DATA AND DESCRIPTIONS

TO ACCOMPANY

QUARTER SHEET 35 N.E.

OF THE

MAPS

OF THE

GEOLOGICAL SURVEY OF IRELAND.

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TO ACCOMPANY QUARTER SHEET 35 N.E.

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GEOLOGICAL SURVEY OF IRELAND.

General Description.

1. *Form of the Ground.*

This quarter sheet includes a part of the County of Kildare, with the towns of Kildare, Rathangan, and Monasterevan occupying its eastern half, while its western portion contains a part of the King's County to the north, and a part of the Queen's County, with the town of Portarlington, on the south.

The district forms a part of the great central plain of Ireland. It is almost entirely flat, with a general elevation of but little more than 200 feet above the sea level. Some small hills south of Portarlington have summits rising to 300 or 400 feet; but the principal hills are in the N.E. corner of the map, in the little range known as the Chair of Kildare hills. The general level of the plain rises as we approach these to 300 and 400 feet above the sea, from which the ground swells up rather abruptly to a maximum elevation of 769 feet in the Dunmurry hill, while the hill of Grange, on which is the Chair of Kildare itself, has a height of 744 feet, and the Hill of Allen (the farthest to the N.E.,) is 676 feet high.*

This little range of hills is about seven miles long, with a width of about three-quarters of a mile, running in a N.E. and S.W. direction, midway between the towns of Kildare and Rathangan. It is cut through, east of Christianstown house, by a valley about a mile wide, the general surface of which is about 270 feet above the sea, giving passage to a small natural brook and an artificial feeder to the Grand Canal, which both run right across the direction of the range. Another gap occurs between the hill of Dunmurry and the Chair of Kildare, forming a picturesque valley through which passes one of the main roads from Kildare to Rathangan.

To the east of the town of Kildare is the gently undulating grassy plain known as the Curragh, or Chase, about half of which is included in this quarter sheet of the map.

Large portions of the district both north and south of Monasterevan are covered by peat bog, to the dreary surface of which an agreeable contrast is afforded by the low woody hills about Emo and Ballybrittas on the one hand, and the bright green velvet-like undulations of the Curragh on the other.

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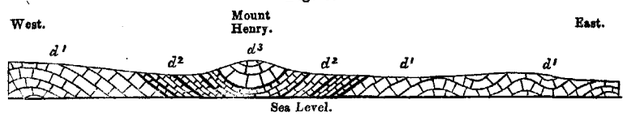
* These and all other elevations are those given in the six-inch Maps of the Ordnance Survey.

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

The great plain which spreads over by far the major portion of this map has everywhere a limestone below it, called the Carboniferous or Mountain Limestone, either appearing at the surface or concealed by a greater or less thickness of gravel or of bog.

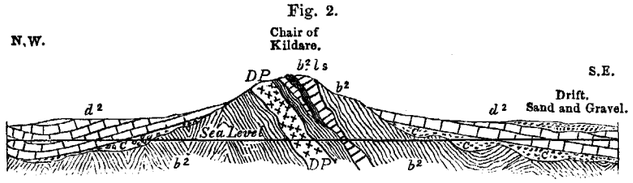
Some of the low hills south of Portarlington are formed of some beds of this limestone, higher in the series than those which are to be found elsewhere, (see Mount Henry, fig. 1); but the hills of the Chair of Kildare are composed of rocks which rise up from below the whole mass of the limestone, and would be found beneath it all over the plain if the limestone were to be penetrated (see fig. 2). These rocks consist partly of a red sandstone, called the Old Red sandstone, and partly of gray slaty rocks containing some beds of limestone of a different character from the Carboniferous limestone, and also some masses of Igneous rock. The three latter rocks all belong to the group known as Lower Silurian.

Fig. 1.



Diagrammatic section through Mount Henry, three miles S.S.E. of Portarlington. Horizontal scale, one inch to one mile. Vertical scale, about four inches to one mile.
d^3 Upper Limestone.
d^2 Calp or Middle Limestone.
d^1 Lower Limestone.

Fig. 2.



Diagrammatic section N.W. and S.E. through the Chair of Kildare. Horizontal scale, one inch to one mile. Vertical scale, about four inches to one mile.
d^2 Lower Limestone.
c Old Red Sandstone.
b^2 Lower Silurian slates and grits.
b^2 ls Limestone in ditto.
D.P. Porphyritic Greenstone.

Although the limestone plain has such a very level surface it by no means follows that the beds of limestone lie parallel to that surface, or that they are nearly horizontal. On the contrary, when seen either in quarries or in natural exposures, they are found to dip in various directions, and sometimes at high angles (see fig. 1), even as much as 60°. Their level surface is, therefore, due partly to this very frequency and variety in the direction of the dip, which causes the same beds to undulate up and down near the surface, over considerable spaces, and prevents beds of any other description of rock reaching that surface; but, principally to the action of the forces of denudation which have planed away, and removed, all the rocks which were once above the level of the present plain.

