

Memoirs of the Geological Survey.

EXPLANATORY MEMOIR

TO ACCOMPANY

SHEET 48 OF THE MAPS

OF THE

GEOLOGICAL SURVEY OF IRELAND,

ILLUSTRATING PARTS OF THE

COUNTIES OF DOWN AND ARMAGH.

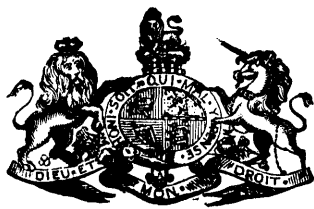
BY

F. W. EGAN, B.A.,

WITH

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

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1872,

the β phase is the same as that of the α phase.

4.2.2. *Thermal stability*

The thermal stability of the polyimides was studied by thermogravimetric analysis (TGA) and thermogravimetric mass spectrometry (TG-MS). The TGA curves of the polyimides are shown in Figure 1. The polyimides were stable up to 400 °C in air and 500 °C in nitrogen. The weight loss of the polyimides in air was about 10% at 500 °C, which was due to the degradation of the polyimide backbone. The TG-MS curves of the polyimides are shown in Figure 2. The polyimides were stable up to 400 °C in air and 500 °C in nitrogen. The mass loss of the polyimides in air was about 10% at 500 °C, which was due to the degradation of the polyimide backbone.

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THE
GEOLOGICAL SURVEY OF THE UNITED KINGDOM

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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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P R E F A C E.

THIS Explanatory Memoir contains, for the first time, some account of the microscopical structure of the rocks of the district. Having made arrangements for the purpose, I hope to be able to carry on the microscopical investigation of the rocks, where desirable, and to publish the results from time to time in these Memoirs.

With the exception of this and occasional assistance and suggestions from myself, the explanatory details of the District included in Sheet 48 have been drawn up by Mr. Egan.

EDWARD HULL,
Director of the Geological Survey of Ireland.

Geological Survey Office, Dublin,
10th April, 1872.

EXPLANATORY MEMOIR
TO ACCOMPANY
SHEET 48 OF THE MAPS
OF THE
GEOLOGICAL SURVEY OF IRELAND.

GENERAL DESCRIPTION.

THIS sheet lies almost wholly in the county Down, of which it occupies a central and western part, approaching to within a short distance of the eastern boundary of Armagh, in which county a very small portion at the N.W. corner is situated. It contains the town of Banbridge, on the River Bann; the smaller towns of Waringstown and Dromore, and part of Ballynahinch, with the villages of Loughbrickland and Dromara.

1. *Form of the Ground.*

In the south-east of the sheet the district is for the most part wild and mountainous. The highest points are—Slieve Croob, 1,755 feet above the sea; Monahoorra and Slievenisky, 1,499 and 1,408 feet, inferior parts of the same hill, at the extremities of ridges proceeding from its summit in a north-westerly and a south-easterly direction; Cratlieve, 1,416 feet; Slievenaboley Mountain, 1,069 feet; Deehomed, 1,050 feet; Benraw, 803 feet; Slieve-garran, 1,293 feet; Clonvaraghan Mountain, 852 feet; and Carriv-moragh, 741 feet.

The highest of these, Slieve Croob, three miles S.E. of Dromara, rises with a slightly waving slope on the north side, through a height of about 1,200 feet in a mile and a half; the steepest part, near the top, being at a little higher inclination than one vertical to three horizontal.

Cratlieve or Legananny Mountain may also be considered a somewhat detached part of Slieve Croob, lying nearly a mile and a half westward from it.

Of the rest, the three last mentioned, situated more to the south, are rugged in many places; the remainder, lying chiefly westward, being less so.

North of this mountainous region the country is also in great part sterile, and interspersed with peat bogs; none, however, of great extent. It is very uneven, some of the highest points occurring in rocky rising ground, such as that called "M'Manus's Quarter," at the N.E. of Burren Lough, 521 feet high; and another marked 730 feet on the six-inch maps, a mile and a quarter west

of the same Lough. The higher portions consist also in part of drift, heaped up in large mounds. This deposit is otherwise chiefly disposed in smaller hills grouped together, or in many cases detached, the arrangement of which lengthwise exhibits a general parallelism to the course of the drainage of the locality. In the detached hills this feature is sometimes remarkably regular, two or three in the same vicinity closely resembling each other both in direction and form. These elevations are commonly between 400 and 500 feet above the sea, but seldom much over 100 feet in the actual height of the hills.

The remainder of the area in this sheet presents, with few exceptions of small extent, a smoothly undulating surface, with many small boggy patches along the streams between the hills, and irregular strips of alluvial flats marking the courses of the principal drains.

The heights remaining to be noticed are—Begny Hill, E. of Dromara, 703 feet high; Garvaghy Hill, S.W. of Waringsford, 671 feet; and Cave Hill, three and a half miles S.E. of Loughbrickland, 589 feet.

The surface has a general fall from east to west, a section from Colonel Fford's Deer Park (N.E. of Slieve Croob) to Banbridge, showing an average descent of 50 feet in a mile. Northward of this, however, the fall gradually becomes inappreciable.

The principal part of the district is drained by the rivers Bann and Lagan, with their numerous tributary streams. The eastern portion, however, over an area of fifty miles, is drained by the Ballynahinch river in the north, and the Leitrim and Moheycarragh rivers in the south; and a small portion in the south-west is drained by rivulets flowing southwards and westwards to the Newry canal.

The Bann enters the sheet at the middle of the southern margin, at about 240 feet above the sea level, and flows with a winding course in a north-westerly direction by Banbridge, leaving the sheet nearly midway along the western margin, at 70 feet above the sea. It afterwards flows through Lough Neagh, and finally into the sea a little N.W. of Coleraine. It has its source in the Mourne mountains, not far from Hilltown (sheet 60).

The Lagan rises in Slieve Croob, at a short distance from its summit, and winding in a westerly and northerly direction by Dromara, through Dromore, and a mile N.E. of Waringstown, it flows northward out of the sheet at an elevation of 110 feet, and finally into Belfast Lough (sheet 36).

The Ballynahinch River springs from several small lakes and streams near the N.E. of the sheet. It is the same which flows into Strangford Lough, near Downpatrick, as the River Quoile. It passes out at the eastern margin, by the town of Ballynahinch.

The Moheycarragh and Leitrim Rivers, at the S.E., flow eastward to Dundrum Bay, sheet 61.

The crest of the watershed between the Bann and the Lagan passes from the top of Slieve Croob over Cratlieve and Slievena-bole Mountain; then north-westerly to within a mile of the Gall Bog, the long strip of bog west of Waringsford: thence westward

beds are exposed in but one place within the limits of this sheet, but the boundaries, which are well established in that to the north, (36), have been continued, so as to embrace that portion of the district, which, from the similarity of its features to those of the neighbouring district to the north formed of Bunter sandstone, may be inferred to be composed of this formation.

Red Marl. (Keuper).—Similar remarks apply to that portion which has been coloured as belonging to this division, its western boundary, at the junction with the Chalk, being determinable with tolerable accuracy.

Upper Greensand.—This member of the Cretaceous Series, which appears in a narrow strip at the south margin of the adjoining sheet, (36), appears to die out as represented on the map, quite close to the northern edge.

Upper Chalk.—This division occupies a narrow space between the Red Marl and the basaltic sheet, rising with a somewhat sudden change of level to the higher elevation of the latter, which overlies the Chalk.

Granite.—The Granite occupies an area of about twenty-six square miles at the south and south-east of the map. At its junction with the grits and shales of Lower Silurian age, it in many places presents appearances which show clearly that it has been formed by the melting up of these rocks. The Silurian strata are often converted into mica schist: in other places penetrated by veins and strings ramifying in all directions, which exhibit every variety of passage from the original rock to true granite. The whole mass has evidently undergone a process of extreme metamorphism, working upwards and outwards into the surrounding stratified rocks.

The essential constituents of the granite appear to be quartz, orthoclase, and black mica. Oligoclase (?) also is sometimes present, and perhaps always, in various proportions. Hornblende occurs as an accessory, and a greenish mineral (*chlorite*?) in small nests. There is sometimes a little iron pyrites.

In most places the mica is abundant, and exists chiefly in small scales, the granite as a general rule being finely crystalline. In some localities larger scales of mica prevail, often exhibiting an iridescent appearance.

The larger scales appear to occur most commonly in those descriptions of granite in which the felspar weathers from white to a pinkish colour, as is often the case in that of Slieve Croob.

In the interior of the granitic district, as on Benraw and in its neighbourhood, the rock is chiefly of a light-gray colour, weathering yellowish, and occasionally pink; close-grained, and not very micaceous, and containing a few well-developed crystals of hornblende.

Towards the southern margin of the sheet the granite very frequently weathers pink. In some few cases, however, it is very

Note.—For remarks on the mineral characters of the Triassic strata, and on their position in relation to the beds of the same series as developed in Lancashire and Cheshire, the reader is referred to the memoir accompanying sheets 37, 38, and 29. These beds, together with those of the Cretaceous series, are also further described in the memoir of sheet 36.

white, of fine texture, and enclosing many distinct crystals of hornblende.

Sometimes the granite is traversed by veins having a very fine texture, and containing only a few small scales of black mica, in which a perfect hexagonal form is preserved, and in addition to this occasionally a few slender prisms of hornblende. The course of such veins is sometimes clearly traceable through the coarser granite, though never for any great distance.

As a general rule, the granite is closely jointed, and broken up by irregular cracks, owing to which it is not very valuable for building. In very many places it has a stratified appearance, and this is sometimes so regular as to resemble even bedding.

Quartz veins are not frequent in the granite, except in a few localities. They are in some places found in the decomposed rock, in which there is also sometimes observable a parallel disposition of the constituents, which gives it a somewhat foliated appearance.

Patches of Silurian rock, slightly altered, are occasionally found in the mass. These appear to be examples of incomplete metamorphism in certain spots.

In a few places near the S. margin of the sheet, and at distances of about one to two miles W. of the granite boundary, the Silurian rocks are traversed by veins of very felspathic granite, of a more compact texture than that hitherto spoken of. There is a general tendency to coincide with the planes of bedding, which are, however, in some places interrupted and broken in upon by the granite, which thus appears to have acted intrusively. This action is limited, so far as can be judged from the rare exposures of rock in this locality, to a narrow space passing in the general line of strike through the points marked in the map as small patches of granite, and which shall be more particularly noticed in the Detailed Description (see p. 24).

Syenitic Granite.—In the low ground to the E. of Slievegarra, and partly up its slope, the granite becomes syenitic by the appearance of hornblende in great abundance. In many parts the quartz and felspar are nearly absent, and the rock becomes almost black from the dark colour of the hornblende and mica. The granite gradually loses this hornblendic character, traces of which were, however, observed over Slievegarra and in a few other localities.

Basalt and Dolerite.—The Basalt on this sheet lies at the edge of the great basaltic plateau which occupies a large portion of the N.E. of Ireland. The rock is of a hard dark-gray crystalline character, and has generally a rudely columnar structure, which causes it to weather into nodular masses. In some places it is vesicular, the cavities being filled, or in the case of the larger ones, lined with zeolitic minerals or carbonates. These are also found lining and filling fissures throughout the mass. They have been formed by infiltration since the outpouring of the basalt.

Basalt (Intrusive).—Dykes of this rock are found traversing the Silurian strata and the granite. It is in most cases finely crystalline, and resembles in appearance the tabular basalt in the N.W. of the sheet. It is sometimes porphyritic, and occasionally

very compact. It generally weathers to a nodular form, disintegrating to a fine brown earth. Specimens of this intrusive basalt are frequently found to affect the magnet.

Diorite (Greenstone).—This rock, which is a crystalline compound of felspar and hornblende, is not abundant. The most characteristic example is found among the Silurian strata, about three miles from Banbridge, towards Dromore.

Trachyte and Trachyte Porphyry.—The latter rock occurs in a hill or boss at the N. margin of the sheet, and is of peculiar interest, owing to its rare appearance. It consists here of a dull gray felsitic base, with crystals of sanidine, and small crystals or globules of quartz.

There are two dykes marked as trachyte. With regard to one, however, the strict propriety of the name is questionable. An account of this rock is given among the microscopical notes by Mr. Hull (page 16).

Felstone, Quartz-porphyry, and Minette (Mica Trap).—Dykes of these rocks occur among the Lower Silurian strata, especially near the eastern margin of the sheet, to the N.E. of the granitic district, where they have a general bearing parallel to the planes of bedding, along which they have, no doubt, been intruded. This is not, however, without exceptions.

Some of the felstones occur in dykes crossing the bedding in a more decided and continuous manner than those of minette, which latter may, however, with the quartz porphyries, be regarded as felstones modified by the appearance of mica in the one case and of free quartz in the other, the quantities of these minerals sometimes varying considerably in the same dyke, and in some parts almost disappearing. They vary also in colour, being light brown, and purplish and greenish gray, and frequently weather on the surface, with a light salmon-coloured tint, passing into white. This latter is especially true of the quartz-porphyries.

Some of the interbedded felstones are, with the Silurian beds, crossed by basalt dykes.

A dyke of quartz-porphyry, traceable for a long distance among the Silurian rocks, is found to penetrate the granite at its north-eastern point.

Besides the felstone dykes above spoken of, there are others found at the junction of the granite with the Lower Silurian rocks, and penetrating the latter. This may be observed at the W. of the trig. point, marked 481, to the N.W. of Ballybrick. These have been classed with the felstones, to which they are allied, though mineralogically they are connected with the granite. They are hard and very tough, and break with a somewhat conchoidal fracture.

Altered Silurian Rocks.—For some distance from the granite the Lower Silurian rocks are more or less indurated, and often highly micacized, being in some places converted into mica schist. These effects of metamorphic action do not extend to more than about a mile from the granite, and in general are not observable for nearly that distance.

