Memoirs of the Geological Survey.

EXPLANATIONS

TO ACCOMPANY

SHEET 193 OF THE MAP

OF THE

GEOLOGICAL SURVEY OF IRELAND,

ILLUSTRATING PART OF

THE COUNTIES OF CORK AND KERRY.

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DIRECTOR-GENERAL OF THE GEOLOGICAL SURVEY OF THE UNITED KINGDOM:

SIR RODERICK IMPEY MURCHISON,
D.C.L., F.R.S., G.C.ST.S., &C., &C.

Geological Survey Office and Museum of Practical Geology, Jermyn-street, London.

IRISH BRANCH.

Office in the Museum of Irish Industry, 51, Stephen's-green, Dublin.

LOCAL DIRECTOR:
J. BEETE JUKES, M.A., F.R.S., &C.

SENIOR GEOLOGISTS:
G. V. DU NOYER, M.R.I.A.; W. H. BAILY, F.G.S.; G. H. KINAHAN, ESQ.

ASSISTANT GEOLOGISTS:
F. J. FOOT, M.A.; J. O'KELLY, M.A.; A. B. WYNNE, F.G.S.; J. KELLY, ESQ.

COLLECTORS OF FOSSILS, &C.:
MR. C. GALVAN; MR. A. M'HENRY.

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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EXPLANATIONS

TO

ACCOMPANY SHEET 193 OF THE MAPS

OF THE

GEOLOGICAL SURVEY OF IRELAND.

General Description.

The whole of this district lies in the county Cork, with the exception of about two square miles occupying its extreme N.W. corner, which is part of the county Kerry. The only town in it is Dunmanway, and the only village, Inchigeelagh.

1. *Form of the Ground.*

The western portion of the area is occupied by a group of mountains which rise higher and higher towards the centre of the district, till they culminate in Shehy Mountain with a height of 1,797 feet. This point is on the main watershed of the district, which separates the Rivers Lee and Bandon, flowing to the east, from the lesser brooks that run to the W. and S. Owen Hill, which rises on it four and a half miles to the S., and Bealick Mountain, six miles to the N.W. of Shehy, are each stated to have a height of 1,762 feet; and there are several other eminences of 1,500 feet and upwards. The lowest points of the watershed are those where it is crossed by the road from Bantry to Cork, at Carrigacona Bridge, between Shehy and the Maughanaclea Hills, where it is about 750 feet high, and the head of the pass of Keamaneigh, where the road from Bantry to Macroom crosses it at a height of 658 feet. A lesser watershed runs eastward from Shehy, between the basins of the Lee and the Bandon, no point on which much exceeds 1,000 feet in height, while it sinks as it runs eastward to heights of 500 feet or thereabouts, where it is crossed by several roads to the N.E. of Dunmanway.

The mountains which occupy the extreme N.W. corner of the district are even loftier than Shehy, a point called Conigar being 1,886 feet. They are abruptly escarped, so as to form an amphitheatre open to the east, enclosing a boggy alluvial tract of about three-quarters of a mile long and a quarter of a mile wide, which is known as the Green Valley of Desmond. The level of this little flat is only 560 feet above the sea, while the mountains rise to 1,700 and 1,800 feet around it.

The well-known lake of Gougane Barra lies in a deep hollow at the entrance of this glen, and with the rugged and lofty cliffs overhanging it on the north, and its solitary and thickly-wooded island-like promontory, with the ruins of St. Finbar's Church, forms an object of exceeding beauty.

The principal rivers which enter the district are the river Lee and the Bandon River. The Lee traverses the extreme northern portion of the district, from W. to E., throughout an extent of about fourteen miles, having its rise in the Green Valley of Desmond. After flowing through Gougane Barra Lake, which is at an elevation of 542 feet, it traverses a narrow valley for a distance of about three and a half miles, when it falls into the head of Lough Allua, at an elevation of only 281 feet above the sea.

Lough Allua, which is fully four miles in extent, by little over a quarter of a mile at its widest part, is nothing more than a widening of the river Lee in a flat and gently-winding alluvial valley, bounded on both sides by rocky and often mountainous ground.

The river Lee, after leaving the lake at its eastern extremity, passes out of the district at the distance of about four miles and a half to the E. of the village of Inchigeelagh, at an elevation of only 223 feet above the sea.

The Bandon River rises on the eastern slopes of the hills, between Owen and Shehy Mountains. After being joined by the Caha River from the north, and flowing S., past Dunmanway, it turns abruptly to the E. into an alluvial tract, through which it flows for the distance of about five miles, when it leaves the district included in this sheet of the map.

G. V. D.

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2. *Formations and Rocks entering into the Structure of the District.*

Aqueous Rocks.

	Name.	Colour on Map.
Carboniferous.	d¹. Carboniferous Slate and Coomhola Grit,	*Dark-gray, with Yellow Dots for the Grits.*
Old Red Sandstone.	c³. Upper Old Red Sandstone,	*Indian red (dark).*
	c². Old Red Sandstone,	*Indian red (light).*

c². *The Old Red Sandstone.*—In this district these rocks consist of purplish gray, greenish gray, and green and purple grits and slate beds. Throughout these are dark, liver-coloured, or purple slates and shales. As a group these beds present every variety of rock, from one which is argillaceous and cleaved, to a compact siliceous grit. Here and there throughout them there are layers and beds of greenish or purplish brown sandy cornstone, formed of small flakes and chips of purple or green slate inclosed in a highly calcareous base. Sometimes the calcareous portion occurs as small lenticular flakes of carbonate of lime. Sometimes the rock is sandy, and the hardening or cementing material is carbonate of lime, which either formed a portion of the original deposition or was infiltrated into it after its formation, in which case the sandy matrix would more readily absorb it than the inclosed argillaceous particles. These cornstones are readily detected by their outward appearance, which is rusty and pitted into small hollows, the latter being due to the decomposition of the calcareous portion of the rock by atmospheric action, and the former to the oxidization of the iron which enters somewhat largely into the composition of all the Old Red sandstones.

