to jointing, which is very regular, rather than faulting.* West of

* For microscopic structure of this rock see p. 17.

Coolaney it corresponds with the schists generally in strike, and may be traced, in a band some 300 feet thick, for a distance of about three miles, but it varies in dip from the adjacent rock: from this it is inferred that the Hornblende Rock has been a pre-metamorphic igneous rock, intruded amongst the beds of the original Lower Silurian shales.

The foregoing sectional sketch illustrates the fact upon which this remark is based.

Close to the southern margin of the sheet, and in the schists, there is also a similar dyke of Hornblende rock, which is only traceable for a short distance, but which corresponds with the foliation and bedding of the metamorphic rocks.

Igneous Rocks.

Granite.—This rock is well seen in the high ground east of Easky Lough, presenting the mamillated knolls so peculiar to granite. It is undoubtedly intrusive, as the veins it sends out among the schistose rocks can be traced in the exposures south of the lough. In places it is highly porphyritic, especially towards the centre of the mass, where the crystals of pink felspar are very large; near its junction with the schists it assumes the character of a syenite, as hornblende predominates over mica, the entire rock being micro-crystalline; in other places it is somewhat like eurite, mica being absent; in such cases the rock weathers very rapidly. It was difficult to estimate the area the granite occupies in this portion of the district, as the covering of bog to the east completely precludes all evidence as to the nature of the sub-strata; at the same time the blocks found in the Boulder Clay underneath the bog, and which are exposed by mountain torrents indicate a wider extension of the granite than that shown on the map.

Dolerite and Basalt.—On the shore line in the Carboniferous rocks, numerous small dykes of dolerite and basalt were noted, most of them being more or less obscure, and only one of ten feet in breadth; the average thickness of these dykes was about three feet, and their resemblance to the dykes on the Sligo coast-line in sheet 64 is remarkable. Their general bearing is in an E. and W. direction, and they are, no doubt, of the same age as those noted in the "Explanation to accompany sheet 64." All are micro-crystalline, with olivine occasionally, and some weather away altogether, leaving only a trace of their original composition on the limestone walls. The rocks in conjunction with these dykes are affected alike; the usual platy parallel structure being given alike to the limestone or sandstone, and the slight alteration or metamorphosis to limestone in conjunction, being proportional to the breadth of the dyke.

Inland, among the Carboniferous rocks, but two or three dykes were noted; one occurs in the bed of the river at Dromore West, and on the north side of the bridge which tilts the beds in a N. and S. direction; another dyke occurs in the Easky, river, immediately N.W. of Dromore workhouse, which is abruptly cut off by a small N. and S. fault.

In the Carboniferous rocks in the S.E. of the district but one dyke was seen, viz.: in Shancough quarry, to the south of the village of Coolaney, which was but three feet wide, bearing E. by S., and oblique to both systems of jointings.

In the Metamorphic rocks, there is a large dyke which runs in a westerly direction, and which can be well seen in the tributaries of the Owenboy river; this dyke is traceable for some distance towards the Belcloghogy loughs, where it is concealed by the bogs. Its composition is similar to those already described among the Carboniferous rocks, with a rude columnar structure in the centre.

Almost south of the loughs above mentioned, is seen a dyke bearing N. 7 W., with a hade northward of 50°, about five or six feet wide, of dark bluish gray hard compact dolerite, with columnar structure; it is remarkable for the extent to which it seems to affect the adjacent schists; its influence may be detected as far as eight feet from the wall on one side.

Post-Pliocene (Drift).

Boulder Clay.—As a rule Boulder Clay is generally found covering low ground, but in this district the low ground for the most part is more or less devoid of any considerable coating, and we find a large part of the Northern portion of the district, which is of the Carboniferous formation, with but a very slight mantle of clay; on the other hand, on the slopes of the mountains occupied by the Metamorphic rocks the thickness is very considerable, and not to be estimated. Sections of the Boulder Clay are well seen in the numerous cuttings made by the streams from the mountainous district south of Easky and Dromore West. The Owenduff river, which is the head water of the river passing through Dromore, cuts through a great thickness of Boulder Clay, just south and west of King's mountain, and a hundred feet vertical section was measured of material derived almost exclusively from metamorphic rocks, in some cases cemented with bi-carbonate of lime. The head waters of the Easky river also cut through a great thickness of Boulder Clay, so from such good evidence it has been inferred that the great tract of ground which is covered with such a thickness of mountain bog, from 400 to 800 feet above the level of the sea, is all overlaid by this formation.

