25.

Memoirs of the Geological Survey.

EXPLANATORY MEMOIR

TO ACCOMPANY

SHEET 25 OF THE MAPS

OF THE

GEOLOGICAL SURVEY OF IRELAND,

BY

S. B. WILKINSON, F. W. EGAN, B.A.,

AND

J. R. KILROE.

WITH

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

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PREFACE.

THE District described in this Memoir was surveyed during the years 1880–84; the northern portion by Messrs. Wilkinson and Egan; the southern, by Mr. Kilroe. It is entirely composed of Metamorphic and Lower Carboniferous strata, together with igneous intrusions, and forms a portion of the great tract of Metamorphic rocks of which the counties of Donegal and Derry are mainly composed.

EDWARD HULL,
Director.

GEOLOGICAL SURVEY OFFICE,
April, 1887.

EXPLANATORY MEMOIR

TO ACCOMPANY

SHEET 25 (NEWTOWNSTEWART) OF THE MAPS

OF THE

GEOLOGICAL SURVEY OF IRELAND.

INTRODUCTION.

THE greater part of the district here described lies in the county Tyrone; the remainder, occupying the north-west corner, being included in Donegal. It contains the town of Newtownstewart, with the villages of Castlederg, Clady, Sion, Plumbridge, and Gortin, in Tyrone; and Castlefinn, in Donegal.

CHAPTER I.

PHYSICAL GEOGRAPHY.

The area described in this portion of the Memoir lies south of a line passing east and west through Early Hill, and corresponding, towards the west of the sheet, with the county boundary.

The Mullaghcarn group of hills appears within the eastern margin of the sheet, of which Slieveard (1,385), and Tirmurty Hill (1,112) are the highest eminences included therein.

The group sends a spur west by north towards Newtownstewart, which terminates in the hill Mary Gray. The highest point of this range is Curraghchosaly (1,372), near to which is Altaraven Glen, or Gortin Gap, a highly varied and picturesque hollow, which severs the range from Mullaghcarn. This gap corresponds with a line of fault. A few other gaps, transverse to the ridge, clearly owe their origin to streams which formerly flowed through them at a time when the physical features were different from those of the present day.

The most striking hill in the district is Bessy Bell, overhanging Baronscourt, the seat of the Duke of Abercorn. It rises rapidly from the east and west, the average slope being 9 degrees, at some points as much as 14 degrees, and falls away gradually towards the north, and by two terraces towards the south-west.

Baronscourt occupies a valley nearly four miles long, running N. by E., and separating Bessy Bell from Mullaghcroy hill (805 feet), which slopes gently upwards towards the west. This hill, though

of no great altitude, commands an extensive view of the Derg valley on the north, and of the flats bordering the Fairywater on the south.

A fine escarpment at the south margin of the sheet runs westward from Mulnavar, and culminates in Bolaght and Bin mountains. It is separated by a wide valley from a tract of ground of moderate elevation, south of Castlederg, containing a few unimportant hills of rounded outline.

The river Derg enters the sheet from the west, and, receiving the Mourne Beg at Lisnacloon near the margin, flows eastward by Castlederg to join the Strule north-west of Newtownstewart. Another tributary of the Strule, the Owenkillew, enters the sheet by its opposite margin, and flows westward to Newtownstewart, receiving the waters of the Glenelly River at Corick. The Fairywater, a third tributary, joins the main channel beyond the south margin, having taken its rise near Blacktown, and drained several square miles of the ground included in this sheet. The Strule occupies a valley running N. by W. towards Newtownstewart, leaving the hill Bessy Bell on the west, and Deer's Leap and Mary Gray on the east. Below the confluence of the above-named tributaries, this river is known as the Mourne. On receiving the waters of the Finn at Lifford Bridge, these united streams take the name of the Foyle, which ultimately enters the ocean north of Londonderry.

The river Mourne running nearly N. and S. divides the northern portion of Sheet 25. The ground to the E. of the river, gradually rising, reaches along the northern margin of the sheet, a considerable height, viz., at Owenreagh Hill, 1,344 feet, Craignagapple, 1,082 feet, Craigatuke, 1,155 feet, and Crockrour, 1,200 feet.

West of the River Mourne the ground is undulating, Whisker-Hill (755 feet) being the highest point.

The Cappagh Burn, which drains the angular tract enclosed by the ranges of Curraghchosaly and Mullaghcarn, flows out of Altaraven Glen, and receives the drainage of the high grounds on the north and east, in its course south-westward to join the Strule at Tattynure.

In the small area lying north of the Finn Valley, there are some well-marked, though in no way very striking, inequalities of surface, due to the different amounts of resistance offered to disintegrating and abrading forces by the underlying rocks, according to their various degrees of hardness. Thus the hard quartzite north of Donaghmore House forms a hill overlooking the adjacent ground occupied by the comparatively soft and easily disintegrated mica-schist. The same is often observed in a more striking manner throughout the areas embraced in the adjacent sheets, the quartzitic rocks forming, as a rule, the more elevated portions of the district.

On the north side of the river Finn the ground rises somewhat more rapidly than on the south. In the latter case it stretches away with gentle and uneven slopes over a tolerably fertile district as far southward as Moneygal Bog, which lies on the watershed

between the rivers Finn and Derg, and through which passes the boundary between the counties Tyrone and Donegal.

A rugged area forms the northern slope of the Finn Valley for a short distance east of Liscooly, the irregularity of surface being caused by an accumulation of moraine drift containing large blocks of gneissose mica-schist and altered trap, which stand out, either singly or in heaped-up masses, from the clay in which they are partly embedded.

Chapter II.

Rock Formations and Divisions.

Aqueous Rocks.