Continuous sections may be seen, showing a thickness of fully 9,000 feet of Old Red sandstone without reaching its base, and without reckoning the "Yellow" sandstone at the top.

c³. *The Upper Old Red or "Yellow Sandstone."*—In this district it is particularly difficult to define the limits of this group of beds, which at best have but an arbitrary boundary, and are nothing more than a band composed of some hundreds of feet of the uppermost part of the Old Red sandstone. The chief characteristic distinction of this group here is the frequent occurrence of pale, yellowish-brown sandstones and yellowish shales, and a greater amount of dark, liver-coloured, or purple cleaved beds than in the Old Red itself. Many of the sandstones are speckled with minute flakes of whitish felspar, which render the rock friable by their tendency to decompose from atmospheric action. Cornstones but very rarely appear in this portion of the Old Red sandstones. As we near the top of the deposit, where the Coomhola grits rest on it, we frequently find impressions of plants. The upper 800 feet or so of the Old Red sandstone may be supposed to represent the thickness of this subdivision.

d¹. *Carboniferous Slates.*—The transition from the Yellow sandstone to this portion of the Carboniferous rocks is for the most part gradual; but in the space of about 400 yards or so, after leaving the decidedly red beds, the dark gray and frequently almost black argillaceous character of the deposit becomes its characteristic feature. In the lowest parts of these slates we find a series of thick bands of gray and sometimes olive-gray, hard, siliceous grits, with gray shale and slate partings, named by Mr. Jukes Coomhola grits, from the valley of the Coomhola River, N. of Bantry, where these rocks are best developed. Other layers of grit, of less thickness and persistence, occur above this band in the mass of the slates. From the numerous and sudden contortions to which the Carboniferous slates have been subjected, the true Coomhola grits or lower beds frequently make their appearance far from their normal position. The uppermost portion of this deposit and the grits appear merely as thin and occasional beds.* The total thickness of the Carboniferous slates in this district may be estimated at about 1,500 feet, the top of the deposit not reached. Mr. Jukes remarks in the Explanation to Sheets 197 and 198, "that the plants which occur in the uppermost part of the Upper Old Red sandstone are likewise found in the lower grits (Coomhola grits), of the Carboniferous slate. Bivalve shells also occur in these grits; casts of shells apparently like cucullæa and mytilus."† These observations will apply in the present instance.

G. V. D.

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

The greatest amount of elevatory force has been exerted over the district in an N.E. and S.W. direction, thus bending the mass of

* See Explanation to Sheets 197 and 198, page 7.

† Ibid. page 8.

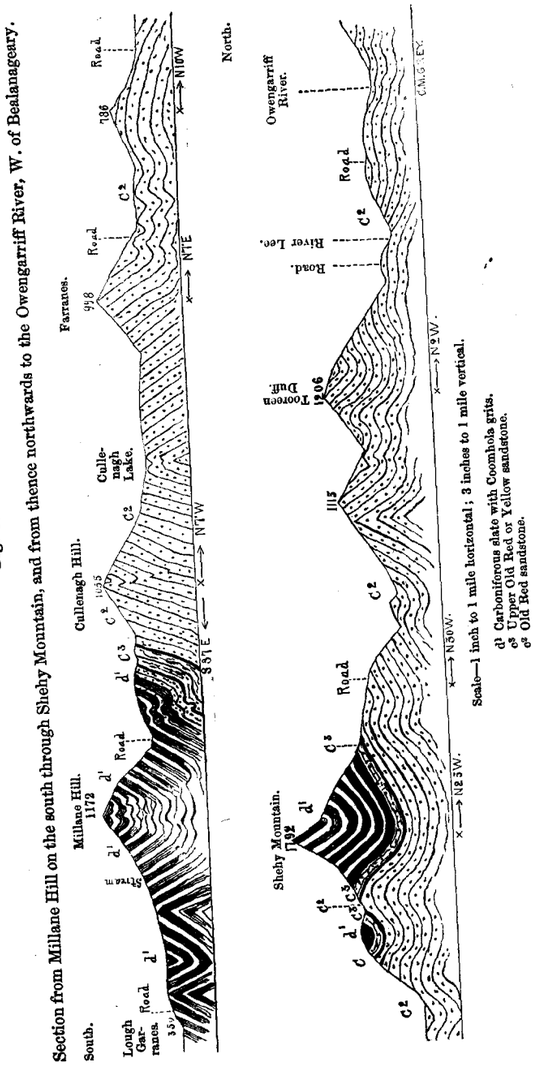
the rocks into two great anticlinals, with a crumpled scoop-shaped synclinal between them, the eastern or narrow and blunt end of which has been elevated to almost the highest point in the district, while the western or open end widens while it slopes rapidly to the W. In this sloping hollow the Carboniferous slates rest, the mountainous ground at either side of them being formed by the Old Red sandstone and the Coomhola grits rising from beneath it, and forming the lofty summit of Shehy Mountain. To the geologist visiting the place this peculiar structure of the summit of Shehy will be at once apparent. If he stands on the bank of the stream, near the spot where the arrow and star is engraved on the map, N. of Carrigmount, and looks to the westward, he will have the truncated edges of the thick Coomhola grits and the dark-gray slate beds presented to him in the foreground; while beyond them he sees bed after bed of grits and slate rising in a succession of graceful curves up to the very summit of the mountain, where they terminate in a sharp synclinal fold which throws them to the N.N.W. at 60°, and to the opposite point at only 15°. As we pass westward from the summit of Shehy, and descend into the glens of the Owngar and Owvane Rivers, this great scoop-shaped mass of rock widens, and we come upon higher and higher beds of grits and slate as each successive layer tends to fill up the depression. On the N.E. margin of the district, in a line with the Shehy synclinal, but distant fully nine miles from it, we find the commencement of a similar depression in the Old Red sandstones, between Teerelton cross-roads and Capeen. This depression slopes to the opposite direction of that at Shehy, or to the eastward. Here a few beds of the Upper Old Red sandstone appear, but beyond a slight elevation in the ground there is no physical feature to indicate this change in its geological structure.

