Memoirs of the Geological Survey.

EXPLANATORY MEMOIR

TO ACCOMPANY

SHEETS 78, 79, AND 80 OF THE MAPS

OF THE

GEOLOGICAL SURVEY OF IRELAND,

INCLUDING PORTIONS OF

COUNTIES ROSCOMMON, LEITRIM, LONGFORD,
CAVAN AND MEATH.

BY

W. B. LEONARD AND R. J. CRUISE, M.R.I.A.

WITH

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

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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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79–80

PREFACE.

Small portions of sheets 78 and 79 were originally surveyed by the late Messrs. Frederick Foot and G. V. Du Noyer, but the greater portions were subsequently completed by Mr. Cruise during the years 1869 and 1870, and inspected by me in 1870. The whole of sheet 80 has been surveyed by Mr. W. B. Leonard, and was inspected by me in 1871.

EDWARD HULL,
Director of the Geological Survey of Ireland.

Geological Survey Office, Dublin,
3rd February, 1873.

EXPLANATORY MEMOIR

TO ACCOMPANY

SHEETS 78, 79, AND 80 OF THE MAPS

OF THE

GEOLOGICAL SURVEY OF IRELAND.

General Description.

The area in these sheets includes portions of the counties of Roscommon, Leitrim, Longford, Cavan, Meath, and a small tract of about a square mile of the county Monaghan in the N.E. corner of sheet 80.

The principal places in the district are the towns of Mohill, Strokestown, part of Carrick-on-Shannon, Jamestown, Roosky, and Drumlish, with the villages of Drumsna, Dromod, and Ballinamuck, in sheet 78. The towns of Granard, Bellananagh, and Kilnaleck, and villages of Scrabby, Ballinalee, Bunlahy, Crosskeys and Mount Nugent, in sheet 79 and in sheet 80, the towns of Ballyjamesduff, Bailieborough, Kingscourt, Moynalty, and Oldcastle, and villages of Mullagh and Kilmainham.

Form of the Ground.

The western portion of sheet 78 is occupied by low undulating drift-hills rarely exceeding 250 feet; the valleys between the hills being in most cases occupied by alluvial flats. The ground however in the S.W. corner of the sheet N. of Strokestown, rises to a height of 416 feet.

A comparatively elevated ridge formed of Silurian rocks runs from the southern margin of the sheet and occupies the ground between Killglass Lough and the River Shannon. Its highest point is 419 feet, being about 200 feet above the surrounding country.

The ground presents no marked features beyond this ridge, until it again rises and forms a well marked range of hills running from sheet 78 to 79 E. of Drumlish and Ballinamuck, the highest points being Carn Clonhugh, 912 feet, about two and a half miles E. of Drumlish; Carrickateane, 623 feet, about two miles to the N.E. of the latter; Edenmore, 768, about the same distance N. of Carrick ateane, and Crott 686, about three miles N.N.E. of Edenmore. There are hills along this range of lesser elevation, but these are the principal ones.

The watershed between the Shannon and Erne rivers runs along these hills, turning to the S. a short distance S. of Carn Clonhugh.

The next elevations of any importance are Bruse Hill, 851 feet, and a hill to the S.W. of it, 651 E. of Arva. The ground to the S. as far as Granard is occupied by low flat drift-hills and bogs. To the W. of the town is the Moat of Granard, which is visible for

many miles around; its height is only 393 feet, but from its isolated position it forms a remarkable feature.

The other elevations presenting any marked features in sheet 79 are the range of hills running between Kilnaleck and Crosskeys, their summits being 614 and 635 feet, and 633 at Cromwell's Camp N. of Crosskeys, and the range of hills running parallel to but W. of the former, their summits being Ardkilmore, 878 feet, Ardkilbeg, N. of the former, and Denmore, 786 feet, near the northern limits of the sheet.

The main drainage of the district is effected by the River Shannon and the River Erne. The water parting dividing those two drainage areas, runs along the range of hills previously mentioned, namely, Carn Clonhugh, Edenmore, and Crott; at Carn Clonhugh it turns in a north-easterly direction, and again to the S.W., and runs in an undulating line to the town of Granard, which town is situated on the crest of the watershed. From Granard it turns to the N.E. and runs in a gently undulating line in the direction of Kilnaleck, and passes along the summits of the hills between the latter town and the village of Crosskeys.

The Shannon enters the district at its extreme N.W. margin and runs in an irregular direction to the S., passing by the town of Roosky, and enters the northern end of Lough Forbes. In its course it passes through the Loughs Tap, Boderg, and Bofin. It enters the district at an elevation of 136 feet, and leaves at 128; and as its distance is about twenty-two and a half miles it allows only an average fall of one-fourth of an inch to the mile.

The River Erne takes its rise from the northern end of Lough Gowna in sheet 79, and runs in a very irregular line to the northern margin of the sheet about a mile to the W. of Drumcarbon.

Lough Sheelin, which is a very extensive sheet of water, drains directly to the S. through Kinally lough.

R. J. C.

The country in sheet 80 is generally hilly, sometimes rising into considerable elevations; the valleys being occupied by ramifying bogs and alluvial flats.

From this character is excepted the district in the neighbourhood of Moynalty and Oldcastle, occupied by the Lower Carboniferous limestone, which shows low, rounded, gently undulating hillocks.

The most marked feature is the N. and S. range of hills midway between Bailieborough and Kingscourt.

Midway between these towns, and S. of the old road at Loughanleagh, the ground reaches its maximum height of 1,116 feet above the level of the sea; N. of the road, in the hill called Cornasaus, it attains a height of 1,027, and near the margin of the sheet 798 feet.

South of this there are elevations of 988 feet, and at Teevurcher Roman Catholic chapel, in the county Meath, the ground falls to 835 and 634 feet.

A lesser, though more persistent, ridge can be traced from Bailie-

borough, near the northern margin, to the southern margin of the sheet, S. of Mullagh.

At Bailieborough this ridge attains a height of 702 feet; at the cross-roads halfway between Bailieborough and Virginia it reaches its maximum height of 773 feet. Two miles S. at Cuilcagh R. C. chapel, where it throws a small spur towards Virginia, it is 645 feet. Near Mullagh it is 679 feet, and dies out under 500 feet near the southern margin of the sheet.

The valley between this ridge and that of Loughanleagh is drained by the Moynalty river.

A nearly parallel ridge extends from N. of Oldcastle to the northern limits of the sheet.

The greatest height is Slieve Rinan, 829 feet, two miles E. and S. of Ballyjamesduff. North of the Ballyjamesduff and Virginia road it attains elevations of 608 and 696 feet; here it turns S.E. to Virginia, and again N. along the Virginia and Cavan road as far as Billistrig point 487. From this it runs N. and E. leaving the district between Lough Acurry and Waterloo hamlet, 707 feet above the level of the sea. The valley between this ridge and the former is occupied by the Virginia river, principal feeder of Lough Ramor, a large lake S. of Virginia, 277 feet above the level of the sea.

The principal watershed of the country, throwing off on opposite sides the tributaries of the Boyne and the Erne, passes in a north-easterly direction about three miles N. of Ballyjamesduff.

The larger portion of the district is drained southerly and easterly by the previously mentioned Virginia and Moynalty rivers. The waters leaving Lough Ramor take the name of the River Blackwater. The Moynalty river is a feeder of the Blackwater, and is itself a tributary to the Boyne.

The small portion of the sheet N.W. of the watershed is drained by streams to the River Erne.

A small district along the western margin is drained by streams flowing into Lough Sheelin, and another along the eastern by the Dee and Glyde.

W. B. L.

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

Name.	AQUEOUS ROCKS.	Colour on Map.
Recent.	Alluvium, Bog, and other superficial covering,	*Burnt Sienna.*
	Drift or Post Pliocene,	*Engraved dots.*
	Carboniferous.	
Upper Palæozoic.	d^3 Yoredale Beds,	*Light grey.*
	$d^{2''}$ Upper Limestone,	*Prussian blue.*
	$d^{2'}$ Middle or Calp Limestone,	*Prussian blue and Indigo.*
	d^2 Lower Limestone,	*Prussian blue, light.*
	$d^{1'}$ Sandstones in the Limestone,	*Prussian blue and Indian ink, dotted with chrome.*
	Old Red Sandstone.	
	c^2 Old Red Sandstone,	*Indian red, pale.*

Lower Silurian Rocks.

Lower Palæozoic.	b^3 Caradoc, or Bala Beds,	*Pale purple.*
	b^2 Llandeilo Beds,	*Pale purple.*
	IGNEOUS ROCKS.	
D	Diorite (*Greenstone*),	*Burnt carmine and crimson lake.*
G	Granite,	*Crimson lake.*

GENERAL DESCRIPTION.

Llandeilo Beds.—Two small exposures of these rocks occur as inliers in the Caradoc or Bala Beds, associated with thin bands of anthracite. The beds consist principally of brownish slates and shales, with some black shales. It is very probable that there may be other tracts of these rocks in the district particularly along the lines of anticlinal axes, but from the insufficiency of data and absence of fossils it was found impossible to determine them.

Caradoc or Bala Beds.—These rocks occupy a very considerable portion of the district just now to be described. They are all somewhat similar in character to those described in previous memoirs. The grits vary from dark gray to greenish gray, and are generally very massive and thick-bedded, the beds sometimes being fully fifteen feet thick. They are mostly siliceous, and traversed by joints and flying veins of quartz. In some cases the joints are very numerous, which causes the rock to break up easily —in other cases the joints are coated with calcite. These grits pass in many cases into a coarse sandstone and from that to a fine conglomerate, in which the pebbles are nearly always quartz. Examples however of a well marked coarse conglomerate interstratified with the grits and shales occur in several places, the conglomeratic beds ranging from eight to fifteen feet thick.

The slates are mostly grayish green but vary in colour, as nearly black and purple slates are not uncommon, the latter occurring particularly in the neighbourhood of the iron beds. Cleavage was seldom noted in the district, and when noted the angle between it and the bedding was very slight, rarely reaching 10°, and in such cases the slates are very much broken by joint planes and planes of bedding; many of the bands of slate were observed to be slightly micasized. The shales also vary in colour as do the slates, only that black shales were more numerous than black slates. The shale beds are in many cases very much contorted. It may be here stated that the whole of the Silurian rocks in this district have a remarkably persistent strike, which is also continuous through Monaghan and Armagh to the coast of Down. There are some slight peculiarities in many places in the district which are referred to in the detailed description.

The slates are rarely so decisively cleaved as to make good roofing slates, and where the cleavage is distinct it is so interrupted by joint planes, planes of bedding, and bands of unequal texture, that they become shattered into small pieces.

These beds are probably the representatives of the Bala and Caradoc beds of N. Wales.

At one locality in the N.W. of the district the underlying Llandeilo series seem to be exposed. These are black shales, with a thin bed of anthracite. No graptolites were here observed.

Lower Silurian Rocks of Sheet 80.—These strata consist of gray, purplish gray, and greenish gray grits and flags, with layers and beds of gray, green, and purplish shales and slates. The grits are occasionally interstratified with sandstones; these beds are always very massive, sometimes amorphous like a greenstone, and show their composition to be white and pink quartz, red and white felspar fragments in a greenish gray felspathic paste.

W. B. L. and R. J. C.

Old Red Sandstone.—The beds which we consider to belong to this formation, and are coloured as such, are situated in the district of Annaduff, near Jamestown; they rest unconformably on the Lower Silurian rocks. In the original survey of this neighbourhood by Mr. F. Foot, these beds, along with the overlying yellowish, pebbly sandstones, were all grouped as Old Red Sandstone; but Mr. Foot has left a note stating that these lower beds were peculiar, and differed in composition from those which overlie them.

With regard to the yellow pebbly sandstones and conglomerates which underlie the Carboniferous Limestone of this part of the country, we have come to the full conclusion that they are referable to the Carboniferous system itself.* On the other hand, as the red and purple brecciated sandstones which are interposed between these Lower Carboniferous strata and the Silurian grits and slates are apparently unconformable to both formations, and bear some resemblance to Old Red Sandstone strata in the north of Ireland, we consider ourselves fully justified in referring them to that formation.

These beds consist of red and purple pebbly sandstones, and consolidated conglomerate of subangular pebbles of Silurian grits, slates, and earthy hæmatite, evidently derived from the older rocks of the neighbourhood. The beds are of considerable thickness, and are unconformably overlapped both to the north and to the south of the tract by the Lower Carboniferous grits. They occur in two detached portions as shown on the map; no fossils were observed in them.

E. H. and R. J. C.

Lr. Carboniferous Sandstones.—The sandstones in this district are generally fine grained siliceous grits varying in colour from bluish gray and reddish white to yellowish brown. There are, however, a considerable number of coarse well marked conglomeratic beds, the pebbles being about the size of an egg, and in nearly all cases composed of vein quartz and quartzite similar to those of the Longford beds. The fine grained sandstones are in many places very flaggy, and are extensively quarried for building purposes, &c. In the latter beds bands of shale are very frequent. In some places, particularly N. of Drumlish, the series

* See Explan. Memoir to accompany Sheets 86, 87, pages 10 and 11 (1871).

attains a very considerable thickness, but owing to the amount of drift concealing the strata it would be impossible to estimate it.

In the neighbourhood of Granard they are interstratified with the limestones, and in this locality vary from a fine grained siliceous grit to a calcareous grit, which, in some places, weathers to a brown colour.