		Colour and Signs on Map.
Recent and Post-Glacial.	Peat (bog), Alluvium and other superficial deposits,	*Raw umber.*
Post-Pliocene,	Drift, boulder-clay, . .	*Engraved dots.*
Carboniferous Series.	Calp Sandstone, . .	$d^{2''}$, *Indigo with white dots.*
	Lower Limestone, . .	$d^{2'}$, *Light Prussian blue.*
	Lower Carboniferous Sandstone, ...	d^1, *Prussian blue with Indian ink and yellow dots.* (Upper, $d^{1'}$; Lower, d^1, *Do., lighter.*)

Metamorphic Rocks.

Gneiss, ...	*ν, Crimson lake.*
Mica-Schist, ...	*μ, Do.*
Mica-Schist passing into Gneiss, . .	*μ & ν, Do.*
Quartzite, ...	q, *Yellow over do.*
Limestone, ...	λ, *Cobalt blue.*
Hornblende Rock and Schist, and Metamorphosed Diorites, ...	Δ, *Burnt carmine.*

Igneous Rocks.

Felstone (intrusive), ...	F †, *Orange chrome and carmine.*
Felstone Porphyry (intrusive), . . .	Fp †, *Do.*
Basalt, Dolerite, ...	$B_{\dagger}$, *Burnt carmine.*
Diorite, ...	D, *Do.*

Metamorphic Rocks.

The various species of metamorphic rock represented in this district are gneiss, mica-schist, quartzite, limestone, and certain foliated hornblendic rocks, which—from the abundance of felspar in many specimens, and its constant presence in perhaps all—might be grouped under the common title of "foliated diorites." The ordinary kinds attain degrees of relative importance in the order in which they are named above, gneiss predominating; and they graduate into each other, as a rule, so imperceptibly as to render the mapping of the bands by means of distinct boundary lines almost impracticable.

Gneiss.—The prevailing variety is that in which the three minerals, felspar, quartz, and mica occur together, and in such proportions as to constitute a solid, often massive, rock; in which,

moreover, the foliation, though always distinct, is rarely so pronounced as to induce a schistose *structure*. It varies in colour from light grey and pink to dark grey, according as the mica present happens to be white or dark green, and the felspar white or flesh-coloured. The latter felspar is not of common occurrence, and plagioclase may be noticed in some specimens of this fine-grained gneiss. The rock in a few places is greenish, due to the presence of chlorite and hornblende.

Coarse grey gneiss occurs at points west of Mullaghcroy Hill and on the south slope of Garvetagh Hill, south of Castlederg, The felspar is disposed in microcrystalline masses, imbedded in the rock, interrupting the foliation, or obliging it to follow a zig-zag direction. This gneiss, however, splits with unexpected facility, and might be termed schistose, a character which the finer variety often assumes in the district.

Mica-Schist.—In several places the schistose structure is highly developed, a character which is usually concurrent with an evident increase of mica in proportionate quantity. This variety prevails in Baronscourt valley, and on the east and west flanks of the hill Bessy Bell. Much of it is also to be met with in the bed and banks of the Strule. At numerous other points insignificant bands of mica-schist occur in the gneiss, though not indicated on the map. Talc is occasionally associated with white mica in the schist; hornblende and chlorite have already been noticed as associated with the constituent minerals of the gneiss of the district. Garnets occur in the schist in Silver Hill, south of Castlederg, and (?) actinolite crystals in the infiltered quartz on the east shoulder of Clady Hill, south of Victoria Bridge.

J. R. K.

The neighbourhood of Plumbridge and the higher range of hills, Craigatuke, Crockrour, Owenreagh, Meenashesk, crossing the river Mourne by Sion and Clady, is occupied by metamorphic rocks. In the N.W. the dip is steady at about 30° N.E. A dislocation, however, takes place a little south of Parkfield and Sion: here the beds dip from 30° to 40° S.E. south of the fault, while they retain the N.E. direction of dip N. of the fault.

At Koram and Owenreagh hills the dip is from 3° to 5° S.E.; further E. the beds appear to be rolling, and are seen at Crockrour to dip at 30° N.N.E.

The general character of the beds is a micaceous schist, becoming sometimes more chloritic or quartzose.

Quartz Schist.—At Fearn Hill, however, the beds have a more decidedly quartzose appearance, and a division can be drawn between the micaceous and chloritic schists and these beds. The dip is still in the same direction.

S. B. W.

The mica-schist, as seen in the vicinity of the main road, at the north-west corner of the sheet, is in part very dark and argillaceous, with highly glistening surfaces; but it is more

frequently light-coloured and quartzitic. There are also occasional bands of quartzite. The darker beds occur at Magheraboy, east of which a small rough area is occupied by the overlying quartzite. Dark glossy schists are seen in section in the stream at Donaghmore House, and are overlaid by quartzite in the rising ground to the east

The rocks in the Drift-denuded area at Drumcannon consist of hard and solid, clearly foliated, fine gneiss or gneissose schist, with bands of softer glossy mica-schist. The gneiss is in some cases very granitoid in appearance, has a slightly bluish tint, and is finely speckled with black mica.

In the valley at Gortnagrace, three miles south of Castlefinn, and in the small gulleys adjoining, dark glossy mica-schists, some of which are pyritous, exhibit variable dips ranging from 5° to 35°, with slight rollings to the north-west and south-east. In the southern part of the valley the softer and more fissile schists are associated with highly glistening, hard gneissose beds.

F. W. E.

Quartzite and Siliceous Schist.—The gneiss of the district frequently becomes highly siliceous, and occasionally passes into siliceous schist or quartzite, through the partial disappearance of felspar and mica; for it is seldom noticed that these minerals entirely disappear. The siliceous schist chiefly occurs as bands in the gneiss, which are usually too insignificant to require representation on the map.