This surface remains equable as long as the rocks in its horizon remain the same; but wherever rocks of a different character are brought into that horizon—whether it be by depression of the beds bringing in from above rocks, which formerly spread over the country, as shown at Mount Henry in fig. 1, or by elevation of the beds allowing another set of rocks to rise up from below, as shown in fig. 2—there the form of the ground changes. The little hills S. of Portarlington are an instance of the first change, resulting from depression bringing in higher beds that now rise in small hills above the general level of the plain, while the Chair of Kildare hills are an instance of the latter change (see fig. 2). So long as the lithological character of the beds remains nearly the same, the action of the forces of denudation upon them produced similar effects; but when that character changed, the effect was also changed, the rocks being more rapidly eroded if they were soft, or brittle, or much jointed—more slowly if they were hard, or tough, or but little split up by joints. In the first case a hollow or valley would be formed, in the latter a hill or a crag.

Unconformability.—When we come to study the relations between the rocks composing the hills of the Chair of Kildare, and those forming the limestone plain, we perceive that there is something more to be said than that the lower rocks have been thrust upwards and the upper rocks partly washed away so as to expose them for a certain space at the surface.

If that were all that had taken place we should find the beds of the Chair of Kildare declining regularly downwards from a central axis of elevation, the same beds appearing regularly on *each* side of the axis, and passing gradually in *each* direction beneath the limestone plain. Instead of that we find the rocks in the Chair of Kildare greatly broken and confused, dipping in all directions, and striking sometimes right across the range: the position of the beds of the one set of rocks having often no relation to the position of the other set; and the boundary of the upper set, or Carboniferous limestone, coming right across different beds of the Lower Silurian. It is clear, therefore, that the Lower Silurian rocks had been greatly tilted and disturbed, and had suffered largely from denudation before the Carboniferous limestone had been deposited upon them. In the line selected for section (fig. 2), indeed, the Lower Silurian beds happen to dip in the same direction as the limestone on the S.E., but at a higher angle; but even here the Lower Silurian beds dip away from these same beds of limestone on the N.W., showing the entire want of conformity between the two.

We see, also, in the map three small irregular looking patches of Old Red sandstone appearing from underneath the Carboniferous limestone, and like it spreading across the beds of the Lower Silurian rocks, and dipping from them like the Carboniferous limestone, and at the same low angle.

These relations between the several groups of rock show us that pre-

viously to the period of the deposition of the Old Red sandstone, the Lower Silurian rocks were very much in the same condition, and even their surfaces very nearly in the same state in which we see them now; and that during the Old Red sandstone period the Chair of Kildare hills, after having previously existed, probably, as part of a large dry land, came to form an island in the sea of that time. On the shores of that island sandy and pebbly beaches were deposited of irregular outline and extent, and of no great thickness. These, when consolidated into sandstone and conglomerate, formed the rocks now known as the Old Red sandstone. Depression of the bottom of the sea then occurred to such an extent that sand was no longer accumulated, but the sea became deeper and clearer, and was occupied by multitudes of mollusca and other marine creatures, of the debris of whose bodies the limestone was formed. This depression continued until, doubtless, the whole of what is now the Chair of Kildare disappeared beneath the waters, and was buried eventually under the upper beds of the limestone formation, if not still more deeply under thick beds of Coal Measure shales and sandstones, which formerly spread over all.

At some subsequent period the elevation of these rocks took place, and the accompanying or subsequent erosion and removal of large portions of them, surface after surface being formed and removed until the present surface was produced. During this process the old island was exhumed again, and it is most probable that many alternations of elevation and depression of the mass of the country took place, and the different surfaces were more than once alternately dry land and the bottom of the sea. This uplifting action was at one time also a little stronger under the area which is now occupied by the range of the Chair of Kildare hills, than under the surrounding region, so as to give them a slight additional elevation, and to cause the beds of limestone which immediately surround them to decline gently from them.

During what geological period this elevation and denudation took place we have no direct evidence to show us. Judging from analogy we should suppose that it happened chiefly during a very ancient period, before the time when the rocks called New Red sandstone were deposited.

We know, however, that during a very late tertiary time (namely, that to which the appellation of the Glacial Period is now ordinarily attached,) this district, in common with all Ireland, was again depressed for a great length of time beneath the sea; and that that sea was traversed by currents which caused some additional erosion and removal of rock, and left great masses of the debris, in the shape of sand, gravel, and clay, heaped here and there about its bottom, forming what is now known as "the Drift."

The breakers and currents of this sea may, to a slight extent, have modified, either by slightly deepening the valleys, or slightly lowering the hills, the outlines of the Chair of Kildare range, and other parts of the present surface; and, as the country slowly rose again from beneath this sea into dry land, much of the loose matters called Drift, spread over its bottom, may also have been removed from place to place, one part being perhaps swept clean, while

another received an accession to the drifted materials which had been previously accumulated there.

One effect of these currents traversing a shallow sea, may be seen in the curious long ridges of gravel called Escars. These run occasionally for many miles across the country, like great railway embankments, with an elevation of 50 or 60 feet or even more, often with steep slopes, and either in straight or gently undulating lines, with small knolls, clusters, and branches occasionally. When cut into they are found to consist of rudely stratified masses of sand, gravel, and boulders, in irregular layers which conform to the general outline of the sides of the ridge. They appear to have been formed by the action of currents running in different directions piling up materials along the eddy or slack water formed at their mutual boundary.