In the S.E. of the district the drift is much thicker over the Carboniferous rocks than in the north, and is composed of Boulder Clay containing limestone blocks more or less polished and striated. Each of the divisions into which the Carboniferous series is subdivided has as a capping, representatives of its lithological character; thus over the Calp there is a larger proportion of earthy limestone blocks than of the purer limestones which bound it on either side. The gentle slope at the foot of the mountain consisting of the Lower Limestone is also largely obscured by a drift deposit, having an external form of low oblong hillocks, the trend of which is northwards, which continues even to where the drift covers the flank of the mountains.

Sand and Gravel.—The only apparent representative of this division of the drift is found in the valley immediately south of Easky Lough, where sand and gravel entirely composed of limestone, although in the heart of the metamorphic rocks, assumes somewhat of an *eskery* form; the continuation, however, of these, in sheet 65, which lies to the south is of a very marked character, and will be described in its place in the Explanation to accompany that sheet.

Erratic Blocks.—These are especially numerous in certain localities; for example, in the rivers at the west of the district which flow northwards, the beds of the streams are filled with blocks and boulders of metamorphic rocks, chiefly granite and mica schist, the granite having been transported from that part of the Ox mountains which lies S.W. of Lough Talt (Sheet 65), and which was recognized by its composition.

East of Easky, transported blocks are not so numerous, the coast in the immediate neighbourhood having a fair proportion, but eastward of Cooanmore Point no granite erratics were noticed, although there are a few of mica schist.

All the granite erratics on the shore north of Easky, and in Cooanmore Bay, are of the type of the granite found at Easky Lough, ten miles S.E. of Easky.

The coast line west of Ballysadare Bay shows but few specimens of erratics, while on the east side none were found save on the top of Knocknarea (1078), which is much higher than the metamorphic hills to the south, some few blocks of a siliceous schist were noted.

Chapter III.

Principal Faults.—The oldest faults in the district are to be found in the Metamorphic rocks, and probably the oldest is that which traverses the country in a north and south direction through Easky Lough, but which is not shown on the map, in consequence of the enormous coating of bog covering the ground. Along this fault, which has a downthrow to the west, we have the rugged and precipitous escarpment along the Cloonacool hills, bringing up the granite on the east. Next in age is the great east and west fault, which traverses the country to the north of the Metamorphic hills; by this fault the limestones have been thrown down to the north. Subsequently there was a great fault in a N.N.W. direction, running from a point a few miles west of Coolaney, by Knockacrea, and out towards Aughris Head; by this fault we have the micaceous quartzites brought up against the mica schists, the foliation of each being but very slightly affected in the proximity of the fault. Either contemporaneously, or more recent than these, are minor faults affecting the limestones, and not of much consequence; for example, we have the N.E. and S.W. fault traversing Knocknarea, and numerous very small upheavals along the shore line north of the village of Easky.

Chapter IV.

Microscopic Notes.

By Professor Hull, LL.D., F.R.S.

Chert from Upper Carboniferous Limestone, Knocknarea.—This is one of the specimens described in the joint memoir by Mr. Hardman and myself—"On the Nature and Origin of Beds of Chert"*—in which we endeavour to prove that such beds are due to the replacement of the original carbonate of lime by silica during, and after, the process of formation. The original calcareous rock has, apparently, in this case, been highly cellular and fissured, so that it is replaced largely by mammilar chalcedonic silica lining the walls of the cells and fissures. A few obscure forms of crinoids and foraminifera may be made out in the more solid portions, much darkened by carbonaceous(?) matter. A few large translucent cubes, probably those of salt (sodium chloride), together with crystals of calcite, are visible with a high power.†

Foliated Hornblende rock (two specimens), Ox Mountains, W. of Coolaney.—The foliated structure is well seen under the microscope. The hornblende occurs in bands, or long rod-like forms, scarcely crystalline in outline, and with more or less rounded terminations. Alternating with these are elongated clear spaces of quartz, and small traces of felspar; magnetite is abundant in black irregular grains. The different minerals polarize strongly.