The quartzite varies in colour from white to grey or pinkish. It is often flaggy, and even in the massive varieties planes of foliation are indicated by the presence of mica, along which the rock splits with comparative ease. A ribband structure of alternating minute bands of pink and grey is frequently noticeable, which is doubtless due to original bedding and lamination. This is best seen in Crilly's Hill and Leitrim Hill, where a considerable outcrop of quartzite, with siliceous schist bands, occurs.

J. R. K.

Limestone.—The mica-schist and gneiss at points become calcareous, and frequently pass into white, blue, and pinkish limestone, which is, moreover, usually crystalline and sometimes schistose. Few of the bands are traceable for any great distance on either side of the chief openings by which their existence and direction are ascertainable.

A few important outcrops of limestone occur in the district: one in the south-west corner, including a band of quartzite; another in Magheracreggan and Whitehouse, north of Magheralough, which may have been continuous, prior to faulting, with that occurring east of Magheracreggan. In Whitehouse the limestone is white and crystalline, but wherever visible is shattered, as if by faulting in the immediate vicinity. The same outcrop, east of the fault, probably contains schist bands, though not represented on the map, the continuation northward of those indicated; but fine blue crystalline limestone is to be seen at

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the cross roads, where a considerable thickness of it in massive beds has been exposed by quarrying. A similar important outcrop of limestone is to be met with on the east shoulder of Clady Hill, west of Mulvin Parks, which may represent the former outcrop, though no evidence has been discovered in Drumclamph, Kilstrule, or Ardstraw, by which the continuity might be established. The Clady Hill limestone is evidently the continuation of that seen at Victoria Bridge, the Carboniferous rocks now concealing the intermediate portion.

The limestone is magnesian at several points, being converted into dolomite at one locality noticed about half a mile west of Learmore Hill Trig. Station, S. by W. of Castlederg.

Iron pyrites commonly occurs in the limestone, as also in micaceous and hornblendic schists.

J. R. K.

The limestone district west of Castlefinn forms the southern part of a wide area which stretches away northward into sheet 17, and in which these beds predominate, having occasional bands of quartz-schist and mica-schist interstratified. The rock is crystalline, generally bluish-grey in colour, though sometimes white, and is in most cases highly schistose.

White crystalline limestone occurs at Collomstown cross-roads, and at a point immediately west of this, on the border of the sheet, where the rock has been slightly quarried. Here it is striped with dark laminæ having a bluish tinge, and exhibiting varieties of texture, from finely to coarsely crystalline. Some of these beds contain cubes of iron pyrites.

Directly south of Collomstown cross-roads, at a point a little east of the main road, there occurs a small boss composed of thin crumpled beds of limestone, in part coarsely crystalline, but more usually compact, and highly indurated. Similar conditions are observed in various places in the adjoining district to the north, where the limestones are found to occur in the immediate vicinity of altered trap rocks. They indicate a special degree of metamorphism, due to these beds having been already altered in contact with the trap before the changes took place that affected all the rocks of the district.

Blue, flaggy, crystalline limestone, distinctly foliated, and having highly micacised planes of lamination, is quarried at Hightown, and yields a very good description of lime.

The diorite north of Hightown cuts through beds of blue crystalline limestone containing veins of white quartz and calcite, the latter mineral exhibiting a beautifully perfect rhombohedral form.

Blue schistose limestone, pierced by a narrow dyke of basalt and by thin veins branching from it, occurs west of Cloghcor.

The thin bands of limestone near Castlefinn, and in the areas directly east and south of it, are but little exposed. The stone has been slightly quarried in some cases, as at the place called "Raws," where a small quantity is annually procured for

local purposes. It has also been quarried at half a mile south-west of Gortnamuck, and to a small extent between Dartan and Egglybane. In the last locality the beds are exposed in small openings in the bog, and in the adjacent stream, and consist of dull bluish crystalline limestone containing iron pyrites, the decomposition of which imparts a sulphurous character to the peat.

Contorted beds of blue crystalline and schistose limestone, with beds of decomposed calcareous schist, occur at the edge of the sheet north of Castlefinn, and with them are associated thick beds of quartzite. These have been quarried for road purposes.

The limestone on Crossy Hill has been slightly used for burning, and also that to the north of Churchtown. The beds near the latter place form a band measuring about 100 yards wide at the surface, and thickening out somewhat in the next sheet, along the western flank of Croaghan Hill. They vary in texture and colour, being in some parts blue, and in others grey passing to white.

F. W. E.

There are several bands of limestone in the northern portion of the district, the most important being at Lisky and Victoria bridge, where the stone has been largely quarried. It is a blue, highly crystalline, limestone, well bedded, and having at Lisky a very slight dip; but at Trafalgar, at the railway bridge, the beds curve sharply round across the river, and disappear under the Lower Carboniferous sandstone.

S.W. of Clady a narrow band of limestone runs along the burn; it is somewhat broken up by faulting. At Whisker Hill, a small quarry has been opened, exposing a thin band of crystalline limestone, dipping S.E. at 30°. At Tullygarvan and E. of Urney Hill small quarries have been opened, and S. of Parkfield there are a few beds of blue crystalline limestone, dipping S.E. at 30°.

On the north flank of Conthem Hill, on the W. side of the fault, which is shown on the map, a large quarry is being worked in an evenly bedded, highly crystalline, bright blue limestone. These beds have probably been cut out by faults as shown on the map.