J. Beete Jukes.

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3. *Formations or Groups of Rocks entering into the structure of the District.*

			Colour on Map.
	Aqueous Rocks.		
	Peat Bog and Alluvium.		*Pale sepia.*
	Drift (Limestone Gravel).		*Engraved dots.*
Carboniferous.	d^4	Upper Limestone.	*Prussian blue (dark.)*
	d^3	Calp, or Middle Limestone.	*Indigo.*
	d^2	Lower Limestone.	*Prussian blue (light.)*
Old Red.	c	Old Red Sandstone.	*Indian red (light.)*
Lower Silurian.	b^2	Caradoc or Bala beds.	*Purple.*
	b^2	Limestone in ditto.	*Cobalt blue.*
	Igneous Rock.		
Lower Silurian.	D.P.	Greenstone Porphyry.	*Crimson.*

b^2. The Lower Silurian rocks consist of dark gray olive or brown sandy slates, and thin grit bands; the slates are sometimes of a deep red tinge. Locally interstratified with these are lenticular-shaped masses of limestone of a pinkish gray or dove colour, compact, and traversed by many joints.

A thickness of several hundred feet of slates is shown, the limestones in one place swelling out to probably a hundred feet in thickness.

These beds are identified with the Bala beds of North Wales by means of their fossils, which are very abundant in some parts of the slates, and are often to be well seen also in the limestone. A list of these fossils, drawn up by Mr. W. H. Baily, is given below.

D.P. The Greenstone Porphyry associated with the Lower Silurian rocks, has a dark grey or purplish green base in which are embedded crystals of pale yellowish green feldspar. It is, however, sometimes amygdaloidal, the vesicles being either empty or filled with carbonate of lime. It resembles the porphyries of Lambay and Ballynascorney, near Dublin.

Although, doubtless, intrusive in some places, it appears to be, on the whole, contemporaneous with the Lower Silurian rocks, as is

shown by its having ash beds below it, and by its producing little or no alteration on the adjacent slates.

c^2. The Old Red sandstone, as it appears on the flanks of the Chair of Kildare hills, is a thin and irregular deposit of salmon-coloured sandstones, fine conglomerates, and purplish red slates.

d. The Carboniferous Rocks.—The sub group d^1, or *Lower Limestone Shale* does not show itself, and apparently does not exist anywhere in this district.

d^2. *The Lower Limestone* is light gray, sometimes crystalline, sometimes compact; it contains nodules of black chert, and sometimes thin beds of earthy shale. It is often very crinoidal, and generally contains other fossils.

It is probably several hundred feet thick, but from want of sections it is impossible to state its thickness with accuracy.

d^3. *The Calp* is an irregularly bedded dark-coloured limestone, with frequent beds of black shale. Single beds of limestone, and sometimes small groups of beds, often thin out rapidly and end in a wedge, other beds resting upon and across them so as to compensate for their irregularity. Some of the beds look sometimes as if worn and eroded by currents of water; and considerable portions of them removed before the other beds were deposited on them. Fossils are found in this middle or Calp series occasionally. Its total thickness is probably about 400 feet.

d^4. *The Upper Limestone* is generally white or pale gray, it is very full of fossils, large Productæ and Corals especially. But a small thickness or extent of it enters into the district.

The Drift and superficial deposits will be described further on.

J. B. J. and G. V. D.

The following fossils were collected by the Geological Survey, in 1846, or thereabouts, and were mostly named by Professor Edward Forbes. They were procured chiefly from the limestone of the Chair, but some from the red and gray slates of the Dunmurry Hill:—

ZOOPHYTA (*Anthozoa*).

Heliolites inordinatus (*Lonsdale*).
Favosites alveolaris (*Blainville*).
Halysites catenularius (*Linné* sp.)
Chœtetes Petropolitanus (*Pander* sp.)
Stromatopora striatella (*D'Orbigny*).

ECHINODERMATA.

Fragments of crinoidal stems, undetermined.

ANNELIDA.

Tentaculites anglicus (*Salter* sp.)

MOLLUSCA.

Polyzoa or *Bryozoa.*

Ptilodictya lanceolata (*Lonsdale*).
,, dichotoma (*Portlock*).
,, acuta (*Hall* sp.)
*Fenestella? (*Gorgonia assimilis*).
* ,, ? (thick stems).

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* I can find no reference to these names.

Brachiopoda or *Palliobranchiata.*

*Athyris camelina (*V. B.*)
* ,, æmula (?).
* ,, apiculatus (*Forbes*? n. s.)
Atrypa marginalis (*Dalman* sp.)
Orthis insularis (*Eichwald*).
,, simplex (*M'Coy*).
,, biforatus (*Schlotheim*).
,, calligramma (*Dalman*).
,, testudinaria (*Dalman*).
,, vespertilio (*Sowerby*).
,, Actoniæ (*Sowerby*).
Strophomena depressa (*Dalman*).
,, deltoidea (*Conrad* sp.)
,, corrugata (*Portlock* sp.)
,, compressa (*Sowerby*).
,, tenuistriata (*Sowerby*).
†Leptæna quinquecostata (*M'Coy*).
,, sericea (*Sowerby*).
,, tenuicincta (*M'Coy*).
,, monilifera (*M'Coy* sp.)

3 *a*. 3 *b*.

‡Crania catenulata (*Salter*, ms. Figs. 3 *a*, *b*.)

