# II.

## THE PROBLEM OF THE LIFFEY VALLEY.

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PLATES I–III.

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### THE COURSE OF THE LIFFEY IN THE UPLANDS.

THE Liffey rises in the county of Wicklow, on the south side of Kippure, at about 1,700 feet (530 m.) above the sea, and is joined in the upper part of its course by the Lugnalee, Ballylow, and Ballydonnell Brooks, all descending as consequent streams from the north-west slope of the "Caledonian" granite range of Leinster. Near Kilbride, the river, now meandering in a considerable flat of glacial drift, turns to the south-west, and joins the Kings River at Baltyboys House, south of Blessington. The Kings River, rising in the great moorland at Wicklow Gap, has already attained far more importance than the Liffey, which unites with it on a drift-platform, almost at right angles (Plate II., fig. 1). The course of the Kings River to this point runs practically parallel with that of the Liffey between Kippure and Kilbride. Both are obviously consequent streams. Their united waters, however, known as the Liffey, are diverted almost immediately to the south and south-west, and have excavated a fine rock-gorge in which the waterfall of Pollaphuca is a striking incident (Plate II, fig. 2). Below this gorge the Liffey meanders, far out of its direct course to the sea, along the margin of the Bog of Allen in the drift-covered central plain of Ireland.

The course of the Dodder, rising close to the Liffey, but on the north side of Kippure, remains far more direct, and the contrast between the two rivers has been often pointed out.

### THE VALLEYS AT BRITTAS.

The bend in the Liffey at Kilbride appears the first anomaly in its course. As the river enters the drift-filled area, a broad highly matured valley stretches before it to the Slade of Saggart; the Slade is a steeper valley descending northward over the upland edge. The rise in the present drift-filled floor of the valley that leads upwards from Kilbride is only 130 feet,

*i.e.*, from 650 to 780 feet above Ordnance datum, from the loops of the Liffey to beyond Brittas, a distance of 3½ miles. The original field-map of the Geological Survey shows that the granite floor is exposed in the Liffey in the north of Ballyfoyle townland at a height of 660 feet. Hence, the river must be very near its floor of erosion in the adjacent Kilbride loops. The depth of the drift-covering to the north near Brittas is unknown; but the Ordovician slate lies near on either hand as we pass along the broad through valley to the Slade of Saggart. The rock-floor of the valley running up northward at Kilbride, if we could lay it bare again, might be found to have a rise of only 100 feet (30 m.) from the meadows where the Liffey meanders to the water-shed near Brittas ponds. (Plate II, fig. 3.)

The Brittas River, far too small for this valley, runs down it to the mountain stream of the Liffey at Ballyward bridge, the water being here about 620 feet above the sea. The Liffey continues south-westward to Blessington, and is joined midway by a very small stream coming down the wide valley in which the main road from Dublin runs. The west side of this valley is formed by the long strike-ridge of Ordovician rock, which we may call after its highest townland, Slievethoul (1,308 feet; 396 m.). This western valley is divided from the hollow of the Brittas River by the rock-ridge of Golden Hill, which includes granite, schist, and slate, and which stands up as a sort of island, the two valleys meeting round its northern end. The western of these valleys, that of the main road, is virtually dry, but presents the appearance of having been occupied by a considerable stream. It has the same old and matured aspect as the Brittas River valley which unites with it. It is difficult to conceive that any rivers generated on the present land-surface to the north can have eroded these large valleys. Their high maturity excludes the suggestion that they are due to overflow waters from the melting ice-sheet that once occupied the Irish plain. They pass northward as a "through valley" into the narrower Slade of Saggart, which has a rapid fall towards the limestone lowland. If we adopt the suggestion that these Brittas valleys were eroded by a river that had its head-waters on limestone land now lost to us,[1] we have still to explain the Slade of Saggart.