The valley of the river Lee has been excavated out of the Old Red sandstone, and for the most part along the strike of the beds; while the head valley of the Bandon River, after following nearly in the strike of the Old Red sandstones between Shehy and Dunmanway, turns abruptly to the S., where it receives the Caha River and crosses the strike of the beds nearly at right angles for the distance of two miles and a half. At Dunmanway the river enters on the Carboniferous slate district lying to the S., where it turns abruptly to the E.N.E., following the strike of the beds and passing through a broad alluvial tract for the distance of six miles. The narrow and rocky gorge of Keamaneigh, to which allusion has already been made, cuts right across the strike of the Old Red rocks in a north and south direction for the distance of nearly two miles, being in some places about 100 feet in depth from the crest of the adjoining cliff to the level of the road. This mountain pass is not the result of any fault or dislocation in the mass of the rock, but has been formed, like almost all "passes," by the erosive action of water, probably the action of the sea, as the rocks gradually rose above it.* To the same cause is due the formation of the precipitous amphitheatre of rock now surrounding the Green Valley of Desmond and overhanging the Lake of Gougane Barra.

* See Explanation of Sheet 184. "Drift."

Fig. 1.

Section from Millane Hill on the south through Shehy Mountain, and from thence northwards to the Owengarriff River, W. of Bealanageary.



At the distance of four miles to the W.S.W. of Dunmanway the Carboniferous slates form Millane Hill, which reaches an elevation of 1,172 feet; the beds here are bent synclinally, the topmost curve forming the summit of the hill. From the similarity of this structure with

that of Shehy Mountain, it would appear that such was best adapted to resist the destructive forces of the seas and currents which modelled the entire surface into the physical features which it now presents.

It will be apparent to any one studying the accompanying section, Fig. 1, that the amount of rock removed from off this district by denudation is something enormous. It is evident that the Carboniferous slates and grits forming the summit of Shehy Mountain are on the same geological horizon and were absolutely once connected with the Carboniferous rocks forming Millane Hill and those occupying the district S. of Dunmanway, hence the present form of the ground is due to long-continued and powerful forces of denudation acting on strata already bent and contorted, during the progress of their slow upheaval from beneath the sea.

G. V. D.

Detailed Description.

[The district was examined by Mr. W. L. Willson (now of the Geological Survey of India), and Mr. G. V. Du Noyer, assisted occasionally by myself. Mr. Du Noyer has drawn up the following detailed description from the notes entered on the six-inch maps.—J. B. J.]

4. *Position and Lie of the Rocks.*

c^2. *Old Red Sandstone.*—The best development of the Old Red sandstone is to be seen at the distance of something more than two miles to the north of Dunmanway, over the hilly ground lying to the W. of the Neaskin Loughs. The rocks consist of purple cleaved earthy layers, with purple grits and sandstones; and they are exposed in an unbroken section for the distance of two miles and a quarter, commencing at the Bandon River on the south, where the lowest beds appear, and terminating in the rocky ground beyond the Caha River on the north. Throughout this distance the dip of the beds is to the north, at from 45° to 60°, and if we curtail the section to a distance of two miles, and allow 50° as the average dip, we have an aggregate thickness of 8,100 feet of rock, and neither the top or the bottom of the deposit reached.

The exact locality of this section is indicated on the map by a series of arrows following each other in close succession. In the red and green slates and grits which appear on the eastern flank of Carrigareirk Mountain, north of this section, and which dip to the N.E. and E. at various angles up to 60°, we find a few green and brownish purple cornstone bands.

The next most important and continuous section is that afforded by the Pass of Keamaneigh, from about its central part southwards, and from thence along the western side of the upper portion of the Glen of the Owvane River opposite Cullenagh Lodge. The beds exposed in this section, which is over two miles in length, are chiefly purple grits and slates, with an occasional green bed of either variety of rock. The universal dip throughout is to the S. or S.S.E., at angles of from 60° to 85°. If, therefore, we allow 60° as the average angle of inclination, we have an exposed thickness of rock amounting to fully 9,000 feet. This section terminates on the S. near Cappaboymore Lough, where the Yellow sandstone comes in; and as this band has been estimated at 800 feet thick in this district, we must add this amount to the former section, thus making 9,800 feet as the absolutely exposed thickness of the Old Red, and the base of the deposit not reached.

At the northern end of the Pass of Keamaneigh, and on the side of the Inchigeelagh road, there are a few beds of coarse purplish brown conglomerate, the inclosed pebbles being quartz and quartzose grits, but slightly rounded.

I am under the impression that these represent the lowest beds of the Old Red to be found in all the district, and a little more upheaval and subsequent denudation, or denudation alone to the depth of some hundreds of feet at this locality, would have brought to view whatever rock it is on which the Old Red sandstone here rests.

On the western and southern slope of the mountain S. of Loughnabrade, in the N.W. corner of the district, Mr. Willson notices a very continuous section in green and purple slates and grits. The dip of the beds is invariably to the S.S.E., at from 20° to 60° and 75°, at the southern or upper part of the section; and as they are observed over an extent of two miles, if we suppose 50° to represent the average dip, we have a thickness of 7,875 feet, which, with 800 feet of Yellow sandstone at the top of the section on the northern bank of the Owenbeg River, we have a total of 8,725 feet of rock.

The steep mountain escarpments which surround the green Valley of Desmond, and the cliffs overhanging Gougane Barra Lake on the north, afford good local sections through a thickness of about 3,500 feet of the Old Red sandstone.