Discina sp.
Lingula ovata (*M'Coy*).
,, sp.

Lamellibranchiata.

Mytilus mytilimeris (*Conrad* sp.)
,, similimus (*Forbes* n. s.)
,, sp.
,, sp.
Conocardium dipterum (*Salter*).

Gasteropoda.

Holopœa concinna (*M'Coy* sp.)
Murchisonia bicincta (*M'Coy*).

4 *a*. 4 *b*.

§ Trochus fucatus (*Baily* n. s. Figs. 4 *a*, *b*.)

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* Probably Von Buch is meant by V. B; they are so named on the tablets, no reference being given to the two last, which may be Professor E. Forbes's MS. names. They are called on the tablet Atrypa, but are evidently Athyris,

† Found also in the red slate of Dunmurry Hill.

‡ Found in some gray slate either from Dunmurry Hill or the south side of Grange Hill. This species is doubtfully referred to antiquissima (*Eichwald*) by M'Coy in his Synopsis, Sil. Foss., p. 25.

§ This species, Figs. 4 *a*, *b*, exhibits bands of colour similar to those that have been observed marking fossil shells from the carboniferous limestone of Derbyshire, and indicating, according to Professor E. Forbes, their having lived in a shallow sea. It was called Turbo tricinctus (*M'Coy*) on the tablet, evidently by mistake, as that author describes Euomphalus tricinctus only, an Upper Silurian fossil from Galway. In Sir R. Griffith's collection it is named by M'Coy, Euomphalus subsulcatus (*Hisinger*), but as that is an erroneous identification, I have called it *Trochus fucatus.*

5 *a*. 5 *b*.

Turbo rupestris (*Eichwald*. Figs. 5 *a*, *b*.)

6 *a*. 6 *b*.

* Euomphalus tubæformis (*Baily* n.s. Figs. 6 *a*, *b*.)

Heteropoda.

Bellerophon sp.

Pteropoda.

Theca sp.

Cephalopoda tetrabranchiata.

Orthoceras subgregarium ? (*M'Coy*),
,, tenuicinctum ? (*Portlock*).
,, sp.

Crustacea (*Entomostraca*).

Ostracoda.

Cythere Macoyii (*Forbes* n. s. ?)

Trilobitæ.

Remopleurides longicostatus (*Portlock*).
Cyphaspis sp.
†Illænus Bowmanni (*Salter*).
‡Phacops Brongniarti (*Portlock*).
Lichas Hibernicus (*Portlock*).
,, laxatus (*M'Coy*).
,, sp.
Cheirurus bimucronatus (*Murchison* sp.)
,, clavifrons (*Dalman* sp.)
Spærexochus mirus (*Beyrich*).
Cyphoniscus socialis (*Salter*),

The following fossils were found recently on the north slope of Grange Hill, at the back of a new cottage, in some thin bands of sandstone interstratified with slate :—

Annelida.

Tentaculites Anglicus (*Salter* sp.)

* In Sir R. Griffith's collection this shell is named by M'Coy, Euomphalus ellipticus var., on comparing it with that species, however, in the same collection, I consider it to be distinct, and have, therefore, given it the above name.

† Found also in the red slate. ‡ Found in gray slate.

Mollusca.

Brachiopoda.

Orthis testudinaria (*Dalman*).
,, calligramma (*Dalman*).
,, flabellulum (*Sowerby*).
,, vespertilio (*Sowerby*).
Strophomena compressa ? (*Sowerby*).
,, sp.
Leptæna transversalis (*Dalman*).

Lamellibranchiata.

Species apparently belonging to the genera Orthonota, Modiolopsis (of which there are three or four species), Arca, and Cleidophorus or Nucula.

Gasteropoda.

Species of the genera Pleurotomaria, Holopæa, and Euomphalus.

Several of the above are, probably, new species, but want of access to the proper works of reference prevents the attempt at their identification for the present.

W. H. Baily.

September, 1858.

Detailed Descriptions.

4. *Position and Lie of the Rocks.*

(The district included in this Map was surveyed by Messrs. W. L. Willson, G. V. Du Noyer, J. O'Kelly, and A. B. Wynne. Mr. Willson's Notes have been abstracted from the six-inch maps, by Mr. Du Noyer.)

Carboniferous Limestone.—There are but few districts in Ireland of equal extent to that comprised in this quarter sheet where the rocks appear so seldom at the surface. The only localities in the part of the county Kildare which is included in this map, where the limestones can be seen, are the following :—Beds of limestone appear on the road north of, and close to, Dunmurry house ; but these will be described hereafter. The following are from Mr. Willson's Notes :—

On the road between the townlands of Kilmoney South and Drinnanstown South, there are to be seen thin beds of bluish gray earthy limestone, dipping northwards at from 10° to 50°.

In the field N.W. of Kilmoney cottage, hard and compact limestones have been quarried : they are light gray in colour, and fossils are very abundant in them ; the dip of the beds being S.S.E. at 20°.

On the main road, through the townlands of Boston Common, limestones appear, which are rather earthy, and dip N.W. at from 10° to 60°.