S. B. W.

Hornblende-Schist.—Many, if not all, of the hornblendic rocks above referred to, are unmistakeably intrusive. Thus: south of Magheralough, hornblende-rock, though observed to be foliated, almost surrounds a mass of quartz-schist dipping south; and south-east of this point, in Derrygoon, limestone and mica-schist strike against similar rock, which seems to have been originally connected with the last mentioned intruded mass—the connection being now interrupted only by faulting. Again, south-east of Lisnacloon, in Ganvahan, foliated diorite cuts across siliceous and micaceous schists, sending off-shoots into them on the north side, which may be distinctly traced; and south of this point, in the river, a mass of grey mica-schist is surrounded by, or included in, hornblendic rock, which is quite schistose.

Though the intrusive character of these rocks is thus clearly established, and there is an evident general connection between

the various forms assumed by the hornblendic rocks of the district, many of the schistose (hornblendic) bands run so conformably to the adjacent mica-schists, that the former may have been contemporaneous representatives of the ordinarily occurring intruded masses.

Epidote apparently fringes the crystals of hornblende in Derrygoon in some specimens; and mica not infrequently accompanies, or even takes the place of, hornblende, as in the rock behind Magheralough National School, and in the Glenknock diorite, near Carraghadoos.

J. R. K.

In the north-western part of the sheet this rock occurs principally in low ridges, running for short distances parallel to the general strike. From its character, and its mode of occurrence here and in the adjoining districts, it appears to be a trap rock intruded in the form of sheets along the planes of bedding, and subsequently metamorphosed in common with all the other rocks of the country.

Masses of black, finely fibrous hornblende-schist, with intervening beds of gneissose schist, occur near Drumcannon Upper, three and a half miles south-east of Castlefinn. It contains iron pyrites in abundance, occasionally forming cubes nearly an inch in diameter, but chiefly in small particles. Ferruginous springs, depositing ochre at the surface, occur in the vicinity of this rock; and the same is found to be the case in several other localities in the district, in connection with these and other pyritous rocks.

Dark gray and greenish-coloured hornblendic schistose trap overhangs the stream at a point less than half a mile south of Castlefinn, as shown on the map. It weathers to a dark sandy material, the less weathered portions projecting in slabs, so as to give it the appearance of a bedded rock dipping at low E.N. Easterly angles. Crystals of felspar may be distinguished in the less schistose parts. Hornblende is the principal constituent, and exists in a fine fibrous form.

F. W. E.

Carboniferous Rocks.

Lower Carboniferous Sandstone and Shale.—Two areas of Lower Carboniferous beds occur in this sheet, one stretching from Doortans by Victoria Bridge to Gortin, brought down against the metamorphic rocks by a large fault which bounds the area on the south; the second area, lying within the southern margin of the map, and running almost its entire length, is terminated on the east by a fault which throws these beds down against the metamorphic rocks of the Mullaghcarn group.

The basal beds of the latter area consist of schist breccia, red conglomerate, and pink argillaceous sandstone with white quartz pebbles. Purple sandstone, red shale, and, rarely, pale massive sandstone also occur. All these varieties are exposed by streams cutting across the outcrop at various points and in a few places where the rock is devoid of drift covering.

At the west margin, on the verge of the bog, and near the dolerite dyke there indicated, a thick bed of fine bluish gray pure limestone occurs, resting on the quartzite and metamorphic limestone band, and passing beneath the conglomerate. It is believed to be of Carboniferous age, though a local and exceptional deposit.

South of Bessy Bell the following section is to be seen: breccia or conglomerate with soft red sandstone, pinkish grey micaceous, and dark purplish and blue shale. This last contains concretions and thin seams of limestone with thin bands of calcareous grit. Higher still, occur purple and blue shale, brown argillaceous grit and seams of impure limestone.

This series corresponds closely with what may be noticed south-east of Newtownstewart, with the exception that the conglomerate attains here a greater development, and pebbly sandstone bands are more frequent. Pinkish gray grits also occur west of Erganagh; and, higher in the series, pale grits replace the prevailing pink varieties.

It is to be noticed that the prevailing character of these beds changes in passing from one end of their outcrop to the other—the arenaceous constituents predominate towards the west, the argillaceous towards the east.

A pre-carboniferous valley seems to have existed in the direction of Altdoghal and Branletter, between Ballynatubbrit Mountain on the north and Deer's Leap on the south. Whether the formation of that in which the Strule now flows can date further back than the epoch of faulting which brought down the Carboniferous rocks to their present position, cannot now be ascertained with certainty. Nevertheless it is very probable that the displacement of the schist and Carboniferous boundary, as indicated in the valley, is not entirely due to faulting, from which it may be inferred that at least an indentation in the range of metamorphic hills existed in the direction of the valley prior to the Carboniferous epoch.

Referring to the northern area, the series of sandstone, shale, &c., seems divisible into two portions—an upper and a lower; the latter corresponding more closely than the former with the series above described as occurring south of Newtownstewart.

The Lower Calciferous Sandstone Series is represented at Doortans and Little Whisker Hill, west of Victoria Bridge, as also at Lisnafin Glebe, E. by S. of Douglas Bridge, by pink pebbly grit and conglomerate, coarse pebbly sandstone, greenish and purplish shale, and some pale sandstone.

The Upper Calciferous Sandstone is well represented in a section laid open by the Owenkillew and Glenelly rivers at Corick, where may be seen pale sandstone with greenish and purplish flaggy grits and shale. The shale contains thin grit beds and earthy limestone. Pale sandstone predominates, which may be taken to distinguish this upper portion of the Calciferous series from the lower.

Ripple-marks have been noticed in the pale micaceous grit near Seemullan, W. of Gortin.