On the S. side of the valley and lake, the beds for the most part dip to the S.S.E., at from 50° to 65°; but at the western extremity of the lake they are suddenly bent in a series of sharp folds, causing them to dip to the N.N.W., at from 25° to 35°. In the precipice on the N. side of the lake, over the island promontory and ruined church of St. Finbar, a fault occurs, having a strike of about N.W. and S.E. On its west side, the beds dip to the N.W. at 70°; but on the east, to the E.S.E., at only 15° or 25°, an inclination which they more or less retain for a distance of about one mile to the N.E., and out of the northern limit of the map.

The mountainous and rocky district lying to the S. of Lough Allua, on the northern side of what may be called the Carriganine and Carrigareirk range of hills, affords many continuous sections and interesting examples of curved and contorted beds, traversed by a well defined cleavage.

Over an area of about six square miles, lying to the S. of Inchigeelagh, bands of cornstone, which are more or less calcareous, are of common occurrence; many of these are so compact, massive, and calcareous, that it may be of economic importance my noting the exact localities where such as I have detected occur. With but one exception these calcareous beds are unknown, and no attempt has ever been made to utilise them. They may yet, however, prove of some value in a district where lime is so costly; the nearest limestone quarries being at Anahalla, S. of Macroom, twelve to fifteen miles distant.

In reference to these cornstones, it is evident that from the small per centage of lime which they contain, they cannot be treated as an ordinary limestone. They should not be subjected to more heat than would be sufficient to reduce the calcareous portions of the rock to a state of pulverization, by which means the more arenaceous part would be disintegrated and form a coarse sand, and the whole become well adapted for top-dressing to land.

The cornstones which are found in the east side of the district just indicated, are brown and rusty, and appear in the northern part of the townland of Gortnaknockane, close to and due S. of the farm houses marked on the one-inch map, as on the S. side of the Lough Allua fault. These beds are inclined to the E. at 40°.

At the distance of a few hundreds of feet to the S. of the small tilled enclosure, close to the farm houses, the same cornstones curve round so as to dip N., at from 65° to 75°.

Another cornstone appears at the distance of 360 yards S. of those just alluded to in the stream between the last named townland and that of Coornahahilly to the W. In the south-western side of the townland of Cooragreenane, lying to the E. of Gortaknockane, and north of the eastern extension

of the fault marked on the map, and north of Gortnacarriga Bridge, there are a few cornstones in contorted beds of purple slates and grits.

On the eastern boundary of this townland, and among the rugged bosses of Red sandstone appearing on the S. side of the Inchigeelagh and Bantry road, a cornstone bed occurs, the rocks associated with it curving anticlinally so as to dip to the N.E. and S.E. at 60°. Close to the extreme S.E. corner of the same townland, but in the adjoining one of Gortnahoughtee, where an arrow pointing to the E., with a 30° as the dip, is engraved on the one-inch map, N. of the commencement of the stream which runs from E. to W. to Gortnacarriga Bridge, there is a cornstone band in green slate. In the extreme south-western end of the townland of Grahan, there are two massive beds of pinkish brown cornstone, from three to six feet in thickness, occurring in pinkish sandstone. These beds are externally of a brown colour, and the calcareous portion weather out into numerous small hollows. The dip of the beds is to the N., at from 25° to 60°; and the southern band of cornstone can be traced for the distance of nearly half a mile. This bed can be traced westerly at the adjoining townland of Gortnahoughtee. These beds, from their containing an unusual amount of the calcareous matter, and from their compactness and bulk, would be well adapted to experimentalise on as to the proper method of calcining them for the purpose of converting them into a manure.

In the eastern portion of this same townland, and at the commencement of the stream which divides it from that of Derrygortnacloghy, a cornstone bed appears in some purple slates, all dipping to the N. and N.E. at 50°. Directly to the N. of this, and distant 365 yards from it, another cornstone is to be seen in purple sandstone, dipping N. at 60°. In that portion of the stream which forms the southern boundary of the townland of Cunnaheen, and which divides it from the townland of Gortnaneadin, three cornstone beds occur in a distance of 450 yards, being associated with purple grits and slates, the general dip of all being to the N.E. or E. at 40°.

At either side of the Inchigeelagh and Bantry road, where it passes through the townland of Curraheen, there are two cornstones in purple slates, both of a light pink colour, but weathering rusty and brown. The most westerly of these beds is close to "The Attar cross-roads," and they both are curved synclinally, so as to dip to the S.E. at 40° and N.E. at 60°.

Amongst the Red sandstones and shales, or shaly beds which crop up in the western portion of the townland of Coorolagh, a bed of cornstone occurs; the dip being to the E. at 35°. Near the stepping-stones which cross the stream, dividing the townlands of Coorolagh and Gortaneadin, and in the latter townland, a cornstone band occurs in green slate. In the extreme N. corner of this townland, where it narrows rapidly, there are several cornstone bands, which, along with the associated purple grits and slates, dip to the N.E. and S.E. at 20°. At the N.W. side of Commons townland there are two cornstones, that to the N. on the edge of the bog, occurs in greenish gray grits, with purple slates below it, all dipping to the N.E. at 40°. The other band occurs to the S.W. of this, and is distant about 300 yards from it, dipping to the N. at 50°. In the townland of Gortnalour, the south end of it is occupied by bog, to the N. of which is a low rocky ridge. Here we find two cornstone bands occurring at the spot indicated on the map by the arrows, which point to the E. at 30°, on the northern margin of the bog; and the arrows to the north of this, one of which points to the N., with 55° as the angle of dip.