Carboniferous Limestone.—These rocks attain, in many places in the district, a very considerable thickness, exceeding 1,000 feet from the eastern shore of Kilglass Lough to the western margin of the map, 78. The limestones are, in some places, thick-bedded, coarsely crystalline, from light to steel gray in colour; in others, dark gray and lenticular, with the surfaces corrugated. There are also many beds of dark almost black shale, with layers and nodules of chert, and in many places the limestone is crinoidal and fetid. Some of the beds may be the passage beds to the middle or "calp" series; and, in many places, particularly along the Silurian boundary it is probable that the beds exposed are really belonging to the Middle Limestones owing to conformable overlap; but, if so, it was found impossible to separate them.

They occupy the western portion of Sheet 78, and a band along the southern margin of Sheet 79. In the neighbourhood of Granard they are interstratified with bands of sandstone, both of which are broken by numerous faults.

As regards these beds in Sheet 80, Mr. Leonard observes:—

"They consist of gray crystalline, often crinoidal limestones, or bluish gray, or dark gray, smooth, earthy limestones and beds of shales and flags. Along the base of these beds occur brown calcareous sandstones with layers of purple shale. These beds either die out, change their lithological character, or are overlapped in places; most probably the latter from their frequent occurrence along the Silurian boundary."

The *Calp Limestone, Upper Limestone, and Yoredale Beds* occurring along the great N. and S. fault, on the E. margin of the sheet, are fully dealt with in the Explanatory Memoir of Sheet 81.

Granite of Crossdoney.—An isolated tract of granite shown on Sir R. Griffith's Geological map of Ireland, occurs at Crossdoney, S. of Cavan, the southern portion of which only enters into Sheet 79. Along the south-west and east it is inclosed by Lower Silurian rocks, which preserve their strike generally unchanged up to the very margin of the granite itself. On this ground partly, and also from an examination of the changes in structure which the Silurian rocks present on approaching the granitic mass, we have come to the conclusion that it is of metamorphic origin*. The rock is generally of a white or slightly pinkish colour, consisting of pink or white felspar, quartz, black mica, and sometimes a little hornblende. It is finely crystalline granular,

* The phœnomena observable here regarding the passage during the metamorphic process of the Silurian grits and slates into the form of granite are similar to those which I have observed in the case of the Sleeve Croob Granite near Newry.—E. H.

and good sections are shown in the Cavan Branch Railway south of that town.

Mr. Cruise has observed that the joints are generally lined with calcite, doubtless, derived by infiltration from the Carboniferous rocks which originally overlay the granite itself, and of which a small outlier occurs near the centre of the mass*.

E. H., R. J. C.

D. *Diorite*—One small boss occurs in the district. See p. 24.

Relations between the Form of the Ground and its Internal Structure.

On comparing the account of the physical features already given with the Geological structure of the district, it will be observed that, with the exception of the limestone plateau N. of Strokestown, all the higher eminences are formed of Lower Silurian rocks; while, on the other hand, the Carboniferous Limestone district is relatively depressed, and to a considerable extent overspread by sheets of water, or by bog lands which were once sheets of water.

The comparatively higher elevation of the Silurian tracts is chiefly due to elevatory forces accompanied by denudation subsequent to the Carboniferous period; but there can be no doubt that the original sea bed over which the Carboniferous rocks was deposited was extremely irregular, and that the comparative levels have been to some extent continued from pre-carboniferous periods.

With regard to the denudation of the district to which the physical features are chiefly due, there can be little doubt that the calcareous beds have been largely carried away in the state of aqueous solution. The rivers which drain those districts are ever carrying away large proportions of carbonate of lime into the ocean, due to the solubility of the limestone rocks. On the other hand, the Silurian grits and slates undergo but comparatively little disintegration from a similar cause, the result of this difference of waste, must be relatively to wear down the level of the country occupied by the Carboniferous Limestone.

The N.W. trend of the drift ridges, especially noticeable in the district E. of the Shannon, seems to bear a close relationship to the direction of the glacial striæ, where they have been observed, and which are found to range in approximately parallel directions. As the ridges are composed of boulder clay with large quantities of stones, it may to some extent be inferred that they to some degree represent the trains of gravel and mud which were carried upon the ice sheet, now generally admitted to have been the agent in the formation of the boulder clay itself. These original ridges have subsequently given direction to the minor ones the forms of which were afterwards moulded by the ordinary agents of atmospheric waste.

E. H. & R. J. C.

* This is shown in Griffith's map, and occurs in Sheet 68 not yet published.

Palæontological Notes.

List of the Localities at which Fossils were collected on Sheets 78, 79, and 80.

No. of Locality.	Quarter Sheet of 6-inch Map.	Townland.	Situation, Geological formation, and Sheet of 1-inch Map.
			Lower Silurian Strata.
		County of Cavan.	Sheet 79.
1	37/2	Kill, . . .	One mile west of Kilnaleck, half a mile south-east of Kill Lough, east side of branch road indurated black slates.
			Sheet 80.
2	38/2	Derrylurgan,	Three-quarters of a mile north-west of Ballyjamesduff, in mill-race, a little south of corn-mill; black slates.
3	38/2	Killyfinla, .	On road to Virginia, three-quarters of a mile east of Ballyjamesduff; indurated black slates.
4	34/1	Leitrim and Greagharne, Boundary.	On road to Moynalty, one mile south of Bailieborough; black slates.
			Old Red Sandstone.
		County of Leitrim.	Sheet 78.
5	35/1	Fearnaght, . .	One mile west of Carcascoffy-bridge, a mile east of Longford and Sligo Railway, two miles north of Drumod; coarse sandstone.
			Carboniferous Limestone, &c.
		County of Roscommon.	Sheet 78.
6	11/1	Drishoge and Cortober, Boundary.	Quarries N.W. and S. of railway station, Carrick-on-Shannon; dark gray shales and limestone.
7	11/3	Grange, . . .	Old quarry, south side of road from Carrick-on-Shannon to Hill-street; dark gray shales and limestone.
8	11/4	Corgullion, . .	Railway cutting, one mile south of Jamestown; dark gray shales and limestone.
			Sheet 78.
9	12/3 & 4	Lackagh, . .	On west side of road from Drumsna to Strokestown, half a mile south of Drumsna; dark gray limestone.
10	12/3 & 4	Cartron, . . .	Quarries close to Coralara station for Drumsna; dark gray limestone.
11	17/2	Drummamoodan, .	Old quarry close to road, three miles S.W. of Jamestown; dark gray shales and limestone.
12	29/2	Newtown, . .	Quarry in Deer Park, one mile S.E. of Strokestown; light gray limestone.
		County of Leitrim.	
13	31/2	Minkill, . . .	On old road to Greagh-bridge, one mile north of Jamestown; dark gray limestone.
14	32/3	Gortinty, . .	Quarry, one mile and a quarter east of Drumsna, south side of road from Drumsna to Mohill; black limestone and shales.
15	32/4	Laheen, South, .	Old quarry near Laheen-bridge, one mile and a half west of Mohill; black limestone and shales.
16	32/4	Boeeshil, . .	Quarry close to Union Workhouse, on road to Dromod, a little south of Mohill; black limestone and shales.

List of Localities at which Fossils were collected—*continued.*

No. of Locality.	Quarter Sheet of 6-inch Map.	Townland.	Situation, Geological formation, and Sheet of 1-inch Map.
17	32/4	Killamaun, . .	At Lough Errill-bridge, north side of road from Mohill to Drumsna, two miles west of Mohill; black limestone and shales.
18	35/3	Drumod, . .	Near Railway bridge, three-quarters of a mile north of Drumod station; light gray Carboniferous sandstone.
19	35/4	Clooncolry, . .	Close to Dromod station, Longford and Sligo Railway; black limestone and shales.
20	36/3	Farnaght, . .	About half a mile from the S.W. end of Rinn Lough, four miles S.S.E. of Mohill; black limestone and shales.
21	37/1 & 2	Knockmacrory, .	Old quarry on road, a little N.E. of Roosky bridge; black limestone and shales.
		County of Longford.	
22	4/1 & 3	Tomisky, . .	Quarry north side of road, one and a half miles S.E. of Roosky; dark gray crinoidal limestone.
23	4/1 & 3	Clooncolligan, . .	A little west of railway, one and a half miles S.E. of Roosky; black limestone and shales.
24	4/1 & 3	Ahanagh, . .	Old quarry, one and a half miles north of Lough Forbes, two miles S.E. of Roosky; dark gray compact limestone.
25	5/1	Monaduff, . .	Quarries on south side of road from Drumlish to Aryagh, two miles N.E. of Drumlish; dark gray sandy shales and flags.
26	8/1	Cloonart, South, .	Quarry close to road, a little north-west of Cloonart bridge, half a mile north of Lough Forbes; dark gray compact limestone.
		County of Cavan.	Sheet 79.
27	37/4	Moydristan, . .	Old quarry west side of road, half a mile west of Mullaghboy House, four miles S.W. of Kilnaleck; dark gray compact limestone.
28	41/2	Carrick, . . .	At "Carrick rock," half a mile west of Lough Sheelin, five miles N.E. of Granard; dark gray limestone with cherty bands.
		County of Longford.	
29	10/1	Lislea, . . .	At Lislea-bridge, five miles W.N.W. of Granard; dark gray limestone.
30	10/2	Gallid and Clogh Boundary.	Quarries east and west side of road to Scrabby, one mile N.W. of Granard; dark gray limestone and shale.
31	10/2	Grassyard, . .	Half a mile north of Granard; dark gray limestone and shale.
		County of Meath.	
32	8/1	Ross, . . .	Quarries near Ross Castle, south of Lough Sheelin; gray crinoidal limestone.
			Sheet 80.
33	8/4	Crossdrum, Lower, .	Quarry on branch road from Castlecor to Roman Catholic Chapel, Moat; one and a half miles west of Oldcastle; gray crinoidal limestone.
34	9/1	Fennor, Upper, .	Old quarry one and a half miles N.E. of Oldcastle, three-quarters of a mile N.W. of Newcastle House; dark gray compact limestone.

3. Palæontological Remarks.

Localities from which Fossils were collected.

No. of Locality.	Quarter Sheet of 6-inch Map.	Townland.	Situation, Geological formation, and Sheet of 6-inch Map.
35	9/1	Fennor, Lower, .	Rocks in fields on each side of road to Ballyjamesduff, one mile and a half north of Oldcastle; gray sandstone.
36	10/4	Rathinree, Upper, .	Quarry a little north of Maperath House, one mile and a half S.W. of Moynalty; dark gray limestone.
37	11/1	Moynalty, . .	Quarry east side of road to Kingscourt, a little north of Moynalty; dark gray limestone.
38	11/1	Horath, . . .	Near Newrath, two miles E.N.E. of Moynalty dark gray limestone.
39	5/4	Cruicetown, . .	Quarries two and a half miles E.N.E. of Moynalty, one mile N.W. of Cruicetown House; gray limestone, overlying sandstone.
		County of Cavan.	
40	43/1	Clonkeiffy, . .	Quarry east road to Ballyjamesduff, a little N. W. of Dunowen, two miles north of Oldcastle; Carboniferous sandstone.
41	43/4	Ballaghdorragh, .	Quarry north of road, one mile west of Ryefield, Cross-mill, five miles east of Oldcastle; dark gray limestone and shales.

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

The numbers opposite each name refer to those attached to the localities.
The mark × placed before a number is intended to show the comparative abundance of the species at that particular locality.

LOWER SILURIAN FOSSILS.

Hydrozoa: *Graptolites.*

Species.	Localities.
Diplograpsus pristis, . . .	× × 1, × 2, × 3, × 4.
,, ? gonophores, .	4.
Graptolithus Sedgwickii, . .	× × 4.
,, tenuis, . . .	2, × 4.

OLD RED SANDSTONE.

Plant fragments (stems, &c., undetermined), . 5.

CARBONIFEROUS LIMESTONE AND SANDSTONE.

Actinozoa: *Corals.*

Alveolites depressa, . . .	19.
Chætetes tumidus, . . .	6, 11, 19, 20.
Cyathophyllum ceratites, . .	× 7, 8, 11, 12, ? 15, 16, × × × 19, × × 20, × × 21, 23, 24, ? 26, ? 27, ? 28, ? 29, 30, 39.
Lithodendron affinis, . . .	6, × × 7, 11, × × 13.
,, junceum, . . .	6, 7, 10, 12, 13.
Michelinea favosa,* . . .	12, 19, 20, 23, 26, 28.
Syringopora reticulata (and var. geniculata),	12, 19, 20, 21, 28.
Zaphrentis cylindrica, . . .	7, 8, 11, 15, 16, 17, × × 19, 20, 26, 30, ? 39.
,, Enniskilleni, . . .	× × 19.
,, patula, ...	? 8.
,, Phillipsii, ...	? 36.

* See Explanation 75 for probable synonyms of this species and of Syringopora.

Echinodermata: *Crinoidea.*

Species.	Localities.
Actinocrinus triacontadactylus, . .	7.
,, stems, . . .	20, 32.
Cyathocrinus ,, . . .	32.
Platycrinus lævis, . . .	28.
Poteriocrinus conicus, . . .	39.
,, crassus, . . .	9, × × 19, 28, 32.
Crinoid fragments, . . .	14, × × 15, 16, × 17, 19, × × × 20, × × 21, × × × 22, × × 23, 24, 26, × × × × 27, × × × 28, 29, × 30, × × 31, × × × × 32, × × × × 33, × × 37, × 38, × × × 39, × 40, 41.

Echinoidea.

Archæocidaris Urii ? spine, . .	20.

Crustacea: *Trilobita.*

Phillipsia Derbiensis, . . .	21.