J. R. K.

Beds of yellow and red sandstone and conglomerate are seen at Ligfordrum National School, dipping nearly S. at 15°. Good sections are also seen where the streamlets cut down through the bog and drift deposits. North of Breen, beds of yellow and red conglomerate are exposed, the dip being from 30° to 40° in a S.S.W. direction. In the river Mourne, at Victoria Bridge, evenly bedded highly quartzose conglomerate dips S.S.W. 15° to 20°. In the bed of Douglas Burn, near Beagh, massively bedded red and yellow conglomerate and coarse grits are seen dipping S.S.E. 25° to 40°. About half a mile down the burn the direction of the dip becomes a little W. of S. at an angle of 20° to 40°. In the bed of the Tullynadall burn and in the Glenelly river sandstones are well exposed.

S. B. W.

Lower Limestone.—A narrow band representative of this division enters the sheet from the south, near Blacktown, and can be traced eastward, till lost under the mountain bog. The character usual to it further south, as a pure blue or bluish-grey limestone throughout, is here changed; a few beds of comparatively impure (earthy or arenaceous) limestone, separated by bands of sandstone, still remain, as indicative at once of the Lower Limestone horizon, and of the tendency to replacement of *calcareous* by *sedimentary materials* in a northerly direction. The limestone beds can be best seen in the escarpment of the Bin Mountain looking northward. A section of the band at this point shows it to be arenaceous in the lower part, with included sandstone beds, which are pebbly; and in its upper portion it becomes quite shaly, possessing, in all, a total thickness of about 600 feet. It is not traceable eastward beyond Lough Corr, though it is, doubtless, continuous where obscured by Drift and recent deposits, as sand, shingle, &c.; for, south of Bessy Bell limestone is visible in Calkill quarry, and at a few other points west of "Mountjoy Railway Station." Here also, however, the rock is very earthy and arenaceous, weathering freely into calcareous shale and rotten stone.

This division may be similarly traced eastward from the foot of Bessy Bell to that of the Mullaghcarn group by calcareous bands at Tattynure Bridge, and higher up in the Cappagh burn.

Calp Sandstone, or Middle Group.—In the west, the Lower Limestone may be observed to dip under flaggy and massive pale sandstone, with occasional small deposits of shale, forming the summits of Bolaght and Bin Mountains. This series is well shown in Kilmore Burn, where the above-described sandstone, &c., are seen to pass up into coarse-grained, felspathic sandstone, frequently containing pebbles of white quartz. The sandstone beds crop out, and may also be well seen in Mulnavar hill.

With the exception of a small section of grey and pale brown sandstone laid open in Carnony Burn, near Erganagh, in the eastern portion of the sheet, the whole of the tract under which these beds may be supposed to occur is obscured by drift deposits.

J. R. K.

Igneous Rocks.

Felstone.—In Magheralough, west of Mullaghcroy hill, a rock penetrates micaceous schists and limestone, which might be described as pinkish syenite, but, from its probable connection with those following, is indicated as a porphyritic felstone. It was observed to consist of felspar and hornblende crystals embedded in pink orthoclase, weathering light greenish brown. Fragments of a similar rock, indicating that it is almost *in situ*, were observed at Carraghadoos north-east of Newtownstewart.

S.E. of this town, near Blackrock Bridge, pink and gray porphyritic felstone is let down against schists, along two lines of fault running northward. It consists of large crystals of felspar, others of hornblende, and hexagonal plates of mica, together with chlorite, all imbedded in a compact felspathic matrix. Similar rock appears in two unimportant dykes in Gortgrannagh and Beltany, a mile N.E. and a mile and a half due east of Bessy Bell respectively.

Dykes of pinkish felstone weathering cream-coloured were also observed in Garvagh, at the west margin of the sheet, near Dreenan Wood; and in Carnoughter on the south slope of Pullan's Hill.

The sheets of highly felspathic trap among mica-schists in the area south-west of Castlefinn are intrusive, and there appears no evidence to indicate that they have been subjected to metamorphic action, such as resulted in the conversion of all the surrounding rocks into schist or quartzite. They occur in masses which, so far as they come within observation, maintain a direction along the line of strike. When seen in immediate association with schists, they show a decided flaggy structure corresponding to the planes of bedding.

Rocks of the above description are found along the road running south from Liscooly. At a point south-west of Magheraboy, on each side of the road, there occurs a dull greenish and partly reddish-coloured felstone, which breaks up easily into rough bed-like pieces and thin flags, having an apparent dip of 30° S. to 10°–30° E. In the least weathered portions the rock is found to be compact, very hard, and sometimes finely vesicular, containing occasionally light greenish-coloured slender prismatic crystals which are probably those of hornblende. A rock of the same nature, of reddish colour, and known in the locality as "Red Rock," occurs at half a mile farther north, on the east side of the road; also at the south-west of Fort Hill, and in other places. It is quarried for road metal, for which the harder portions are well adapted.

The felstone at Drumcannon is compact and slightly vesicular, of a decided red colour, and contains slender prisms of decomposing hornblende, with greenish mottlings probably formed by the same mineral; also very minute specks of iron pyrites. The rock occurs in a bed-like mass, and comes to view in several places on the surface. In its southern part it is seen for a width of about fourteen yards immediately below hornblende-schist and beds of gneiss.

Diorite.—The intrusive sheet of diorite among limestone beds at Foxfield is very well seen in the adjacent quarry, cutting through them at angles somewhat lower than the dip, and to a great extent running along the planes of bedding. Its greatest thickness here is about twelve feet, diminishing to three feet. The rock is dark-gray in colour, weathering with bluish and greenish tints, and consists of felspar and hornblende intimately mixed in a compact to finely granular mass; much of the hornblende occurring in fine well-defined black and greenish crystals. The same sheet of trap is also exposed among limestone beds in a quarry a little to the east, and again at a point farther east, close to the line of fault. Rock of a similar nature, and probably forming a portion of the same mass, occurs in a boss at Gibbs Town, about half a mile to the west.