In the neighbourhood of Monasterevan, in the townland of Coolnafearagh, there is one quarry in hard compact light gray limestone, containing fossils, the dip of the beds being N.N.W. at 30°. North of Monasterevan, in the townland of Ballykelly, are quarries in thick light gray compact limestone, with thin beds of a darker colour, the upper parts of which contain nodules of chert, all dipping N.W. at 25°. North of these quarries, in the townland of Mullaghroe, and that adjoining it to the east, beds of hard thick bluish gray cherty limestones appear, dipping N.W. at 25°.

To the west of the town of Kildare, in the townland of Kilnagoran, are some horizontal beds of dark bluish gray limestones, containing fossils ; and

in the townland of Silliothill, and that adjoining it on the south, some extensive quarries have been opened in the gray limestone, the dip of the beds being S.E. at from 10° to 25°.

South of Monasterevan, in Moore Abbey demesne, the limestone is exposed at the surface in many places, especially in the wood on the east side of the demesne. It consists of dark and light bluish gray beds, occasionally containing chert nodules, and nodular layers, and thin beds of shale, the general dip being to the eastward, at angles varying from 10° to 30°. Outside the demesne, to the eastward, in the townland of Kill, there are several quarries in this limestone, the dip of the beds being eastward from 20° to 40°.

In the townland of Globeisland, still further to the east than the last named locality, are two quarries in thin bedded light gray limestone, with dark coloured earthy shale partings. Fossils are abundant in these beds, the dip being to the S.E., at from 5° to 20°.

Several quarries in the Lower Limestone are scattered over the low grounds which lie about one mile to the north of Kildangan Castle. They expose beds of light and dark bluish gray limestone, containing dark gray shales in the limestones, generally speaking being fossiliferous, and dipping to the north at from 10° to 30°.

At Dune castle, the limestone is brown and slightly cavernous, dipping to the southwards; and at the distance of about a quarter of mile south of the Castle are some thick hard beds of dark bluish black limestone, with thin earthy brown shale beds between them.

A few limestone quarries, about one mile and a-half to the west of the last named locality, exposing thick and thin compact blue limestones, with shaly partings, dipping to the eastward and southward at from 5° to 50°, and containing fossils. This completes the list of the places where the Lower Limestone is seen in the portion of the map included within the limits of the county of Kildare.

G. V. D., *from Notes by* W. L. W.

In the part of the map included in King's and Queen's counties, the limestone may be seen at the following places:—South of Ballintemple, at the N.W. corner of the map, some quarries occur—one at 300 yards S.S.E. of Ballintemple, in a dull brownish gray limestone, magnesian looking, with no appearance of fossils. A quarter of a mile south of the last mentioned locality, another quarry of light gray compact limestone may be seen. One mile farther south again, where the two roads meet, west of Raheenakeeran castle, dull gray limestone, with hard bluish beds, from 2 to 3 feet thick, interstratified with some thin beds may be seen, dipping S.S.E. from 35° to 40°. At Clonsast some quarries appear of dark gray and dark bluish gray compact limestone, dipping S.E. at 20°, and containing fossils.

Three quarters of a mile south of the town of Portarlington, 300 yards S.W. of the railway station, dark gray, rather compact, limestone, with thin shale partings and cherty bands, may be observed dipping E. 10°, S. at 55°. These beds may be traced S. by W. for nearly half a mile, with the same dip and strike. Five hundred yards S.E. of the railway station, a quarry of dark gray and blackish cherty limestone occurs, having the same dip and strike as in the last mentioned locality.

At Saline Field, south of Jamestown, there is a quarry in dark gray limestone, containing some chert and thin shale partings. These beds dip S. 5 E. at 30°, and S. by W. at 5°. Seven hundred yards E. by N. of Wheelahan's bridge, on the north side of the canal, dark gray cherty limestone may be seen, dipping W. 5° N, at 30°, and containing fossils.

West of Tinnakill castle, 300 yards north of Lauragh, and immediately south of the canal, on the west side of the map, a quarry occurs in dark gray and pale bluish gray limestone, in places crystalline, the bedding not being apparent.

Half a mile E. of Moore's bridge, at the cross roads, compact dark gray and pale gray, at times crystalline, limestone may be seen dipping E. at 60°. In Emo demesne, midway between the village and Emo castle, is a quarry of dark gray and bluish gray crystalline limestone, containing fossils.

The preceding data are all taken from places where the limestone described is believed to belong to the Lower division of the Carboniferous Limestone.

The following observations relate to beds which are apparently referable to the higher divisions, namely, the Calp and the Upper Limestone..

The Calp or Middle Limestone only occurs at the S.W. corner of this map, S. and S.E. of the town of Portarlington, and is of very limited extent, the principal localities where it may be seen, are as follows:—one mile and a half from Portarlington, on the Monasterevan road, dark gray and black compact thin bedded limestone, with thin shale partings, thin bands of Calc spar and beds of chert may be seen in a quarry, on the south side of the road, dipping E. 10° S. at 8°. West of Mount Henry, near the church, in the cutting on the road, and in the immediate vicinity, where several quarries are open, dark gray, and thin bedded, compact limestone, with thin bands of shale; and one bed of black shale, about 5 feet thick, may be seen dipping E. 5° S. at 10°. In this locality fossils are rather abundant.