## THE SLADE OF SAGGART, AND OTHER IMMATURE FEATURES ON THE FOOTHILLS OF THE LEINSTER CHAIN.

The present meandering streamlet in the Slade of Saggart is obviously a misfit or a mere remnant in its relatively majestic valley (Plate II, fig. 4). This

[1] Compare E. Hull, "On the origin of 'the Scalp,'" Sci. Proc. Roy. Dublin Soc., vol. i. (1878), p. 11.

valley, however, starting at 780 feet (238 m.) above the sea, was abandoned by its original stream before it had attained full maturity. We must remember that the upland ice that once lay beyond its southern end gave rise to copious streams on melting, and some of this water may have run northward through the Slade. But the steep valley is of pre-Glacial origin, since it was entered by the northern ice, which deposited an infilling of limestone gravel on its floor, in places more than fifty feet in depth. The head of the Slade served for the passage of an ice-tongue southward, which helped to fill with exotic gravel the great hollow stretching down to Pollaphuca.

To illustrate the features of the Slade of Saggart, we must look beyon the Liffey basin. Throughout the counties of Dublin and Wicklow we find valleys overdeepened and new ravines carved out, and the present streams still actively engaged in these erosive enterprises. Yet the valleys in which they run are often cumbered by glacial drift, and we cannot attribute a Glacial or post-Glacial date to the whole of this series of ravines.

Mr. G. W. Lamplugh,[1] in connexion with his masterly explanation of the Scalp, agrees with Mr. Maxwell H. Close[2] in assigning a late Glacial origin to the far larger notch of the Glen of the Downs; and rock-ravines certainly occur, like the Gap of Dunran near Killiskey, and St. Kevin's Gap near Hollywood, carved in anomalous positions on the hillsides of Wicklow, and attesting the vigour of the rivers that accompanied the shrinkage of the ice. Immature features, however, that are strikingly contrasted with the forms of the older valleys of the Leinster Chain, occur on a large scale at various levels along the lower slopes of the chain, and notably therefore among the Ordovician and Cambrian foothills. It is difficult to regard the Devil's Glen near Ashford, by which the Vartry River descends from the plateau of Roundwood, as the result of fluvio-glacial flooding. Together with the Dargle ravine at the foot of the mature valley of Glencree, it appears to have originated in pre-Glacial, if late Cainozoic times. At the head of the Devil's Glen, the Vartry notches the plateau at a height of 500 feet (150 m.) above the sea, and its old meanders are now entrenched in the Cambrian slates for a quarter of a mile further on the level land. This latter feature in itself suggests a recent uplift of the country. The Dargle ravine must be regarded in connexion with the hollow of Glencree, rather than with the cirque in the Powerscourt Deerpark, over the cliff of which

[1] "Geology of the country around Dublin," Mem. Geol. Survey (1903), p. 50.

[2] M. H. Close, "Notes on the General Glaciation of the Rocks in the Neighbourhood of Dublin," Journ. R. Geol. Soc. Dublin, vol. i (1864), p. 12.

the well-known waterfall descends. The ground of the Powerscourt demesne is heavily buried in glacial drift, through which the river now cuts its way. Its unseen floor of rock corresponds with the mature plateau of Roundwood, though cut down to a lower level. At its foot, about Tinnehinch, we drop suddenly into the region of ravines.

Further north, the small Carrickmines River, rising on Three Rock Mountain, occupies a broad mature valley above Carrickmines, in the floor of which it cuts the abrupt notch of Glendruid, where it drops towards th e low ground of Loughlinstown on a rock-slope of 45°. This steep hollow, cut in the granite, and set with little waterfalls, repeats the features that are exhibited on a bold scale by the Dargle and the Devil's Glen. Glendruid starts, however, only 220 feet above the sea.[1]

The Vale of Ovoca has been overdeepened, and the curve of the earlier broad upland basin is traceable when we look across it from above the mines of Ballymurtagh. The river here runs below us between two conspicuous cliffs, which probably give a measure of the overdeepening. Numerous other instances might be cited, such as the uplifted peneplane of the Tramore coast, to show that the surface of south-eastern Ireland lay much nearer sea-level in late Cainozoic times, and that the streams became rejuvenated by uplift somewhere before the Glacial epoch. If, as is here suggested, the Slade of Saggart was cut by water descending from the Leinster Chain, its relative lack of maturity finds a parallel in the Dargle valley and the Devil's Glen, and is no doubt due to the same causes.