At the National School a little N. of Urney Hill a dyke of diorite occurs; it is very hard to obtain a good specimen, as it is much weathered; it has a mottled appearance.

Felstone Porphyry.—In the bed of the stream between Hightown and Plumbridge there are two small dykes of felstone-porphyry running parallel to one another. They consist of a purplish brown felspathic matrix, with a few distinct crystals of felspar, which weather a pinkish drab colour.

At Meenashesk there is a very small outcrop of felstone-porphyry.

South of Fearn Hill a considerable mass of a similar rock appears at the edge of the peat bog.

This rock, as seen one mile south-west of Castlefinn, occurs in a low ridge a few yards in width, running southward from the main road to the houses at Tirinisk. It forms an intrusive sheet among the beds of mica-schist, as is more clearly the case with a rock of the same description at a short distance north of Castlefinn. The mica-schist appears below it in the lane at Tirinisk. Immediately to the west another mass occurs, apparently forming a separate sheet, which can be traced southward to Lisnamulligan, where it is known to occur, though now hidden below the Drift. The same rock, and probably the extension of one of the sheets, is found still farther south, at the west of Gortnamuck, forming bosses on both sides of the stream, and appearing in section on the east side. It consists of a finely granular to compact dark gray felspathic base studded with numerous crystals of white orthoclose, the felspar throughout becoming slightly reddish-coloured in weathering. Mica is present in dark green, and sometimes silvery, scales; and there are occasionally small prisms of hornblende. Grains of quartz also, without any apparent regularity of form, occur very rarely; and there are thinly-scattered minute specks of iron pyrites.

The felspar-porphyry east of Crossy Hill occupies a position between beds of mica-schist in a mass twelve feet wide at the surface. Its intrusive character can be determined in the district to the north. Here it is a light bluish-gray, crystalline, and finely porphyritic rock, frequently speckled with small prisms and irregular particles of hornblende, and hexagonal scales of black or bronze-coloured mica. Minute grains of iron pyrites are also common in this rock.

Dolerite.—A dyke of dark gray coarsely crystalline dolerite crosses Leitrim Hill north-westward from the Aghamore Burn, in the banks of which it was observed to be displaced by a fault running north-eastward.

Another dyke of dark gray dolerite occurs south of Aghamore, near the west margin.

Other rocks known to be intrusive, and therefore primarily igneous, are described as metamorphic, inasmuch as they all show foliation more or less distinctly, even the most coarsely crystalline, on their exposed surfaces, *e.g.*, that in Magheralough.

Basalt Dykes.—Near Cloghcor, north-west of Liscooly, the limestone is penetrated by a basalt dyke, not exceeding a few feet in width, from which proceed narrow veins, from a quarter of an inch up to about nine inches thick, cutting across and intruded along the planes of bedding. The rock is compact, and sometimes abounds in minute crystals of felspar.

Post Pliocene (Drift Deposits).

Lower Boulder-Clay with Sand and Gravel.—Boulder-clay overspreads the north-west of the sheet, except in the denuded portions shown on the map. Sand and water-worn gravel occur in a few places along the Finn Valley, as obscurely seen in the railway cuttings.

The boulder-clay consists of brown sandy clay containing fine subangular gravel and small local blocks, the latter in rare cases reaching two feet in diameter. In the cutting at Magheramenagh there are larger subangular blocks of hornblende-schist, and round boulders of quartzite. Obscurely bedded deposits of fine sand containing layers of small pebbles of the local rocks, and occasionally of basalt, were slightly exposed to view in a cutting at Stranamuck, and also a little way east of Killygordon.

West of Castlederg there are few points at which the rock is not covered by Drift; and where it is concealed, the covering seems very thin. Eastward, however, boulder clay is seen to occupy the valley of the Derg, the Fairywater, Baronscourt, etc., enwrapping the high grounds of Bessy Bell, Mullaghcroy, and the peninsular tract terminating westward in Mary Gray, all of which are devoid of Drift covering.

The boulder clay rises to the 1,000 feet contour line behind Baronscourt, and on "Rylagh Top" (Slieveard). Yet the comparatively low tracts stretching from Clady Hill by Doortans, and from Carraghadoos north-westward by Gallan, are almost devoid of Drift covering.

The Drift of this area seems to represent two, or perhaps three, successive periods of deposits; one, the oldest, in which it is seen to consist of tough clay with débris of local or underlying rock, the larger boulders being usually ice-scratched; a second, consisting of semi-stratified, loose sandy clay, containing blocks of a mixed character, which are usually angular and subangular, and not frequently scratched; and thirdly, stratified sand and gravel, as a rule disposed in irregular hillocks.

Boulder-Clay.—This oldest division seems very widely distributed. In the deep sections laid open by Cappagh Burn, dark gray tough clay, containing glaciated blocks of pale grit, earthy limestone and fragments of shale, forms the lowest portions seen. In the Glenelly River at Corick, and on the north slope of the Ballynatubbrit range, sections of tough unstratified dark grey and brown "Till" are seen to be overlain by great thicknesses (20–30 feet) of semi-stratified sand, gravel, and clay.

Gravelly Drift, may be seen, as just described, in great quantity north of Ballynatubbrit range, where it contains blocks of gneiss and schist, of pale and pink grit, and fragments of white and pink quartz.

In Cappagh Burn the boulder-clay is overlain by various thicknesses, up to 20 feet, of drift similar to that just described.

Hillocks of stratified sand and gravel, mostly of irregular shapes, but some of them linear, are to be met with at several points, viz., along the Derg Valley, near the river, by Crew, Far Hills, and Ardstraw; east of Carraghadoos, running north-eastward towards Tullynadall; at Yellow Knowe, in Cappagh, south-east of Altaraven Glen. Enormous accumulations also occur at the north entrance to the same glen, near Gortin, and at the north entrance to Baronscourt Valley. These hillocks seem to be moraines, indicating the recession of glaciers which occupied the various valleys and glens, with which they are connected.