E. H. and F. W. E.

3. *Relations between the External Form of the Ground and its Internal Structure.*

The mountainous region near the S.E. corner of the sheet has for the most part granite for its subjacent rock, which takes the form of hills, more or less rugged, of which the highest is Slieve Croob.

Most of these hills are nearly devoid of drift; the rock, where not exposed at the surface or in craggy masses, being concealed by a thin covering of peaty mould, frequently overgrown with heath and furze.

This mountain is not, however, entirely composed of granite, its northern side, including the summit, together with the adjoining hill, Monahoorra, consisting of Lower Silurian rocks. This formation also constitutes inferior hills of a rugged nature, lying to the east of the granite district, and forms the more level country which intervenes between them and the eastern margin of the map.

As a rule, especially to the west of Slieve Croob, the junction of the Silurian with the granite passes within short distances of the most elevated points, among which Deehomed Mountain alone is named in the map. Here it is about 140 yards N. of the summit.

The lower ground in the granitic district, as well as the flanks of some of the higher slopes, is covered with drift, and the former is in many parts well cultivated.

The remainder of the district in this sheet lies on the Lower Silurian formation, with the exception of the small area at the N.W. corner, into which the basaltic sheet, with the Chalk, Greensand, and New Red Marl and Sandstone, extend for a little distance.

It is extensively covered with drift, which, occurring in the form of smoothly-rounded mounds, gives the surface of the country an undulating character. As already stated, however, the drift is absent over some tracts, the most extensive embracing the high uneven ground to the N.E. of Dromara, where the Lower Silurian grits and slates are exposed, sometimes in large rugged masses, but very frequently in small bosses, which are more or less rounded, probably by the action of ice.

The most marked differences of level in the Silurian strata exist in the vicinity of the granite. They appear to be due entirely, however, to the diversified action and various amounts of denudation upon the already upheaved and somewhat folded strata, and not to be in any way connected with the existence of anticlinal and synclinal curves.

From the frequent occurrence, in the lower as well as the more elevated tracts, of ice-moulded bosses of rock, and their planed and striated appearance, it seems probable that glacial action has concurred in a great measure to modify the face of the country.

F. W. E.

PALÆONTOLOGICAL NOTES.

The only fossils collected within the boundaries of this sheet were obtained by Mr. Edward Leeson at three localities, all of them situated near its northern margin, two being in Lower Silurian Strata, the third in the Upper Chalk, "White Limestone" of the Upper Cretaceous series.

LOWER SILURIAN, fossil localities, and species of Graptolites obtained from them.

Locality No. 1.—County Down 21/1, townland of Taughblane, from a cutting in the Banbridge and Lisburn Railway, a little west of M'Kee's Bridge, two miles and a half north-east of Dromore.

× × × *Diplograpsus pristis*, var. *scalariformis*.

Locality No. 2.—County Down 22/1, townland of Ballylintagh, a little south-west of Ballylintagh Church, five miles north-west of Ballynahinch.

Graptolithus Becki.

× " *Hisingeri*, (*sagittarius*).

× " *tenuis*.

× × *Diplograpsus pristis*.

CRETACEOUS.—Upper Chalk "White Limestone."

Locality No. 3.—County Down, 20/1, townland of Ballymacateer, a little south-west of Springfield, one mile north-east of Waringstown.

× *Belemnitella mucronata*.

Terebratula carnea.

" *semiglobosa*.

Inoceramus (fragments.)

WILLIAM HELLIER BAILY.

March 14th, 1872.

*Notes on the Microscopic appearance of some Rocks in sheet 48,
by Professor Edward Hull, F.R.S., &c.*

I have taken the opportunity of examining under the microscope a few of the rocks described in this sheet with the following results:—

I. **DOLERITE DYKE**, ranging in a N.W. direction along side of road at Curlet's Hill, N. of Castlewellan Park. The dyke penetrates Silurian rocks, and its walls are well defined.

With 2-inch object glass, magnifying 24 diameters, the rock appears as a crystalline granular aggregate of triclinic feldspar, in a brown augitic base, with amorphous patches of a greenish mineral, in all probability pseudomorphs after olivine, and numerous groups of crystals of titanite. Thus it has the usual constituents of basalt or dolerite.

(a) *Feldspar*.—The feldspar is well crystallized out, in long slender colourless prisms, porphyritically imbedded in the augite. With polarized light the fine hair-like lines are very apparent, but they are also visible without the aid of the prisms. The feldspar is probably labradorite.

(b) *Augite*.—The augite does not assume a distinctly crystalline outline, but merely forms a base for the imbedding of the feldspar crystals; its colour is rich brown.

(c) *Olivine*.—Large amorphous groups of sub-crystalline and globular forms, almost colourless in the centre, but along the margins tinged sap-green, may be regarded with little hesitation as pseudomorphs after olivine. The masses are deeply fissured, and with polarized light exhibit

a faint play of colours—some approach to the crystalline form of olivine may occasionally be observed amongst these groups.

(d) *Titano-ferrite*.—This is abundant, occurring in crystalline groups of various forms, as usual perfectly opaque or black. Individual crystals are rare. The titano-ferrite is often imbedded in the felspar; at other times the facets of the crystals, coincide with, and are determined by, those of the felspar prisms; so that it appears to have crystallized sometimes before, sometimes after, the felspar.

(e) *Zeolite*.—A mineral, slightly coloured, with a fibrous-radiating structure, appears in the field of the view—it is probably a zeolite.

From the general appearance of this specimen it may be inferred that the labradorite was the first to assume the crystalline form—the augite serving as a paste in which the crystals of the former were imbedded. The character of the olivine-pseudomorphs shows that the rock has undergone some metamorphic action since its consolidation.

II. *DOLERITE DYKE, Islandderry Farm, Dromore*.—This is a crystalline granular rock, consisting of a triclinic felspar, augite, titano-ferrite, and olivine.

(a) *Felspar*.—The felspar is well crystallized out as in the former case, and with polarized light shows the characteristic striæ.

(b) *Augite*.—This mineral occurs as a rich brown-coloured base in which the felspar crystals are embedded, but is not itself distinctly crystalline.

(c) *Olivine*.—Several large sub-crystalline forms of olivine occur, besides numerous grains, generally amorphous. Some of the large grains exhibit a dull brownish colour, with a peculiar internal structure, resembling an aggregation of cellular grains tinged green, and apparently similar to those figured and described by Dr. Zirkel.* One small hexagonal form is entirely filled with these globular grains.

(d) *Titano-ferrite*.—This mineral occurs abundantly in irregular angular forms, and crystalline groups, which frequently adjust their sides to those of the felspar crystals.

(e) *Chlorite* (?)—A greenish mineral of secondary formation is infused in patches throughout the mass of the rock, and seems to be the same as that which lines the interior of the olivine crystals and grains.

III. *FELSTONE DYKE*.—Narrow felstone-porphry dyke, 20 inches wide, traversing Lower Silurian strata at Curlet's Hill, N. of Castlewellan, and weathering white.

This dyke attracted my attention when visiting the locality from the appearance of quartz grains, or crystals, of cubical form, and my impression was that they must be pseudomorphs of some other mineral.†

On microscopical examination, with a low power (2-inch glass) the rock was found to consist of a felsitic base, full of rounded or globular greenish cells (?) with colourless centres. Imbedded in this base were large square masses of colourless quartz, besides grains with rounded forms. There were also enclosed in the felsitic base bundles of greenish hairlike masses without crystalline form.

(a) *Quartz*.—On using a very high power (350 diameters) the largest of the quartz crystals was found to be full of cells of various forms, which,

* *Untersuchungen über die microscopische Zusammensetzung der basaltgesteine*, plate 11, fig. 49, p. 64.

† I showed specimens to Dr. Sullivan, Dr. Reynolds, and Dr. Frazer, all of whom agreed that they were quartz. Some difference of opinion occurred as to their being pseudomorphs.

with the cross polarizing prisms, and a bright light, exhibited a splendid play of colours, from rich purple, though green, to glistening gold. I could not determine, however, whether or not these cells contained a fluid.

(b) A well-formed group of crystals of a triclinic felspar was observed imbedded in the felsitic base.

(c) *Cells in the felsitic base.*—With a high power the cells showed forms not unlike the *globigerinæ* of the Atlantic mud. Sometimes they appeared as aggregates of cells coiled round a centre, at other times as single cells. The walls of the cells presented a green colour with the 1-inch and purple with the $\frac{1}{4}$ -inch glass. The interiors were colourless, but there generally appeared a shaded central nucleus with greenish spots. I suppose these forms, which I have called cells, to be real cavities formed during the cooling process, and lined with the greenish colouring matter by subsequent infiltration.

The cubical masses of quartz may be pseudomorphs of some mineral, such as iron-pyrites, fluor-spar, or chloride of sodium. The first of these is the most likely to have been the original mineral, but as none of these are products of igneous fusion—the difficulty remains how their presence is to be accounted for without a double process of transmutation.

IV. Compact grayish-blue felsitic rock, supposed to be allied to trachyte, with a few grains of free silica. Knoll by stream half a mile N. of Islandderry Farm, near Dromore.

With the 2-inch object glass it appears as a nearly uniform felsitic mass of a grayish colour, and speckled with minute black grains. There are several large grains of silica of rounded and amorphous outline, and several long bundles of a black hair-like substance.

The attempt to determine the nature of the black specks with a high power was not very successful. With the 1-inch object glass, and No. 2 eye-piece (magnifying 100 diameters) the specks assumed the appearance of minute grains, sub-crystalline, of magnetite, and “the bundles” above referred to seemed to be aggregations of these grains. There did not appear to be any evidence one way or another for considering this a trachytic rock rather than a highly silicated felstone, as far as the microscopic section was concerned.

EDWARD HULL.

DETAILED DESCRIPTION.

We shall describe the details of this sheet under the three following subdivisions :—*The Banbridge, Ballynahinch, and Slieve Croob districts* ; the first including all the western portion as far east as Dromore ; the second embracing the more rocky country towards the N.E. corner ; and the third the mountainous country towards the S.E., with all the granitic region.

Banbridge District.—This division contains no extensive exposures of rock, being very much covered with drift, between the mounds of which, however, and in the lower portions generally, it is laid bare, naturally and artificially, in a sufficient number of cases to afford numerous dips, as well as accurate information as to its character, the exception being in the case of the Triassic strata where the details are obscure.

Basalt.—The Basalt in the N.W. corner is exposed in a few quarries which have been worked for the use of roads, and it appears occasionally also in bare patches at the surface. An example of both may be seen a little to the N.W. of Summer-hill, beside the road to Lurgan. Here it is a hard dark gray crystalline Basalt.

A mass of amygdaloid, covered by six feet of drift, occurs at the W. of the road going N.E. from Waringstown, to the S. of Perrymount.

No other exposure of Basalt is met with till we go southwards beyond Clare. Half a mile S. of Clare Cottage it appears in a quarry where a space is shown on the Map without drift. It is dark bluish gray and finely crystalline, and jointed with considerable regularity, so as to resemble an even dip at 65° , E. 10° N. A small boss appears again a little to the W. of this; and in the deep drains immediately to the S. and S.W. a rotten amygdaloid occurs below a few feet of drift.

Where coal shafts are marked on the map where the boundary between the Basalt and Lower Silurian passes out of the sheet, a trial for coal was made many years ago. The sites of two shafts, said to have been between thirty and forty feet deep, and to have yielded good coal, are pointed out. They were closed, it is said, owing to a dispute between interested parties, and the erroneous impression which has since existed in the district, that an abundant supply of coal was to be found in the Silurian shales below the Basalt here, has recently been to a great extent removed by an unsuccessful experiment, in which the ground was re-opened, when a band of lignite was met with. According to information received at the spot, this occurs as a bed four feet ten inches thick, below seventeen feet of Basalt and twenty-five feet of drift. The lignite appears to rest on Lower Silurian shales, as all the specimens which were certainly known to have come from below it were of this description of rock. The Basalt above it is chiefly in the form of a dark earthy amygdaloid, often with a greenish tinge, the cavities being filled with a white carbonate. Some of the fragments lying about were almost made up of the same substance, in thin, closely crowded nearly parallel strings, and coloured with a red ochreous earth, which probably filled some of the fissures. This Basalt, both amygdaloidal and otherwise, has a perceptible effect on the magnet.

Cretaceous Series.—This formation, as already stated, occupies a very small space in the map, occurring merely as a narrow strip along the edge of the Basalt, beneath which it is shown to disappear to the N. of Waringstown. There is a site of an old chalk quarry close to the N. margin of the sheet, where the ground falls from the basalt district to the lower level of the Triassic on the east. Immediately to the N. of this, in sheet 36, Chalk abounding in flints is exposed, dipping 5° W.N.W.

To the S. of the kiln near this quarry a small mass of the overlying basalt appears at the surface, and E. of Cambray House there is a Chalk spring.

The Upper Greensand strata do not appear within the limits of this Map. The boundary has been continued from sheet 36 so as to show this division of the series dying out below the Chalk in a manner which, there can be no doubt, is approximately correct.

Triassic Series.—The rocks belonging to this series appear to be exposed only in one spot, in a stream 600 yards due E. of Drumnabreeze House, where the six-inch map shows reddish and purplish conglomerate with sub-angular fragments of Silurian grits, and small greenish fragments of slate. These have been referred to the Bunter Sandstone. The change in the character of the drift, as well as the slight, though quite apparent, alteration in the conformation of the surface, together with the evidence afforded by the details of the Chalk and Lower Silurian Formations, which bound the Triassic, determine the limits as shown in the Map.

Lower Silurian Formation.—These strata appear, near their junction with the basalt, in a stream W. of the northern part of Waringstown.

Here they consist of purplish and brownish gray grits and glossy slates, dipping S. 20° E. at 50° . These rocks were quarried next a house close to the road just W. of this, and their existence here, with the occurrence of an amygdaloid in a well a little S.W. of the spot, serves to fix the boundary just here. Gray grits are found at the W. of the church, and grits and slates in a well S.W. of the graveyard.