There are obvious difficulties in the above explanation of the preservation of the lower slopes from stream-action until almost recent times. The subsidence required to protect them would have admitted the sea over the Irish lowlands to so wide an extent that Cainozoic marine deposits ought to be common beneath the boulder-clay. These, however, would have been largely removed by glacial scour, and such relics as remain may be those that are buried most deeply and successfully in the drift. Mr. James Brenan, of Ballinabranagh National School, Carlow, has recently called my attention to the occurrence of marine fossils of a decidedly Pliocene aspect, including Pectunculus and Fusus, in fields 5 miles south of Carlow and some 500 feet (150 m.) above the sea. Mr. T. Hallissy, who has investigated this discovery on behalf of the Geological Survey, reports that the shells lie in a surface-soil derived from boulder-clay. There is no likelihood that they have been brought for manuring purposes into a region rich in limestone, and the fact that their

[1] Mr. J. R. Kilroe has pointed out that Glendruid was at least partly excavated in pre-Glacial times. "Geology of country around Dublin," Mem Geol. Surv. (1903), p. 117.

surface is frequently brown does not suggest a modern origin. It is to be hoped that further observations may be carried on in this locality. There is no doubt that the Pliocene sea invaded many lowland areas in Ireland, as in England, and that subsequent elevation played its part in the rejuvenation of the streams. We know that in England this elevation measured at least 800 feet.

The pre-Glacial beach traced by Messrs. H. B. Muff (now Maufe) and W. B. Wright[1] over so wide a stretch of the Irish coast-line, and since recognized in the west of England, lies close to the present sea-level. It represents a time when there was a pause in the fluctuations in the amount of land exposed above the reach of wave-action. But its occurrence along the sides of the drowned valley of Cork Harbour shows that considerable submergence of the coast had taken place before this stationary stage set in. At an earlier epoch, the submergence may have been far greater, and the pre-Glacial beach may mark a pause in the succeeding upward swing.

The late Pliocene or post-Pliocene movement of elevation enabled some of the streams to cut new channels in the slopes exposed by uplift to their action. Other streams merely recovered the submerged portions of their former mature valleys, which were thus restored to them from beneath the sea. This fact provides an explanation of the occurrence of mature and immature valleys on the same slopes side by side.

### Possible Preservation of the Foothills by Cretaceous Strata.

While the above considerations offer an explanation of the youth of many of the pre-Glacial trenches among the Leinster hills, another cause may have widely operated in preserving the Ordovician and Cambrian foothills, at very different levels, from denudation. Evidence is rapidly accumulating as to the immense amount of Upper Cretaceous strata that has been lost to us in comparatively recent times. Mr. A. J. Jukes-Browne[2] boldly carries the Senonian sea right across the Irish midlands. We may be inclined to question such an invasion, owing to the probability that extensive patches of Upper Carboniferous strata remained on the midland surface down into Cainozoic times. But the enormous quantity of Cretaceous flint in the south of Ireland, and its abundance off the west Irish coast,[3] indicate the justice of Mr. Jukes-Browne's main contention. Large unworn flints are thrown up at the present day on

[1] "The pre-Glacial raised beach of the south coast of Ireland," Sci. Proc. R. Dublin Soc., vol. x (1904), p. 250.

[2] "The Building of the British Isles," 3rd ed. (1911), p. 333.

[3] G. A. J. Cole and T. Crook, "On rocks dredged from the floor of the Atlantic," Mem. Geol. Surv. Ireland (1910), pp. 18, 22, &c.

the south coast of the county of Wexford, and they appear to come direct from chalk concealed beneath the sea. We have, then, to reckon with the probability that, even in late Cainozoic times, chalk remained as a cover to many of the slopes now familiar to us. Such a covering would maintain large areas as land during a general subsidence, and would for a long time protect the older rocks from denudation.

The mature features, then, developed on the uplands may have been once continued across lower grounds or foothills of Cretaceous strata. When these rocks were removed, the trenching of the older surfaces was resumed, and the steeper slopes of these surfaces allowed the streams to cut ravines. Protection being afforded at some places longer than at others, the features that are still comparatively immature have no general level along the Leinster foothills.

After this discussion, which offers two causes for the relative immaturity of the Slade of Saggart, both of which have probably been in operation, we may return to connect the Slade with the Liffey basin to the south.