A deposit of fine sand, on the north-east slope of Bessy Bell, south of Newtownstewart, has been evenly deposited upon the slope over a considerable area.

The country between Sion and Whisker Hill has in a few places thin deposits of boulder-clay. To the E. of Sion there is a very deep deposit of sand and gravel, well up the sides of the metamorphic hill and down to the lower lands. In the cuttings made by the small streams the banks are seen to be composed of stratified sand and gravel, the pebbles being chiefly those of the Carboniferous sandstone.

Recent Accumulations.

Bog, Alluvium, &c.—The large bog three miles south of Liscooly supplies a quantity of fuel, but it has been a good deal cut away. At Egglybane the peat is, in some spots, impregnated with sulphur, no doubt derived from the decomposition of the iron pyrites in the limestone.

The narrow strip of flat land along the river Finn is composed of fine brown alluvium, sections of which are exposed occasionally for several feet deep in its banks.

Small deposits of ochre are being formed in some localities from water highly charged with iron. Examples occur at the following places:—in the valley west of Gortnagrace, south of Castlefinn, where ferruginous mica-schists are found; in a stream east of the road north of Low Town; in the same vicinity a short distance westward along the main road to Killygordon, where the deposit is of a very red colour; in the railway cutting immediately south of the last-named locality, yellow and reddish ochre being plentifully deposited from water which comes from the Drift; north-west of Drumfergus, a rich ochreous spa, springing from the ground in various spots; and west of Harper's-town, where it is doubtless derived chiefly from the pyrites so abundant there in the altered trap-rock.

Peat.—There are several considerable tracts of peat-bog on the hills between Douglas Bridge and Plumb Bridge; these are being cut for turf very extensively.

The Fairywater wends its way through an extensive boggy and alluvial flat, stretching south-eastward from Magheralough to where this stream leaves the sheet. The flat varies in width from ¾ to 1½ miles, though the eastern part of it merely forms a net-work, separating low, irregularly-shaped Drift mounds.

Another considerable area of peat deposit occurs N.W. of Castlederg—"Moneygal bog." It is continuous around the north shoulder of Pullyernan hill.

Thick mountain bog does not occur in this district to any extent, the few patches represented on the map, as affording peat for fuel, being shallow.

The lowest ground along Baronscourt valley, consists of a narrow alluvial flat, which stretches north-eastward in a curved line, with but a few feet fall from the south towards the north end. It includes the three loughlets, Catherine, Fanny, and Mary.

Roots and logs of fir are of common occurrence in the bogs of the district, associated with those of hazel and oak at Pullyernan Hill, near the county boundary. Oak and fir are very commonly associated.

In a small bog in the townland of Farrest, north of Omagh, a well formed canoe, hollowed out of an oak log, at least three feet in diameter, was found buried under 3 ft. 6 inches of peat. As indicating the age and mode of formation of the bog in question, and that doubtless of others in similar positions, it may be mentioned that the peat now occupies the site of a former loughlet, which yielded fish to a peasant who was in his eightieth year about the time of the discovery of the canoe.

S. B. W., F. W. E., J. R. K.

CHAPTER III.

Principal Faults and Minerals.

The dislocation which is indicated on the map as running by Doortans, Douglas Bridge, and Gortin, is established by evidence already mentioned. Carboniferous beds dip towards the metamorphic rocks, as may be seen at several points along its course. It receives several faults transverse to its own direction from the south, the most important of which is that passing through Gortin Gap. This bifurcates southward, the branches coinciding with two well-established breaks in the next sheet. Most of the other transverse faults are established by evident displacements of Carboniferous and other boundaries.

One of these, crossing the S.W. shoulder of the hill, Bessy Bell, is accompanied by a deposit of barytes, near to where the fault line cuts the main road from Newtown Stewart to Omagh, which also crosses this shoulder of the hill.

J. R. K.

The north-easterly fault which runs along the line of road about two miles west of Castlefinn has a downthrow on the west, bringing down the limestone against the mica-schist. Beds of the latter, more or less quartzose, occur along the stream west of the road-way, being in part broken up, and in the same place associated with a mass of calcareous tufa. The schist comes to view also on the east side of the road. The extensive exposure of limestone beds in the ground to the west, with their constant northerly dip, and the occurrence of mica-schist as just now described, establish the position of this fault, which must have a considerable downthrow.

The fault near Gibb's Town, farther west from Castlefinn, has also a westerly downthrow, but of comparatively slight extent. The limestone occurs abundantly, with E.-S.-easterly dips, throughout the ground to the west, and as far southward as the point indicated by a dip arrow in the stream west of Magheraboy. A decided and abrupt change of dip takes place in the area east of the fault, as will be seen by reference to the map.

The fault east of Castlefinn is proved in the sheet to the north (Sheet 17); here it is obscure, owing to the covering of Drift. The mica-schist, however, appears at Gortfad, and in a stream by the roadside to the north of that place.

F. W. E.

A slight dislocation is marked S. of Sion, running in a N.E. and S.W. direction.

The fault which forms the boundary between the Lower Carboniferous Sandstone and Metamorphic rocks comes into this area a little S. of Douglas Bridge. The effects of this fault are continued to the S. in Mr. Kilroe's work.

S. B. W.

Glaciation.

Fine glacial striæ, bearing E. 30° N. and W. 30° S., are found on a smooth surface of quartz-schist, at the northern margin of the sheet, north of Castlefinn.

F. W. E.

CHAPTER IV.