To the W. of this cornstone bearing district I detected but four bands of this calcareous rock, one occurs on the rocky ridge which strikes in an E. and W. direction across the townland of Tooreenalour, and along the southern face of which the Inchigeelagh and Bantry road passes. This band appears at the distance of 500 yards W. of Drokidaspaunig Bridge, and dips to the eastward at 25°. To the N. of this, in the south-western portion of the

townland of Gortnarea, and on the W. bank of the stream, there is a similar cornstone. At the extreme S.W. angle of this townland, but in the adjoining one of Inchideraille, there is a third bed; a fourth bed appears on the western bank of the Bealaphadee stream, where it divides the townlands of Inchideraille and Kealvaughmore, close to the N.E. corner of the latter. This last cornstone is thicker than usual, and occurs in purple slates and grits, dipping N. at 60. To the N. and W. of Inchigeelagh I found cornstones but at two localities, that to the W. is 500 yards N. of Graigue Bridge, in the southern end of the townland of Turnaspidogy, the band being green and sandy, and occurring in green grits and slates, dipping N. at 50°. That to the N. occurs at the extreme N.E. corner of the townland of Derryvane, in some contorted beds of purple and green grits and slates, the cornstones being green and sandy.

To the S. of the Inchigeelagh cornstone district, between Bealock and Carrigareirk, two cornstone bands appear, one in the southern end of the townland of Gortatanavally, in green grits and slates, dipping N.E. at 40°; and the other at the distance of about 300 yards S. of it, higher up the hill, in the N.E. corner of the townland of Gurteen, at the summit of the hill, in the adjoining townland of Derryleigh.

To the northwards and westwards of Dunmanway, cornstones are to be found at the following localities: on the N. side of the bog E. of Coolmountain House, and S. of the elevation marked 580 on the map, in the townland of Tullagh, and at the eastern end of the rocky ridge which crosses it. Here the cornstone is of a light green colour, and it rests on light green grits, with a green shale over it. To the S. of this, in the northern part of the townland of Moneyreague, and on the W. side of the road, there are three cornstones, just W. of the arrow engraved on the one-inch map, and pointing to the N.N.W., with a dip of 60° between Coolmountain House and the Chapel. Two other cornstones appear on the by-road in the N.E. corner of the townland of Derragh, N.W. of Keenrath House, where the arrow points to the N.W., with a dip of 35°. On the rocky ridge between Cullenagh and Coolkellure Lakes, and on the N.W. slope of the knoll at the eastern end of this ridge, marked 773 feet in elevation, here the cornstone approaches more the character of a sandstone, and is light gray and sandy. On the S. side of the small plantation on the road leading from the Dunmanway road to Hill Farm, and S. of Ship Lough, a light greenish gray cornstone was some years since raised and burnt on the spot. The rock was, however, treated as an ordinary limestone, and a kiln full of it was most effectually fused into one solid mass. Such a signal failure to convert this rock into lime effectually put a stop to any further experimentalising in this respect.

To the S. of this, and on the summit of the hill marked 1,032 feet, a band of light green cornstone, weathering to a dark brown colour, can be traced, interstratified with green and purple slates, and following the various contortions to which these beds have been here subjected.

On the northern base of this hill, near the Dunmanway road, S. of Lackna Wood, and at the base of the arrow pointing to the S.S.E., with a dip of 55°, there occurs a band of light greenish gray cornstone, in green and purple slates.

The last cornstone band to be noticed occurs in dark purple slates, at the northern end of the little wooded glen above the Bleach Mill to the W. of Dunmanway, on the road to Ship Lough.

In the N.E. corner of the district, the Old Red sandstones are well exposed in continuous sections through 2,000 and 2,500 feet of rock, especially on the S. bank of the River Lee, in the townland of Cooldorragha, and on the N. bank of the same river, to the N. of Castlemarters, in the townlands of Rossmore, Gortaveer, and Cooleen.

The section obtained in purple and greenish gray grits and slates on the

northern flanks of Owen Mountain, from the precipice to the W. of Cullenagh Lake, northwards past Dreenwannish Wood to the wood of Farnanes, is important for its unbroken continuity, the stratigraphical thickness of rock exposed being fully 4,550 feet, as an average dip of 60° must be allowed for the beds, while the length of the exposed section is over one mile.

A remarkable fault occurs along a line of sudden flexure in the Old Red sandstone skirting the southern side of Lough Allua. Its direction is nearly E. and W., and it can be distinctly traced for the distance of two miles and a quarter (though its probable length is four miles and a half), from the western side of the small marshy bog at the extreme E. end of Lough Allua, in the townland of Cooragreenane, westerly, to the brink of the stream dividing the townlands of Gortnarea and Inchideraille, just S. of some farm-houses on the northern part of the former townland.

This fault at its central portion, S. of the eastern end of Lough Allua, once formed a wide open vertical fissure, possibly extending for the distance of three-quarters of a mile, with a width of about 10 feet at its widest part. This is now filled with pure quartz appearing as a dyke; and as, at its apparent termination towards the east, it contains thin veins of specular iron ore, we may therefore regard it as a true lode. It is impossible to say to which side this fault throws, and it is most probable that the vertical displacement of the beds is not very great.

At the distance of one mile and a quarter E. of where this lode appears is the townland of Cooragreenane, and in the northern part of the townland of Coorolagh, we find what I have little doubt is its prolongation. Here we can observe a thick bed of quartz extending in an E. and W. direction for the distance of 500 yards, having quartzose red sandstones and purple slates dipping on its northern side to the N. at 75°, while the quartz bed or lode itself dips to the S. at 65°, thus suggesting that the fault here is a downthrow to the S. Due E. of the eastern end of this quartz vein, at the distance of 660 yards, and close to the stepping-stones over the stream dividing the townlands of Carrignacurra and Dromnagapple, but in the latter townland we find what is very likely the still further extension of this fault. Here, close to some purple beds which dip to the S. at 60°, we find a large lenticular-shaped mass of quartz about 100 feet in length, and at a still further distance of 1,200 feet to the east we find some thick quartzose grits, with numerous large quartz veins, striking N. 60° E. vertical, having purple beds abutting against them on the southern side with a dip of N. 40° E. at 40°, or nearly at right angles to their strike. The fact just related would clearly indicate the existence of a fault here, setting all other considerations aside; and as I have little doubt but that it is the extension of that S. of Lough Allua, we may infer that this fault or lode is prolonged for a distance of fully four miles and a half. From the manner in which this fault occurs in the very midst of the Old Red sandstones, and from our being able to trace it to its E. and W. limits, it is evident that it is a large vertical crack, causing the greatest amount of vertical displacement in the central part, or where we find the quartz lode to be broadest and best developed.