In the neighbourhood of Ballybrittas Old, several quarries appear, and the beds are of the same character as last mentioned, and contain the same fossils. They form rather a sharp synclinal curve, dipping W. by N. at from 45° to 60°, at Ballybrittas Old, while about 200 yards N.W. of it, they dip S.E. at 30°. In the vicinity of Emo many quarries occur, immediately south of the village, the beds dipping S.S.E. from 5° to 10°; the limestone is dark gray and black, compact, with chert and thin shale partings. In all these quarries fossils are rather abundant. Half a mile S.W. of Emo, north of glebe house, another quarry of dark gray and black limestone occurs, and another 500 yards west of the last mentioned locality. Seven hundred yards north of The Togher, a quarry of dark gray and black limestone appears dipping N.N.W. at 15°.

The Upper Limestone is of very trifling extent on this map; it may be seen in a quarry north of Mount Henry, at the R.C. Chapel, and National school, dipping S.E. at 20°, and is gray and pale gray, flakey, in places crystalline limestone, thick bedded, and containing fossils. Half a mile N. by W. of that locality, and 500 yards west of the height which is marked 333 on the map, some quarries in limestone of the same character may be seen; and also south of Lea castle, at the canal bridge, on the south side of the canal, dipping S.E. at 5°. Five hundred yards S.E. of the last locality, on the north side of the road, another quarry of pale olive gray limestone occurs, dipping W. by N. at 10°; and 300 yards south of the last mentioned locality, another extensive quarry of thick bedded gray and pale gray limestone occurs, dipping N. by W. at 5°.

J. O'K. *and* A. B. W.

Lower Silurian and Old Red Sandstone Rocks.—If we commence the detailed examination of the Chair of Kildare hills, by supposing that we approach them on the S.E., we are struck in the first place by finding a few beds of the Lower Limestone appearing on the road, not quite half a mile N. of Dunmurry house, and close to the base of the hill which rises above it. There are dark gray very fetid limestones, with thin gray earthy shale partings between the beds, the dip of which is but 5° to the S.E. A few hundred feet beyond them, and further to the north, we reach the dark gray fissile slates and red purple shales and slates of the Lower Silurian rocks, which dip S.W. at about 60°.

We have here, therefore, the junction of the Carboniferous with the Lower Silurian rocks, and the unconformability of the former on the latter clearly

established. It is of importance to notice this particular locality, as it is the only spot in the entire extent of the Geological boundary of the Chair Hills where the one rock is observed to approach so closely to the other. The boundary between the two as laid down on the map, is in other places drawn entirely from inference, and from observing the physical features of the ground. Having noted the foregoing fact of the Carboniferous Limestones, resting directly on the Lower Silurian slates, without the interposition of any other rock, we should naturally expect, that, by following the boundary of either of these rocks to the east or west of the locality last noticed, the same fact would be apparent. This is not the case, however; for at the distance of about one mile to the S.W. of the Limestone, in the townland of Redhills, we find clear evidence of the presence of a small portion of the Old Red sandstone, lying in a small bay-shaped hollow, on the east flank of the hill, about three-quarters of a mile, Westwards, from Dunmurry house.

If we now return to the limestones on the Dunmurry road, and proceed to the N.E. along the base of the hill, passing south of "the Chair," we arrive at the distance of not quite two miles, at Newington house. Here we have again a few beds of the Old Red sandstone, appearing in the most unexpected manner, and like the former, occupying a depression in the S.E. flank of the hill; these rocks may be seen in the back road to Newington house, and consist of salmon coloured thin and fine conglomerates, and purplish red slates dipping S.S.E. at 15°. Judging from the low angle of the dip, this deposit cannot here be of any great thickness. Unfortunately, no direct evidence exists to enable the observer to define with accuracy the extent of the Old Red sandstone here, the form of the ground alone being his guide.

To the east of Newington house, the Chair hills are cut through by a flat valley, nearly one mile in width, the greater portion of which is occupied by marsh land and bog. No evidence, therefore, is to be had here, as to whether the Old Red sandstone beds extend across this flat or not.

If we cross this marshy valley, we reach the western base of the eminence called the Hill of Allen, which rises to the height of 676 feet; and if we proceed along its S.E. margin, we find that the first approach to a rise in the ground exposes the shattered and upturned edges of the Lower Silurian rocks. These consist of hard bluish gray earthy slates, and fine grained grits; but neither their dip nor their strike is apparent.

Proceeding along the road which leads from Miltown to the Leap of Allen, we soon pass off these slates, and find ourselves on a dark purple porphyritic Greenstone, which forms the main mass of the hill to the north, and will be described presently.

At the forge, in the townland of Barnacrow, we once more find the Old Red sandstone, which here rests directly on the porphyry at angles of dip varying from 10° to 15°, and inclining apparently to the N. The lower beds appear to be dark red shales and sandstones; the conglomeritic character of the rock being lost.

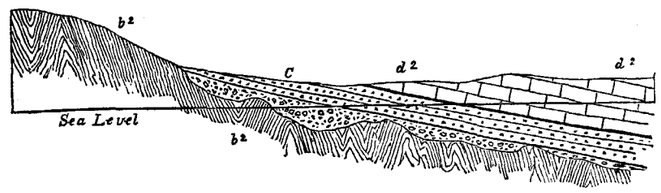
By following this road to the north, the eminence called the Leap of Allen, 387 feet in height, is reached; and this is formed entirely of the Old Red sandstone, which here spread out in all directions, being nearly two miles from N. to S., and about one mile from E. to W.