At the angle of roads S.W. of Drumnabreeze House, gray grits occur, and pale-gray grits with layers of glossy slate. Some of the grits have a purplish tinge. Here was observed a small fissure filled with brown hæmatite and quartz. The beds, which are covered by 14 feet of drift, dip S. 40° E., at 75° – 90° . At the mill-pond S.E. of this there are greenish-gray micaceous grits and shales, with greenish and purplish glossy slates; and in the streams between this and the main-road to the S.W., similar beds appear.

At the Corn Mill W. of Islanderry House coarse grits with slaty layers occur in a quarry, and purplish grits appear beside the road at the N.W. of the pond near the same house. These dip N. 20° – 40° W. at 65° . Rocks similar to these, with gray slates and purplish splintery shales, &c., are found in several localities along the hollows in the country around Red Hill and Lisnashanker House, and have been quarried on a small scale in a few instances. Among them a south-easterly dip prevails, but a few exceptions towards the N.W. indicate a somewhat folded condition of the strata.

At the western extremity of the marshy strip S. of the latter house there is a knoll composed of volcanic rock marked in the map as Trachyte. This has been already referred to in the microscopic notes by Mr. Hull, among which will also be found a description of the dolerite which forms a dyke along the course of a stream at the W. of Islanderry Farm.

In a small quarry at the W. of Red Hill there are gray and purplish grits. Some of the joints are stained red, and coated for a thickness of an inch with a hæmatitic putty-like substance.

At the W. of the boss of trachyte porphyry, N.E. of where a south-easterly dip of 70° is engraved, there are thick-bedded grits and slaty layers, with a bed of fine conglomerate containing quartz pebbles in a gray paste. This conglomerate passes into a coarse grit.

The boundary of the trachyte porphyry, which is concealed below a considerable depth of boulder-clay drift, is on that account not quite clearly defined. It is, however, very nearly as engraved. The mineral composition of this rock has been already stated. It is exposed in two quarries, one close to the N. margin of the sheet, the other next the road at the W. of the boss, and again at the townland boundary between these two points.

Along the stream to the S. of the trachyte porphyry, Silurian grits and slates appear, the dip of the beds varying chiefly between W. 10° S. and S.W. This change from the usual south-easterly dip arises, no doubt, from disturbances connected with the outburst of that large igneous mass.

There is a basalt dyke, as shown on the Map, W. of Kilntown. It is 4 feet wide, cutting across beds of grit and dark fissile slate, dipping S. 15° E. at 65° , and the rock is dark, with a finely crystalline structure.

Gray and bluish grits with gray flags appear in several places at the surface over an uneven space to the W. of The Palace, N.W. of Dromore. The dips vary between S. 10° E. and S. 20° W., at 70° – 80° in the northern part, becoming as low as 40° in the southern.

In a deep railway cutting S. of Quillyburn Bridge, rock occurs,

covered with drift for various depths, 45 feet overlying it towards the north end, and the least depth being about the middle. It consists of light-gray grits, often soft and calcareous, with beds of crumbling shale, and occasional beds of hard darker shales, interstratified without much regularity. There is a constant southerly dip, generally from 10° to 20° W. of S., at 35° to 50° , and occasionally varying to a few degrees E. of S. A little N. of the bridge the beds are somewhat displaced by small faults, and at a distance of 120 yards they are crossed by a dyke, 5 feet wide, of dark and very finely crystalline basalt. In some parts it is full of zeolites, and it mostly weathers with a dimpled surface. It affects the magnet very sensibly. This dyke appears again a little to the S.E., behind a house near Quillyburn Bridge. Here also it cuts across grits and shales, and weathers to nodular masses.

A small portion of another basalt dyke appears at the W. side of the above named cutting, a little farther to the N.

Some of the grits and shales, the latter especially, about the middle of the cutting, are penetrated by strings of carbonate of lime, and many of the exposed surfaces have the appearance of being covered with frost, from the occurrence of innumerable minute crystals of the same substance.

South-east of Clanmurry, between the railway and the road on the E., there is a wall of a basalt dyke exposed, with the usual north-westerly bearing. It weathers to nodules, and, as is always the case with the intrusive basalt, so far as was observed, has a slight effect on the magnetic needle.

For upwards of a mile S. of Quillyburn Bridge, the district to the E. of the railway is almost denuded of drift for a breadth of quarter to half a mile, and the rock appears in a few places in low gently undulating ground. On the west side the surface rises up with a rounded outline along the slopes of the higher hills composed of drift.

Where the Dromore and Banbridge road passes close to the railway there is a cutting on the latter exhibiting a good section through the Lower Silurian grits and shales, which are here covered by 3 to 10 feet of boulder-clay drift. The grits are fine-grained, of a bluish gray colour, and the shales are generally dark, and for the most part splintery, with some less friable beds which show a fine lamination, and glossy surfaces of fracture. In some spots these rocks contain many thin strings of carbonate of lime. The prevailing dip in this cutting is S. 20° E., at 20° – 30° .

The beds here are crossed by three dykes of basalt, one 12 feet wide, at the point where the railway passes nearest to the road. It is dark, heavy, and compact, or very finely crystalline, with vesicles filled with zeolites, and containing also granular particles of a dark brown glossy ferruginous mineral which becomes magnetic in the reducing flame of the blowpipe. These particles weather out so as to leave a dimpled surface on the rock. The dyke bears N. 15° W. across the railway, and is jointed in a manner which resembles bedding in thicknesses of 1 to 4 feet, dipping E. 15° N. at a high angle. The grits and shales cut by this dyke dip S. 20° E. at 30° , increasing to 60° at the bottom of the cutting, and N. of the dyke they are somewhat disturbed, shifting a little to the W. of S., at 40° . To the S. of it there is a pipe of basalt, 9 inches wide, cutting up through the beds.

Just to the N. of the above dyke a ferruginous spring flows from the rock on the E. side of the railway. The water has a metallic taste, and leaves a rusty brown deposit on the bed of the drain.

South-east of Rockvale a third dyke of basalt crosses this cutting. It

is seen in a small mass at each side below several feet of drift. This rock also is compact, and abounds in the ferruginous mineral mentioned as occurring in the dyke N. of this.

The rock seldom appears in the country lying to the W. of Dromore. In the bed of the river Lagan, N.W. of Gilhall House, there are fine-grained grits, contorted, but with an average dip a few degrees W. of S. at 45° .

Half a mile N.E. of this, in a small quarry close to the stream which flows S. by Islanderry Farm, bluish gray grits occur in thick beds, with beds of dark slate weathering purple, showing a rude cleavage striking E. 20° S. The dip is 30° – 45° S.W.

At the W. part of the bend of the river Lagan, about a mile S.E. of Donaghcloney Bridge, grits and gray flags appear in the bed and in the banks, overlaid by a deep covering of boulder-clay drift. They have a general dip of 45° S. 20° E. At the sharp bend, N.W. of Milltown, there are dark shales dipping S. at 30° .

At the S. of the river Lagan, and a little E. of Donaghcloney Bridge, there is a shaft, partly filled up, which was sunk by the late Lord Downshire in search of coals. It is said to have been 109 feet deep, of which about 100 were through the rock. The few fragments of grit lying about, said to have been brought up from it, are stained a reddish colour, probably from the presence of an oxide of manganese; and a mineral which from the description appears to have been iron pyrites in rather large cubes, was got in some quantity half way down the shaft. This experiment affords an instance, in addition to that already noticed near Lawrencetown, of the futility of a search for coals in the Lower Silurian strata.

No rock appears over a considerable area W. and S. of Donaghcloney.

A small boss of Dolerite occurs at the boundary between Ballylough and Clare, at the N. of the former townland. It is of a somewhat lighter colour and coarser texture than the ordinary basalt, and contains small zeolites. Beds of greenish grit are found close to it, and also, together with glossy shales, in a quarry to the N.E. and S. of the road, where they dip E. 40° S. at 40° .

Silurian rocks occur in a few places S. of Windmill Hill, with a south-easterly dip at 30° to 45° , and also close to the basalt boundary, W. of King's Hill.

Gray grits and flags are found in the bed of the river Bann at Lawrencetown, dipping W. 20° N. at 30° ; and a little further to the west there is an extensive exposure across the river, in which bluish shales predominate, with a few beds of fine-grained grit. The shales are often delicately laminated, and the beds have a wavy strike, dipping at low angles, chiefly 10° – 30° , but sometimes much higher. A rude cleavage is in many cases observed. The prevailing direction of the dip is southerly, with variations to E. and W. At Tullylish Bridge the undulating character of the bedding is well seen. The banks of the river Bann in this locality often slope up for 30 or 40 feet above its bed, thus exposing a deep deposit of drift, beneath which the rock disappears.

Grits and shales occur in other parts of the river, to the E. of Lawrencetown. At Milltown they occupy a considerable part of its bed, exhibiting a wavy strike, and dipping southerly at 25° – 50° .

On the higher ground S.W. of Milltown shales and bluish grits, dipping W. 20° N. at 35° , appear over a bare patch marked on the map; and in the stream W. of Moorestown, and at other places to the N.W. and S.E. of it, grits and glossy shales occur. These all appear to

show traces of an unusual amount of disturbance over a small area round Lawrencetown, its greatest effects being observed about that place.

At a spot one mile E. of Milltown, between Tonaghmore and Kilpike, coal is supposed by the people in the district to occur. The same fallacy exists in several other localities throughout this sheet.

A little to the N. of the cross-roads, S.W. of Patterson's lake, there is a basalt dyke, with the usual north-westerly bearing. One wall is exposed, forming the side of a quarry containing bluish and gray grits and splintery shales dipping W. 30° N. at 20° . The basalt, which is very dark and compact, with scattered grains of olivine, weathers to nodular concretionary masses of a light brown colour, speckled closely with dark ferruginous spots. The arrangement of the spheroids into which it weathers exhibits a regularity not often seen in this district. This rock affects the magnet with remarkable ease.

Besides the dykes of basalt already noticed along the Banbridge and Lisburn railway, it is crossed by others in this neighbourhood. One a little N. of W. from Tullyhinan House is 8 feet wide, and is exposed in a low mass, cutting across grits and shales which dip S. 20° E. at 45° - 60° . This basalt is very compact, and contains distinct crystals of labradorite. It slightly attracts the magnetic needle.

A little S. of this dyke another occurs, 12 feet wide, cutting across beds of grit in a low hillock W. of the railway, and traceable for 20 yards, appearing again in a mass 100 yards to the N. It contains many minute crystals of felspar, and also particles of the dark brown glassy ferruginous mineral which was noticed in the dykes on the railway near Dromore. Some parts abound in this substance, which weathers out and leaves small cavities on the surface, while in other parts it is almost absent.

In two small cuttings on the railway, at the S. of the large letter D, there are beds of light gray grit alternating with thinner beds of dark shale, and covered by a few feet of drift. Close to the bridge, over the more southerly cutting, there is a thick bed of soft brown sandstone, such as is elsewhere very occasionally met with. Here the beds dip S. 5° - 20° E. at 40° to 75° , while in the other cutting to the north the dip is S. 20° - 40° W. at 40° - 50° .

A mass of finely crystalline diorite occurs in a deep wide drain at the W. of Tullyhinan House, near the road from Banbridge to Dromore. It is of a gray colour, rather dark from the abundance of hornblende, the crystals of which are quite distinct. This rock, which is seen for a length of about 50 yards along the banks of the stream, weathers to a coarse sand.

Silurian grits and shales are exposed in several spots at the surface just N. of this, and among them is a dyke of basalt containing a few zeolites. It is 3 feet wide, bears W. 25° N., and is exposed for a length of 10 yards.

To the S. of Tullyhinan House the rock appears in many places, both in bosses and in patches at the surface, over the large irregular area marked on the map. In the western part the dips lie chiefly between E. 25° S. and S.E., with a few exceptions towards N.W. They range in amount from 35° to 80° . Towards the E. the dip is more steady, at about 45° S. 20° - 30° E. The rock in great part consists of hard bluish grits in massive beds, with occasional bands of dark shale, and greenish crumbling slate. The grits have been somewhat extensively quarried in one locality for the bridges of the Banbridge and Lisburn railway. In a quarry at the point where the roads from Banbridge to Dromore

and to Dromara diverge they show a dip to W. 20° N. at 30° . Here they are cut up by numerous joints, among the principal of which there is an amount of regularity, so as at first sight to resemble even bedding.

In a quarry at the W. of the cross-roads near Magherally Church, a dyke of finely crystalline basalt, 2 feet wide, cuts across thin beds of gray and bluish grits.

One-third of a mile N. of Magherally Church, to the E. of the road, there are three exposures of trap consisting of a pinkish felsitic mass containing many particles of a dark mineral in which a fibrous structure is obscurely seen, and a rudely prismatic form. This mineral, which fuzes readily to a dark greenish bead, is probably hornblende. The rock occurs as a dyke cutting across thick grit beds behind a house close to the road, and again 170 yards to the S.E. Its junction with the grits is clearly marked in several places. At 100 yards farther to the E. from the boss behind the house there is a large mass, no doubt part of the same dyke, in which the felspar occurs in a more distinctly crystalline form. Here it is seen also in contact with bluish grits.

Just opposite this, on the W. side of the road, there is a narrow dyke of concretionary basalt cutting beds of grit. Its width is 2 feet 6 inches.

Half a mile E. of the cross-roads at Greenfield there are two bosses of finely crystalline diorite, which again appears a little to the S. of the road, among beds of grit. Here it is seen to lose its crystalline form, and to pass into a dark coloured compact mass.

Lower Silurian grits and shales occur in several places through the country E. and S.E. of Greenfield, all showing a south-easterly dip. A quarry S. of Ballooly House exposes massive coarse grits with occasional thin beds of finer grain, dipping S. 30° E. at 70° .