Another, but much smaller fault, nearly parallel with the former, and distant from it about half a mile to the south, appears on the southern slope of the summit marked 817 feet; and in the townland of Coornahahilly, W.N.W. of Gurtnacarriga Bridge, this dislocation, which is of the same nature as the former, can be distinctly traced for the distance of only half a mile, when it appears to terminate. On the N. side of this dislocation the beds dip N. 13° W. at from 60° to 65°, the strike of the fault being E. 13° N., or directly in the strike of the beds, while on the S. side the beds are brought abutting against it, dipping to the E. and N.E. at from 30° to 50°. The fault to the N.W. of Dunmanway, which brings in on its western side a small detached portion of the Carboniferous slates, is a downthrow to the N.W., and the amount of vertical displacement necessary to produce such a result need not be very great, as the beds on that side are inclined at low angles.

c^3. *Yellow Sandstone, or Upper Old Red.*—These beds are but imperfectly developed in the district, the band of those represented as skirting the Carboniferous slates being merely a slice, 800 feet thick, taken off the Old Red sandstone proper. I am not aware that in the Shehy district they offer any marked difference in lithological character from the Old Red partially surrounding that mountain, and they have been introduced here merely for convenience and uniformity sake. To the west of Dunmanway the case is very similar, but to the E. there certainly is a decided difference in the appearance of the upper portion of the Old Red. We here find the greenish brown and yellowish brown sandy beds to increase in frequency, and liver-coloured, cleaved, earthy beds are rather more abundant than lower down in the deposit.

When these beds appear on the N.E. margin of the district they are better marked than elsewhere, though imperfectly seen. They consist of brown, yellow, and red sandstones and cleaved beds, and they appear on the road side at the two localities indicated on the map by the arrows pointing to the N. with a dip of 65°, and to the S. with a dip of 60°. These beds, on their prolongation to the E. into the adjoining Sheet 194, spread out into the synclinal, which brings in the limestones of the Anahalla Valley to the S. of Macroom (see Explanation of Sheet 194).

d^1. *Coomhola Grits in Carboniferous Slates.*—The beds are well exposed to the W. of Dunmanway in the rocky ground N. of and skirting the road to Millane, in the townlands of Incheast and Dromleena. They consist of light-gray grits and gray slates, and at the former locality they form a band of fully 700 feet in thickness. A good section through these beds is obtained in the by-road which strikes northwards over the rise of ground at the western suburb of Dunmanway. Here some of the thin grits are ripple or current marked. Some of the Coomhola grits are spread out to the N. of Dunmanway by means of the fault to which I have just directed attention, and lie against the eastern face of Mount Gunnery; at least Mr. Jukes and I detected there thin beds of compact gray grits with gray slaty layers, which have all the appearance of beds belonging to this group, and if so, their occurrence here, so far N. of their normal line of strike, can only be accounted for on the supposition of a fault such as I have described, and which I have no doubt exists.

The development of the Coomhola grits on the summit of Shehy Mountain and over the extension of the Carboniferous slates to the westward of it, as well as over the N.E. flanks of the Maughanaclea hills and in the glens of the Owngare and Owvane Rivers, is greater than in the neighbourhood of Dunmanway, and the localities where they can be best observed is on the townlands of Carriganass and Coosane.

Over the Carboniferous slate district to the S. of Dunmanway the localities where these beds are best exposed is as follows. On the northern bank of the river Bandon, along the ridge which strikes E.N.E. through the southern part of the townland of Nedinagh West and into the adjoining townland of Nedinagh East. Here we find gray and dark-gray slates and grits all dipping to the N.N.W. at from 60° to 70°, and exposing a thickness of about 870 feet of rock.

Over the rocky ground to the N. and N.W. of Ballinacarriga Lough, where we find the same assemblage of beds for the most part dipping to the N.N.W. at high angles, and representing a similar thickness of rock. In the grounds about Clashnacrona Cottage and the section afforded by a cutting in the Dunmanway road, we have some good exposures of the dark-gray, earthy portion of the Carboniferous slates above the Coomhola grits. Here, however, the strike of the beds and that of the cleavage, which is E.N.E. and W.S.W., so nearly coincide, though the respective dips may be to opposite points of

the compass, that the rock does not yield any roofing slate. In one instance, however, where the beds dip suddenly to the W., they are at once converted into roofing slate by a cleavage which strikes E.N.E., and dips at 80° to the S.; this occurs in the N.E. corner of the townland of Maulanimirish, at the distance of about one mile to the E.N.E. of Clashnacrona Cottage.

5. *Cleavage.*

As at many localities over the district the slaty cleavage is well developed, it may be of interest to note where it can be best observed and any peculiarities which it may present. The uniform strike of the cleavage here varies from 10° to 30° N. of E. and S. of W., but its dip changes from N. to vertical and sometimes to S., over certain areas which are represented by wide bands running more or less in the direction of its strike without any apparent reference to the geological structure of the district. Thus we find that over the southern half of the Carboniferous slates which occupy the S.E. corner of the district, from Lake View on the W. to the neighbourhood of Shallee House on the E., the cleavage has a *southern dip*. The northern half of the Carboniferous slates with the Yellow sandstones and a portion of the Old Red as far as an imaginary line running in a N.E. direction from the northern side of the glen between Owen Mountain and the summit marked 1,055, past Hill Farm and Ship Lough, and then with a curve to the north of Ardeahan House, and from that straight to the summit 738 feet S. of Cappeen, and thus out of the district on its eastern side, would give a band having an average width of four miles, over which the cleavage is *inclined to the N.*