Another specimen from the same district gives somewhat similar results. Layers of clear silica alternate with hornblende of a sap-green colour. The latter appears to be imbedded in the former in bundles, or rods, of varying length, together with numerous black grains of magnetite. The hornblende is not properly crystallized out, though molecularly it is in the crystalline condition. The quartz under the polariscope separates into distinct grains, pressed together, and polarizing differently. With a high power, numerous minute cells are apparent in the quartz, but I was unable to determine the existence of a fluid within them.

Quartz Schist, Ox Mountains, W. of Coolaney.—Finely micaceous schist, reddish and gray colours, slightly foliated. Under the microscope the components of this rock are easily recognized with a low magnifying power. Two sections, one taken nearly parallel to the planes of foliation, and the other at right angles thereto, gave the following results.

The rock appears to consist of light brown mica arranged in flowing, wavey layers, alternating with, and imbedded in, bands of quartz, a little felspar, a little chlorite, and occasional black patches of magnetite irregular in form, and distributed throughout the entire mass. The mica is nearly equal in quantity to all the other minerals together, of which the most abundant is silica.

With ordinary light the silica appears to be solid, but with polarized light it is seen to consist of numerous distinct polygonal grains, pressed together in various ways, and polarizing differently; in this the section resembles that of hornblende rock

* Scientific Trans. Roy. Dub. Soc., Vol. I., New Ser., p. 80.
† Proc. Roy. Dub. Soc. (Dec., 1878), p. 131.

and schist, and some granites. With a high power the silica is seen to be highly cellular, but the cells present no appearance of containing fluid. They are probably filled with gas. The felspar, which is not abundant, appears to be monoclinic, and without crystalline form.

Chapter V.

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 Sligo.	Sheet 42. Carboniferous Limestone—Lower.
1	11/1	Carrowrush, . .	On seashore, near Cloghanaffrin, two miles north-west of Easky; dark gray earthy and compact limestone.
2	11/1	Castletown, . .	Rocks in river close to Finned Bridge, one and a half miles west of Easky; dark gray compact limestone.
3	11/1	Do., . . .	On shore a little west of river, about one mile north-west of Easky; dark gray compact limestone.
4	11/1	Do., . . .	On shore a little west of lane, about one mile north-west of Easky; dark gray compact limestone.
5	11/1	Do., . . .	On shore half a mile north-east of Castletown House, one mile west of Easky; dark gray compact limestone.
6	11/1	Finned, . . .	On shore, about two miles north-west of Easky; dark gray limestone.
7	11/1	Oldgrange, . .	Rocks in river, a little south of Finned Bridge, one mile south of preceding locality; dark gray earthy limestone.
8	11/2	Killeenduff, . .	At Cooangar Bay, one mile north-east of Easky; dark gray limestone.
9	11/2	Castletown, . .	On seashore, about half a mile north-west of Easky; dark gray compact limestone.
10	11/2	Bunowna, . .	In river, about half a mile north of Easky; dark gray compact limestone.
11	11/2	Do., . . .	On shore, about half a mile north-east of Easky; dark gray compact limestone.
12	11/2	Do., . . .	On shore, a little east of preceding locality; dark gray compact limestone.
			Sheet 54.
13	11/2	Cloonagleavragh, .	In river, a little east of Fortland, about three quarters of a mile south of Easky; dark gray limestone.
14	11/4	Cloneen, . . .	In river, about half a mile west of Loughannanura, two and a half miles south-east of Easky.
15	11/4	Do., . . .	In river, about two miles south-east of Easky; dark gray earthy and compact limestone.
16	11/4	Do., . . .	In river, two miles south of Easky; dark gray limestone and shale.
17	11/4	Carrigeens, . .	In river, a little north of Camcuill, one and three-quarter miles west of Dromore; dark; gray earthy limestone, decomposing.
18	12/2	Aughris, . .	On seashore, about half a mile east of Aughris; dark gray compact limestone.
19	12/3	Carrownrush, . .	On seashore, one and a quarter miles north of Dromore; dark gray earthy shales.

Palæontological Notes.