Mollusca: *Polyzoa.*

Ceriopora rhombifera, . . .	20.
Fenestella antiqua, . . .	× × 6, 7, 19, × 20, 21, 38, 39.
,, membranacea, . . .	11, 13, 30, 38.
,, species undetermined, . .	21.
Polypora polyporata, . . .	× 20.

Brachiopoda.

Athyris expansa, ...	12.
,, planosulcata, . . .	7, 10, 11, 19, 20, 22, 28, 30, 33, 36, 37, 38, 39, 41.
,, Royssii, ...	32.
Chonetes comoides, . . .	8, 9, 11.
,, Hardrensis, . . .	6, 10, 19, 20, 38.
,, papilionacea, . . .	12, × × × 31, 37, × × × × 39.
Orthis Michelini, . . .	× × 19, 20, 21, 23, 30.
,, resupinata, . . .	12, 13, 32.
Productus aculeatus, . . .	39.
,, giganteus, . . .	9, × × × 12, 31.
,, punctatus, . . .	6, 7, 12, 28, 32.
,, scabriculus, . . .	7, 9, 11, 19, 20, 24, 38, 39.
,, semireticulatus, . .	6, 7, 8, 9, 11, 13, 15, 16, 19, 20, 22, 23, 24, × 28, 29, 30, × 31, 32, × 33, 35, × × × 36, 37, 38, 39, 41.
Rhynchonella pleurodon, . .	6, × 19, 28, 31, × 33, 34, 39, 40, × × 41.
Spirifera cuspidata, . . .	× 19, 28, 31.
,, glabra, . . .	× × 36, 38, 39.
,, laminosa, . . .	28, 37, × × × 40.
,, lineata, . . .	39.
,, pinguis, . . .	12, 22.
,, striata, . . .	6, 7, 8, 10, 12, 13, 15, 16, 18, 19, 20, 22, 26, 28, 31, 32, × 33, 34, × 38, 39, 41.
Spiriferina cristata, . . .	19, 20, 21, 27, 31, 36, × × × 40, 41.
Streptorhynchus crenistria, . .	6, 7, 11, 12, 19, 20, 24, 28, 30, 31, 33, 36, 37, 38, × × 39, 41.
Strophomena analoga, . . .	6, 8, 11, 19, 21.
Terebratula hastata, . . .	21, 31, 39.

Lamellibranchiata.

Cucullæa ? casts in sandstone, . .	18.
Modiola Macadami, in sandy shales, .	25.
Pleurorhynchus aliformis, . .	22.
,, Hibernicus, . .	24, 33.

Gasteropoda.

Acroculia vetusta, . . .	6.
Euomphalus Dionysii, . . .	13, 38, 39.
,, pentangulatus, . .	12, 31.
,, species undetermined, . .	20, 22.

Species.	Localities.
Loxonema rugifera,	31.
,, suturalis,	? 38, 39.
,, species undetermined,	37.
Natica plicistria,	39.
Heteropoda.	
Bellerophon, species undetermined,	39.
Cephalopoda.	
Nautilus biangulatus,	11, 12, 14.
Orthoceras, species undetermined,	20, 31.
PISCES.	
Helodus lævissimus, Palatal teeth,	17, 33.
Fish palates and fragments undetermined,	33.

REMARKS ON THE FOSSILS.

Throughout the large area of Silurian rocks exposed on Sheets 78, 79, and 80, it was only at a few places organic remains were observed, and these always in black or carbonaceous slates; they consisted entirely of the fossils known as Graptolites, which are exclusively confined to Silurian strata, those observed being characteristic Lower Silurian species.

In the townland of Kill, near Kilnaleck (locality No. 1), pits were sunk in 1854, under the direction of Dr. Whitty, C.E., through these Silurian slates in search of coal,* which he described as being found at a depth of seventeen feet, "the bed of Anthracite appearing to be about four feet average thickness."†

In the detritus of hard black slates which had been thrown out of the shaft, and at a small quarry near it, we found an abundance of the characteristic double-form of Graptolite *Diplograpsus pristis*, which has a row of cellules on each side of the axis, as well as a simple form, having a single row of cellules on one side, *Graptolithus tenuis*, also characteristic of Lower Silurian strata. These fossils are the remains of zoophytes of marine origin allied to the recent Sertularidæ, and offer important evidence as to the marine conditions under which this anthracitic carbon was most probably accumulated.

Similar indurated black slates with the Graptolite *D. pristis*, was found to occur at Killyfinla, three-quarters of a mile east of Ballyjamesduff (locality 3)—they, as well as the preceding, precisely resembling those described as occurring at the Commons of Slane and other parts of the county of Meath—at which place pits have also been sunk with the idea of obtaining coal.‡

No other Silurian fossils but Graptolites, as previously mentioned, were observed in the district included by these sheets of the map, the associated rocks consisting of gray, thickly-bedded grits and shales, with which these black carbonaceous slates containing Graptolites are evidently interstratified; corresponding with strata occurring in the adjacent sheets 81, 91, and 92, where other beds, containing fossils of

* This so-termed coal is very different in its mineral constituents to that of the true Coal Measures, as it contains no bitumen, has an excess of carbon, and exhibits no evidence of vegetable origin, like ordinary gas coal, resembling more the character of Graphite or *Plumbago*. It is possible that it may have originated from the decomposition of marine plants, *Fucoids*, combined with the Graptolites, with which marine animals it is usually associated.

† Journal of the Geological Society of Ireland, vol. vi., pp. 187, &c.

‡ Memoirs of the Geological Survey of Ireland. Explanations to Sheets 91 and 92 p. 20; and 81, 82, p. 13.

Caradoc-Bala age, were observed to be associated with the Graptolite slates, so that it would appear that although these species of Graptolites, with others found elsewhere, and especially in the south of Ireland, are recorded in Murchison's "Siluria" as of Llandeilo age, they, in this country, at least, may be considered to be contemporaneous with the overlying formation—that of the Caradoc or Bala—as before indicated in the remarks on the fossils to sheets 81 and 82, pp. 13 and 14.

The only presumed Old Red Sandstone strata from which fossils were obtained is situated two miles north of Drumod (locality 5), where a section is exhibited in a quarry near the railway of coarse Sandstones overlying micaceous flaggy beds containing plant remains, including large and smaller stem-like fragments, from a half to three quarters of an inch in diameter, some of them being marked with irregularly arranged depressions; it would be hazardous to decide from these fossils whether they belong to Old Red Sandstone or Lower Carboniferous strata.

The calcareous beds or Carboniferous Sandstone interstratified with the Limestone are not very fossiliferous in this district, where fossils do occur, as at localities 18, 35, and 40, they were found to be, as in other places, included in adjoining sheets of the map, characteristic species of the Lower Limestone.

According to the fossil evidence it would appear that the strata observed at localities 6, 7, 8, 9, 10, 11, 12, 15, 16, 17, 19, 20, 21, and 23 on sheet 78; 30 on sheet 79; and 37, 38, and 39, on sheet 80; belong to the Lower Limestone series. At locality 25, sheet 78, the small bivalve shell, *Modiola Macadami*, highly characteristic of Lower Limestone shale, was observed in dark gray sandy shales, and in the same river section some of the surfaces of the associated dark gray sandy flags were covered by black markings, which may have been the remains of Fucoids.

The Limestone was not found to be very fossiliferous, except at a few localities; at locality 22 on sheet 78, and 32 on sheet 79, it was remarkably full of Crinoid fragments, forming a Crinoidal Limestone, and at localities 28 and 31 of the same sheet a great variety of fossils were procured.

WILLIAM HELLIER BAILY.

April 10th, 1873.

DETAILED DESCRIPTION.

For convenience of description the area in sheets 78, 79, and 80 is divided into the following districts:—

I. *Ballintober, North.*
II. *Mohill.*
III. *Granard and Finnea.*
IV. *Arvagh and Ballinalee.*
V. *Silurian district E. of Arva and in the neighbourhood of Scrabby, Kilnaleck, and Bellenanagh.*
VI. *Virginia, Ballyjamesduff, and Oldcastle.*
VII. *Bailieborough, Kingscourt, and Moynalty.*

The hilly and mountainous district in sheet 80 is formed of Lower Silurian grits and slates, and the low undulating country about Moynalty and Oldcastle has Lower Carboniferous limestones and sandstones for its underlying rock.

1. *Ballintober North.*

Lower Silurian rocks.—A comparatively elevated ridge running in a north and south direction is formed, with a slight easterly trend. These rocks lie in the southern portion of the district.

There are numerous exposures from the Cottage, about a half a mile south of Lough Boderg, along the road, and in the high ground to the E. They nearly all consist of hard green, generally amorphous, grits, striking about N. 10° E., the dip being vertical. In the neighbourhood of the Roman Catholic chapel, three-quarters of a mile S.E. of the Cottage, and in the road section to the W., a few beds of red shales and conglomeritic grits were noted.

West of Carrowlaur, one and a half miles S.E. of the Roman Catholic chapel, and at the southern end of Lough Boderg, there are numerous exposures of hard greenish gray and bluish gray grits, the dip in most cases being vertical. South of the last locality, in the neighbourhood of Newtown and Sheerin-street, there are bosses of hard green grits in places slightly conglomeritic and in others ashy looking, the dip in most cases being very indistinct. In the road section, immediately E. of Lough Acrick, there are bluish gray and green grits and shales, in which the dip ranges from 50° to 87°.

At the trig. point, 502° W. of the Lough Acrick, and in the high ground about it, hard massive green grits form bold crags to the E. In a few places in the immediate vicinity of the trig. station a faint cleavage was observed. W. of this, at Gayfield House, there are hard green amorphous grits streaked with red, and in places finely conglomeritic.

In a quarry by the roadside, about a quarter of a mile N.E. of Gayfield House, there are gray shales, with some bands of bluish green and nearly black grits, dipping S.E. at 45°. Midway between Gayfield House and Kilglass Church, to the S., the junction between the Silurian and Carboniferous rocks is remarkably well seen. In the occupation road, leading from the church to some farmhouses on the hill, there is a very fine section of hard amorphous green grits, with a few bands of red shale.

At Rooaun Lodge, south of the church, there are green and grayish shales exposed in the road section, and southwards along the junction of the Silurian and Carboniferous rocks there are numerous sections of green and gray grits and shales, with occasional bands of red shales. At the cross roads, N.W. of Newtown, and in road section, the grits and shales are very much weathered; and, at some farmhouses 300 yards south of the cross roads, there are vertical green shales weathering brown, and showing a slight spheroidal structure. A band of red ochre was also noted in this section. Two hundred yards further S. there is another section, in which the beds are slightly conglomeritic and deeply weathered.

About a mile N.E. of Newtown, at the Trig. Station 323, there are green and gray ashy-looking grits and shales, and in the stream to the E.; also at the Roman Catholic Chapel to the N.E.

Between Loughs Bofin and Boderg, and immediately N. of the Crunkill Lough there are bosses of hard green grits in places slightly conglomeritic, and in the stream running between Loughs Boderg and Crunkill there are reddish and greenish grits and shales. This patch of the Silurian rocks occurs as an inlier in the Carboniferous Sandstones.

d^1. *Carboniferous Sandstone.*—A narrow band of these rocks rest on the flanks of the Silurian ridge in this portion of the district. They consist principally of flags, grits, and conglomerates. Half a mile S. of Lough Boderg, and about the same distance S.E. of The Cottage, quite

close to the Silurian boundary, there are two exposures, the basal beds being coarse conglomerates, and the upper beds, which are seen 200 yards farther N., yellow quartzose flags.

Along the western boundary of the Silurian ridge these rocks are freely exposed. About a mile S. of The Cottage, in road section, and in occupation roads leading to the lake there are numerous exposures of reddish white hard quartzose amorphous Sandstones, in places conglomeritic. Farther S. in the stream, 200 yards N. of Aghamore, there are Yellow Sandstones and flags, and 250 yards S. of Gayfield House, a good section is seen from the road to the lake.

West of Rooaun Lodge at the Silurian boundary there are red flags and shales, and farther S., a little W. of the school-house, there are fine conglomeritic grits, and red and yellow flags dipping westwards at 30°.

At Fairbank and southwards for about a quarter of a mile conglomerates, and red and yellow flags are freely exposed, the average dip being about 30°.

On the eastern flank of the ridge the first exposure of the sandstones is seen in the stream, between the Trig. Station, 323, and the corn mill to the E., where there are coarse conglomerates dipping eastwards at 5°. About a mile and a half N.E. of the last exposure at the "Spa Well" in the bog are Yellow Sandstone flags in "Flanagan's Quarry." West of Newtown to the N., near the boundary, there are conglomerates nearly horizontal, with bluish gray grits weathering brown, and also in the stream 100 yards to the E.

d^3. *Carboniferous Limestone.*—Along the road running to the S. from the Carrick-on-Shannon Station in the extreme N.W. corner of Sheet 78, there are several limestone quarries. The rock, in all the exposures as far as the corn mill W. of Danesfort, may be described as dark gray, irregularly bedded, lenticular, thin, flaggy limestone, with occasional bands of shale, and layers and nodules of chert, some of the surfaces being corrugated. Similar beds form an escarpment along the stream a little further S., S. of the graveyard.

In the railway cutting where it passes beside the bend in the River Shannon, and in the neighbourhood of the old church to the S., dark compact fetid limestone full of corals is exposed.

At Corralara Station, and in its immediate vicinity, dark gray craggy limestone occurs, on which glacial striæ were noted. Similar beds of limestone are exposed along the Jamestown Canal.