Near the N. of Corbet Lough, and along the stream E. of the road, are massive coarse quartzose grits, with thin beds of finely micaceous grit; dip S. 20° E. at 55° .

At the S.E. of Eliza Hill, and also half a mile S.W. of it, massive grits were quarried for building Poland's Bridge over the river Bann, and other bridges. Here they dip E. 40° S. at 50° .

At Milltown the bed of the river Bann consists of gray grits with purplish and greenish slates dipping S. 30° E. at 50° , and cut across by a dyke of pinkish granular felstone 10 feet wide.

Close to the river, at the N. of Balleevy House, rather dark grits and layers of greenish slate occur, dipping S. 30° E. at 70° . In an excavation among shales, a layer 3 inches thick was met with, consisting of a substance resembling coal dust in appearance. This, which was probably the debris of a bituminous shale, has produced an impression that coal exists here.

Rock appears in a few places in the immediate vicinity of Banbridge. At the W. of Reilly-street, near the gas works, greenish shales and gray grits dip S. 30° E. at 55° .

Very dark alum shales, with minute crystals of iron pyrites, were reached in a well below 20 feet of boulder clay, at the W. of Newry-street; and similar rock is said to have been met with at greater depths in neighbouring wells.

In the railway cuttings near Banbridge the rock is covered by many feet of drift. W. of Edenderry House there is a depth of 15 to 30 feet overlying bluish grits and soft friable shales, having a somewhat wavy strike, and dipping on an average S. 40° E. at 45° - 60° . These rocks are in many parts stained red, probably from the presence of manganese, and are penetrated by thin strings of carbonate of lime.

In the next large cutting to the N.E. similar rocks occur in masses coming up in some places to near the surface, and gradually dying out in rounded forms below several feet of drift, probably the result of ice-moulding. These also have a wavy strike, dipping S. 10° E. to S.E. at 45°.

Just to the N. of the trig. point 257, these beds are crossed by a basalt dyke, 3 feet 6 inches wide. It is somewhat vesicular, and weathers with a tendency to a spheroidal structure.

A mass of finely amygdaloidal basalt, with zeolites, occurs among grits at the W. of the railway, 500 yards S.W. of Solitude.

Half a mile W. of Huntley Glen a mass of finely crystalline basalt, rather lighter in colour than is usual, comes up to the surface in small patches. It is well seen in a quarry N.E. of the Farm-house, where it is regularly jointed, so as to resemble a dip of 70° S. 20°-25° W.

N.E. of Lindsaystown grits and shales are exposed in many localities, and present variations of dip and strike, apparently marking an extension of the disturbances already noticed as existing to the N.W. of this.

Southward from Lindsaystown we meet with rock occasionally close to the low flat patches between the drift hills.

At the National School, W. of Ballygowan House, the road from Banbridge to Scarva passes through a cutting exposing friable shales and some thick beds of bluish grit, with an average dip of 30°-50° S. 30° E. The rock again appears at the surface of the old road on the high ground to the north.

A dyke of light coloured pinkish granular felstone 3 feet to 5 feet in width cuts across beds of grit and delicately laminated gray flags, at the N. of Silverford Bridge. It is exposed at the surface for a distance of about 10 yards. The beds dip S. 5° E. at 20°.

Another mass of felstone occurs at the W. side of Legananny Moss, a mile W. of Loughbrickland House. It lies between beds of grit, for a width of 10 feet. Here it is very compact, of a light colour, varying from pinkish to greenish gray, and weathers nearly white. It contains a small quantity of iron pyrites. It appears again a little to the W. of this spot, at a house beside the road, and in a third place a little farther to the W. in a stream.

At a house N.E. of Diamond Lodge there is a mass of gray finely crystalline trap exposed to a small extent among grits at the surface of the ground. It contains minute prismatic crystals which appear to be hornblende, in a felsitic mass.

600 yards E. of Silverford Bridge, massive beds of bluish grit appear at the surface, weathered in a remarkable manner with numerous cavities, generally 1 to 3 inches in length, and less in depth. Many of these bear some resemblance to the foot-prints of quadrupeds and of children, from which circumstance the rock is regarded with some degree of superstition. They have a prevailing direction lengthwise, N. 30°-35° E.

At a house between the above and Silverford Bridge, rock was reached in a well, below 18 feet of drift. Some small fragments of it were observed, showing it to be a dark shale with a gloss on the surfaces of fracture, caused probably by a thin bituminous coating. The impression that coal might be found at this spot is very strong among the residents in the district. The existence of unusually dark shales in a stream one-third of a mile N.W. of the Hill Head, is considered to favour this impression also. It should be borne in mind that there is no evidence of the existence of coal anywhere among the Lower Silurian strata.

At the W. of the road, in the low ground S. of Loughbrickland, there is a dyke of finely-crystalline basalt, containing a few small zeolites. There is a general regularity in the direction of its joints, striking E. 20° N., or at right angles to what seems to be the bearing of the dyke, which appears in two patches above the surface of the ground.

At the W. of Loughbrickland massive bluish and gray grits are exposed in many spots, and have been in some quarried for building. Similar rock, probably some of the same beds, occurs a mile and a quarter N.E. of Loughbrickland, dipping E. 40° S. at 60° . These were quarried for some of the bridges on the partly-constructed railway from Banbridge to Ballyronney.

One mile from Loughbrickland towards Banbridge, on the W. side of the road, there is a vein of light-coloured granular felstone among massive grit beds. It again appears close to the old road, a little N.W. of this. It contains in some parts particles of a soft dark mineral, which may be a variety of hornblende. The width of this dyke is not more than a few feet, but it could not be ascertained exactly. Its junction with the grits at one side is clearly marked, and has a north-westerly bearing. In a quarry close at hand to the N.W. there is a dip of 30° S. 40° E. among grits and shales.

A mass of felstone similar to that just mentioned occurs among grits 600 yards to the S. of it, at a farm-house a little distance E. of the road.

A little E. of the trig. point 472 there is a dyke, in irregular widths of a few feet, cutting across beds of hard fine-grained grits. It is compact felstone, of a purplish brown colour, and weathers nearly white. It can be traced for about 20 yards in length continuously.

At the N.E. of Claymount thick beds of bluish grit, dipping S. 30° E., at 60° , with variations eastward, were quarried for building the unfinished railway walls at Banbridge. These beds are in some parts very coarse, and contain a few sandy nodules.

S.W. of Loughbrickland the rock rarely appears. N. of The Rocks, at the N. side of the road, a mass of felstone occurs, apparently between beds of grit, which dip S.E. at 25° . The same rock is found 450 yards W. of this, as a dyke bearing N.W.; and it is perhaps a portion of the same which occurs in a somewhat different form at the N.W. of the Presbyterian Meeting-house, in front of a house W. of the road, among grits and greenish shales which dip 20° to 40° S. 40° W. In the two localities first mentioned, it is granular, of a light gray colour, and mottled with greenish particles. Near the Meeting-house it is more compact, and contains a few flaky particles which appear to be minute scales of dark-coloured mica.

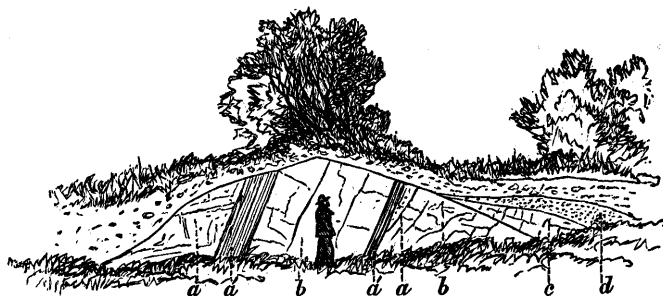
Over the country to the E. and S.E. of Loughbrickland the rock appears occasionally in small bosses in the low ground between the drift hills, which are here very extensive. The dips are all at high angles, and lie chiefly towards the S.E. South of Clover Hill there are flags and massive grits, dipping S. 40° E. at 80° .

N. of the junction of roads three-quarters of a mile W.S.W. from Cave Hill, a mass of very close-grained Granite occurs among light gray grits and flags, which dip N. 40° W. at 80° . It appears to be a vein several feet wide, intruded along the planes of bedding, and at the line of contact with the grits permeating them in strings, which in many parts exhibit a gradual but rapid passage from grit to Granite. Similar Granite occurs at two-thirds of a mile S. of Cave Hill, in small patches at the surface of the ground, in contact with grits, and presenting much the same appearances of intrusion and metamorphic action. This closely-grained Granite is of a very light colour, sometimes having a faint bluish

tinge on a fresh fracture, is highly felspathic, and contains, besides hexagonal scales of black mica, slender rectangular particles which seem to be made up of extremely small scales of the same mineral.

At nearly two-thirds of a mile S.W. from Ballynaferris National School a section at the W. of a narrow road shows this Granite in two masses about 10 feet wide each, apparently intruded between beds of flags, and in places seen to cut them.

Section showing Granite occurring among Lower Silurian rocks at side of narrow road, two-thirds of a mile S.S.W. of Cave Hill.



a. Hard bluish grits. a'. Compact flags. b. Close-grained granite. c. Silurian débris apparently in situ. d. Sand (chiefly decomposed granite).

300 yards N.W. of the National School the Granite appears in several small masses at the W. of the road. Some of these are composed of a comparatively coarse description, containing reddish and white felspar, and abundance of black mica, with a little hornblende. Some of the reddish felspar crystals exhibit a finely striated appearance.

The finer description of Granite occurs again nearly a mile E. of Cave Hill, as marked on the map, where grits and shales also come occasionally to the surface, showing a high north-westerly dip.

As we approach the granitic district we find the Silurian rocks for the most part micacized. In a quarry at the S. of Wilsonstown, where there is a S.E. dip marked 70° , there are thin beds of grit and shale altered to the form of mica-schist. The south-easterly dips about here are exceptions to the nearly invariable rule of a north-westerly direction which is found to exist near the Granite along its northern junction with the Silurian rocks.

Slieve Croob District.—The junction in the S.W. of this district is in many places conjectural, owing to the quantity of drift which covers the rock. Granite occurs in several patches and small masses from one-third to two-thirds of a mile E. of Wilsonstown. It is fine-grained, generally of a dark pinkish gray colour, and highly glistening with abundance of black mica. In some spots the Silurian grits are found in contact with it, and here, as elsewhere, their character varies from a very slightly altered condition towards that of true Granite.

At one-quarter of a mile S. of Wilsonstown Granite occurs at a house just to the E. of where the junction is drawn, and 300 yards W. of this, altered grits and shales are found in a quarry on the hill. Here they dip at high angles on both sides of a vertical line. Strike E. 40° N.

Half a mile S.W. of Ballybrick, at the W. side of the road, there is a hillock composed of Granite abounding in red felspar, and containing a greenish-coloured mica. In some parts it is harder, and more compact

and siliceous than in others. On the E. of the road near this, there is a boss of the more ordinary gray Granite containing small masses of Silurian grit, slightly altered.

On Shannaghan Hill, marked 481 feet high, fine-grained Granite appears extensively at the surface. In some places, especially at the top of the hill, and down its north-eastern slope, large masses of fine grit occur, which at first sight might appear to be fragments embedded in the granite. They are found, however, to present the evidences of metamorphism already specified, and retain a constant north-westerly dip similar to that of the grits and shales in the vicinity. The lamination is throughout the grits very plainly marked, its planes being in most places highly micacized.

In a section 16 feet deep at the W. of the hill, where two felsite dykes are engraved on the map, grit beds are found dipping N. 40° W. at 60°–80°. These, which are also highly micacized, and show a delicate lamination parallel to the bedding, are penetrated by strings which present various characters, from that of a very finely granular mixture of felspar and quartz, to that of Granite. Two dykes of hard felsitic rock, of a pinkish colour, are especially conspicuous, crossing these beds, one 3 feet wide, and bearing S. 40 E., the other 50 yards S. of it. In some parts this rock, when closely examined, is found to contain dark particles which appear to be the result of incipient crystallization, tending to the production of Granite, into which it passes by a rapid gradation, as is seen in some parts of the latter dyke.

In a small quarry at the Granite boundary, 400 yards N.E. of the top of Shannaghan Hill, this partial crystallization is well seen in different stages among metamorphosed grits, in which also many minute crystals of iron pyrites are observed.

Nearly half a mile S. of Hillhead, in a quarry at the E. side of the road, where marked on the map, a mass of close-grained siliceous granite occurs in a width of 10 feet among shales and fine grits. It appears to be intrusive, and somewhat resembles that already noticed as existing to the S.W. of this, at the S. and E. of Cave Hill. These are most probably connected, and mark a narrow line of metamorphic action, having a general parallelism to the boundary of the Granite lying to the east. At the N.E. of the quarry just mentioned, the Granite appears in several patches at the surface of the ground, as do also the stratified rocks close at hand, though their actual contact was not observed except in the quarry. The Granite and the grits, which latter dip S. 40 E. at 70°–80°, are cut by joints which have the same average direction, that is, N. 15°–20° W.

At Doyle's Close, half a mile N.E. of Shannaghan Hill, the Granite near the junction abounds generally in mica, but it is occasionally very close-grained and almost devoid of that mineral. In both conditions a few small crystals of hornblende are detected. The grits about here are in some cases converted into quartzite, as may be best seen in a quarry at the junction of roads N. of Doyle's Close, where the beds dip N. 25 W. at 50°–80°. Here the micacized appearance is absent, but it is observed where the grits and shales are largely exposed a little to the S.E. Here the junction with the Granite passes, and is well marked.

The boundary can be traced with tolerable accuracy as far as Deehomed Mountain, by the occurrence of bosses of both descriptions of rock; and over the mountain it is quite easily followed.