Localities from which Fossils were collected—*continued.*

No. of Locality.	Quarter Sheet of 6-inch Map.	County and Townland.	Situation, Geological Formation, and Sheet of 1-inch Map.
20	12/3	Carrownrush . .	On road side, about one and a half miles north-west of Dromore ; gray calcareous limestone.
21	12/3	Ballyeeskeen, . .	In river, close to R. C. Chapel, two miles east of Dromore; carboniferous sandstone, dark gray sandy shales.
22	12/3	Donaghintraine, .	Close to river, about half a mile north-east of Dromore ; dark gray earthy shales.
23	12/3	Do., . . .	On seashore, about one mile and a quarter north-east of Dromore; dark gray earthy shales.
24	12/3	Dromore, . .	A little west of Dromore; gray compact limestone.
25	12/3	Carrowmabley, .	On seashore, about one mile north of Dromore; dark gray shales.
26	12/4	Kilrusheighter, .	On seashore, at Belturlin, about four miles north-west of Dromore; dark gray compact limestone.
27	12/4	Aughris, . .	On seashore, a little north of preceding locality; dark gray earthy limestone.
28	12/4	Doonmadden, . .	On seashore, about two miles north-east of Dromore ; dark gray earthy limestone.
29	13/3	Soodry, . . .	On seashore, a little east of Dumoran Strand, one and a half miles south-east of Aughris Head ; dark gray earthy shales.
30	13/4	Carrowloughan, East,	On seashore, a little west of Derkmore Point, Ballysadare Bay; light gray very fossiliferous limestone.
31	17/2	Bellafarney, . .	Close to river, two and three-quarter miles south-west of Dromore ; dark gray earthy and decomposing limestone.
32	17/3	Culleen, . . .	Close to river, a little south of Culleen's Bridge, about five miles south-west of Dromore ; dark gray compact limestone.
33	17/3	Ballyfeenaun, . .	East side of road from Dromore, about a mile south-west of preceding locality ; gray very crinoidal and fossiliferous limestone.
34	18/1	Ballyglass, . .	In river, about half a mile south-east of Charlesfort, one mile south-east of Dromore; dark gray earthy shale.
35	18/1	Lecarrow, . .	In stream, a little south of R. C. Chapel, one mile south-west of Dromore ; dark gray compact limestone.
36	18/1	Do., . . .	On roadside, a little north-west of R. C. Chapel; dark gray earthy limestone.
37	19/1	Carrowdurneen, .	Close to road, a little south of Leckfield House ; gray calcareous limestone.
38	19/1	Farranyharpy, .	A little south of Red Hill, about six miles south-east of Dromore; light gray arenaceous limestone.
39	19/2	Tanrego, West, .	On shore, a little north-east of Tanrego House, Ballysadare Bay ; dark gray limestone.
40	19/2	Do., . . .	On shore, a little north-west of Tanrego House, close to preceding locality; dark gray compact limestone.
41	19/2	Do., . . .	A little south-west of Tanrego House, about four miles north of Coolaney; dark gray compact limestone.

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 is intended to denote their comparative abundance.

CARBONIFEROUS LIMESTONE, SANDSTONE, and SHALE.

Actinozoa.—*Corals.*

	Localities.
Aulopora campanulata (young of Syringopora),	40.
Chætetes tumidus,	7, 8, 12, 22, 24, 25, 33, 35.
Cyathophyllum ceratites,	14.
,, or Zaphrentis,	5, 12, 14, 15, 16, 25, 29, 30, 38, ×40, 41.
Isastrea Portlocki,	5.
Lithodendron affinis,	1, 6, 8, ×9, 10, 12, ××16, ×18, 26, 33, 35, 36, 41.
,, junceum,	12, 16, 26, 40, 41.
Syringopora ramulosa,	11, 14, 15, ××16, 18, 26.
,, reticulata,	18.

Echinodermata.

Actinocrinus lævis,	31.
,, sp. stems and joints,	17, 23, 25.
Platycrinus lævis,	25.
Poteriocrinus crassus,	×××23.
Crinoid stems and joints,	1, 4, 6, 7, 8, 9, 10, 11, 12, 15, 20, 22, ×××25, 27, ×28, 29, ××31, ××32, ××××34, 37, 38, 39, ×41.

Polyzoa.

Ceriopora rhombifera,	××××25, 28.
Fenestella (Hemitrypa) Hibernica,	10, 35, 39, 41.
,, membranacea,	6, 31, 33, 36.
,, Morrissii,	12.
,, multiporata,	40.
,, plebeia (? antiqua)	8, 14, 16, 17, ××××25, 39.
,, quadridecimalis,	25.
,, varicosa,	24, 29, 40.
Polypora polyporata,	1.
Sulcoretepora parallela,	16, 41.
Vincularia dichotoma,	6.
Fenestella sp.	4, 24, 27, 41.

Brachiopoda.