Farther E. along the railway, near Moyglass House, there are numerous crags of steel-gray limestone, and at the railway bridge, crossing the Shannon, there is a large flat bed of limestone called the "Dancing Stone," on account of the people assembling to dance on it on Sunday evenings.

Farther S., in the neighbourhood of Prospect Lodge, the Glebe House, Fair Green, and Tully Lodge, crags of steel-gray limestone are freely exposed. West of Tully Lodge, along the western margin of the sheet, and about Rush Hill, and the Roman Catholic Chapel to the S., there are bosses and crags of dark gray compact limestone.

At Hill-Street cross-roads thin bluish gray compact limestone with well marked joints is freely exposed, as also in crags to the S. and E. of the cross-roads, in some of which, particularly in the direction of Ashford Vale, the limestone is more massive and of a steel-gray colour.

South of Cloonahee House, at the avenue gate, there are quarries in light blue compact limestone with well marked joints bearing N. 25° W.

Farther south, in the neighbourhood of Creta House, there are small

terraces formed of steel-gray limestone, the main joints being N. 25° W., and the cross joints W. 10° S.

At Moyglass cross-roads and Ballygarden there are numerous exposures of bluish gray flaggy limestone. Farther south, at Caslan's Wood, the limestone which is similar to that at Creta House forms a series of low terraces.

About 300 yards N. of Strokestown several quarries are opened in dull gray, compact, finely crystalline crinoidal limestone, and at the cross-roads, a quarter of a mile farther N., there are crags of limestone of a rather dark gray colour, finely crystalline, thin-bedded, and full of corals.*

West of the last locality at the cross-roads S. of Gillstown House, and southwards along the Mountain River there are bosses and crags of limestone similar to that last described. On some of them faint, N. 20° E. glacial striæ were noted. North of Fairbank exposures of a dark gray sub-crystalline limestone are seen, the main joints being S.W. and N.E.

Along the eastern shore of Kilglass Lough, as far as Gayfield House, dark bluish and brownish gray limestones are seen dipping to the W. at the high angles of 70° and 80°.

West of Lough Forbes, near the southern margin of the Sheet, bosses of steel-gray limestone of the Burren type are seen near the old church. Similar beds are also seen at Shanvally to the N., and in quarries at the cross roads about a mile south of the village of Roosky, as also at Roosky Bridge.

II.—*Mohill District, including the Country E. of the Shannon, to the boundary of the Silurian Rocks E. of Lough Forbes and Mohill.*

Lower Silurian Rocks.—A small ridge being a continuation of the Silurian ridge already described in the Ballintober District (see page 18), occurs N. of Lough Boderg.

The principal exposures of the rock are seen in the railway cutting, and along the boundary between the Silurian and Old Red Sandstone rocks. Near the bridge, 200 yards N. of the 80th mile-post of the Longford and Sligo Branch Railway, the beds consist of variegated red and green grits and indurated shales, with beds of red hematite.† At the cross-roads at the Roman Catholic Chapel to the N. there are bluish green grits, in which the dip is uncertain. Along the road running from the Chapel to the S.E. there are several exposures of greenish gray grits, particularly near the Sandstone boundary. A good section of hard greenish gray grits is seen in the stream running southwards from a small lake about half a mile E. of the trig. station 288. In the road section running westwards from Corrascoffy Bridge there are fine-grained conglomerates with blue grits and shales, dipping N.W. at 40°.

The remaining exposures of these rocks are seen quite close to the small patch of igneous rock to the N., where they consist of red and

* The following note on the limestones in this locality was made by the late Mr. F. J. Foot:—"The limestones in the neighbourhood of Caslan's Wood are generally dark or dull steel-gray, finely crystalline or compact, crinoidal, and full of corals, exactly like those of the hills S. and S.E. of the town of Roscommon, in fact the Burren type. But they are also undistinguishable from the limestones about Strokestown and the western base of Slievebawn which latter must be Lower Limestone. They are also undistinguishable from the flat beds of limestone at, and S. of, Gillistown Bridge which are apparently flat or nearly so up to the base of the hill eastwards, and therefore must be Lower Limestone.

† For description of iron ores, see page 41.

green shales, and at the cross-roads to the N.E. quite close to the sandstone boundary where there are red and green variegated shales.

c^2. *Old Red Sandstone.*—A band of rocks, which we consider to be in all probability referable to the Old Red Sandstone, rests on the flanks of the Silurian ridge last described. The junction between them and the Carboniferous sandstones is well seen at Corrascoffy Bridge, where the coarse basal conglomerate of the latter is well shown quite close to the former; the Old Red Sandstone at this place consisting of a fine reddish sandstone, with occasional fragments of Silurian slates.

In the railway cutting quite close to the 80th mile-post of the Longford and Sligo Branch Railway these rocks consist of sub-angular pebbles of Silurian grits, slates, and earthy hæmatite dipping to the S. at about 5°. Beds precisely similar are seen at the trig. station 288 to the N., and in the road running to the N.N.E. close to the Silurian boundary, as far as Cloonhoo Lough; the average dip being about 15° to the E., in some cases, however, such as immediately W. of the lake, the dip increasing to from 25° to 30°.

d^1. *Carboniferous Sandstones.*—About two miles E. of Drumsna, and immediately W. of the patch of igneous rock, there are yellow conglomeritic sandstones, and also in road section 200 yards west of the railway bridge before referred to (see page 20); as also in the railway cutting 300 yards N.W. of the 89th mile-post. North of the latter place at the cross-roads quite close to the Silurian boundary there are extensive quarries in yellow flags, very large blocks being easily obtained; the bottom beds in one of these quarries consist of obliquely laminated micaceous yellowish white flags, with fragments of silurian rocks; the next are thick-bedded yellowish white sandstones, weathering freely; the next beds in the quarry are similar, only thinner, while the top beds are still thinner and might be called shales.

At Corrascoffy Bridge before mentioned (see pages 20 & 21) there are coarse conglomerates, nearly horizontal, and yellow flags in a quarry 300 yards N.N.E. of the bridge beside the river. There are no further exposures along the eastern boundary of the Old Red Sandstone, it having been drawn from the shape of the ground.

South of Dromard House, which is about six furlongs west of Lough Rinn, there are some quarries in yellow calcareous sandstone, the upper beds weathering honey-combed along the planes of bedding. West of Dromard Lough there are numerous large sub-angular blocks of a similar sandstone, which has apparently weathered *in situ*.

In the railway cutting at the bridge 100 yards S. of the 88th mile-post, and N. of Dromod, there are light and dark gray micaceous flags, and flaggy sandstones, ripple-marked, with imperfect remains of plants.

A mile S.E. of Drumod, and 100 yards S. of the trig. station 224, white and light yellowish grits, weathering brown in places, are seen in a quarry. A mile and a half E. of the latter place, and about six furlongs W. of Annaveagh Bridge, at the trig. station 194, there are quarries in hard white siliceous grits. Similar beds are exposed in road section to the N., about midway between the latter place and Dromard House.

Two hundred and fifty yards S. of Curraghclady, and about a mile and a quarter W. of Drumlish, there are crags of coarse conglomeritic grits, and at Corroosely to the N., similar beds are well exposed in the road section, the main joints being about N.E.

At Briskil Lower, three miles S.W. of Drumlish, the coarse conglomerates with pebbles of jasper are succeeded by calcareous grits, which probably are the passage beds into the Lower Limestone.

In the stream crossing the new road between Ballinamuck and Drum-

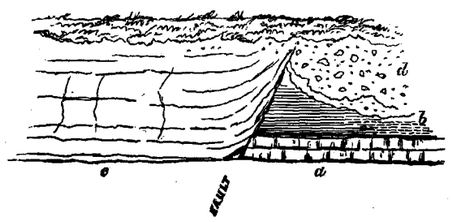
lish, about a mile and a half N.E. of the latter place, gray and yellow flags were noted, in which the late Mr. Foot found plant remains. A quarter of a mile to the E., near the fault boundary, there are large exposures of coarse conglomerates; N.W. of this, in the neighbourhood and S. of the Roman Catholic chapel, N. of the line of fault, the sandstones which are in places coarsely conglomeritic and in others fine hard siliceous grits, are freely exposed. All these rocks are ice-planed, and in many cases retain a N. 30 W. striæ. At the cross-roads S.W. of the fault at Dermot and Grania's Bed, and W. of it, white sandstones and conglomerates are again seen in numerous crags and bosses.

About six furlongs N.E. of the Roman Catholic chapel, near the mill, coarse conglomerates are seen resting directly on the edges of the slates and grits. About two miles further N., a small outlier of coarse conglomerates forms a knoll immediately over Fearglass Lough.

At the village of Ballinamuck there are extensive quarries in yellow flags and grits.* There are also several exposures of conglomerates and grits a little to the N.E. of the village.

At the Roman Catholic chapel, about a mile and a quarter E. of Rinn Lough, the boundary between the sandstones and limestones is shifted by a small fault, the sandstones being of a yellowish gray colour, with well marked joints N. 10° to 12° W., the cross joints being E. 10° S. The following sketch of the fault was taken at the brook on the N. side of the occupation road.

Fig. 1. Sketch showing Fault Boundary between Limestones and Sandstones.



a. Thin black or dark blue earthy Limestones
b. Black shales.
c. Thin yellow and gray Sandstones.
d. Boulder clay with Limestone boulders.

About a mile E. of Cloocoe Lough there is a quarry in white quartzose sandstones. Half a mile E. of Lurgan House, about two and a half miles N. of the fault, ripple-marked yellow flags are seen in road near some farm-houses, and also in the stream running to the S.

On the eastern side of Keeldra Lough there are coarse conglomerates and white quartzose grits freely exposed. At Mount Ida, to the N. of the lake, there are numerous bosses of a fine grained white quartzose sandstone, with well marked joints N. 20° W. East of Lough Keeldra, at the Skeahoges, conglomerates and fine grained sandstones are again freely exposed, and about a third of a mile to the N.E., coarse conglomerates are seen by the roadside directly resting on Silurian shales and grits.

* The following note was made by the late Mr. Foot:—"*Ballinamuck quarries.*—Beds from two to three feet thick; these can be 'cleaved,' 'split,' or 'pooled' into flags of two or three inches. The two-inch flags are the best, and are sold at 2*s.* per square yard."

North of Mount Ida, at Drumloughan, white sandstones were noted in the stream, dipping to the N. at 20°. No further exposures of these rocks were noted in this district.

Carboniferous Limestone.—There are several quarries in dark shaly limestone E. of Shannon Lodge, in the extreme N.W. corner of this district. By the side of the road, 250 yards S.E. of Creagh Bridge, there are quarries in thin shaly dark limestones, the surfaces being in some cases glaciated.

Quarries in similar beds were also noted at the cross-roads to the S.E. above the bend in the River Shannon, and at the road N. of Mount Campbell House.

East of Drumsna, at the cross-roads N. of Gortinty Lough, a quarry was noted in dark compact limestone with shale partings, and another in similar beds S. of Mucklaghan Lough to the N.E. Limestone is freely exposed along the S.E. shore of Gortinty Lough, the most northern beds being dark gray and compact. Half a mile N. of Lough Forbes, near the southern margin of Sheet 78, and 200 yards N.W. of Clonart Bridge, thin-bedded dark blue shaly limestone is seen in a quarry with well marked glacial striæ N. 27° W. Further N., between the latter place and the railway, there are several quarries in similar beds. Half a mile S.E. of the old castle, on the eastern shore of Lough Forbes, in the demesne, there are blue, gray, compact limestones, dipping to the S. at 18°; and further E., in the railway cutting S. of the Silurian boundary, and in fields W. of it, there are extensive quarries in very dark, nearly black, thick-bedded, earthy, and siliceous limestones, all dipping to the S. at angles ranging from 10° to 20°. North of Briskil Lower, and about two miles W. of Drumlish, quarries were noted, the limestones in the quarry to the N. being dark gray, finely crystalline, while those to the S. are in some places of a light gray colour, waterworn and rugged.

At the Drumod Station dark blue, shaly, fetid, fossiliferous limestone occurs. Similar beds were also noted a little N.E. of Roosky Bridge, at the railway cutting W. of Aghamore House, in the stream dividing the counties of Leitrim and Longford, and at the bend in the River Rinn, to the E., E. of the Roman Catholic Chapel; some of the beds in the latter place being finely crystalline.

Two miles N.N.E. of Drumlish, in the stream crossing the old road leading to Ballinamuck; there are two patches of dark gray shales and flaggy limestones brought in by a fault, downthrow to the S.W. Well marked joints, W. 20° N. and N. 20° W., were noted here.

The next exposure of the limestones occurs about four miles to the N.W., near the Roman Catholic Chapel W. of Lough Rinn. The boundary here is also a line of fault. West of Lough Rinn, at the cross roads between it and Drumard Lough there is a quarry in dark blue impure limestone, weathering brown.

In the stream at the Bridge of Mohill, flaggy and shaly limestone is freely exposed, as also to the W. at Drumdoo, Laheen, and Lough Erril bridges.

Similar beds are also seen at the cross roads N. of Mohill and S. of Gortfadda. Half a mile E. of Gortfadda at the stream crossing the old road, there are numerous exposures of a light gray highly crystalline limestone, dipping eastwards at 50°. Farther E., at the small lake W. of Drumkeilvy Upper, similar beds are also seen dipping N. at 20°, and also at Drumkeilvy Lower, the beds undulating at the latter place.