Small pits were sunk in search of iron ore some years ago, near the road passing by Bigham's Close, at two-thirds of a mile S. of that spot. In one which remained partly open, closely-grained hard reddish-coloured grits were found. One thousand yards eastward from this, at the top of

a lane leading up to the N.W. part of Deehomed, crumbling grits, covered with a reddish powdery substance, occur a little below the surface, and this colouring is more or less to be observed in the soil and drift throughout the neighbouring district, especially to the N.E. Similarly coloured crumbling shales and grit occur, together with gray grits and green shales, dipping N. 35° W. at 85°, in a stream at the S.E. of Bigham's Close. They are covered by about 30 feet of drift, through which the red colour extends.

In a hollow known as Redmond's Glen, at the cross-roads W. of Ring's End, there are small bosses composed of gray and bluish grits and flags. Most of these are micacized, and some of the flags present a finely mottled appearance, such as is occasionally observed in the slightly altered rocks. A section about 10 feet deep, said to have been opened partly in search of iron ore, exposes crumbling flags and grits with splintery shales. Most of these have throughout a purplish-brown or liver colour. They have high northerly and southerly dips, with an average strike of E. 25° N., and are covered by 2 or 3 feet of reddish clay mixed with *débris*. A small mass of magnetic iron ore was picked up along the stream a little W. of Redmond's Glen, and a few similar fragments are said to have been found in the vicinity, though it does not appear to have been discovered *in situ*.

On the W. slope of Deehomed Mountain, near the junction of the Granite and the Silurian, very highly micacized grits in thin beds are met with, having generally a finely laminated structure. These appear in smooth, apparently ice-worn patches at the surface, wherever the shallow covering of soil has been removed. The two rocks are only very occasionally seen in contact owing to this covering, though both are exposed in many spots.

Nearly 200 yards W. of the summit, a portion of a Basalt dyke is seen in contact with the Granite.

The Granite of Deehomed, like all the rest in the sheet, is finely crystalline, but in some spots much more so than in others. It is generally of a whitish-gray colour, becoming more or less discoloured with reddish and yellowish tinges by weathering. This latter is especially the case with the more coarsely-grained rock. In the mica, all of which is dark, a variety of colours is sometimes observed.

A little E. of the summit a very fine description is found, highly felspathic, of a yellowish colour, and weathering white. The mica exists in very small scales grouped together in nests. The white-weathered surface can be sometimes peeled off in flakes. In the Granite of Deehomed occasional crystals of hornblende are found.

On the S. slope of the hill a dyke of Basalt can be traced as on the map, by the appearance of patches, about 2 yards wide, at the surface. It bears 10° to 20° W. of N., and is, perhaps, the same dyke which was noticed a little W. of the summit. The rock, which is compact, is cut by joints at right angles to the direction of the dyke, and has a general tendency to split off parallel to them.

North of this dyke a vein of finely granular rock, apparently composed of quartz and felspar, with a few slender crystals of hornblende, can be traced in nearly the same north-westerly direction for 150 yards, and also for some distance at the E. side of the basalt dyke, nearly parallel to it. The rock is of a light-gray colour, sometimes slightly bluish, and weathers nearly white. This vein, which was found to be 11 yards wide in some parts, cuts as a dyke through the coarser Granite, the junction on both sides being sometimes well marked. The jointing, which principally strikes about N. 15° W., is continued through both rocks.

At a cluster of houses at the N. side of the road, and S. of Deehomed Mountain, a dyke of rather coarsely crystalline basalt, 4 feet wide, appears cutting through Granite; and at 2 feet 6 inches from it a vein of finely-grained felspathic rock 5 feet 6 inches wide, somewhat similar to that just mentioned as occurring among the Granite. The proper name for it is probably *granulite*. There appears to be a very small quantity of mica present. The adjoining basalt dyke exhibits a rude columnar structure for 6 inches from the exposed surface at its S. side. The direction of its course is W. 20° N. Immediately behind the dwelling-house a portion of a dyke of extremely compact basalt appears.

Over Slievenaboley Mountain the Granite is exposed in large and small rugged masses, and in patches at the surface, among the heath and furze which cover great part of the mountain. It is of the usual finely crystalline character, consisting of quartz, white felspar, and black mica, with sometimes a little hornblende. The mica is almost always abundant, and occurs, not so much in distinct plates, as in small aggregates of minute scales. The rock is quarried to a small extent, and in a quarry half a mile N.W. from the summit, good gate posts and rolling stones are procured. The rock is for the most part rather closely and irregularly cracked in the exposed parts, and has to be well opened up to get at good stone. There is a certain degree of regularity in the joints, which here strike principally about E. 40° S., and are crossed by others striking E. 30° N., which latter in section give the appearance of rude stratification, dipping 80°, S. 30° E. Veins of white quartz penetrate the Granite in a few places on Slievenaboley Mountain, but they are not of frequent occurrence in any part of the district. Fragments of Silurian grit, apparently from broken boulders and drift gravel, are found as high up as the summit, seeming to indicate that the drift at one time extended to this height, which is marked 1,069 feet.

About the Windy Gap, and N.W. of it, the surface of the Granite presents a close jointing, which divides it into small cuboidal masses, or rhomboidal weathered to a rounded form. It disintegrates to a fine brown sand, in which the mica retains its black colour, not becoming bronze-coloured as in the minettes.

The altered character of the Silurian strata near the Granite is well seen in a low hill of rock a mile N. of the top of Slievenaboley. They consist of grits and shales converted in many places into micaceous schist. There are also some pale grits which appear to be unaltered. The dip is N. 30 W. to N.W. at 80°.

About where the junction crosses the road, to the E. of this hill, the Granite and the Silurian rocks are often seen in contact. Most of the latter are laminated parallel to the planes of bedding, but in some cases there is an obliquely foliated appearance, which may result from oblique lamination. The Granite about here contains quartzose veins, which may be seen exhibiting a remarkable approach to parallelism in a section at the point where the junction crosses the road N.N.W. of Boley Lough. These veins vary in composition from compact quartz to a yellowish quartzose Granite with very little mica, and in widths of half-inch to 6 inches.

In the district N.E. of Slievenaboley the Granite presents slight variations in character, sometimes abounding in pink felspar, which occurs especially in the more coarsely crystalline varieties. At the N. and W. of Boley Lough it occasionally becomes very hard and compact, of a dark colour, with a somewhat porphyritic structure, containing crystals of yellowish-pink felspar, and a few of hornblende, with small flakes of black mica thinly distributed.

On the hill E. of Boley Lough the Granite has been quarried to a small extent, and affords good head-stones, gate-posts, steps, &c., in some spots where it is of a pure whitish-gray colour, and of a uniform texture. In a quarry one-third of a mile E. of Boley Lough, stones were got out 10 to 14 feet long and 2 to 3 feet thick. This rock is said to be free from discolouration in weathering. In some localities about here, and N. of this on Cratlieve, fragments of Silurian grit are found apparently imbedded in the Granite.

South-west of the above quarry, at the E. of the road, the Granite is seen disintegrated *in situ* for several feet in depth, and traversed by veins of quartz, which stand out somewhat from the crumbling mass. In this condition of the rock there is observed a parallelism in the disposition of the component minerals, causing an obscurely foliated appearance.

The Granite of Cratlieve is of the same general character as that of the localities hitherto noticed, being for the most part of a whitish-gray colour, weathering more or less brown and pinkish. It is occasionally more compact than ordinary, and slightly tinged blue along a fresh fracture. Sometimes it changes in its texture suddenly, becoming comparatively coarse, and full of red felspar. A small quantity of hornblende is occasionally detected.

At the N.E. of Cratlieve a dyke of finely crystalline dolerite occurs, bearing north-westerly, and forming a slightly elevated ridge several yards in length.

At the W. of Monahoora, where the river Lagan flows through a small ravine, Silurian rocks are exposed in rugged masses which exhibit high north-westerly and south-easterly dips. In the bed of the river appears a dyke of compact light pink felstone containing a few globules of clear quartz. The course of this dyke appears to coincide with the direction of the river so far as it can be traced.

On Monahoora, Lower Silurian grits and flags appear in many places, affording a few north-westerly dips. The exposed surfaces, which often present the appearance of ice-rounding, exhibit in many cases an extremely delicate lamination. Strings of quartz are frequent in some parts, and a little S.E. of the summit some of the grits have been converted into quartzite.

At the junction of the Granite and Silurian, near the top of Slieve Croob, two dykes of basalt occur. One, half a mile W. of the summit, consists of a large wackenic mass with crystals of labradorite porphyritically imbedded. It attracts the magnet very readily. The other, 250 yards S.W. of the summit, is exposed in a face 5 feet high, and can be traced for 30 yards in a line a few degrees W. of N. It is very compact, containing small cavities, chiefly oval, filled with a glossy dark ferruginous mineral, which affects the magnet. The rock is cut with some regularity by divisional planes in the direction of its length, and easily breaks up into flaky fragments parallel to these.

At about 350 and 750 yards respectively from the summit of Slieve Croob, in a direction 5° S. of E., two dykes occur; the former of basalt, 6 to 10 feet wide, and bearing W. 40° N. This is probably the same dyke as that which has been just noticed. The other consists of dolerite, and bears N.W., with a width of 6 feet. Some of the Granite bosses on Slieve Croob are *roche moutonnée* and striated, in a direction from N.W. to S.E.

The Silurian rocks near the Granite on Slieve Croob are generally micacized, and assume a dark colour. Sometimes they are lighter, and

appear to pass into very fine Granite by the gradually increasing development of crystals without the usual high amount of micacization.

To the S.E. of Slieve Croob the Granite often contains hornblende. This is especially the case on Slievenisky, down its south-eastern slope; and at its base, about the junction with the Silurian W. of The Rookery, the hornblende is in some places more abundant than the mica.

The Granite on Slievenisky often has the appearance of rude stratification with a high dip, owing to the regularity of its jointing. As a general rule, this may be said of the Granite throughout the district. The directions are very variable, though often constant for some little extent. There do not appear to be any grounds for connecting these appearances with true stratification.*

The micacized flags and grits to the E. of Slievenisky often exhibit a wavy lamination.

At the northern base of Slievegarra the Granite contains hornblende in many places, and is generally of a dark hue from the quantity of mica together with this mineral. Here it is seldom of the clear whitish gray colour elsewhere observed, being for the most part brownish with a shade of pink.

Ascending Slievegarra from the N. we meet with similar rock, the hornblende almost disappearing on the upper parts of the hill. At the eastern base it becomes syenitic, and often almost black from the abundance of hornblende and mica, while it weathers with an unusually light colour.

The Granite on Benraw Mountain is of the ordinary fine-grained whitish gray description, with occasional crystals of hornblende. On the south slope a mass of compact basalt occurs in a small quarry. This seems to be probably part of a dyke which appears in a stream at the cross-roads nearly a mile S.E. of this. It contains cavities filled with a dark glistening ferruginous mineral, and a few small crystals of labradorite. For about one-eighth of an inch from the surface it weathers very light brown, and the dyke, which is 10 to 15 feet wide, is closely jointed so as to resemble bedding at first sight.

On a hill at the S. of Slievenaboley a large mass of basalt occurs, occupying an area about 150 yards by 50, and in its vicinity are smaller dykes evidently connected with it, all marking an outburst of a magnitude unusual in this district. The Granite about here is in some parts very fine-grained, containing a few slender crystals of hornblende and a small quantity of black mica in minute hexagonal scales. So far as could be observed this description of rock appears to occur intrusively in the ordinary Granite.

In the townland of Derryneill, to the S. of Benraw, the Granite is very much exposed over a hilly area including Bell's Hill and Derryneill Hill. It is finely crystalline, consisting of quartz, white feldspar, and black mica, with sometimes distinct crystals of hornblende. At the S. part of Derryneill Hill (marked \triangle 513), a few crystals of this mineral of an unusually large size were found—one measured nearly half an inch long.

A dyke of basalt cuts through the Granite across Derryneill Hill, and is well exposed in some places. To the S.E. of the summit it occurs in a quarry, in contact with Granite, and is seen for a width of 13 feet, nearly its full dimension. Here it disappears below the Granite to the south, but comes up again in spots between this and the south margin

* As already noticed in the General Description, the direction of this apparent dip throughout the Granitic district is almost universally more nearly N. and S. than E. and W.

of the sheet. North-west from Derryneill it can also be traced in patches at the surface, and due E. of Prospect House it is well seen for a width of 16 feet in a rudely columnar mass, and again appears 700 yards N.W. of this in contact with the Granite on each side.

The Granite on a hill about a mile S. of Benraw Mountain, called Carnalroe, is of a clear white hue, and regularly jointed, and presents surfaces rounded probably by ice action.

Towards the S. of the sheet the Granite abounds more in pink felspar than elsewhere. In the stream flowing S., at the W. of Carrivmoragh, this mineral occurs, with hornblende distinctly developed, and small scales of black mica. North of the Roman Catholic Chapel very distinct though slender crystals of hornblende are numerous in parts of the Granite between this stream and the road on the west.

Carrivmoragh and the adjoining hill on the east, called in the six-inch maps "The Annagh," contain many exposures of Granite in rugged masses, but more generally in patches among the heath and furze. It is of the ordinary fine description, for the most part weathering yellowish and brownish pink, and contains occasionally a little hornblende.

On Curlet's Hill, to the S. of Clarkill Wood, there are many exposures of grits in thick beds, and micacized in different degrees. They are in many places penetrated by strings of white quartz. The dip averages E. 25° S. at 50°-75°. The surface is sometimes marked with grains of quartz weathered out in bands rudely parallel to the bedding. There are also often small knobs remaining on the exposed surface, showing the heterogeneous nature of the rock, and its consequent varying capability of resisting weathering agencies.

On this hill there occur several veins of felstone porphyry, as shown in the Map, traversing the Silurian strata. The rock is of a light gray, slightly pinkish colour, weathering yellowish white, and sometimes quite white. It is a compact felsitic mass, enclosing grains of clear quartz, in many of which a crystalline form, that of bi-hexagonal pyramids, is apparent. There are also present, though rarely, what appeared to be minute scales of black mica. One dyke, behind a garden at the W. of the hill, is 7 or 8 feet wide, and is seen to cut across the bedding, along the planes of which, however, the igneous masses appear to have for the most part flowed.