Athyris ambigua,	8, 29, ×××30.
,, planosulcata,	1, 2, ××3, 6, 8, 9, 10, 14, 19, 26, 27, 31, 33, 35, 37, 41.
,, Royssii,	1.
Chonetes Hardrensis,	××19, 29, 31.
,, ,, var. C. gibberulus M'Coy,	33.
,, papilionacea,	8, 9, 26, 33.
Orthis Michelini,	××14, 16.
,, resupinata,	8, 26, 29, 30, 31, ×32, 33, 35.
Productus aculeatus,	33.
,, fimbriatus,	1, 3, 10, 33.
,, giganteus,	1, ×6, 8, ××11, ××××16, 18, 26, 27, 33, 36.
,, punctatus,	1, 2, ××3, 4, 5, 6, 7, ××8, 10, 11, 17, 23, 24, 26, ××27, 32, 33, ×××34, 35, 36, 37, ××× 39, 40.

Brachiopoda—continued.

	Localities.
Productus pustulosus,	6, 7, 40.
,, scabriculus,	7, 8, 12, 15, 16, 17, 22, 24, 27, 28, 35, 39, 41.
,, semireticulatus,	2, 4, ××× 5, 6, 7, 8, ×××× 10, 11, 12, 14, 16, ××20, 23, ××××24, 26, ××27, 32, 33, ××× 34, 35, 36, 37, ×× ××39, 40.
,, undatus,	5.
,, Youngianus,	33.
Rhynchonella pleurodon,	3, 8, 17, 29, 32, 37.
Spirifera bisulcata,	3, ××× 28, 29, 32, 38, 41.
,, glabra,	3, 5, 26.
,, laminosa,	? 4, 14, 23, 25.
,, lineata,	33.
,, striata,	6, 8, 12, 15, 26, 38, 40.
Spiriferina cristata,	3.
Streptorhynchus crenistria,	× 6, 7, 14, 15, 16, 18, 27, ××29, 31, 33, 39.
Strophomena rhomboidalis,	9, 16, 22, 27, 40.
Terebratula hastata,	3, 6, 31.
,, ,, var. sacculus	12, 31.

Conchifera.

Avicula gibbosa,	3.
,, lunulata,	8.
,, sp.,	19, 21.
Aviculopecten concentricostriatus,	? 40.
,, desquamata,	27.
,, ellipticus,	12.
,, fimbriatus,	34.
,, macropterus,	10.
,, megalotus,	31.
,, planicostatus,	8.
,, plicatus,	4.
,, segregatus,	? 4.
,, sp.	1, 3, 4, 6, 17, 21, 39.
Axinus orbicularis	? 12.
,, sp.	7, 26.
Cypricardia cylindrica,	3.
,, striato-lamellosa DeKon.,	8.
,, tumida,	27.
,, sp.	3, 4, 12, 17, 35.
Edmondia sulcata,	27, 35, 39.
,, unioniformis,	3.
,, sp.	4, 6, 35, 36.
Gervillia sp.	4.
Leda oblonga,	? 7.
Modiola Macadami,	××× 21, carb. shales.
,, sp.	9, 24.
Myacites sulcatus,	3.
,, sp.	33.
Myalina Verneuilii,	39.
Pinna flexicostata,	2, 3, 6, 8, 9, 10, 20, 27.
Pleurorhynchus rostratus,	3.
Posidonomya vetusta,	8.
Pullastra bistriata,	29.
Sanguinolites costellatus,	8.
,, discors,	4.
,, sulcatus,	20.
,, transversus,	1.
,, tricostatus,	8, 12.
,, sp. indet.,	1, 2, 3, 8, 9, 12, 20, 21, 30, 35.
Solemya Symesii, n. s.	10.

Gasteropoda.

Dentalium inornatum,	1, 6, 8, 12, 35.
Euomphalus crotalostomus,	1, 5, 12.
,, Dionysii,	12.

Gasteropoda—continued.

	Localities.
Euomphalus pileopsideus,	3, 7, 31, 33, 37, 41.
„ pugilis,	1.
„ sp.	8, 9, 26.
Loxonema rugifera,	6, 8.
„ tumida,	12, 27, 33.
„ sp.	3, 4, 5, 7, 8, 9, 10, 26, 33, 36.
Macrocheilus antiquus,	12.
„ subulatus,	12, 41.
Natica sp.	4, 7.
Pleurotomaria abdita,	3.
„ Yvanii	37.
Turritella spiralis,	8.
Small bivalve and univalve shells,	×4, 11, 21, 33, 39.