### Suggestion of a Former Flow of the Liffey System Northward.

If the Slade of Saggart was at one time occupied by a large stream, this stream was generated on the uplands to the south. At present, however, these uplands are drained by the Liffey system in an opposite direction. The Slade of Saggart is connected with this system by the through valley of Brittas. As we have seen, a merely slight modification of the floor of the Liffey at Kilbride would suffice to carry its waters through the Brittas valley to the Slade of Saggart. The lower part of the Liffey at the present day is largely fed by the Kings River, coming down from Wicklow Gap. We may ask ourselves if it is possible to bring this river into harmony with the course suggested for the pre-Glacial Liffey, and to picture the joint waters flowing northward through the mature Brittas valleys, and developing features of gorge and waterfall in the Slade of Saggart, as the rocks there became exposed to river action.

### The Upland of the Liffey in Glacial Times.

Before we consider the cause of the reversal of drainage which must in that case have taken place, leading to the present Liffey system, it is well to recall the conditions that prevailed in the district during Glacial times. The oncoming of the epoch of refrigeration checked the process of river-erosion, since the land became covered by unmelting snow. Dry arctic conditions set in, which abolished the head-waters of the streams. As glaciers developed

from the snowfields, some of them doubtless proceeded to overdeepen the mature or immature valleys of Pliocene times. The Vale of Ovoca may have been influenced by this process; but the ice occupying the Irish Sea rose up against the eastern foothills, and they were again protected from local agents of denudation. Narrow valleys like the Devil's Glen were choked by ice, and the main glacier currents moved across them. When the ice-constituents of the invading glaciers melted, the stones, sand, and mud that formed a large part of the lower layers remained behind. A return of cold conditions, however, developed the local ice to such an extent that it carried boulders of granite from the central chain of Leinster across the Ordovician and Cambrian foothills, and down upon the plateaus of older drift. These boulders are now found widely scattered, though valleys as large as that of Ovoca intervene between them and their source. The Liffey basin was, of course, affected by all these conditions.

The Slade of Saggart, which was being actively excavated about the epoch of the pre-Glacial beach, became choked by the ice-front that was thrust against it.[1] The valleys to the south were occupied by invading ice, and were ultimately crossed by glaciers from the Leinster Chain, which have deposited numerous granite boulders on the east side of the Slievethoul range, at heights of 500 ft. (150m.) above the main valley-floor.

Long-continued glacial conditions converted the uplands of the granite chain into a "karling"[2] of the Alpine type. The sterner features that were temporarily produced on the high levels by the sapping action of the ice, and by frost-nibbling following upon occasional sunny hours, have long since been modified by the spread of taluses and the growth of soils. Yet the shaded quarter-inch map (1 : 253,440) of the Ordnance Survey sufficiently reveals the numerous broad glacier-basins, which became worked back at their heads towards the central axis of the chain. Commonly, these basins join the lower ground by narrow valleys, down which the ice descended as glacier-tongues. These outlets were eroded in the first instance by streams running from the snow-patches that gathered in the incipient cirques.[3] They were occupied, as the cirques grew in importance, by the glaciers generated in the basins. As the valley below became filled with ice, the upland glaciers opened on the larger ice-stream, and many of them were overridden and obliterated. When conditions grew milder, the step at the mouth of the cirque again became the

[1] Compare W. B. Wright, "Some results of Glacial drainage round Montpelier Hill, Co. Dublin," Sci. Proc. R. Dublin Soc., vol. ix, (1902), p. 581.

[2] A. Penck, "Die Alpen im Eiszeitalter," (1902), p. 284.

[3] For modern examples, see G. A. J. Cole, "Glacial features in Spitsbergen in relation to Irish geology," Proc. R. Irish Acad., vol. xxix B. (1911), Plate XI.

seat of an ice-fall, and ultimately of a waterfall. In the cases of Glendasan and Glendalough on the east side of the chain, this step-feature remains conspicuous. In the Liffey upland, the great Kings River basin opens on the main valley at Baltyboys House, through a comparatively narrow hollow. The rock-step has been here worn down, and the only indication of its former presence is the narrowness of the valley in the schist region between Lackan and Burgage Bridge. Drift that was piled across the outlet, rather than any residual rock-barrier, no doubt closed the basin as the Ice Age waned, and was responsible for the lake which is traceable in the flat floor of the Lackan hollow.

When the ice melted away, the Slade of Saggart must have run almost dry. The post-Glacial stream has never been a strong one, and it has done little to remove the mass of drift deposited in the valley head.