A little E. of the top of Curlet's Hill, a dyke of this felstone porphyry occurs in a width of 12 yards, diminishing to a few feet before it disappears to the northward. In this the crystalline form of the quartz is well shown.*

West of Curlet's Hill, on the W. side of the road a dyke, 8 feet wide, of finely granular bluish felstone crosses beds of grit and flags in a direction nearly E. and W. This rock is somewhat porphyritic, with small felspar crystals, and contains also a few scales of black mica.

Between Curlet's Hill and the granite on the west, the Silurian rocks occur in *moutonnée* bosses, some of which are striated, the direction of the striae being from W. 35° N.

The junction of the Granite and Silurian is plainly traced along the west slope of the Clonvaraghan Mountain, and as far N. as Keltonstown, their contact being exposed in many places. The grits are highly micacized, and dip at very high angles away from the granite, the direction varying from E. 5° S. to E. 10° N. The granite is finely crystalline, and weathers for the most part pinkish brown. Viewed from some

* For notes on the microscopical appearance of a specimen from one of these felstone porphyry dykes, see page 15.

distance, as from the road through Clarkill Wood on the S., the line of junction up the S.W. of Clonvaraghan Mountain can be easily distinguished by the different shades of the weathered surfaces.

Where the hill slopes down on the S. to Clonvaraghan Wood, grits are exposed along a steeply sloping face, called in the six-inch maps "Spinkanee." They dip E. 25° S. at 65° - 70° , and are micacized in various degrees.

The more finely grained grits in the neighbourhood of the Granite sometimes present a peculiar structure on the weathered surface. It is dotted with projecting particles resembling in general appearance small grains of wheat somewhat flattened. This structure is observed so far into the rock as the weathering extends, and appears to indicate the partly crystalline condition of the mass.

The rocks over the hill marked 777 feet N.E. of Clonvaraghan, exhibit in many places an extremely delicate lamination, which causes a finely grooved appearance on the exposed surface, arising from the various degrees of weathering of the laminae. No ice-striae were observed here, but the occasionally rounded form of the rocky surface seems to be due to ice-moulding.

Over the wild hilly district in which Black-L. is situated, this smooth rounding at the surface of the ground is often well marked, as on the hill to the W. of that lough. Generally speaking, however, the rocks here are exposed in uneven masses formed of thick beds of grit, in which there may be obscurely discerned an approach to a rounded form. Groups of flags occur occasionally among the grits, and these are often finely laminated, obliquely or otherwise. The usual dip is S. 30° E. to S.E. at 60° to 85° . Among the grits a rude cleavage sometimes exists.

The surface rises gradually, but unevenly, northward from Black-L. till it reaches the height marked 734 feet. On this hill, especially S. and S.E. of the summit, the bedding is a good deal disturbed, so as to dip both E. and W. of S., and occasionally N.E.

Three hundred yards S. of Black-L. a dyke of basalt, 4 feet wide, crosses the grit beds for about 100 yards in length. It is finely crystalline, and contains a few zeolites.

The rocky district stretching away to the N.W. of Black-L. is traversed by several dykes, the principal of which are shown on the Map.

At the S. of Hamilton's Folly, there is a dyke of dark finely crystalline basalt, about 15 feet wide. In one place it is exposed in a face 10 feet high, forming portion of its western wall, and is cracked and jointed in many directions, but with a certain degree of regularity which gives it somewhat the appearance of a series of beds 1 to 3 feet thick, forming an anticlinal curve.

Just N. of the top of Hamilton's Folly the grits and shales are traversed by a dyke about 10 feet wide, of dark pinkish gray minette, being a compact or very finely crystalline felsitic mass, with small hexagonal scales of black mica, and occasional comparatively large crystals of light coloured felspar. It weathers nearly white, with a surface that peels off in flakes, and the mica weathers to a bronze colour.

At the S. of the cross-roads to the N.E. of Hamilton's Folly, a boss of rock occurs which appears to be a felspathic granite. It exists in other spots in the vicinity, weathering in nodular masses at the surface of the ground. In some places it becomes compact, and is traversed by quartz veins. The grits in its neighbourhood are micacized.

One hundred yards N. of the same cross-roads, in a quarry at the W. of the road, there is a mass of finely crystalline dark pinkish gray trap, consisting of pink felspar mixed with a dark greenish mineral, and with

a few scales of mica. There are also occasional globules of quartz, and small crystals of iron pyrites. East of the road this rock appears in a few bosses, forming a dyke which traverses the Silurian strata in a north-easterly direction, or along the average line of strike.

North and S. of Hillside Cottage there are similar bosses and other exposures of felspathic trap, generally resembling one another in composition, but varying slightly in the proportions of the different constituents. This variation may be observed also in different parts of the same mass. They nearly always contain black mica in small hexagonal scales. It is sometimes absent, however, and in some cases is quite undistinguishable, except in the weathered portion of the rock.

Three hundred yards S. of Magherahamlet Meeting-house, a dyke occurs in several bosses. It consists in some parts of a granular mass of pink felspar with small scales of black mica, and with a dark greenish mineral throughout. In other parts it is more compact, and in some it is highly and finely crystalline, sparkling with minute crystals of felspar, black mica, and a few delicate prisms of hornblende. The soft greenish mineral mentioned here, and as generally occurring in these igneous rocks, fuses readily to a dark greenish bead. At 300 yards E.N.E. of the glebe house at Magherahamlet, a mass occurs which seems to be the continuation of the same dyke. It exists as an irregular patch at the surface among beds of grit which have wavy dips of 15° – 45° N. 30° W. & S. 30° E. Here its eruptive character is put beyond a doubt by its position among the grits. This mass is cut across by a dyke of basalt 18 inches wide, which appears again a little to S.E., crossing beds of Silurian grit.

In a small quarry 300 yards N. of Hillside Cottage, a dyke of quartziferous porphyry occurs, cutting through grits. It is a pinkish compact felsitic mass with quartz globules, and weathers nearly white. This dyke can be traced in bosses in a south-westerly direction for 300 yards. It again appears half a mile further S.W., and is next seen outside the wall of the Deer Park, in a mass 8 feet wide, filling a nearly vertical crevice in beds of grit, and then overlying them for a depth of 2 feet, and for a width N. and S. of 18 feet. Inside the wall it is plainly seen cutting across the beds, which dip on each side N. 20° W. at 60° ; and it appears in several places inside the southern wall, being finally observed at the junction of the Granite and Silurian, to the W. of Hamilton's Folly, and penetrating both rocks as shown on the Map. In some places the above rock becomes more crystalline, and contains, besides imperfectly developed crystals of pink felspar, a few hexagonal plates of black mica.

From the similar modes of occurrence of these veins of felspathic rock, and of others in the vicinity, their apparent similarity of composition, and their transitions from one degree of crystallization to another, they appear to be all closely allied, though distinguished by the various designations of felstone, mica-trap or minette, and quartz porphyry.

Going northward through the Deer Park, near its eastern side, we meet with gray grits in thick and thin beds, cleaved slaty layers, and gray flags, dipping N. 20° – 40° W., at 70° – 80° . These are exposed extensively and in rugged masses towards the N. of the Deer Park. They are crossed by dykes of basalt as shown on the Map.

At the S. of a pond W. of the Meeting-house there is a large mass of pink trap generally resembling those above noticed, but containing also well developed thin crystals of hornblende, which are in some parts abundant, while the mica is nearly absent.

Over the spaces which are shown without drift, to the N.E. and N.W. of Monahoora, there are numerous exposures of rock at the surface, with a prevailing north-westerly dip, changing occasionally to S.E.

They lie chiefly between 60° and 80°, the higher angles being most frequent. In the space called in the six-inch maps Rocky Quarter, immediately N.E. of Monahoorra, the dip lies between W. 20° N. and N.W. The rocks consist of gray grits, occasionally in massive beds, and fine gray flags.

About the cross-roads at Creny's Lane the prevailing dip changes to a south-easterly direction, and this continues throughout the remainder of the sheet to the N.

Going westward we find the rock close to the surface, and in many places exposed, on the high ground which rises up on the S. and E. banks of the river Lagan, to the E. of Massford. These are greenish and gray flags, with less frequent beds of light gray grits, and occasionally massive coarse grits. There is a constant south-easterly dip, at 60°–80°. Some of the massive grits weather to a coarse brown sandstone, as seen in a quarry 600 yards W. of the cross-roads marked Creny's Lane, and again appearing on the road to Massford, three-quarter mile W. of the same cross-roads. Similar brown rock occurs in thinner beds along with ordinary gray grits and flags in the high ground N.W. of Massford, where the dip is constantly south-easterly, at about 60°.

At two-thirds of a mile S. of Massford a vein, about 4 feet wide, of pinkish felspathic and micaceous rock, occurs in a stream W. of the road, among grits. It appears to be siliceous, and to approach most nearly to the character of compact granite. Its course, so far as it can be seen, is parallel to the strike of the beds, or E. 30° N.

Ballynahinch District.—The Lower Silurian rocks appear along the banks and in the bed of the river at Waringsford. They consist of thick beds of grit, sometimes coarse, interstratified with gray flags, and are crossed by a basalt dyke, 5 feet wide, at the S. side of the river, near the W. end of the mill-pond. It appears again in the steep bank next the corn-mill. At the N.W. of Waringsford green slates and thin grit beds are exposed in the sides of a narrow pass between two drift hills, through which the river flows into the extensive flat along the N. side of the road to Dromara. Here they dip S. 20° E., at 70°.

A mile N. of Waringsford a dyke of felstone occurs among massive bluish grits and gray flags. It appears in a small quarry S.E. of the National School, varying in colour from a pinkish brown to light-bluish gray. It is compact, with a few distinct crystals, and contains a little iron pyrites, and occasionally small prismatic crystals which appear to be hornblende. This dyke again occurs at the surface of the road S.W. of the school, where its junction with the grits is clearly seen, as also in a quarry at the S. of the road.

North-west of The Diamond massive grits and splintery shales exhibit a constant southerly dip, ranging from S. 20° W. to S. 20° E. at 60°–85°. Among them portions of a basalt dyke appear along the line engraved on the Map. It is in some parts vesicular, the cavities containing zeolites.

For three miles E. of Dromore rock appears in several places up the course of the river Lagan, in small exposures at each side, and over the undrifted space N. and W. of Orchard Hill there are numerous bosses. These consist chiefly of massive grits, and among them are found portions of dykes of basalt and light-gray compact felstone as on the Map. The dips are all southerly, varying a few degrees on each side of S., at about 50°, and occasionally as low as 25°.

About Lagangreen Bridge and E. of it the surface of the ground is uneven, and studded with bosses of rock, often overgrown with furze. There is a constant southerly dip, averaging about S. 25° E., at 50°–60°.

The rocks are massive gray grits, with occasional beds of compact flags, delicately laminated, and also glossy greenish shales. The grits are in some places very coarse.

In a quarry at the N.W. of Lagangreen Bridge there is a dyke, about 70 feet wide, of finely granular pinkish-gray felstone, cutting through beds of purplish and greenish grit, dipping S. 20 E., at 60°. It is found S. of this again, along the western bank of the river, where, in conjunction with grits and shales, it forms bosses which have been quarried into, so as to show the line of contact across the bedding in several places.

Nearly half a mile E. of Lagangreen Bridge, at the S. of the road from Dromore to Dromara, there is a boss of dolerite 30 yards long by 7 broad, rather more coarsely crystalline than the basalt usually composing the dykes in this district. It has a very sensible effect on the magnetic needle. In some parts this dolerite becomes more compact, and contains zeolites. It is evenly jointed at right angles to the course of the dyke, which just here is N. 25 W., the joints dipping northerly at about 30°. South of this it appears in a few small patches, but more conspicuously to the N., where it forms part of the eastern fence of the road for about 10 yards in length, and 4 or 5 feet high. This dyke can be traced further N. in surface exposures at M'Adams' Loan Ends, and at the W. of Summer Hill, and in a well-marked ridge N.W. of Orchard Hill, where it abounds in zeolites. The continuation of this dyke southward may perhaps be found either in a boss, 30 yards long by 10 wide, which rises up in the alluvial flat S.E. of Spring Mount; or in a more dyke-like mass at the cross-roads N.E. of this, where there is a ridge of basalt 120 yards long by a few yards wide, running in a north-westerly direction.

In the rocky space in which this mass of basalt occurs, there are many irregular bosses of grits and occasional beds of flags. Some of the grits are very coarse and siliceous. There is throughout a dip of about 55° S. to S. 15° E.

West of the avenue of Moydalgan House there are rather coarse brown grits, probably the same beds which appear on the surface of the road S.W. of the Manse, two and a half miles W. of Dromara.

In the rocky area E. of Scion Hill there are grits and flags dipping S. 30° E. at 45°–50°. The grits are massive, generally fine-grained, and of a bluish colour, weathering very light, and may be recognised as the same which occur abundantly three miles away, along the line of strike, in the high rugged ground one mile N. of Dromara. The flags are compact, and of a bluish colour. Some of them exhibit a peculiar marking on the joint planes, resembling impressions made with small pan-like moulds, of nearly circular form, and varying from 1½ to 2½ inches in diameter. The smaller ones are situated, two or three together, somewhat centrally within the larger, and are more faintly marked. This unusual jointing, as it appears to be, crosses the lines of fine lamination without disturbing them. The longer axes have a direction generally parallel to the planes of bedding.

At Dromara there are thin beds of grit and shale, variously interstratified, at the surface of the road and elsewhere, dipping S. 20 E., at 70°.

Half a mile S. of Dromara, and over an area stretching to the S. and E. of Begny L., there are many exposures of rock, which may be generally described as gray grits in thick and thin beds, alternating occasionally with single and thinly grouped beds of compact flags, and sometimes cleaved slates; the grits being in a few places very coarse. The dip is S. 20° E., at 70° to 80°.