Heteropoda.

Bellerophon apertus,	××6, 8, ? 12, 18, 27, ? 31, ×37.
„ Dumontii,	10.
„ sp.	3, 4, 10, 33.

Cephalopoda.

Goniatites sphæricus var. crenistria,	1, 7.
Nautilus sulcatus,	1, 3, 10, 12, 36.
Orthoceras cinctum,	12.
„ inæquiseptum,	? 27.
„ sp.	3, 4, 8, 12, 20, 21, 26, 33.

CRUSTACEA: *Entomostraca.*

Leperditia Okeni,	3, 7, 21, 32, 37, 39.

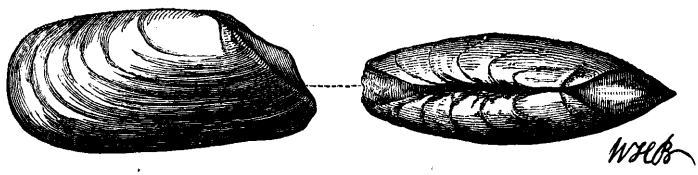
Trilobita.

Griffithides globiceps,	12, 36.
„ longiceps,	×4, 6, 27.
Phillipsia Derbiensis,	7, 8, 9, 15, 16, 27, 33, 36.
„ pustulata,	1, 6, 7, 22, 27, 32, 33.
„ sp.	17.

FISH REMAINS.

A very large palatal tooth of a Cestraciont fish *Psammodus rugosus*, in dark gray carboniferous shale, said to have been found by Captain Jones somewhere near Easky, and given by him to the Earl of Enniskillen in whose valuable collection of fossil fish it is included; measures three and a half inches by two and a half. This typical specimen is figured in Agassiz' Poissons Fossiles, vol. 3, p. 111, pl. xix, fig. 15.

Another palatal tooth, but of a different species, *Psammodus porosus* was obtained by Captain W. K. Dover from carboniferous shale in the river, half a mile west of Coolaney; this specimen was also presented to the Earl of Enniskillen by its discoverer.



Solemya Symesii, n. s.

March 23, 1880. WILLIAM HELLIER BAILY.

GLACIAL STRIÆ observed in this DISTRICT.

County and 6-inch Sheet.	Townland.	Direction.	Remarks.
Sligo.			
11	Castletown, . . .	N. 50 E.	On shore west of Easky River.
,,	Killeenduff, . . .	N. 50 E.	On shore west of Cooanmore Point.
12	Doonaltan, . . .	N. 70 E.	On shore.
,,	Doonaghintraine, . .	N. 80 E.	Do.
,,	Do., . .	E. & W.	Do.
,,	Aughris, . . .	E. & W.	Do.
,,	Do., . .	N. 65 W. and N. 30 E.	Do.
13	Sheeanmore, . .	N. 30 E.	Do.
,,	Toberpatrick, . .	N. 40 E.	Do.
,,	Do., . . .	N. 60 E.	Do.
,,	Finnure, . . .	E. & W.	Do.
18	Farranyharpy, .	N. 80 E. and N. 55 E.	Newer. At junction of laneways west of Skreen Church.
19	Derinch Island, .	E. & W. and N. 65 W.	Newer. On shore.
20	Kinnagrelly, . .	N. 35 W.	"Roches moutonnées."
23	Fiddandarry, . .	N. 20 W.	Grooving at right angles to foliation and can be seen a quarter of a mile away.
24	Dunowla, . . .	N. 5 W.	
,,	Carrownaleck, .	N. & S. and N. 35 E.	Newer.
,,	Laughill, . . .	N. 35 E.	"Roches moutonnées."
25	Carrownabanny, . .	—	"Roches moutonnées," shore of lough.
,,	Cappagh, . . .	—	"Roches moutonnées."
,,	Cloondrihara, . .	—	"Roches moutonnées."
,,	Carrownacreevy, . .	—	"Roches moutonnées."
,,	Carrowmurray, . .	—	"Roches moutonnées."

R. G. SYMES.

INDEX.

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[58.—250.—6/80.]

SLISHWOOD MOUNTAINS LOOKING ACROSS LOUGH GILL.

Rockwood (Serpentine) Gap. Doonce Rock and the Islands are of Limestone