Northwards of this line and over that portion of the central part of the district which I have examined, between Dunmanway and Bealeanageary, forming a band of about seven miles in width between the line just indicated and one which would commence near the northern boundary of the Shehy Carboniferous slates and strike through the commencement of the name OWBEG, where it is engraved on the map, to a point between Cullenagh Bridge and "The Lodge," and from thence past the southern side of the summit of Doughill Mountain and that marked 1,209 feet on the N.E. of it, to the hill marked 542 feet on the N. side of Lough Allua, and from thence straight out by the northern margin of the district, the cleavage is *vertical.* To the north of this last defined imaginary line, including the valley of the Lackavane River, the greater part of the Pass of Keamaneigh, with the northern slopes of Doughill Mountain, and the ground at either side of the western end of Lough Allua, and defined by a line which would run very nearly parallel to the last, and at the distance of between one mile and a half to one mile from it *the cleavage dips to the N.*, while the district around Gougane Barra and over the mountains to the S.W. of it, as far S. as Lough Naman, and as far E. as Bealeanageary, *the cleavage dips to the southwards.* At the extreme N.E. corner of the district a cleavage, which has a *northern dip*, appears to enter that of the mass of the *vertical cleavage* somewhat in the form of a wedge. The space thus indicated is bounded by a line which would strike westerly for the distance of six miles from the E. edge of the map past the S. side of Teerelton cross-roads to a distance of two miles and a half beyond Ahanrawarraga cross-roads, where it turns abruptly to the N.E. as far as the sharp bend in the river Lee. Here it becomes deflected to the westwards, as far as Castlemarters, from which place it would again strike in a N.E. direction out of the district.

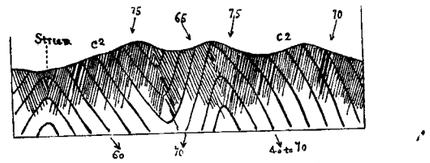
From the foregoing observations, it would appear to me that in beds which dip to the N.N.W. or nearly so, the cleavage is inclined to the S.S.E. or thereabouts; that in beds dipping to the S.S.E. the cleavage is inclined to the N.N.W.; and when there is much contortion in the strata the cleavage is either vertical or inclined to the N. and S. according as the beds change their dip to the opposite points of the compass.

The following illustration, taken from some rocky ground in the eastern

end of the townland of Gortnacarrig, and at the extreme N.E. corner of the map, N. of the elevation marked 658 feet, sheet $\frac{82}{12}$ of the six-inch map, will explain this, though on a diminutive scale.

Fig. 2.

Section looking west through the southern end of Gortnacarrig.



Scale—6 inches to 1 mile for distance and height.

The arrows on top of Section refer to the cleavage; those below to the bedding.

The cleavage which pervades the Old Red sandstone to the S. of Inchigeelagh, over an area of about nine square miles, has a strike of 10° to 30° N. of E. and S. of W., and is vertical, the beds in which it is most strongly developed being invariably deflected from their ordinary dip to the N.N.W. or S.S.E., and bent round so as to be inclined in bold and sweeping curves, at various angles, to the N.E., E., and S.E. This fact can be observed at the following localities. On the boundary between the townlands of Coorolagh and Gortanadin to the W. of the stepping-stones; in the southern portions of the townland of Curraheen, S. of the Altar cross roads; in the northern part of the townland of Gortnahoughtee, and in the southern portion of the adjoining townland of Cooragreenane.

To the S. of this district, the same facts are apparent along the eastern side of the townland of Derryleigh, and to the E. of the summit marked 1,092 feet, and from thence westerly over the range of the Carrigareirk mountains to the townland of Lackabaun. On the southern side of the Carrigareirk mountains, and over the rocky ground along the north side of this part of the Caha River, the dip of the sandstones is for the most part due N. at from 45° to 60°. Throughout these beds the cleavage strikes from 20° to 30° N. of E. and S. of W., and is vertical. To the S.E. and E. of Inchigeelagh the sandstones are in many places bent, so as to dip to the N.E., E., and S.E., at various angles; and at such localities the cleavage is particularly well developed, striking, for the most part, 20° to 30° N. of E. and S. of W., vertical, with one exception in the townland of Shanacashelkneeves, at the summit marked 718 feet, S.E. of Killhanna cross roads, where it dips to N. 30° W. at 60°.

The cleavage is well seen over the rocky ridge which strikes nearly E. and W. for the distance of two miles to the S. of Gortroe Lodge. The beds here, for the most part, dip to the eastwards at from 20° to 60°, and the cleavage is persistent through them, with a strike of 20° to 30° N. of E. and S. of W., vertical. To the W. of Dunmanway the cleavage is well developed over the rocky ridge between Coolkellure and Cullenagh Loughs. The dip of the sandstones here is to the N.E., E., and S.E., at from 15° to 50°; the cleavage running through them with a strike of 20° N. of E. and S. of W., vertical.

The line of boundary for the southern limit of the vertical cleavage passes, as before stated, in a N.E. and S.W. direction between Coolkellun Lake and Ship Lough. To the S. of this imaginary line, the strike of the cleavage is steady at from 20° to 30° N. of E., inclined from 65° to 75° to the S. This fact can be observed over the rocky ground to the N.E. of Ship Lough, the dip of the beds being S.E. to E. and N.E., at from 15° to 60°.

Similar cleavage is observed over the hilly ground between Hill Farm and Dunmanway.

On the western flank of Mount Gunnery, a singular peculiarity in the cleavage is apparent in some localities, especially in the dark purple beds on the road side in the N.E. corner of the townland of Coom, where the dip is S. 30° E. at 30°, the average inclination of the cleavage planes being to S. 25° E. at 75°. Here we find that these beds have been subjected to a propelling force acting from below upwards in the direction of the line of bedding, while they were yet under enormous pressure. Each bed appears to have been moved for the distance of a few inches on the one immediately in connexion with it, and the friction thus produced has bent the cleavage planes in the upper portion of each of the two lower beds, and the lower portion of the upper bed.