On the road S. of the E. end of Begny L. there is a dyke of light

pinkish finely granular felstone, mottled with green particles. It is 3 feet wide, and strikes parallel to the road for a distance of about 30 yards. It again appears 200 yards N.E. of this, E. of the cross-roads, in a mass 4 feet wide, between beds of grit.

500 yards E. of Begny L., at the N. of the road, a dyke of amygdaloid appears for a short distance with a northerly bearing, and between it and the road is a boss of compact bluish gray felstone, weathering white for nearly half an inch from the surface. It is jointed with some regularity, so as to resemble a dip of 75° E. 5° S., as may be seen in section at the adjoining fence.

Among the massive grits which occur E. of Begny L. some are very coarse, and take the form of a shaly breccia. They are traversed by a basalt dyke apparently about 10 feet wide, and exposed in a low mass for 20 yards in the usual north-westerly direction. The rock is finely crystalline, of light gray colour, along a fresh fracture, and, like most of these basalts, breaks with a rough surface. It is probably the same dyke which appears near the cross-roads E. of Begny Hill, and again in a conspicuous ridge N.W. of the same hill, where it is full of zeolites, and weathers into small well-rounded nodules. In some parts where this nodular structure is not so apparent, it passes into a rough wackenic mass, of a very brown rusty appearance on the surface, and the interior greenish, spotted with minute spherical cavities full of a dark ferruginous mineral. This rock has a very perceptible effect on the magnet.

Exposures of basalt occur in several other places in this district, forming dykes as engraved in the Map, over the high uneven ground lying to the W. of Burren L., and extending to the N. of Dromara. This area is closely studded with bosses and surface exposures of rock, the former often somewhat rounded in the form of *roches moutonnées*. These consist chiefly of massive grits, of gray and bluish gray colour, with occasionally gray compact flags. There is throughout an average dip of 60° S. 30° E., with slight variations in a few places, and occasionally a change for a short distance to N.W. The grits are sometimes coarse in spots, as is apparent by the occurrence of large quartz grains crowded together in patches and irregular bands on the weathered surfaces. They very often weather nearly white, and in this respect, as well as in having often a pinkish tinge, these grits may be sometimes mistaken at first sight for felstones.

The Basalt dyke S. of Winter Hill is about 15 feet wide, and is seen in many places appearing a little above the surface. The rock is finely crystalline, closely jointed, and contains a few zeolites and ferruginous grains.

At the S.E. of Clontanagullion L. the grits and flags are seen in many places with high south-easterly dips. They are crossed by a dyke of compact basalt, 11 feet wide, where marked on the Map.

There are several smoothly rounded exposures of flags and slates laid bare in the bog to the W. of Dunbeg L. from over which 20 feet of turf are said to have been cut. These dip nearly vertically S. 40° E.

In addition to the evidence of ice action afforded by the somewhat rounded form of the bosses and the planing of the rocks at the surface, well preserved striae were observed in several localities throughout this district, where they are engraved on the Map. They vary in direction between W. 20° N. and W. 35° N. The grits and flags on the top of Begny Hill are planed at the surface, probably by glacial action.

At the junction of roads S.W. of Dunbeg L. a dyke of felstone, 8 feet wide, appears between beds of shale. It is light gray, pink in some places, compact, and contains a little iron pyrites. There is also a green

mineral which appears to be mica. This rock weathers very rusty brown. It is seen cutting the beds, though its general direction corresponds to that of the strike, or E. 35° N.

Slates and flags grouped together, alternating occasionally with massive grits, appear in Montalto Demesne, and to the W. and S. of it. They dip at high angles for the most part, and indicate a folded condition by several changes from a prevailing north-westerly direction to a south-easterly. In rare cases the angle of dip is as low as 30° , but generally lies between 65° and 90° . The beds described as slates exhibit a cleaved structure, striking about 10° from the strike of the beds. This is to be seen well in a quarry in the demesne, S. of Montalto House, where the beds are vertical, striking E. 40° N., and the cleavage dips E. 40° S., at 75° .

At the W. of Mutton Hill a mass of basalt occupies the greater part of a small field, coming up to the surface in several spots, and close to it are gray grits and shales. This basalt is finely crystalline and contains zeolites.

To the S.E. a vein of minette, a few feet wide, occurs in a quarry as a bed-like mass among thin grits and greenish shales, and can be traced for about 70 yards. It again occurs in a boss half a mile W.S.W. from this, where it has also been quarried along with thick-bedded grits and gray shales. Here it comes up to the surface in a mass 40 feet long, so far as it was exposed, and diminishing from 10 feet wide at one extremity to 4 at the other. There can be in this place no doubt of its intrusive character, while it still follows the general direction of the strike. This rock is of a pinkish-gray colour, changing sometimes to bluish, mottled with dark green, and of variable texture, from compact to finely granular. The mica is dark, generally abundant, and in the weathered rock becoming bronze-coloured. This dyke may be further traced as shown on the Map. At the houses W. of the road it is 15 feet wide, between vertical beds of flags striking E. 30° N.

A dyke of finely crystalline basalt, the width of which was not ascertained, bearing W. 20° N., cuts through beds of gray and purplish grits and shales, in a quarry W. of the road, N.E. of Larkhill. In the avenue E. of the road grits and slates dip N. 20° W., at 60° . Cleavage planes in the latter incline 80° S. 30° E.

Gray fissile compact flags occur in many places in the uneven ground S.W. of Montalto Demesne. In one spot they have been quarried to use as roofing slates, for which purpose they are quite unsuitable, being too heavy. An example of this was observed on a house in Bridge-street, in Ballynahinch.

Close to Rockvale, nearly a mile W. of Ballynahinch, a dyke of vesicular basalt is exposed in several places in the form of low ridge-like masses and patches at the surface. In a lane S. of the road it is well seen, for a width of 15 feet, and exhibits a regularly jointed structure, the planes inclining N.W. at 45° . At the N. of the road it crosses a field in a conspicuous ridge 25 feet wide, bearing N. 40° W., and again beyond that. It is afterwards found in the banks of the Ballynahinch River 300 yards S. of Casey's Bridge, where it crosses the river so obliquely as to be exposed for a considerable length. Here it is vesicular to a high degree, and abounds in zeolites. It can be still traced further on as on the Map. Ice striæ bearing S.E. are found on thick beds of grit at Rockvale.

At one-third of a mile N.W. of Casey's Bridge the road is crossed by a dyke of greenstone, which appears on the N. side in a small quarry; and on the S. side it cuts across flags and grit beds, with a width of 11

yards. Their junction is seen on each side of the dyke. It is a finely granular bluish mass, becoming in parts more compact and tinged with pink. There are delicate crystals of hornblende throughout, and also minute cubes of iron pyrites.

Extensive and numerous exposures of rock occur throughout that part of the sheet which lies to the N. and N.W. of Ballynahinch. The beds have a very constant south-easterly dip. A section along the dip, from Ballynahinch northwards, would exhibit alternations of grits and flags and shales, more or less grouped together, as far as the N.W. of Ballykine Loughs, beyond which massive beds of fine and coarse grit occur for a mile farther on. These can be recognised as the same beds which have been already noticed in the high ground N. of Dromara, and are not improbably the same which appear somewhat extensively at the S.W. of Loughbrickland.

From one mile N.W. of Ballykine Loughs to the N. margin of the sheet, grits also occur very abundantly, in massive and thinner beds, and are sometimes almost coarse enough to be called fine conglomerates. Among them there are also frequently bands of slates and flags. These beds do not present the constant south-easterly dip which exists over the space of two miles to the S., but change occasionally towards the N.W., the anticlinal curves being sometimes exposed.

North-east of Magheraknock Fort a well-marked dyke of bluish-gray finely granular felstone, 3 feet wide, crosses grits and flags in a quarry S. of the road. The felspar is occasionally in distinct larger crystals, and the mass contains many small irregular cavities filled with a fine purplish-brown powder, some being lined with quartz. White carbonates occur too, and a few minute cubes of iron pyrites. The adjacent beds on each side dip S. 20° E. at 70°, but some are also considerably disturbed in the immediate neighbourhood.

S.E. of the above felstone dyke there is another more properly marked as greenstone, crossing grit and flag beds, which dip N.W. at 80°. It varies in width chiefly from 4 to 8 feet, and in one place shoots off a vein 18 inches wide. This rock is very finely crystalline, of a bluish gray colour, and sparkling with minute crystals of felspar, and in some parts slender prisms of hornblende. In its weathered form a few small scales of dark mica were detected. The rocks traversed by this vein are gray finely micaceous flags and thick beds of bluish grit. Some of the grits are very delicately laminated.

The road from Ballynahinch to Dromore passes over a very rocky district in the townland of Burren. That called on the 6-inch maps "M'Manus's Quarter," W. of Laurel Lodge, is covered over with bosses and other exposures of rock. In many of the bosses a certain amount of rounding is observed, though they are often large rugged masses without any such shape. The exposures at the surface are smoothly rounded, retaining occasionally faint traces of striae. The beds consist chiefly of massive grits, interspersed with groups of flags and slates, being in great part the same which have been already noticed N. of Ballynahinch, and N. of Dromara. They are also exposed very abundantly over the rising ground W. of Burren L. The slates and flags occur chiefly in groups, 30 or 40 feet thick, among the massive grits. The dips lie mostly between S. 25° E. and S. 40° E., with occasional variations to the W. of N. These strata are traversed by basalt dykes as shown on the map. They are, in general, closely and unevenly jointed, with sometimes, however, an amount of regularity which produces the appearance of stratification nearly at right angles to the true planes of bedding.

In the rocky tract E. of Cluntagh House tough grits occur in several large elongated bosses pointing about N. 20° W., in which the bedding is very obscure. A little to the E. of this it is vertical, with a strike of E. 20°-30° S. These bosses, which slope down on their W. sides at angles varying from 35° to 50°, and are more or less rounded, probably owe their form to ice moulding. They are more rugged on the E. side.

The dyke of basalt at the W. of L. Aghery, occurs in well-marked detached ridge-like masses, sometimes 10 feet above the average surface of the ground, and is about 15 feet wide. This basalt is finely crystalline, of a rather light bluish-gray colour when freshly fractured, and becoming darker on exposure to the air, as do all the lighter descriptions. A system of close regular joints divides it transversely, giving it a rudely columnar structure. Others traverse it with more or less regularity in the direction of its length. This dyke appears again at the W. of the bog to the north, as well as at an intermediate point in a drain S. of the road.

Along the railway N. of Dromore the Silurian rocks are exposed in deep cuttings below several feet of drift. West of Bann Hill they consist of brown, bluish and greenish grits, variously interstratified with glossy shales, gray slates, and soft friable shales, each description occasionally predominating. About midway in the cutting thick beds of brown grit occur with shales. These are somewhat disturbed by small faults. The dip throughout is S. 10°-20° E. at 40°-70°.

The cuttings near the N. of the sheet are crossed by many dykes, some of them, no doubt, the continuation of those which have been noticed in the district to the S.E. They cut at various angles across the beds, and have in most cases the usual north-westerly bearings. In the cutting W. of Grove Hill the beds traversed by these igneous masses are gray grits, some of which are tinged red, and green and purplish slates. The surfaces are in some cases ripple-marked and sun-cracked. The dykes, six in number, consist of basalt, some being vesicular, and containing zeolites. One has a width of 40 feet, the rest varying from 4 to 18 feet. The dip here is S. 10°-20° E.-at 60°.

The cutting W. of M'Kee's Dam exposes gray and greenish grits, occasionally somewhat conglomeritic, and variously interstratified with green and purple slates. These beds are traversed by veins of carbonate of lime, and contain fissures sometimes filled with earthy matter. Minute cubes of iron pyrites are common in some of the grits. The dykes in this cutting are principally composed of basalt and dolerite. At the



Dyke of trachyte, and two narrower dykes of basalt, traversing Lower Silurian strata in railway cutting W. of M'Kee's dam.

S. side of the more southerly bridge there is a dyke of vesicular trachyte, 6 feet wide, of a grayish-white colour. It is easily observed among the contorted slates by the rich yellowish-brown colour to which it weathers. It is of a very finely granular texture, and the cavities are often lined with minute spherical particles of the same colour as the mass. The most southerly dyke is of dolerite, 7 feet wide, and contains many small felspar crystals. The basalt is mostly compact and hard, and occurs in dykes of a few feet in width. Opposite the S. part of M'Kee's Dam a mass of dolerite occurs, about 20 feet wide, containing zeolites, and finely porphyritic in some parts. N. of this, two veins of soft very finely crystalline basalt cross the beds, which between them are a good deal contorted in places. With the exception of these occasional contortions, the dips are southerly, varying a little E. and W. of S., at 50° to 60° .

Eastward, between the railway and Annahilt, there are many exposures of rock, throughout an extensive space otherwise covered with drift. The grits are often very coarse grained. About a mile S.W. of Annahilt they are of this character in places, and occur along with ribband slates, dipping S. 10° E. at 60° . Going northward we meet with thin beds of gray grit interstratified with gray slates, and ribband slates, sometimes finely gritty; and occasionally gray grits with the bedding almost obscured. There is a constant south-easterly dip to the N. of the sheet, chiefly at 60° to 70° .

Passing eastward by Ballylintagh House, over a district more thickly covered with drift, we meet again with rock extensively exposed to the W. of Lough Erne. They are throughout gray grits and slates, for the most part evenly bedded, and having a prevailing south-easterly dip, varying from 10° to 90° . They are occasionally contorted and otherwise disturbed, the contortions being in some cases sharp. These beds are also traversed by dykes, as shown on the map.