At Riverstown to the W., where the Cloone River bends and runs

along the road, thin-bedded, dark gray crinoidal limestone, with some chert bands occurs, as also in the stream running into the river from the N. S.S.E. of Riverstown, near the Sandstone boundary, quarries were observed in black, compact, earthy limestones, with brown shales.

Diorite.—A small boss of coarsely crystalline amygdaloidal diorite of a dark green colour occurs in the Silurian rocks E. of Drumsna, between Gortinty and Cloonbo Loughs.

III.—*Granard and Finnea District.*

Lower Silurian Rocks.—S.E. of the southern end of Lough Gowna, near the fault boundary, gray conglomeritic grits with slate layers dip to the N. at 70°. At the Roman Catholic Chapel in the town of Granard, hard gray grits dip N.W. at 65°, and in the town flaggy grits with shaly layers are freely exposed. The junction between these rocks and the Carboniferous rocks to the N. is a line of fault. In the old road W. of the work-house dark gray and greenish flaggy grits are vertically folded.

At the cross roads at Ballydaly, N. of Granard, dark gray Silurian grits are seen, and also in the neighbourhood of Cloghchurnel Upper and Aghnagarron, near the fault boundary. In the road section near the termination of this fault, dark gray slates are seen, and a large boss of hard massive greenish gray grits in which the bedding is obscure occurs a quarter of a mile N.N.E. of the last locality.

Silurian slates and grits are seen *in situ* at the cross roads E. of Granard, near the Sandstone boundary, and in several places close to the boundary as far as Creevy Upper, the dip being as a rule rather obscure.

At Creevy Upper gray Silurian slates, with a well marked N. 60° E. cleavage, dipping S.E. at 80° were observed.

Carboniferous Sandstone.—About a mile W. of Bunlahy, Yellow Sandstones were said to have been quarried; angular debris of them were noted about the place; on this evidence the band of sandstone along the Silurian fault boundary was inserted.

Along the south side of Granard there are three bands of sandstone interstratified with limestones, and terminated to the N. by the line of fault which runs through the town.

At the Moat of Granard the lowest beds consist of Yellow Sandstones, the next in ascending order of Yellow calcareous Sandstones, with thin layers of fine gravelly conglomerates formed of quartz and black slate, and the top beds which are seen at St. Patrick's Well, S.W. of the town, of calcareous Yellow Sandstones. Many exposures of these rocks are seen to the E. at the places indicated by the arrows on the One-inch Map, and are supposed to tail out eastward, owing to conformable overlap along the margin of the Silurian rocks, and partly owing to the wedging out of an intermediate band of limestone.

North of Granard there are five bands of sandstone, interstratified with limestones, striking in a general N. 10° W. to N. 20° W. direction, and terminated to the S. by the fault passing through the town, and on the N. by an E. and W. fault about six furlongs N. of the town. The following is a description of the section, including the associated limestones, commencing at the lowest beds in the lane W. of the union workhouse. Fine-grained grits, dark gray compact limestone, gray calcareous sandstone weathering brown, black compact limestone, yellow and gray calcareous sandstone, black compact limestone (very narrow band), gray calcareous, weathering brown, and passing into a yellow quartzose sandstone, dark gray compact limestone, and yellow sandstones; the exposure

of the latter band being seen near the church, and thinning out in a northerly direction before reaching the fault. On the N. of the E. and W. fault are two circular bands of sandstone, terminated to the W. by a N. 20° E. fault, and to the S. by the E. and W. fault. The upper band forms an escarpment about thirty yards N. of the E. and W. fault, and consists of irregularly laminated pale brown and yellow grits, in places flaggy, the surface of the beds in many cases being ripple-marked. Between these sandstones and those to the N. a band of dark gray compact limestone is seen. The band of sandstones on the N. are principally yellowish grits and gray calcareous sandstones, weathering brown.

N.W. of these two bands of sandstone are two more also terminated by lines of fault, one of the faults being that already referred to as the N. 20° E., while the other, which is more to the W., is a very large nearly N.S. fault with a downthrow to the W. There are quarries in the most southern of these bands a little W. of the road W. of Rockfield House, where a narrow band of limestone, supposed to thin out to the E., is also seen.

At Rockfield House there are several quarries in gray calcareous grits, weathering brown, the dip in many cases being very indistinct.

N. of this band, quite close to the quarries are other quarries in dark gray compact limestone, the upper beds being flaggy, with earthy shale partings. The northern boundary of this band of limestone is supposed to be a line of fault, repeating the beds of sandstone to the N. Exposures of these bands are seen at the cross roads W. of Rockfield House, and in the field to the N. of the cross roads, where they consist of light gray and greenish calcareous grits, with brownish and purplish sandy shale layers. The latter band is also seen in quarries to the E., by the roadside 250 yards N.E. of the National school, where the beds dip S.E. at 30°, and weather of a rusty brown colour. A band of limestone separates this band of sandstone from that to the N. Quarries were opened on it 100 yards W. of the last described exposure of sandstone, and also immediately W. of the cross roads last mentioned, where the limestones which are flaggy and dark gray, are rolling slightly, it being however only a local curve.

At the cross roads between this and Clanboy Bridge to the N., there are quarries in dark gray compact limestone, coarsely bedded, with some shale partings.

East of Clanboy Bridge, in the occupation road, are seen yellow sandstones and gray calcareous grits, as also at the fort S. of Mullinroe Lough, and E. of it along the limestone boundary. Separating this band from that to the N. is a narrow band of limestone, exposures of which are seen immediately N. of the sandstones, 300 yards to the N.E. of Mullinroe Lough. One hundred yards N. of the limestones there was a quarry in yellow sandstones which is now filled up, but they are well seen to the E. in the drain leading from the farmhouses, near the fault boundary, where the top beds consist of soft, pale, yellowish brown, micaceous sandstones.

These sandstones are displaced to the W. by a slight N.E. fault, a little W. of Mullinroe Lough, but no exposures of them were noted, the evidence for the fault being the band of limestone which is seen in quarries at the occupation road, 200 yards W. of the last mentioned lake.

The following section from Granard, and passing close to Clanboy Bridge to the N.N.W. illustrates the position and relations of the beds to each other in the section just now described. (See section, fig 2.)

A band of sandstone has been drawn from Creevy Upper, along the margin of the limestone to Mount Nugent.

The evidence for this band is very slight, owing to the thick covering of drift which conceals the rocks, but it is very probable it occurs as indicated. Sub-angular blocks and boulders are noted close to the church N. of Sara Cottage on the shore of Lough Sheelin and at the village of Mount Nugent, where large blocks of yellow sandstone are scattered all over the ground. The sandstones are seen *in situ* a short distance E. of the village, and are described by Mr. Leonard (see page 36). The outlying patch of sandstone to the S. of Mount Nugent, forms a distinct feature. Exposures of it are seen in the road quite close to the lake where the sandstones are of a pale yellowish colour.

Carboniferous Limestones.—West of Bunlahy, and at the southern boundary of the patch of sandstones engraved on the map, near the road, there are black and dark gray finely crystalline limestones, and at the cross-roads to the S.E. there are quarries in dark gray, thick-bedded compact limestone.

The village of Bunlahy is built on a knoll of dark gray earthy compact limestone with sandy shales and flags, and there are quarries in similar beds a short distance W.S.W. of the village. There are also several quarries along the road leading to Granard, as far as the cross-roads N. of Ballymore, some of the top beds near the cross-roads being of a gray colour and thick-bedded. Along the road leading to the fault boundary to the N., and also along the road branching from it to the E. and leading to the large N. and S. fault, there are several exposures of dark gray compact limestone generally with shale partings. In the stream which flows into the southern extremity of Lough Gowna, and close to the boundary fault of the limestone, the beds are seen dipping northward in the direction of the Silurian rocks, which proves that the boundary is here a fault.

Between Ardolagh and Anneville W. of Granard, there are several quarries, the limestones in some being dark gray, compact, evenly bedded, with black chert seams, while in others, particularly those near Anneville, the limestone is of a lighter colour and more crystalline.

At the cross-roads N.E. of Anneville, dark gray compact limestone is also exposed, and in quarries in the occupation road leading from the cross-roads to some farmhouses, as

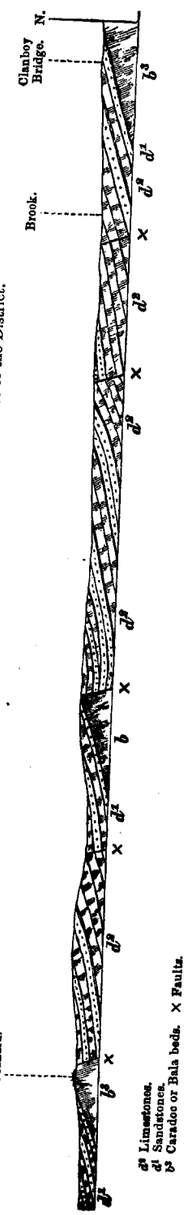


Fig 2. Section from Granard to Clanboy Bridge to illustrate the structure of the District.

also in a large knoll to the E. where the limestone is very compact with shale partings.

In the old road leading from the cross-roads last referred to, to the town of Granard, dark gray compact limestone is freely exposed.

There are several exposures of dark gray compact limestones, similar to those already described to the W. of Granard in quarries and knolls, which require no further notice.*

About a mile E. of the town close to the Druid's Castle, there are quarries in dark gray compact limestone, as also at Tober Felin to the S. of Creevy Upper, quite close to where the limestones thin out; there is a quarry in which rusty impure limestone three feet thick is separated from pale gray sandstone by two bands of black shale with a narrow band of sandy shale between them, the three bands being thirteen inches thick.

North of Bracklagh, and about 300 yards E. of the railway there are several quarries in dark gray compact impure limestone. N.E. of the latter place there are extensive quarries, known as the Carrick Rock quarries.

The limestone at this place forms an extensive knoll, there being over 100 feet thick of the beds exposed. The lower beds consist principally of flaggy dark gray compact limestones, the middle beds of pale gray crinoidal limestones, and the upper beds of dark gray irregular limestones, full of chert nodules, which in some cases are so arranged as to resemble rude oblique lamination.

The middle beds are extensively used for slabs, blocks, and gravestones, and among them were noted some beds consisting of an agglomerate of crystalline gray limestone pebbles, cemented in a matrix formed entirely of crinoid fragments, with a few spirifera. Some of the upper beds are remarkably fetid.

About half a mile W. of Mulghboy House there is a quarry quite close to the road, in dark gray crystalline limestone, in which the main joints are N. and S., and E. 15° S. North-east of the latter house, and quite close to Kilnahard House, pale gray crystalline limestone is observed rolling.†

At the Church, to the N.E., limestone was quarried, but the quarry is now filled up. Farther E., at Woodlawn, and at the Corn Mill, quite close to the lake, several quarries in dark gray compact thin-bedded limestone, with shale partings, were noted, as also at the cross-roads to the N.

South of the village of Mount Nugent, and about 250 yards S.E. of the old R. C. Chapel at Crossralt, there is a knoll of elliptic shape formed of beds of various thickness of pale gray finely crystalline limestone, with layers and nodules of chert. Similar beds are exposed at the cross-roads N. of the chapel.

In the road section immediately west of the small knoll of Sandstone S.W. of the chapel, pale gray crystalline limestone was raised, but the quarries are now filled up.

There are numerous small islands in the lake quite close to this, the principal of which are Sheep Island, Wall Island, and Inchacup Island. They are all formed of large angular blocks of gray crystalline limestone, the solid rock being just beneath the water.

At Ross Castle, and at the lake margin N. of it, highly crystalline pale gray limestone is freely exposed. At the lake the surface of the rock is in many places deeply excavated by water action into wide fissures,

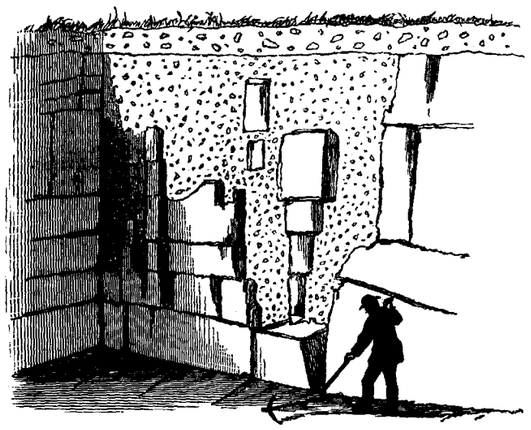
* The limestones interstratified with the sandstones in the neighbourhood of Granard have been already referred to when describing the latter rocks (see page 25).

† These beds resemble those at Curry Rock, S. of the lake. See Memoir, Explan., 89 and 90.

which are filled with brown clay and drift, the latter being entirely local, consisting of a breccia of chert fragments and pale gray limestone.

South of the Castle are the well-known Ross Quarries, of one of which the following diagrammatic sketch was made by the late Mr. G. V. Du Noyer :—

Fig. 3.—Ross Quarry.



The upper beds are pale gray highly crystalline limestones, but in depth the beds gradually become more siliceous and difficult to work. The limestones in these quarries are quite undistinguishable from those in the Ardbrackan Quarries, W. of Navan.*

The deep hollows and trenches which have been worn in the old surface of the light gray limestone, as shown in the above sketch, are filled with stiff brown marly clay, containing a fine breccia composed entirely of chert fragments in various states of decomposition. The superficial deposit is the ordinary limestone gravel.