The outline of this deposit, on the northern extremity of the Chair hills, where the Lower Limestones of the surrounding county is supposed to rest on it, is only capable of being determined by inference; for there is not a single quarry of limestone within many miles of it, and the sandstone itself, when it is seen in situ, is confined to the summit of the hill and the low ground immediately to the south of it. Between the three localities just noticed, where the Old Red sandstone can be seen, the Lower Limestone overlaps and conceals it, and rests directly on the Silurian slates; a fact to be accounted for, not by the supposition of an unconformability between the limestone and

the underlying sandstone, but that the sandstones were only slightly and partially developed in places favourable for their deposition, that deposition being very partial in this neighbourhood, while the subsequent formation of the limestone was extended over a much wider area.

The following diagrams will explain this—

Fig. 7.



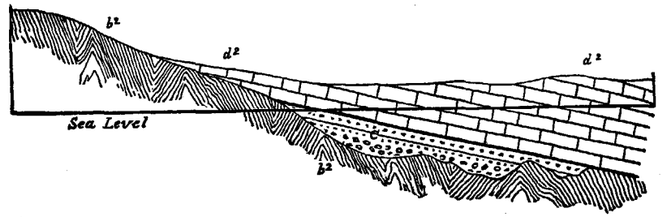
Diagrammatic Section showing the mode of occurrence of the Old Red sandstone, and Carboniferous Limestone, on the S.E. flanks of the Chair of Kildare.
Scale about 4 inches to 1 mile.

d^2 Lower Limestone.
c Old Red Sandstone.
b^2 Lower Silurian.

In figure 7, the Old Red sandstone is seen rising out between the limestone and the Silurian hills, in regular beds, which lie parallel to those of the limestone, above them, while they are quite unconformable to those below, and fill up the irregularities and hollows in the surface of those rocks, in such a way as to make a smooth and level floor on which the limestone was deposited in regular beds. This is the relation between the rocks, at the three points, on the flanks of the Chair of Kildare, where the Old Red sandstone is distinctly seen.

At other places where it is not seen, and where the limestone is observed or believed to rest directly on the Lower Silurian rocks, the relations of the rocks must be as shown in figure 8, the irregular and partial terminations of the Old Red sandstone beds being overlapped by the limestone, which stretches across it, so as to completely conceal it. This would indeed be the case, even in figure 3, if we supposed the limestone beds to be continued till they touched the Lower Silurian.

Fig. 8.



Diagrammatic Section, showing the manner in which the Carboniferous Limestone overlaps the Old Red sandstone, on the S.E. flanks of the Chair of Kildare hills.
Scale about 4 inches to 1 mile.

d^2 Lower Limestone.
c Old Red Sandstone.
b^2 Lower Silurian.

The Lower Silurian slates, which form the main mass of the Chair of Kildare hills, are but imperfectly seen on the northern extremity of the range; they consist of dark gray splintery slates, and thin hard bluish gray fine grained grits; these appear on the western slope of the Hill of Allen.

This hill is, as before stated, mainly formed by a mass of very hard dark purplish green porphyry, containing crystals of pale yellowish green felspar. The extent of this boss is fully a mile from N. to S., by more than half a mile from E. to W. A detached lenticular shaped mass of the same rock appears to the west of the main mass, and very close to it, in which the felspar crystals are much more perfectly developed, and larger than in the more massive porphyry.

The Hill of Grange, on which is the Chair, has the Lower Silurian slates and thin grits very well seen on both its N.W. and S.E. flanks; the centre and crest of the ridge being entirely composed of a bed of cotemporaneous porphyry, varying in thickness from probably 400 to 1,000 feet, and capable of being traced in the direction of the longest axis of the hill, that is, from N.E. to S.W., for the distance of one mile and a half. This rock has precisely the same lithological character as that mentioned previously as forming the Hill of Allen, and although there is no direct evidence to show that it is connected with it, yet it is quite possible that it may be. In one spot adjoining the knoll called "the Chair," this porphyry changes its usually solid aspect, and becomes quite amygdaloidal; the vesicles being filled with carbonate of lime; and near the summit of the hill, the porphyry exhibits traces of Epidote. As the slate rocks, when observed close to this porphyry, do not show any trace of alteration or metamorphism, and as beds of ash may be seen below it on its northern side, it is concluded, that the porphyry is a cotemporaneous deposit, occurring as a thick bed and not an intruded mass.*

In the Lower Silurian rocks which appear on the N.W. slope of the ridge, at the distance of 1,000 feet east of Grangehill house, and at the small cottage which is there built, there are some brown earthy slates, and greenish gray sandy and ashy grits, dipping apparently S.E. at 60° to 70°, and thus underlying the great porphyry bed. In them many fossils occur, especially Orthis Flabellulum, of which a list has been already given by Mr. Baily and others.