Drift Deposits. (Post Pliocene). The drift is chiefly that which is known as *Boulder clay*, and consists of boulders, generally well rounded, and pebbles of the underlying rocks, together with some from the other rock formations of the adjacent districts, all bound together in a stiff brown gravelly clay, with more or less fine sand through it. It is for the most part very clayey. Many of the boulders are smoothly worn and ice-striated. Another description of drift, of comparatively rare occurrence, consists of gravel and sand with a little clay, distributed in layers composed of these materials mixed together in different proportions. Occasionally this sand and gravel is overlaid for a depth of a few feet by a more clayey deposit. It appears in no case to occupy a greater extent than a small patch among the boulder clay drift, and in a few instances is found in the form of low hillocks more or less distinct from the larger mounds of that formation. No traces of shell remains were found among these sands and gravels.

The nature of the drift in the basalt district can be well seen in a few artificial cuttings. At the S. of Crow-hill, in a cutting for the drainage of the Clare bog, for example, it is a tenacious clay of a rich brown colour, with many boulders of basalt, some of diorite, and a few of grit from the neighbouring Lower Silurian district, together with many chalk nodules and flints.

West of Waringstown the clay of the Basalt drift is worked for bricks. They are tolerably hard, and of a red colour, and are sold at 21s. or 22s. per 1,000.

In the Silurian area about Donaghcloney, near the N.W. of the sheet the boulder clay drift is gravelly. It is exposed in a few places where the hills have been partially cut away along the sides of the river Lagan or of its adjoining flats, and consists of a light-brown clay with many

small basalt boulders, and about an equal number of Silurian grit. The fine gravel mixed up with the clay consists chiefly of the same materials, with flint and chalk chips, both of which latter also occur in a small quantity throughout the mass in larger pebbles. So far as it can be observed, this drift is unstratified, and these examples may probably be taken to represent the great body of drift in the neighbouring hills. Stratified sand and gravel is exposed in a pit at the east side of the river, and west of Ballymacanally Cottage. The gravel is composed of Lower Silurian rocks, Basalt, Diorite, a few of fine red and light-yellow Sandstone, &c. A few pebbles of Limestone, apparently identical with that of Castle Espie, (sheet 37), were also found here.

Fragments of Gneiss are present sometimes in the stratified gravels, as to the W. of Banoge Bridge, where they, together with rounded flints and chalk pebbles, occur among Silurian and Basalt pebbles. Here thin layers of fine pure sand and of gravel dip at an angle of 20° in a south-westerly direction, that is, towards the adjacent lower ground, a fact which is generally found to hold good.

There are many cuttings in the boulder clay drift along the Banbridge and Lisburn railway. At Maypole Bridge, N. of Dromore, it contains larger boulders than are usually observed, measuring four feet in diameter in some cases. They consist of Lower Silurian grits and basalt, with a few of diorite and granite, also large. Some of the Silurian blocks retain a striated surface. Many of the boulders have evidently remained exposed to the atmosphere since the cutting was made, and those of Basalt exhibit very different powers of resisting its weathering influence, some being in great part crumbled away to a dark rotten mass, while others have been dimpled, and others again scarcely affected. The most disintegrated were those which were amygdaloidal.

Close to this cutting, bricks are manufactured, of a better quality than are made elsewhere in this sheet, as more care is bestowed on them. They are sold at 25s. per thousand.

In the first railway cutting S. of Dromore there are 45 feet of boulder-clay drift over the rock. All throughout these cuttings basalt boulders are found. They diminish slightly in number as we go southward, but are never absent from the drift.

The drift generally in the immediate vicinity of the river Bann, especially along the lower half of its course through the sheet, contains numerous small boulders, with sometimes very little clay. It presents also more or less obscurely, the appearance of stratification. These features are observable in the railway cuttings at the S.E. of Banbridge, where there are many small boulders of basalt and Silurian grits in light-brown clay, with occasional layers of gravel and sand. Flints and broken pebbles of chalk are common in the drift about here. Between Banbridge and Lawrencetown, on the Banbridge and Scarva railway, it is somewhat similar, the small boulders being in places closely packed, and almost free from clay, as if it had undergone a process of washing and sifting. This is probably what has taken place, the coarse boulder-clay drift having been washed, and the boulders worn down, by the action of a current of water along a channel corresponding in direction with the present one, and the materials re-arranged and deposited with various degrees of regularity. Fragments and pebbles of granite are occasionally found, such as would be brought down from the granitic district through which the river flows in the upper part of its course. The basalt boulders are the most numerous, having most effectually resisted the wearing, on account of their hardness.

At Lawrencetown station there is a pit containing stratified sand covered by 3 feet of boulder clay.

In the high ground over the river, at the S. side, and N.E. of Tullylish House, pits have been opened in mounds of gravel and sand, exposing the stratification very well. In one there is a layer of fine sand at top, 1 to 4 feet thick, and below it thin beds, some 4 to 6 inches thick, of fine and coarse sand alternating with gravel, and some thicker beds of shingle and coarse gravel. These last consist chiefly of Silurian rocks, among which are fragments of a conglomerate composed of light and dark-shaly pebbles bound together with a brown ferruginous cement. Basalt gravel is mixed throughout, with a smaller quantity composed of diorite, compact granite, chalk, flints, &c. These layers have clearly a general parallelism to the surface of the mound, the sharp curve corresponding to the top being well seen. This cannot be said to be usually the case, though there is undoubtedly at times a connexion between the conformation of the surface and the arrangement of the layers, perhaps in all cases a consequence of the equal resistance offered throughout one layer to wind and other destructive agencies. Another pit to the S.E. exposes similar beds covered by about 4 feet of gravelly clay. This gravel and sand caps the boulder-clay drift, of which the banks of the river are formed. In the former pit it is exposed for about 30 feet deep, immediately below which the clay is said to have been reached. No trace of shells was found among it. A similar deposit is laid bare in a gravel pit W. of the river, and to the E. of Bannford. Here a few fragments of brown plastic clay, rounded so as to resemble pebbles, were picked out of the gravel.

The ordinary unstratified boulder-clay is found in the railway cuttings S.W. of Lawrencetown, and also along the roads from Lawrencetown and Scarva to Banbridge. In the vicinity of the latter town, the clay is used for making an inferior description of red bricks, which are sold at about 20s. per thousand. A far better class could be made with a little more care.

The cuttings of the partly constructed railway from Banbridge to Ballyronney are for the most part through boulder-clay drift, in which granite boulders appear numerously as we approach the granite district. This may be seen in the cuttings for about a mile N.W. of Kate M'Kay's Bridge. In another a little way S. of the same bridge they are abundant; and here the Silurian drift is overlaid by 3 or 4 feet of granitic drift, being a lighter coloured clay containing almost exclusively granite boulders. Further S., to the west of Ballyronney Lough, in a cutting about 30 feet deep, there are 10 or 12 feet composed chiefly of disintegrated granite overlying stiff bluish and brownish clay with Silurian fragments.

Over the granite district the drift hills are, so far as can be ascertained from cuttings near the surface, formed of a sandy soil abounding in round granite blocks, and apparently the result of the disintegration of that rock. Boulders of Silurian grits and basalt are, however, almost always found in small quantity.

The drift which covers the valley between Deehomed and Slievenaboley is a rich brown clay, containing small round and sub-angular blocks of Silurian grit, and a few of granite and basalt. It is exposed in sections along the stream which flows southward to the Drumadonnell river. A short way up the slopes of the two mountains just named, it ceases and gives place to a deposit of granitic detritus; which itself soon dies away from over the granite. The drift along the valley also changes as we go southwards, turning to a light sandy clay with granite boulders, and a few of Silurian grits. In a cutting on the road side, E. of Prospect

House, there is a reddish-brown clay containing pebbles of Silurian rocks and many small disintegrated granite boulders. A large chalk pebble was also found in it.

The Silurian district in the extreme S.E. of the sheet is covered thickly with drift, sometimes disposed in the form of long low esker-like mounds, which point 20° to 30° W. of N., corresponding to the course of the drainage. Between this and Ballynahinch the same feature prevails, but with less regularity. N. of Ballynahinch the mounds are more detached; and in nearly all cases there is a tendency to slope down more gradually on the southern extremity than on the northern.

West of Dromara the drift hills (which are composed of boulder-clay) occur very much in the form of large esker-like mounds, running E. and W., with long strips of bog between them.

Bogs and Alluvial Flats.—There are no extensive bogs in this sheet, but there are many small patches, and along the streams there are narrow alluvial flats. The upper turf has been nearly all cut away from the bogs, so as to leave nothing but the soft muddy portion at the bottom. This has to be put through the process of "baking," in order to make fuel.

In the Clare Bog, S.W. of Waringstown, there is a shallow covering of peat left over a deposit of fine brown clay and sand mixed. The clay is sometimes absent, leaving only a very fine light-coloured siliceous sand. This bog has been thoroughly drained.

In the vicinity of the railway, between Banbridge and Dromore, there are irregular strips of bog of some extent, portions of which have been drained at considerable expense. To the W. of the railway, in the bog E. of Patterson's L., a section below the uneven surface formerly covered by peat shows 5 feet deep of alternating layers, 1 to 2 feet thick, of sand with fine and coarse Silurian gravel, and underneath this somewhat gravelly brown clay with large sub-angular blocks of blue Silurian grit.

In the Gall Bog, W. of Waringsford, turf mud is baked extensively every year. The upper turf, a small quantity of which remains, is said to have been cut away for nearly 30 feet. Trunks of oak trees are found in it; and in one spot, N. of the road, several were observed imbedded in the turf, lying together, and pointing in nearly the same direction, a few degrees W. of N. The large flat N. of Waringsford is connected with this bog, and a section as seen in the deep drain through it shows 2 to 5 feet of brown alluvium overlying Silurian gravel.

The bog W. of Dunbeg L. has been cut away for 20 feet deep in some places, exposing the rock, as already noticed.

There is a large bog to the N. of Ballynahinch, partly included in this sheet, in which turf is cut extensively. The level of this bog is about 40 to 50 feet higher than that of the boggy marshes about Ballykine Loughs, which lie only about one-quarter of a mile away to the W.

A few imperfect remains of deers' antlers have been found in some of the smaller bogs. A head and antlers are said to have been dug up a few years ago from below 12 feet of turf, and resting on stiff clay, in a patch in Tullyrain, two and a half miles E. of Banbridge; and somewhat similar remains near the same place about thirty years ago. A skeleton of the Irish Elk was found in the townland of Ardbrin about five miles S.E. from Banbridge. The head and antlers alone were preserved, and are now at Hillsboro' Castle. An imperfect head and antlers were found in Tonaghmore, N. of Banbridge; and others, quite perfect, at the boundary between Ballymoney and Ballycross, near the same place. These horns measure 7 feet from tip to tip.

At the N. of Red Hill, near the boundary of the New Red Sandstone

at the N. of the sheet, bones and deers' horns are said to have been found in turf below the drift; also two tubs or barrels constructed with wooden pegs, at a depth of about 60 feet.

Not far from this, in the townland of Aghandunvarran, E. of the railway, the upper portion of a grinding-stone or quern, composed of Mourne Mountain granite was found in the drift.

The principal alluvial flats are those of the rivers Bann and Lagan. They are composed of river loam, often covering a deposit of gravel for a depth of a few feet, and sometimes containing gravelly, and occasionally peaty layers. A section 5 feet deep in the bank of the Lagan, a mile W. of Dromore, shows 2 feet of brown clayey alluvium at top, and below it 2 feet of alternating layers, 2 to 6 inches thick, of clayey sand and of the same mixed with pebbles, chiefly Silurian and basalt; and at the bottom a brown clay with a little sand full of larger pebbles. A worn fragment of red brick was picked out of the gravel 3 feet below the surface. There is sometimes a greater depth of alluvium, and it varies somewhat in composition, becoming occasionally a tenaceous clay.

Near the W. of the sheet the alluvial flat of the river Bann consists of 2 to 4 feet of brown alluvial clay covering Silurian gravel, chiefly of large pebbles. Here, as in a few other places, there is a difference of a few feet in the levels on different sides of the river, that on the N. being about 5 feet higher than that on the S. side.

Shell marl is found in several places below the bogs, but it is not commonly so, as in some districts. It occurs in the small bog at the coal shafts, N. W. of Lawrencetown, and is said to be found occasionally in similar situations in the country immediately to the E. and N. E. of this. It was observed also in a pit at the E. side of the road from Banbridge to Dromore, E. of Gowdy's Town.

In deepening the Ballynahinch river, $1\frac{1}{2}$ mile N. W. of Ballynahinch, a large number of small spiral shells and closed bivalves were dredged up among the mud.

In several of the wells in this sheet the water is charged with iron. In Lisnasluggan, 4 miles S. E. of Banbridge, by the road to Rathfryland, there is one, close to which bog iron ore was found 2 feet below the surface. In the stream, S. E. of the neighbouring school-house, the water leaves a brown ferruginous deposit on the rocks, and in a well 600 yards W. S. W. from Tanvally House a similar deposit is observed. In wet seasons the water here bursts up through the drift, and flows down to the bog on the S. leaving a brown residue along its track.

In a stream at Finnis Bridge, $2\frac{1}{2}$ miles E. of Tanvally House, the water is ferruginous, and covered with a reddish brown scum.

Similar appearances occur in the flats along the river Bann, S. of Corbet Lough; and in small wells in various places, as near Drumnavaddy Lough, $2\frac{1}{2}$ miles N. N. W. from Banbridge; N. E. of Ballygowan House, 2 miles W. S. W. from the same town, &c., &c.

In the railway cuttings near the N. of the sheet, the water which flows from the Silurian rocks is in many places coated with a metallic scum.

Nearly 2 miles S. of Ballynahinch, at Spa Cottage, there are two spa wells enclosed and reserved for the medicinal use of those who visit the place for the purpose. They are in separate houses, a short distance apart. The water of one, called the "Sulphur Spring," has a yellowish tinge, and a strong taste, very disagreeable to most people. The other, called the "Iron Spring," is quite clear, and tasted slightly of iron.

F. W. E.

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