### THE POLLAPHUCA BARRIER (BRITONSTOWN).

The gorge in which the waterfalls of Ballymore Eustace and Pollaphuca (Plate II, fig. 2) occur has been excavated in a barrier of Ordovician slate and volcanic rocks. The north-east side of this barrier runs at right angles to the strike of the strata, so that it is not due to the outcrop of any rock of special hardness. Whatever the direction was in which the pre-Glacial Liffey escaped from its somewhat singular imprisonment among the foothills under the strike-ridge of Slievethoul, the hollow north of the Pollaphuca barrier requires explanation. The barrier connects the drift-covered plateau of Bishopsland (600 ft.; 183 m.) with a height of 1079 ft. (329 m.) in Lugnagroagh upon the granite. Looking south-east along it from a height on the main road of 622 ft. (190 m.), where we stand upon the bare edges of the slates, we realize how sharply it has been cut through by the Liffey, which runs 90 ft. (27·4 m.) below us (Pl. II, figs. 5 and 6). The local ice, in its final extension, after the continental type of ice-sheet had withdrawn, spread across this barrier, and carried granite boulders over it, as it did against the east side of the Ordovician ridge above Tinode. The Liffey gorge, above and below Pollaphuca, has been eroded through this covering of late Glacial drift, and is, I believe, entirely post-Glacial. The river, when it reached the solid rock, began by carving out a ravine which is the main feature of the townland of Britonstown; this is now dry in all but its very lowest portion, where it emerges steeply on the present Liffey gorge below Pollaphuca.[1] This imma-

[1] This ravine was described as an earlier course of the Liffey by Wm. Fitton, "Notes on the Mineralogy of Part of the Vicinity of Dublin" (1812), p. 39. The hollow above the barrier was regarded by Fitton as the basin of a lake.

ture and abandoned hollow, known as the Glen, was accompanied, even in its early stages of development, by the present ravine of the Liffey, and the intervening part of the barrier, on which the hotel now stands, formed an elongated island in the stream. The north-west branch of the river, probably in consequence of its somewhat shorter course,[1] undercut the south-east branch, and drew off the full flow of the stream. At present we may ascend the dry ravine (Plate III, fig. 7), where the vertical rock-walls remain in places unobscured, and emerge at its head on a grassy upland at about 620 ft. above the sea. From this to the Liffey at the ruined Horsepass Bridge (550 ft.) there is a fall of 70 ft. (21·3 m.); this measures the amount of glacial drift which formerly supported the stream, and which has been swept away from above the barrier. Looking south from above Horsepass Bridge, where the old coach-road crossed the river, it is interesting to observe the head of the south-eastern notch on the left of the view, high above the floor of the present gorge (Plate III, fig. 8).

We cannot point to any difference in resistance to erosion between the rocks forming the Pollaphuca barrier and those immediately above it, when we seek to account for the immense contrast in the form of the valley in the ravine region on the one hand, and near Horsepass Bridge upon the other. The Pollaphuca gorge is essentially a young feature, due either to the general rejuvenation of the district, or to the fact that the river has only recently begun to flow in this direction. Both causes may have operated together; but I believe that the latter is by far the more important.

## The Basin of Blessington.

The drift-filled basin above the Pollaphuca barrier (Plate III, fig. 9) cannot have been excavated by a stream flowing south across the barrier. Nor can it have been formed by a stream flowing northward, since such exposures of bare rock as we possess provide good evidence that the slope of its floor is in the opposite direction. We are slow to invoke earth-movements or faulting to account for such a depression. It has all the aspect of a hollow of erosion, subsequently filled and overfilled by glacial drift. Considering that it has been developed in schists and slates, which go to pieces so readily under glacial conditions, its excavation may be most reasonably attributed to prolonged glacial scour.[2]

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[1] Compare B. Dietrich, "Morphologie des Moselgebietes," Verhandl. naturhist. Vereins der preuss. Rheinlande, 1911 (for 1910), p. 159.

[2] On rock-barriers in the course of glaciers and the formation of basins behind them, see A. Penck, "Die Alpen im Eiszeitalter" (1902), pp. 143 and 254.