There are many small islands in Lough Sheelin, in addition to those already referred to. The principal are Church Island, Gull Island, and Sporting Rock. They are all formed of bare rock weathering similar to that already described at the margin of the lake N. of Ross Castle.†

Middle Limestone, or "Calp."—About four miles W. of Granard, at the cross-roads E. of Ballinalough House, S. of Bunlahy, pale gray, finely crystalline, dolomitic, thick-bedded limestone is freely exposed in knolls and bosses. South of the cross-roads, along the River Rhine, flaggy

* See Ex. Mem. Geo. Survey, 89 and 90.

† The following are the prices as furnished to the late Mr. G. V. Du Noyer, by Mr. Ahern, the lessee and manager of the Ross Quarries :—

Rough stone, 1s. per cubic foot at quarry.	Arch stones, punched, 1s. per foot.
Window sills, 1s. 3d. per superficial foot at quarry.	Headstones, 5 ft. by 4 to 6 ft., £5 to £6, with letters.
Gate posts, rough, 35s. per pair at quarry.	Chiselled quoins, 1s. 6d. per superficial foot.
Ornamental do., £6 to £7 per pair at quarry.	Any superficial work, 1s. 3d. to 1s. 6d. per foot.
Tombstones, 7 ft. by 3½ ft., £10, with cut pedestals.	

black earthy limestone, with shale partings, dip S. at 10°. These beds may be near the passage beds between the Upper and Middle limestones.

No further exposures of this division of the limestones were noted in the district, the evidence for the band of Upper limestones S. of Lough Sheelin along the margin of the map occurring in the sheet to the S. (89).*

IV.—*Arvagh and Ballinalee District, including the Silurian Country West of Lough Gowna.*

Lower Silurian Rocks.—East of Lough Forbes in the railway cutting there is a fine section of these rocks, consisting principally of grayish green grits with occasional bands of red shales, dipping at low angles to the S. N. of the bridge they are contorted and rolling. Numerous exposures of green and gray grits are seen in the rising ground to the N.E. as far as the hamlet of Leitrim. At the hamlet and E. of it green and gray grits dip to the S.S.E. at 80° to 87°.

In the road running to the S.W. from the town of Drumlish green grits are seen dipping at low angles to the S.E. Similar rocks are also freely exposed for about half a mile in the road running in a S.W. direction past the Drumlish Church.

At the corn mill N.E. of Drumlish, green and bluish grits are seen with small veins of calcite and specs of copper pyrites. Crags of green grits and gritty shales are very numerous in the ground to the N.E., in some cases there being numerous exposures of bright red and green variegated shales, the dip in all these rocks being very indistinct. At the junction in the stream about a mile and a quarter N.E. of the corn mill there are hard green grits and shales dipping to the S.E. at 40°.

At Carn Clonhugh, S.E. of Drumlish, and in the high ground E. and W. of it hard gray and green grits with occasional bands of red shale are freely exposed, striking in a N.E. direction, the rocks being nearly all polished and planed and in some cases apparently retaining the ice striæ.

In the stream running from the N.N.W. to the margin of Sheet 78, S.E. of Carn Clonhugh, there is a fine section of blue ashy grits with black shales, the latter being full of iron pyrites ; and in the stream, to the E. at Glen Lodge, N. of Ballinalee, the following section which is over half a mile in length is seen ; commencing at the N., the beds consist of crumpled jet black shales, then blue shales, black shales rolling, bluish grits, black and gray shales, blue shales, black shales, brown shales, blue grits, gray shales, coal black shales apparently vertical with quartz veins, and particles of iron pyrites and green grits and shales. The coal black shales may be the representative of the anthracite bed in the neighbourhood of Kilnaleck, which shall be afterwards referred to—the section very much contorted. Immediately opposite Glen Lodge, the late Mr. Foot considered there was an unconformability in the Silurian rocks, but when visited by Professor Hull and myself we were unable to observe anything which could safely be considered as an unconformability. In the stream farther E., N. of Lislea Bridge, another section in dark gray and black grits and shales is also well shown—the beds nearest the boundary consisting of decomposing black shale, like a coal smut, with decomposing grit bands.

S.S.E. of Ballinamuck, near the corn mill, in the mill race, there are green and gray grits with red shales dipping S.E. at about 30°, and farther E., near the eastern margin of the Sheet, similar rocks are exposed in stream dividing the townlands of Aghadowey and Edenmore.

* See Ex. Mem., Geo. Survey, 89 and 90.

At the corn kiln, S. of Ballinamuck, before referred to (see page 22), red and gray shales and green grits are capped by coarse Carboniferous conglomerates. Along the stream running from the N.N.E. to Ballinamuck Bridge, coarse gray grits are seen in several places, and westward at Fearglass Lough green grits with quartz strings and veins dip to the S. at 35°.

At Keeldra Lough, about three miles N.N.E. of Fearglass Lough, greenish grits are seen along its eastern margin quite close to the sandstones, and N. of the lake near Mount Ida, there are quarries in green shales. The next exposure of the Silurian rocks in the N. of the Sheet is shown about a mile E. of the head of Lough Keeldra where the sandstones are seen resting on them. (See page 23.)

At the trig. station 623, about a mile from the western margin of Sheet 79, and three miles N. of Ballinalee, and along the high ground to the trig. station 768, there are numerous exposures of greenish and grayish grits and shales, ice-planed, and in some cases striated. In the vicinity of the trig. station 768, there are numerous beds of red shales and grits, full of quartz strings and veins. Trials were made in those beds for iron ore, as it was supposed the Cleenrah iron beds extended in this direction.* N. of the trig. station, at the eastern shore of Annagh Lough, green grits and shales are seen, and at the N.W. end of the lake in the occupation road, blue and purple grits, and blue slates occur, as also to the N., just at the margin of Sheets 78 and 79.

At Kiltycon, N. of the lake, and at the Roman Catholic chapel at the cross-roads to the N.E., and in the high ground about the trig. station 508, green and gray grits with occasional bands of shale are polished and striated.

At the Moyne cross-roads there are quarries in gray grits and shales, and at Lough Nabock, and at trig. station 686, to the S., gray and greenish quartzose grits, full of quartz strings, and occasional bands of shale are freely exposed.

Along the old road from the cross-roads to Guinikin Bridge a little W. of Arva, there is a fine section of green grits, purple flags, and light blue shales dipping, to the S.E. at angles ranging from 20° to 40°. The same beds are also well exposed in the high ground to the S. as far as Horsepark, the dip slightly increasing.

In the river at the town of Arvagh there are gray grits in which the bedding is very indistinct, and in the wood at the back of the town greenish gray thick-bedded grits, with occasional dark beds of shale, dip to the S.E. at 40°. Similar beds are seen also on the southern shore of Garty Lough, the dips ranging from 15° to 30°. Gray and green grits are also seen along the eastern side of Lower Lough and at Gulladoo Lough near the northern margin of the Sheet.

Between Arvagh and Enaghan Lough to the S. there are gray coarse grits in which the bedding is very indistinct. W. of the lake there are greenish gray quartzose grits, and a little S. of the old road there are some hæmatite bands in the Silurian grits.†

In the stream running into the extreme N.W. end of Lough Gowna, near the old castle, green and gray grits and dark shales are exposed. Greenish gray grits and slates are also seen at the cross-roads at the N.E. end of the lake dipping S.E. at 65°.

About a mile to the W. of Cornadrung Cottage the following section is exposed in the stream; commencing at the road and proceeding westwards, are gray and blue crumpled shales, dark crumpled shales, light

* For description of these beds, see page 41. † See page 41.

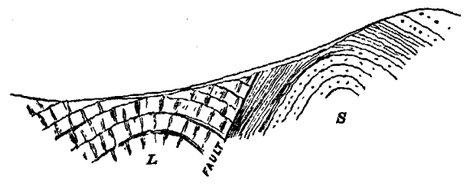
gray and dark crumpled shales, gray and blue shales contorted and micasized slightly, gray and blue shales, light gray shales contorted, three beds of iron ore * with purple slates and shales associated, and grayish blue shales.

Farther S. in the stream N. of the Roman Catholic Chapel greenish gray grits and ferruginous shales are seen, and also in the stream E. of the chapel, and S. of the Tuck Mill, where the grits are more massive, and are full of quartz strings. At the trig. point 484, to the S., and in the old road running to the S. as far as the cross-roads N. of the trig. station 632, there are exposures of grits with shale partings and rotten gray and black shales.

At the cross-roads and in the road leading to the W. bands of ochre are associated with the gray and black shales.

Carboniferous Limestone.—At the boundary, which is a line of fault, between these and the Silurian rocks at Lislea Bridge the limestones are massive and thick-bedded, and near the junction dip towards the Silurian rocks, while S. of the bridge they dip to the S. The following sketch was made by Mr. Hull when visiting the district :—

Sketch, Fig. 4.—Showing the relations of Carboniferous and Silurian Rocks S. of Lough Gowna.



L. Carboniferous Limestone.
S. Silurian rocks.

About a mile S. of the bridge, near Kilshruley House, there are quarries in thin, black, flaggy, compact, limestone, with occasional layers and nodules of chert.

At the village of Bunlahy there are several quarries of dark gray crystalline limestone, some of the beds having nodules of chert. The late Mr. Foot considered that those might be the junction beds between the Lower Limestone and the calp.

V.—*Silurian District E. of Arvagh, and in the neighbourhood of Scrabby, Kilnaleck, and Bellananagh.*

Llandeilo Beds.—About a mile and a quarter W. of Kilnaleck, in the townland of Kill, there were two shafts opened on a narrow band of anthracite,‡ interstratified with brownish shales, in which the characteristic Llandeilo fossils were found. A continuation of these rocks were seen in the occupation road near the Roman Catholic Chapel, about a mile S.W. of the latter locality.

Caradoc or Bala Beds.—From the S.E. corner of Garty Lough, N. of the town of Arva, to the Roman Catholic Chapel to the N.E., near the northern margin of the Sheet, there are numerous exposures of thick-bedded massive quartzose grits in which the bedding is very indistinct.

* See page 41 for description.

East of the chapel there is a comparatively elevated ridge running in a S.W. direction, passing to the W. of Bruce Hall.

At Drumroe Lough, near the northern margin of the Sheet, there is a large exposure of green grits full of quartz strings, with some bands of blue slate. This exposure is known as the Aghanock Rocks. West of Drumroe Lough, in the road and stream from the corn mill, there are greenish grits and shales seen in several quarries.

In the old road crossing the eastern shoulder of Bruse Hill there is a very fine section exposing purple and gray slates and flags dipping S.E. at 70°. West of the Trig. Station 851, the western side of the hill is rather precipitous, and the rocks are slightly contorted, but in other respects similar to the beds on the east side.

The exposures in the road section, about two miles S.W. of the Trig. Station 851, consist of greenish gray massive quartzose grits, full of irregular quartz veins and strings, the bedding being as a rule very indistinct, and the rocks are traversed by numerous joints, the principal bearing from N. 30° to N. 40° W.

About two miles W. of Bruce Hall greenish quartzose grits, in places slightly conglomeritic, and in others associated with blue and purple shales, are freely exposed in the high ground S. of the main road. The main joints are N. 35° W., the general dip being to S.E. at high angles.

South of the latter locality, along the River Erne, and in the high ground to the S. of the river, the rocks are principally gray thick-bedded grits, with some slates and shaly beds, all full of quartz strings.

At the bend of the river, W. of the Trig. Station 290, ribbon slates form a small knoll. The dip of these beds is to the N.W., thus showing the existence of a synclinal axis between them and those to the N. North of the last locality, along the granite boundary S. of River View, there are several small knolls of greenish gray grits.

At the Bleach Mills to the S. massive thick-bedded grits are seen, and are known as the Lackan Rocks. In the stream quite close to the granite boundary, N. of the mills, gray shales were noted dipping to the S.E. Frequent exposures of grits and shales are seen along the road quite close to the granite boundary, as also in the neighbourhood of the Roman Catholic Chapel and trig. station 419, W. of it. In the railway cutting, quite close to the chapel, there is a very fine section in greenish thick-bedded grits.

In the old road, S. of the Roman Catholic Chapel, as also in the railway cutting as far as the 79th mile-post, and about 200 yards below it, blue and gray grits and shales are seen.

There are also several exposures of similar beds close to the road running under the railway, as also on western side of Oghill Lough.

At the bend in the road N. of Lough Dawan, which lies about a mile and a quarter S.W. of the last mentioned lake, gray grits are seen dipping to the S.E. at 70°; at the margin of the lake there is a boss of very quartzose grits in which the bedding could not be seen.

Coarse greenish grits are seen to the S. at the southern end of White Lough, and also still farther S. to the E. of the Black Lough, where they are associated with some bands of shale. A small boss of dark gray shales and fine thin-bedded grits is seen at Sallaghan Lough W. of the White Lough. Similar beds were also seen by the side of the lake S.W. of the trig. station 321.

A few exposures of greenish gray quartzose grits were noted in the neighbourhood of the trig. point 410, N. of the village of Scrabby.

About two miles S. of Scrabby Bridge, W. of Mullanalaghta Roman Catholic Chapel, there is a small ridge of irregular broken ground, formed

by a series of hummocks in which the rocks which are hard greenish-gray grits weather *in situ*.

In the old road running from the chapel to the lake greenish grits are exposed in several places, and the ground is covered with angular and semi-rounded fragments of Silurian grits and shales. At the margin of the lake near the corn-mill, there are two knolls of hard quartzose grits.

East of Mullanalaghta and quite close to St. Patrick's well, the ground is high and irregular, and is formed of broken and pointed masses of grits with a thin coating of drift. Where the rocks are exposed they are hard dark gray quartzose grits, the bedding being very obscure.