It is impossible to say whether the movement producing this effect was a sudden or a gradual one, the result in either case being the same; but I am disposed to think it was the latter. It is clear that the cleavage was fully developed and the beds consolidated at the time of the disturbance, otherwise the result of the compressing force would be the obliteration of the cleavage planes, as if the beds were soft they would be unable to preserve such a structure under such pressure.

To the W. and S. of Dunmanway, on the southern slopes of the hills over the valley of the Dirty River, the Old Red sandstone, Upper Old Red, the slaty portion of the Coomhola grit series, and the Carboniferous slates above, are all cleaved in the direction of 10° to 30° N. of E. and S. of W., the dip of the cleavage being from 10° to 30° E. of S. at from 60° to 75°.

6. *The Drift.*

There is tolerably clear evidence to prove that masses of ice supporting or enclosing blocks and large boulders of grit and sandstones, apparently derived from the local rocks, were floated over the eastern portion of the district. Very many rock surfaces, when bared of the peaty or other covering, are found to be smoothed and to exhibit well defined striæ, which are most usually thin at the end pointing to the N.N.W., and blunt at the other, or that pointing to the S.S.E., from which peculiarity of form it would appear that the ice-bearing currents set in from the former point. The highest elevation at which I have observed these glacial striæ is 975 feet, and the lowest, 200 feet.

Over the summit of Coolsnaghtig Hill, which is 975 feet above the sea, and its eastern end, called Mount Gunnery, to the N. of Dunmanway, which is 757 feet in elevation, these glacial striæ are well defined. Over both eminences the blunt edges of the sandstone beds are very frequently presented to the N.N.W., and when so, are found to be more or less rounded and marked by horizontal striæ. Here and there, over the crest of Mount Gunnery, as well as on its western and southern flanks, there are many perched boulders; and one called "Mareagh," is almost at the very summit of the hill. On the southern flanks of this hill the rocks are much rounded and striated, and often quite polished.

The illustration given on p. 19, is interesting in another respect, as it shows how readily the sandstones yielded on the cleavage planes, to what must have been the concussion of an iceberg which suddenly grounded on such a submerged inequality in the sea bottom. The current sent the iceberg up the inclined plane of rock facing to the N.W., till the shoaling of the water arrested its further progress. The concussion thus given to the rock on its somewhat precipitous brow presented to the S.E. evidently detached massive flakes from off its precipitous face, which was turned to the S.S.E., and threw them one on top of the other down the inclined talus at its base,

just as a lot of books would lie one over the other if suddenly thrown down on their sides from a previously close and vertical position. It is more than probable that the iceberg had permanently grounded and melted away here, leaving the perched boulder, which we now see on the summit of the rock, as the most palpable evidence of its shortlived existence.

Fig. 3.

Perched boulder, S. flank of Mount Gunnery, Townland of Coom; about 500 feet above the sea.

There are two very large perched boulders of Old Red sandstone in the low grounds close to and N. of the Dunmanway Workhouse, one called "The White Horse Rock."

The largest erratic block in the district, and by far the most picturesque in every respect, occurs at the distance of three miles westward of Dunmanway, in a small semicircular hollow in the hill on the E. side of Ship Lough. This block is called "Ship Rock," and roughly measured, is 40×25×16 feet; this would give a bulk of something like 16,000 cubic feet, with a weight of about 1,100 or 1,200 tons.

This really remarkable block may possibly not have travelled far, yet it is a true ice-borne mass. It consists of a series of purple grits, and thin cleaved purple earthy layers, and around it are many large flakes which have fallen off it from the result of atmospheric action, for originally it was much larger.

To the N. of Dunmanway, in the townland of Gurtanure, and at the junction of the Caha River with the Bandon River, a rocky boss affords some very interesting examples of "Roche Moutonnée" and glacial striæ. Here we find purple sandy beds, weathering into pinnacles on the lines of the dip and cleavage and cross joints, and their sides and angles rounded and polished, and marked with well defined horizontal striæ. On the level polished surfaces we find that the glacial striæ have a direction of W.N.W. and E.S.E., and present the same peculiarity of form as before noticed, viz., thin at the end pointing to the W.N.W. and blunt at the other, thus suggesting the direction from which the current came which floated the ice masses; viz., the W.N.W. The horizontal markings have not, however, this peculiarity, but are a series of fine groovings and scratches.

On the Carboniferous slates to the S.W. of Dunmanway, at the summit

marked 964 feet, and west of Milane Hill, we find a perched boulder of hard light gray gritty slate, measuring $6 \times 4\frac{1}{2} \times 2\frac{1}{2}$ feet, and it is known to the peasantry by the name of Gallaunkeogh.

Fig. 4.

Ship Rock and Lake, with Owen Mountain in the distance.

Over the Carboniferous slate district to the S. and S.E. of Dunmanway, the compass bearing of the glacial striæ is precisely the same as that over the Old Red sandstone and mountainous country to the north. This is apparent on the smooth and horizontal rock surface of the Coomhola grits and slates, at an elevation of 399 feet, and to the N. of Ballinacarriga Lough, where the striæ are well marked, and point to 20° W. of N. and E. of S.; the blunt end of the striæ being presented to the latter point.

We rarely find any accumulation of sand and gravel over this district, except to the southwards of Dunmanway, around the bogs and the alluvial flats of this portion of the valley of the Bandon River. If such a deposit ever was spread out over the lower grounds, it has since been removed by the effects of the currents of the glacial sea.

7. *Mines.*

In Sir Richard Griffith's Catalogue of Mines and Metalliferous Indications, it is stated that mundic was found in the townland of Demesne, close to Dunmanway,—Sheets 107 and 108.

Copper is said to have been observed in the townland of Derreens,—Sheet 107—on the authority of Mr. R. W. Townsend, M.E.

In the townland of Coom (Lackua Wood), and Inchanadreen,—Sheet 107—copper is stated to have been discovered, and the fact communicated by Mr. Fitz-Lionel Fleming.

G. V. D.

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