The knoll of rock called "the Chair," consists of pale pinkish gray fine-grained limestone, occurring as a narrow lenticular bed in the dark gray Lower Silurian slates, which overlie the great porphyry bed. A second and very thick lenticular mass of similar limestone adjoins and overlies the one first mentioned to the south; and a third, but much thinner bed, can be traced close to and N.W. of the one last named. Although three exposures of this limestone appear, it is likely that there are but two beds. The thinner or the one to the north forming two of the bosses.

These lenticular masses of limestone appear to be bent round, so as to dip to the eastward and southward, at an angle, probably, of 35°; but this is a point not at all easily determined.

* On the Hill of Grange, this igneous rock would, in places, be called a Felspar Porphyry containing an occasional crystal of hornblende, rather than a Greenstone. It has a dull grey compact base, with translucent plates of green, glassy-looking felspar, and here and there, at wide intervals, a crystal of dark green hornblende. In other spots the hornblende is much more abundant, so as to bring it within the definition of a Porphyritic Greenstone, some of the hornblende crystals being very pale green, like Epidote, and of these some are half made up of white crystalline Carbonate of Lime, while some cavities are filled with the latter substance, having a green coating only, and others are entirely empty. In some of the latter minute crystals were observed at the sides, which, according to Mr. Gages, who accompanied me in the examination of the hill, seemed to be Olivine. It appeared to us that some of the crystals of hornblende were metamorphosed into Carbonate of Lime, which being removed by water caused the vacant cavities.—J. Beete Jukes.

The rocks last described appear on the south-west brow of the "Chair hill," and occupy high ground; but they are not traceable into the valley lying to the south-west, through which the road between the towns of Kildare and Rathangan passes, although they ought to be seen on the opposite side of it if followed along their line of strike. A fault is, therefore, supposed to occur here, having a direction parallel to that of the glen, thus cutting off the slates, limestones, and porphyries of the "Chair hill" on the north-east from the beds forming Dunmurry hill on the south-west. This idea is much strengthened when we come to examine the east slopes of Dunmurry hill, on the west side of the glen. Here the slate rocks can be observed across the entire width of the hill, a distance of much more than half a mile; and they are found to change their strike to a N.W. and S.E. direction, dipping to the S.W. at from 35° to 60°. A thick band of bright red sandy slate occurs in their lower portion, above which is a series of gray and olive gray slates and thin sandy grits, in lithological character and aspect essentially different from any of the slate beds of the "Chair hill" on the N.E. They doubtless belong to the same formation, as is proved by their fossils, but they are clearly not the same beds.

From the road passing through the glen east of Dunmurry hill, to near the school-house of Knocknagalliagh, adjoining Knavingstown house, a distance of two and a-half miles, in a S.W. direction, the eminences which form the western termination of the "Chair hills," are all composed of the same olive slates, and thin gray grits, as those of Dunmurry hill; they were observed to be contorted in a series of very regular zig-zag curves, which carry almost the same beds from Dunmurry hill, to the termination of the ridge, the dips being to the S.W. and N.E. at angles varying from 25° to 60°, the greater amount, however, being the exception.

At the distance of three fields N.W. of the summit of Red hills, are some red, green, and brown, sandy slates and gritty layers, through which run quartz veins in which hæmatite has been detected.

Adjoining Killeagh common on the N.E. are pale greenish gray sandy slates, and cleaved sandy grits, the strike of the cleavage being N. 45° E., with its planes inclined 75° to the S.E.; the rocks are also smoothly jointed in directions striking N. 50 W.

It might be well to remark, that in no instance along the N.W. flanks of the range of the "Chair hills," do the Carboniferous Limestones and the Lower Silurian rocks appear in junction; the boundary of both, as exhibited on the map, being a purely arbitrary one, and suggested, I may say, entirely, by the physical features of the district.

G. V. D.

5. *The Drift.*

The entire surface of the county included in this quarter sheet, with the exception of that forming the extreme summits of the Chair of Kildare hills, is covered with limestone pebbles, sand, and gravel. The fragments of limestone may, of course, be the debris of the beds immediately below the drift; through it, however, may be detected equally well rounded fragments of grits and sandstone of various colours and characters, derived from more distant sources.

At the Railway cuttings adjoining the town of Kildare, this sand and gravel may be observed to be regularly stratified, the coarse and fine portions being separated from each other, and the strata lying at angles of 30° or 40°. On the S.E. of the map, between Nurney and Eagle hill, the sand and gravel is piled up into a low, but in places, steeply sloping irregular ridge, forming an excellent example of an Escar.

Other large ridges of similarly heaped up materials, are cut through by the Railway, to the east of the town of Kildare, and over the whole of the Curragh and the neighbourhood, a thickness of Drift more than 100, sometimes, perhaps, as much as 200 feet in thickness, is interposed between the surface of the ground and the solid limestone which lies below.

The large tracts occupied by peat bog and alluvium are, doubtless, covered also, to a greater or less thickness, with Drift lying between the peat and the rock below. Over these spaces, however, the dotted character for Drift is not extended, because the peat bog here becomes the superior formation. It is sometimes as much as 25 or 30 feet in thickness, and crowded occasionally with trunks and roots of trees, the latter always in the position of growth, testifying to the former presence of great forests which spread over the plains. A layer of white earth 4 to 6 inches thick, consisting chiefly, if not wholly, of Diatomaceæ, may sometimes be seen in the lower part of the bogs of this district.

J. B. J.

September, 1858.

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