In the town of Bellananagh at the Roman Catholic chapel, green and gray grits are seen, and at the cross-roads to the S. of the town, the junction between the grits and granite rocks is seen in a quarry opened for road metal.

North of the town in the high ground about Fleming's Folly coarse greenish quartzose grits are freely exposed. Several beds of fine conglomeritic grits were noted quite close to the monument, the pebbles varying in size from peas to beans.

At the fault boundary between the granite and Silurian rocks in the railway section to the W. of the "Folly," the grits are slightly altered. Mr. Hull, when visiting the district with me, observed that the phenomena was somewhat similar to that at Slieve Croob, county Down, the blue quartzose grits becoming indurated and saccharoid, then small black mica flakes make their appearance; third stage felspar becomes developed in rounded blebs, and ultimately the rock emerges into a fine grained granite consisting of quartz, felspar, black mica, and hornblende.

This change of the Silurian rocks is abruptly terminated by a fault bringing the granite into contact with them.

West of Bellananagh in the old road leading across the hill, there are blue shales and slates exposed dipping N.W. at about 70°. In the neighbourhood of the Cottage N.E. of the town, there are numerous exposures of dark blue shales and grits, traversed by numerous quartz strings, and broken by joints which in many cases are coated with calcite.

The hill to the E. of the Cottage and N. of Coornaseer Lough, is formed of coarse massive gray and blue grits, which are in some places slightly conglomeritic. A few bands of shale were also noted, particularly along the northern margin of the lake.

At Legwee Bridge $3\frac{1}{2}$ miles S. of Bellananagh dark-gray and greenish grits are polished and striated. About a quarter of a mile N. of the bridge blue shales and gray grits are freely exposed both in the road section and at both sides of it. West of the road at Lough Islan, gray grits and fine-grained sandstones, the latter passing occasionally into a fine conglomerate, in which the pebbles are all quartz, are seen. These rocks are polished and striated N. 27° W. and tail to the S.W.

South of Legwee Bridge, between it and Killdream Lough, there are numerous exposures of dark greenish-gray grits and sandstones with occasional beds of shale and slate, the latter being in some cases slightly micasized. Cleavage was also noted in a quarry about 250 yards S. of the bridge.

N.W. of Killdream Lough, where the road crosses the railway at the 76th mile-post, greenish-gray massive grits with a few bands of shales and slates are seen dipping to the S.E. at 60°, and in a quarry about 100 yards S.E. of the mile-post coarse quartzose grits passing into a fine conglomerate were noted.

There are numerous exposures of gray coarse quartzose grits along the

road leading from the railway as far as the Roman Catholic chapel to the N.W. and also along the road to the S.W. in the direction of the Black Lough.

South of Killdream Lough, for the distance of about a mile, the ground is also very rocky, particularly about Glascarrick, where the rocks are greenish-gray quartzose grits with occasional beds of dark-gray shales. Striæ was noted in this locality. S.S.E. of Killdream Lough, at the trig. station 403 near the railway, similar rocks to the last described are freely exposed, but require no special description.

At the village of Kilcogy, S. of Glen and its immediate locality, exposures of blue shales and slates are very numerous, and in the occupation road, running to the N.E. a bed of fine conglomeritic grits was noted. One mile and a half N.N.E. of the village, a very fine quarry by the roadside is opened, in dark blue slate and flags, in which were observed two systems of joints, one being vertical, the other dipping to the E. at 10° and both striking N. 8° W.

About a mile N.E. of this quarry, in the stream W. of the Roman Catholic chapel, and 300 yards W. of the stream, light gray shales are seen.

S.E. of the chapel, and W. of Lake View, at the trig. station 411, there are quartzose grits, and at the cross-roads N. of the house, a quarry is opened in dark gray shales. Along the road running to the S. from Lake View there are several exposures of grayish green grits and slates. At the trig. station 429, very quartzose grits passing into fine conglomerates were noted. In the old road E. of the trig. station, leading to Ballyheelan, contorted ferruginous shales and grits occur interstratified with fine conglomerates.

Two hundred yards N.E. of the village there is a quarry in dark gray thin grits and slates. Further N. at the cross-roads S. of Foxfield, massive quartzose grits with thin shale bands occur. Along the road branching from the cross-roads to the N.N.W. dark blue shales and slates are freely exposed, and in the bed of the river, about half a mile from the cross-roads, ribbon slates occur.

At Foxfield House, and along the road leading to Kilnaleck, are massive grits and sandstones, the latter in many cases passing into a fine conglomerate; they range from light or grayish blue in colour to dark blue. The bedding in most cases is very indistinct, but it probably is about N. 30 E. There are numerous very large semi-angular blocks along this section, which have evidently weathered *in situ*. At Omard Lough there are massive quartzose grits full of quartz strings.

There are large quarries in blue compact grits, and grayish sandstones with occasional layers of shale at the back of the houses on the W. side of the town of Kilnaleck. Striæ N. 30° W. was noted in this locality, as also on similar rocks at the cross-roads, about half a mile N.W. of the town.

N. of the last-mentioned cross-roads, to the trig. station 416, and in the high ground to the S.E. between it and the church, there are numerous exposures of hard quartzose grits, with occasional bands of shale and slate.

In the hill near the glebe house, N.E. of Kilnaleck, there are a couple of beds of fine conglomeritic grits, which are probably a continuation of those near Foxfield already referred to. East of the Roman Catholic chapel, N.E. of the glebe house, there is a quarry at the cross-roads in broken shales.

At the southern end of Gradum Lough, and along the occupation road leading eastwards to the main road, fine thin grits and slates are well seen, and a little S. of the road a well marked fine grained conglomeritic grit was noted.

At the trig. station 614, E. of Gradum Lough, and along the ridge in the direction of the village of Cross Keys, beds precisely similar in character, and probably a continuation of those in the neighbourhood of Foxfield and Kilnaleck already described (see page 34), are freely exposed.

At the cross-roads S. of the village, striæ N. 30° W. was noted on green and gray grits and flags. In the village blue and dark brown grits and shales were observed dipping S.E. at 70°. Along the road leading to Cromwell's Camp from Cross Keys there are numerous exposures of dark gray and blue grits and shales, as also in that running in a N.W. direction from the village. The rocks in many places along the latter road were observed to be very much crumpled and contorted.

East of the village gray massive thick bedded grits with occasional bands of ferruginous shale form a well marked escarpment to the W.

About a mile in a southerly direction from the town of Bellananagh, quite close to and at Ballintemple church, thin and thick bedded grits and slates are seen in quarries and in the river section at the graveyard S.E. of the church; similar rock forms a rude escarpment bounding the alluvial flats to the S. and W.

N.E. of the trig. station 411, which is about half a mile in an easterly direction from the church, a bed of fine conglomerate was noted. Striæ occurs on several of the exposures about here.

These beds are, probably, a continuation of those already described about Legwee Bridge (see page 33), and are continuous in a N.E. direction to the margin of the sheet, passing through Ardkilmore 878, and Denmore 786.

In the neighbourhood of Ardkilmore they are well exposed, and along the Worm ditch and road to the W. of it, numerous fine sections in coarse and fine grained grits and shales and slates are seen.

At the Saint's grave, N. of Ardkilmore and the hill to the S. of it (Ardkilbeg), are rotten and slightly contorted ferruginous shales and slates.

Around the eastern margin of Kill Lough, N.W. of Kilnaleck, gray and brown shales and slates are seen, as also at the margin of the bog due W. of the lake.

There are frequent exposures of gray and green grits, shales, and slates in the high ground to the N. of this bog and along the road section leading from Legwee Bridge to Corr Lough. The green and blue shales and slates are well shown, quite close to the Roman Catholic chapel, in the stream.

A little S. of the Roman Catholic chapel, N.E. of Derrin Bridge, which is about 4 miles from Bellananagh, on the main road to Kilnaleck, coarse massive conglomerates are interstratified with grits, sandstones, and shales. The conglomerates consist of rounded pebbles of the following rocks, firmly cemented together in a coarse gritty matrix:—purple and greenish quartzite, vein quartz, quartziferous felstone, purple grits, and angular fragments of slate. One of the beds is about 15 feet thick.

The associated grits and sandstones are principally coarse gray to greenish gray. The latter frequently pass into a well-marked fine conglomerate, in which the pebbles are about the size of peas, and are nearly all quartz. Coarse conglomerates were also noted in the line of strike about a mile to the N.E., and again further to the N.E. at the stream they were similar to those just now described. The beds near the stream were interstratified with dark brown ferruginous rotten shales.

There were a few more exposures of grits and shales noted about this locality, but, as they are all similar to those already described, they need no further notice.

G. Granite.—In the field immediately W. of the Crossdoney railway station, at the extreme northern margin of Sheet 79, bosses of fine grained granite are seen—the principal constituents being yellowish-white felspar, quartz, and black mica, with iron pyrites and a greenish mineral, probably chlorite. About half a mile S. of the railway station the junction, which is a fault, is seen in the cutting. Copper pyrites was noted in small nests in the granite at this place.

There are several quarries in fine grained granite, with hornblende as an accessory—in some cases the felspar being pink in the granite along the road running to the N. of Drumcarbon, near the northern margin of the sheet. There are also quarries and exposures in a similar granite in the neighbourhood of Bellananagh and in the road leading to the railway. In a field at the railway crossing it was quarried to build the new Roman Catholic church in the town, and also in a quarry S. of Drumcarbon, close to the roadside. It makes a very good building stone. R. J. C.

VI. Virginia, Ballyjamesduff, and Oldcastle District.

Lower Carboniferous Limestones.—The Lower Carboniferous Limestones of this district are only seen in the vicinity of Oldcastle. Somewhat less than a mile N. of Oldcastle, and a short distance W. from the cross-roads, gray sandy limestones are exposed. By the side of the road running N. and W. of Moatfield House, siliceous yellow sandstones make their appearance, and seem here to be the basal beds. Half a mile N., at the county boundary, these beds are again exposed, but in neither place do they show evidence of dip; this is due to their massive character, and the exposure being in small old quarries.

N.W. of Dunowen here a quarry is opened in pale dove-coloured, sandy, nearly compact, limestone; the dip is apparently W. of N. Two miles W., at the cross-roads E. of Mountpallas, thick and thin bedded gray compact limestones dip from the Silurian. S.S.E. at 5°, a short distance S.W. of Castlecor, one mile W. of Oldcastle, irregularly bedded, gray, coarsely crystallines, encrenitic, fœtid limestone dips N. at 15–10; this reversion of the dip from the basal boundary brings the Moatfield House sandstones to the surface in Oldcastle, at the margin of the sheet.

Two miles N.E. of Oldcastle, and N.W. of Newcastle House, hard, dark-gray limestones are seen dipping S.E. at 15° from coarse Silurian grits, exposed 70 yards to the W. Further N. gray limestones dip due E. at 5°, and at Newcastle House, N. of the road, similar beds dip E. of S. at 10°; still, in the immediate neighbourhood of Silurian exposures, showing the yellow sandstones to be thinned out or overlapped. The boundary towards the E. for several miles is thickly covered with drift.

At Ballydorragh, three miles E. of Newcastle House, a large quarry is opened in compact dark-gray limestone, with black shale beds and partings passing up into pale dove-coloured sandy limestones. These beds, by a fault, strike against coarse hard Silurian grits exposed by the road-side 300 yards W. The Silurian grits are also exposed due S. and W. at the railway, and due N. of quarry and E. a boss of the same rock shows a glacially planed surface-striæ N. 40 W. On this surface numerous crosses are cut, some of considerable antiquity, evidenced by being overgrown with lichens; they are attributed by the countrymen to the "Fairies" on "Hate Nights."

Lower Silurian Rocks.—One mile N. of Virginia, in the townlands of Murmod and Burnew, these rocks are exposed over a large heath-covered area. By the S. side of the old road, massive coarse greenish grits, with thin gray grits and slaty layers, dip S. 30° E. at 80°. N. of the road, in the neighbourhood of trig. point 668, conglomeritic grits and sandstones, with occasional thin grits and beds of slates and flags, are well exposed in knolls and crags, with a general dip N. 30° W. at 75° to 90°; but W. and S. in the Virginia river, a short section shows the presence of a sharp synclinal and anticlinal curve. W. of the Virginia and Cavan road, at Cornaslieve Lough, strong grits dip at S. 40° E. at 75°, and have been rounded and planed by glacier action; the ice-flow apparently was from the N.W.

About three and a half miles along the Virginia and Ballyjamesduff road, and to the S. at Slieve Rinan, trig. point 829, coarse sandstones and strong grits are well exposed in ice-rounded knolls and abrupt crags. One-third of a mile S. of the trig. point 829, and a short distance W., several large quarries were opened in great beds of gritty slate; the dip is S. 30° E. at 70°, the cleavage striking E. 30° N. and vertical; the slates are small and thick from the gritty nature of the slate and indistinctness of the cleavage. To the S.W. of these quarries, by the side of the road, gray grits and slates dip S. 30° E. at 55° and N. 40° W. at 85°. Two miles S. from Ballyjamesduff, on the road to Oldcastle, in the neighbourhood of a small bog, the coarse sandstones of Slieve Rinan stand vertical, and dip N. 30° W. at 85°. At the Glebe House, two miles due S. of Ballyjamesduff, gray sandstones, with occasional slaty layers, show an anticlinal curve at low angles, the axis dipping S. 30° W. at 10°. To the S.E. at Cornamucklagh, trig. point 333, the coarse sandstones strike N. 20° E. Standing vertical, and one mile to the S. under Mount Prospect, hard greenish grits, with slaty layers, show a strike of E. 30° N. Half-way between Mount Prospect and Mount Pallas vertical dark-gray slates and thin grits strike E. 30° N., while similar beds a little E. dip N.N.E. at 70°. About one mile N. of the town of Oldcastle, in the townland of Fennor, W. of Newcastle House, thin gray grits and slaty layers strike N. 30° E. and stand vertical; and one mile further N., over a track of high land in the townlands of Carrick, trig. point 478, and Croaghan, trig. point 590, hard greenish grits and very massive quartzose grits, with occasional slaty layers, dip S. 30° E. at 75° and 90°.