Palæontological Notes—Sheet 25.

Localities from which Fossils were collected.

No. of Locality.	Quarter Sheet of 6-inch Map.	County and Townland.	Situation and Geological Formation.
		Co. of Tyrone.	*Carboniferous Series.*
1	10/3	Drumnahoe, . .	Rocks in Douglas Burn, half a mile east of Douglas-bridge, three miles north of Newtown Stewart; dark gray micaceous shales.
2	10/3	Knockroe, . .	Rocks in same stream, at Douglas-bridge, half a mile west of preceding locality; light gray clay.
3	11/3	Glashygolgar, .	Rocks in Glenelly river at Glashy-bridge, four and a half miles north-east of Newtown Stewart, two miles south-west of Plumbridge; yellow sandstone.
4	18/1	Corickmore, . .	Rocks in Glenelly river, at Corick-bridge, three and a half miles north-east of Newtown Stewart; dark gray coarse earthy shales.
5	18/1	Droit, . . .	Rocks in Owenkillew river, a little north of Woodmount, four miles north-east of Newtown Stewart.
6	18/1	Do., . . .	Rocks in same river, one mile east of Killymore-bridge, about a quarter of a mile west of preceding locality; dark gray shale.
7	18/2	Cullvacullion, .	Rocks in stream, one mile north-east of Gortin, five miles east of Newtown Stewart; dark gray nodular shales.
8	19/1	Droit, . . .	Rocks in same river, a little east of Springhill, about one mile east of preceding locality; dark gray micaceous shales.
9	24/4	Binnawooda, . .	Quarry, five miles south of Castlederg, one mile east-south-east of Blacktown; dark gray limestone.
10	25/4	Lisnagirr, . .	Quarry, three-quarters of a mile west of Mountjoy-bridge, five miles south of Newtown Stewart; dark gray compact limestone.
11	25/4	Lisnacreaght, .	Quarry, close to small stream, one mile and three-quarters east-north-east of Mountjoy-bridge, five miles south of Newtown Stewart; light gray sandstone, micaceous shales.
12	25/4	Tully, . . .	Quarry, close to stream, half a mile west of Mountjoy-bridge, five and a half miles south of Newtown Stewart; dark gray micaceous shales.
13	26/1	Dunmullen, . .	Rocks, in Cappagh Burn, half a mile north-east of Tattynure-bridge, five miles south-east of Newtown Stewart; dark gray micaceous shale.

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

The number 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.

Plantæ.

	Localities.
Lepidodendron Sternbergii (selaginoides) termination of branches—dark gray shales,	6.
Plant remains, Filicites and reed-like, stems with fine longitudinal striations, some 1 and ¾ inch diameter; dark gray micaceous shale,	12.
„ „ Filicites, light gray sandstone and micaceous shales, one specimen, one inch in diameter,	10.
„ „ reed-like, Filicites linearis; dark gray micaceous shales,	1, 11, 13.
„ „ Filicites, stems, some 1 inch diameter and longitudinally striated; yellow sandstone,	3, 9.
„ „ branching; dark gray shale,	6.
„ „ „ „ „ „	5, 7.
„ „ aquatic plants, small, branching, and bifurcating; light gray clay,	2.

Actinozoa: *Corals.*

Syringopora geniculata,	4.

Annelida.

Serpula omphaloides,	××5, 6.

Crustacea: *Phyllopoda*

Dithyrocaris Colei,	5.
Leperditia Okeni,	×5, 8, 10.

Brachiopoda.

Productus giganteus, P. semireticulatus,	8.
Spiriferina cristata,	9.

Mollusca: *Lamellibranchiata.*

Modiola Macadami,	×4, ××5, ×××6, ××× 8, 10.
Sanguinolites sulcatus,	10.

Gasteropoda.

Euomphalus pileopsideus,	10.
Pleurotomaria or Murchisonia, sp.?	7.

Cephalopoda.

Cyrtoceras Gesneri,	10.
Orthoceras, sp.?	4, 5.

Pisces.

Helodus (fish palate),	10.

Remarks on the Fossils.

The fossils I have enumerated and identified from the places before mentioned, were collected by Mr. Richard Clark. At six of the localities mentioned plant remains only were the fossils obtained, viz., localities numbered 1, 2, 3, 11, 12, 13. At the localities numbered 5, 6, 7, 9, plant remains were found associated with corals and marine shells, mollusca, &c., such as are characteristic of Lower Carboniferous strata. At one place (locality No. 6), the plant remains are especially interesting, some of them exhibiting the termination of branches of a Lycopodiaceous plant, which appears to be identical with *Lepidodendron Sternbergii* (*selaginoides*), a species also occurring in true Coal-measures. With these plants, at the same locality, are associated small bivalve shells, *Modiola Macadami*, and an annelidan *Serpula omphaloides*, indicative of Lower Carboniferous Shales. At locality No. 5 fossils were collected, showing a correspondence with those of the Lower Limestone shales of Clogher, Tyrone, a place I have visited, where the same small annelid shell, *Serpula omphaloides*, attached to plant stems, was found associated with the Phyllopod Crustacean, *Dithyrocaris Colei*, which Mr. Clark assures me also occurred at this locality, but the brittle character of the specimen observed prevented its preservation. The small Entomostracan Crustacean *Leperditia Okeni*, also characteristic of Lower Limestone shale, was frequent at this locality, and at locality No. 8, with the eminently characteristic bivalve Mollusc, *Modiola Macadami*. At localities Nos. 4, 9, and 10, described on the map as Lower Carboniferous Limestone, a coral *Syringopora geniculata*, some Brachiopods, and bivalve shells, were the distinguishing fossils.

William Hellier Baily.

December 3rd, 1886.

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