In the neighbourhood of the fault, S. of Lough Ramor (see page 36), in a railway cutting S. of Ryefield-cross Mills, hard dark-gray grits and black quartzose shales are very much contorted, but with a general dip to the N.W. at 20° to 75°. At Daly's Bridge, near the Virginia-road station, pale gray slightly calcareous grits, with slaty layers weathering pale brown, dip W.N.W. at 80°.

East of Ballyjamesduff, and over a considerable tract pebbly sandstones and strong grits are interbedded with thin grits and gray and dark slates. The general dip is north-westerly, but varying from W.N.W. to N.N.W.; the cleavage of the slates, where observed, is always striking with the bedding, but, unlike the latter, was always vertical. These beds, to the N. of the road at the Presbyterian meeting-house, in the townland of Gallonnambraher, trig. point 608, are very much ice-planed and crag abruptly to the N.W. Stria, where observed, showed a direction of N.W. to S.E. The coarse sandstones consist of pink and white quartz pebbles, grit, and slate fragments, embedded in a greenish-gray

matrix. A fresh surface, unacted on by the atmosphere, occasionally shows a beautiful lively green.

About one mile N.E. of Gallonnambraher, trig. point 608, in the townland of Pollamalady, trig. point 696, the character of the beds are notably changed, consisting of thin, rarely thick, gray grits, with great beds of gray shale and ribbon slate, and show the abnormal dip over the townland of S.S.W. at 30° to 40°. A short distance W., at trig. point 669, vertical gray and green slates and flags strike E.N.E. S. of the eastern half of Lough Nadreegeel, by the side of the road, vertical thin brown concretionary sandstones and flagstones strike E.S.E.

West of Lough Nadreegeel a short section is exposed in a small stream running N. and S. The beds consist of thin gray grits, thin brown sandstones and flags, with gray and purple shales; they are somewhat contorted, with a general south-easterly dip. At the northern limit of the section, by the side of the road, gray and greenish thin grits, brown sandstones, and rotten shales are very much crushed and contorted, dipping in every possible direction at angles varying each side of 50°. Due W., less than a mile by the side of a road, vertical gray grits, smooth flags, and rotten shales show their faces to the S.W. Near the great cross-roads at the hamlet of New Inn, gray and purple shales and thin smooth grits dip E. 10° S. at 45°, and show a small break by which they come against more massive beds.

Two miles to the N.W., along the main road in the neighbourhood of the Roman Catholic chapel, the rocks are freely exposed over a large area. S. of the chapel strong gray grits and shale beds dip S.E. at 60°. At the chapel, coarse massive grits, thick gray grit, and slaty layers, showing ripple marks, dip E.S.E. at 50°. A quarter of a mile N.W. still, by the side of the road, a great quarry is opened in thick and thin smooth gray grits, gray flags, and pyritous shale, dipping S.E. at 45°. Less than a quarter of a mile W. and S. of the Roman Catholic chapel, by the side of an old road, where it gives a laneway to the W., a quarry is opened in beds quite different from the surrounding strata. They consist of dark blue and black shattery shales, containing a thin bed of black carbonaceous clay, and are probably the continuation of the beds already noticed to the S.W. in Sheet 79 at Kilnaleck (see pages 34–41).

One mile N.E. from the previously-mentioned hamlet of New Inn, from Assan Bridge to Waterloo hamlet, a distance of two miles along the main road, and on each side of the road, the rocks are freely exposed in great rounded knolls, broken crags, and quarries.

For a distance of more than 500 yards along the road from Assan Bridge, coarse strong sandstones show themselves in crags and rounded bosses; the bedding is obscure; the most prominent joints are E.N.E. and N.N.W. in strike. By the side of the road, where it gives a laneway to the right, a large quarry shows, interstratified with the coarse grits, gray iron-stained shales, slates, and flags; the dip is S.S.E. at 20°. Due E., at a group of houses, similar shales and slates coming to the surface strike in a curve E.N.E. and N.

Travelling along the road N.E. in the bog and beyond the bog are again the massive coarse grits, with an occasional bed of slate, to show the dip of S.S.E. at 25–30°. Where the road from the S.E. joins the main road, and on the left side, a small quarry exposes thin grits and purple shales, dipping N.N.W. at 10°; the axis of the wide anticlinal dipping about E.N.E. at 5°. Further are again seen the dirty white weathering, massive sandstone, with its pebbles, patches, and strings of quartz, and occasionally interstratified thin grit beds, gray and purple shales, dipping S.S.E. at 20–30°.

In a small quarry S. of Waterloo hamlet, thin gray grits and beds of gray shale dip S.W. at 45°. A similar large exposure of rock may be examined about Billis' Bridge, a couple of miles to the S.

A short distance W. of the bridge, thick and thin hard gray grits and beds of gray and brown slate dip S. 30° E. at 50°. On the S. side of the road dark gray and pale gray shales and slates and cut up grits dip S. 30° E. at 75°. E. and N. of the bridge, behind the schoolhouse, vertical coarse grits face the north. Near Billis, trig. point 485, hard, splintery, and shattery grits and rotten slate dip S. 30° E. at 55° to 60°. 500 yards N. of the Presbyterian meeting-house, here and on the road-side, thick gray grits, occasionally thin and shattery, and gray slates, stand vertical or dip S. 30° E. at 85°; the cleavage in the slates dips S. 30° E. at 70°. To the N., in the vicinity of the bog, and on the road to the W., the beds are strong greenish grits, with interstratified beds of gray and purplish shale and slate.

The only other exposure of rock necessary to mention within this district is that in the neighbourhood of Killinkere church and chapel, a few miles to the east. At Tober Ultan the strong grits and sandstones dip S. 30° E. at 60°, and are similar to those already noted at Assan Bridge and Waterloo hamlet.

On the opposite side of the N. and S. road, and N. of Corratinner Lough, behind the Roman Catholic chapel, the coarse sandstones continue the S.S.E. dip, and here are planed and rounded by glacial action; by the roadside at the chapel striæ were observed striking N.W. and S.E. These sandstones here show a concretionary structure, and occasionally contain calcareous nodules weathering into holes. The unweathered matrix is a beautiful green.

N. of the church massive greenish grits are interstratified with great beds of glossy gray and green slate and shales showing ripple marked surfaces. The cleavage observed dips S. 30° E. at 67° the beds being at an angle of 55° and with the same strike.

The slates are thick, small, and coarse; they were formerly largely worked; they must be set in mortar. The beds to the N.E. about trig. point 549, show no notable variation in character; their occurrence is sufficiently indicated on the map.

VII. Bailieborough, Kingscourt, and Moynalty District.

The limestones in this district occur about Moynalty.

Half a mile S. from Moynalty, and a short distance to the W. of the road, pale gray hard calcareous sandstones dip S.E. at 15°. Midway between Westland House and Cherrymount thick yellow grits show the same direction of dip with an angle of 20°.

The Silurian rocks are exposed at Cherrymount.

In the Kingsfort demesne dark gray compact limestone with shale partings dip S.S.E. and S.S.W. at 20° and 15°.

A short distance E. of Kingsfort, trig. point 260, the basal sandstones reappear, and again at Mahonstown further E. The beds between Kingsfort and Mahonstown sandstones are dark gray flaggy limestones and shales.

N. from Moynalty, and E. of the road running N., gray crystalline limestones dip N. of E. at 10°, while to the W. of the road the Silurian beds crop out.

Half a mile N.E. of Curraghtown House, one mile E. of Moynalty, gray crystalline fœtid limestone, with flaggy and shaly beds, dip N.W. at 40°, and one mile due E., and S.E. of Horath House, several large quarries are opened in similar beds, the dips shown being N.E. and

S.S.E. at angles varying from 16° to 30°. The only other beds exposed within the district are those N. of Blindbridge, two miles N.N.E. of Horath House, at the eastern margin of the map. In the immediate vicinity of the Silurian beds the basal calcareous grits show an anticlinal curve, but a general dip of S.S.E. at 20°.

Here also crystalline thin limestones, with beds and partings of shale, dip. S.S.E. at 20°, and W. 30° S. at 20° to 30° and are somewhat contorted as they approach the great N. and S. fault in Sheet 80.

For the small exposures of calp limestone, upper limestone, and Yoredale beds within the limits of Sheet 80, see observation in the general description page 11. W. B. L.

Post Pliocene or Drift Deposits.

It is quite possible that the three series of drift deposits exist in Sheets 78 and 79, but owing to the insufficiency of data it could not be determined with certainty.

The Lower Boulder Clay is generally of a reddish brown or yellowish brown colour, with numerous boulders and blocks of various sizes often polished and striated. It generally occurs in ridges having a north-westerly trend, and rests on the underlying rock, which in many cases is striated and polished.

The Middle Sands or Gravels also occurs in ridges, which are very irregular as a rule. They consist of rolled and waterworn stones of various classes, the limestone boulders predominating, in most cases interstratified with fine layers of sand and gravel.

Bog, Alluvium, &c.—The bogs and alluvium of this district though not so extensive as those in the sheets to the south,* are still of very considerable extent.

They all have that north-westerly trend noticed in the district to the S. This is particularly noticeable in the centre of Sheet 78, where the bogs are more extensive than to the W. or E. of it. Alluvial flats are more numerous along the course of the Shannon and its tributaries and lakes along the western margin of the sheet than in any other part of the district. The north-westerly direction is not quite so apparent among those flats, owing to their ramifying among the drift hills.

There can be little doubt that these bogs and flats occupy the position of ancient lakes. R. J. C.

The Lower Boulder clay is distributed over the whole area occupied by the Silurian strata in Sheet 80.

Foreign blocks are rare.

Evidence of glacial action is sometimes met with as the planed and scratched surfaces and Rochès moutonneès at Killinkere and the frequent abrupt cragging of rock masses to the N.W. The direction of the flow where indicated is always from the N.W., or varying but slightly from that point.

The limestone area is covered by sands and limestone gravels which occasionally extend short distances into the Silurian country.

The numerous bogs and alluvial flats in the district trend N.W.

Bog iron ore is constantly met with; beds several feet thick are exposed along the streams in the alluvium W. of Cornaslieve Lough one mile N.W. of Virginia.

Fresh water shells are frequently to be seen in local marls; univalves of the genus *Lymnæa* and bivalves of the genus *Cyclas*, being the most abundant.

W. B. L.

* *Vide* Ex. Mem. Geo. Survey of Ireland, Sheets 89 and 90.

Mines.

*Silurian Anthracite.**—A narrow seam of anthracite occurs near Kilnaleck, in the townland of Kill. Several shafts were opened on its course; the principal one being about ten fathoms deep. It is associated with thin grit and shales, and being nearly vertical it is very difficult to work. It probably is of no commercial importance, but from a geological point of view is extremely interesting.

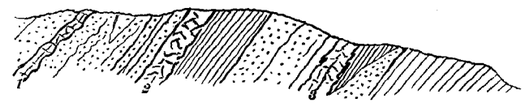
Iron Ore.—Reddish brown hæmatite occurs in several places in this district interstratified with Silurian grits and shales.

In the railway cutting 150 yards above the bridge, at the 90th mile post of the Longford and Sligo Branch Railway, about three miles S.E. of Drumsna, in the townland of Gortinee, there are beds of slaty hæmatite evenly bedded with bands of chloritic slate, the dip corresponds with that of the rock S.E. magnetic at 60°. Some of the ore has been sent to Bristol. It is the property of the Rev. H. Stepney.†

Three wide beds of a good dark brown hæmatite occurs about five miles S.S.W. of Arva, in the townland of Cleenragh. Some years ago these beds were extensively worked by Dr. Ritchie of Belfast. The ore, which is of a very good quality, was at first carted to Crossdoney Station, but the carriage was found to be too expensive. Afterwards Dr. Ritchie put boats on Lough Gowna, and carted the ore from the mines, a distance of about a mile to the lake. It was then taken by the boats to the extreme eastern part of the lake, and a run on a small tramway about a mile to a siding on the Cavan branch line.

Dr. Ritchie also opened on some hæmatite beds in the townland of Enaghan near Arva. Three very irregular bands occur as seen in the following sketch by Mr. Hull. The works here were very soon abandoned as the ore was not as easily worked as that at Cleenragh.

Section of Silurian Rocks with Iron Ore at Enaghan.



a b c d e

a. Green grits.
1. First bed of iron ore, irregular in thickness, average one foot.
b. Hard greenish grits, much shattered, and jointed with slickensides, ten feet.
2. Second bed of iron ore, irregular, average thickness two feet.
c. Red shales and jaspideous beds fifteen feet.
d. Hard greenish grits, much ironstained in lower part, about fifteen feet.
3. Third bed of iron ore from two to four and a half feet in thickness.
e. Irregular beds of grit wedging into red shales.

* Dr. Whitty has written a paper on the occurrence of this Anthracite. See Journ. Geo. Soc., Dub., vol. vi.

† Since the above was written two shafts have been sunk to a depth of thirty feet on the beds of ore, which apparently seem to impro e in depth. July 14th, 1873.

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