Reference has already been made to the ice-tongue that pushed through the Brittas valleys from the north, while the ice of the Irish plain overtopped the Slievethoul ridge, and pressed down against that of the main chain. The resultant movement led to a considerable flow southward across Britonstown, even when natural watersheds and snowsheds were obliterated during the maximum of the Ice Age. If, as has been suggested, the floor of the Liffey and Kings River valley then sloped northward, the Britonstown barrier formed a col at the head of a tributary stream, and the ice-flow was forced to ride up over it. When the local ice was free to assert itself during the second glaciation, its denuding action was most powerful as it emerged on the main north-and-south valley across the junction of the granite and the schist, where the geological structure and the resulting form of the pre-Glacial valley-side promoted a steep downward plunge. During both these glacial stages, it is probable that considerable overdeepening of the main valley about Blessington took place. Farther north, near Brittas, where no large valleys opened on the main one, the only serious agent was the ice-tongue from the north. The main scouring therefore occurred near Blessington, and the quantity of limestone drift remaining in the basin shows that the hollow was eroded almost entirely during the earlier and more important glacial stage. The products of local erosion were carried out over the Britonstown col, no doubt abrading and lowering it, but not reducing it to the level of the region to the north, where sub-glacial plucking was most intense. When the ice-movement ceased, a hollow had been formed, by local overdeepening, some 250 ft. below the pre-Glacial valley-floor. Into this, the gravel of limestone and other stones, imported from the north and north-west, sank as the ice-mass stagnated in the valley. This limestone drift, though it was doubtless to some extent incorporated in the later and more local glaciers, fills much of the basin of Blessington at the present day (Plate III, fig. 10). When the ice-shrinkage allowed of the reappearance of ordinary streams, these began to flow on the plateau of glacial drift. If the Pollaphuca barrier had not been by this time sufficiently lowered, the accumulation of drift against it might well have maintained the flow of the Kings River and the Liffey northward. As it was, the general slope of the infilling of drift was southward, and the drainage of the district began to notch out the twin ravines of Britonstown. In proportion as these ravines were deepened, the basin above became cleared of some of its burden of glacial drift. The meanders above Horsepass bridge have not yet found the old ice-deepened floor. It evidently lies here somewhere near 550 ft. (168 m.) above the sea, and the surface of the drift-plateau rises 100 ft. above it.

## Conclusion.

The main points of the foregoing considerations are as follows:—Both the Kings River and the Liffey, running at first north-west and north, are drawn off to the south-west along angular bends. This suggests an interception of their original courses by a stream working back from the south-west. Before we accept a theory involving a reversal of the drainage-system of this part of the foothills of the Leinster chain, we should be prepared to indicate a previous outlet for the rivers of this system. The large mature valleys near Brittas, now occupied by insignificant streamlets, may at one time have held the Liffey, which reached the plain by a rapid fall in the Slade of Saggart. This steep valley is considered in relation to others on the margins of the Leinster chain, and the conclusions arrived at are, it may be remarked, independent of the question of its former occupation by the Liffey. When we examine the possible cause of the reversal of drainage, it is found in a considerable scouring and overdeepening of the valley-floor near Blessington by glacial erosion. Even when the basin so formed had become choked by glacial drift, its surface was lower at Britonstown than at the junction of the Kings River and the Liffey, which now began to flow again after the Ice Age. The point of junction, moreover, was lower than that of the entry of the post-Glacial Liffey on the main valley near Kilbride. Hence the new flow was directed southward, over the barrier that remained under the drift at Britonstown. The Pollaphuca gorge results from the post-Glacial trenching of this barrier, and the river is now removing the infilling of drift in the glacially eroded hollow around Blessington. The floor of this hollow represents a local overdeepening of about 250 feet (77 m.) in the easily eroded Silurian slates, and this, by its excess over the small overdeepening near Kilbride, suffices to draw the Kings River and the Liffey southward. The Liffey at Kilbride has consequently been able to lower its bed as the Pollaphuca outlet deepened, and the small local drainage from the gap at Brittas runs down into it along large valleys once excavated by the river in its northward course.

There is much in the foregoing pages that must be regarded as suggestive, rather than capable of proof. I have attempted, however, to state the problems that are raised by the phenomena in the field. It is hoped that the general considerations involved may aid in the more extended study of the surface-features of south-eastern Ireland.

## DESCRIPTION OF PLATES.

### PLATE I.

Drainage-map of the country between Saggart and Pollaphuca. (Based on the maps of the Ordnance Survey.)

### PLATE II.

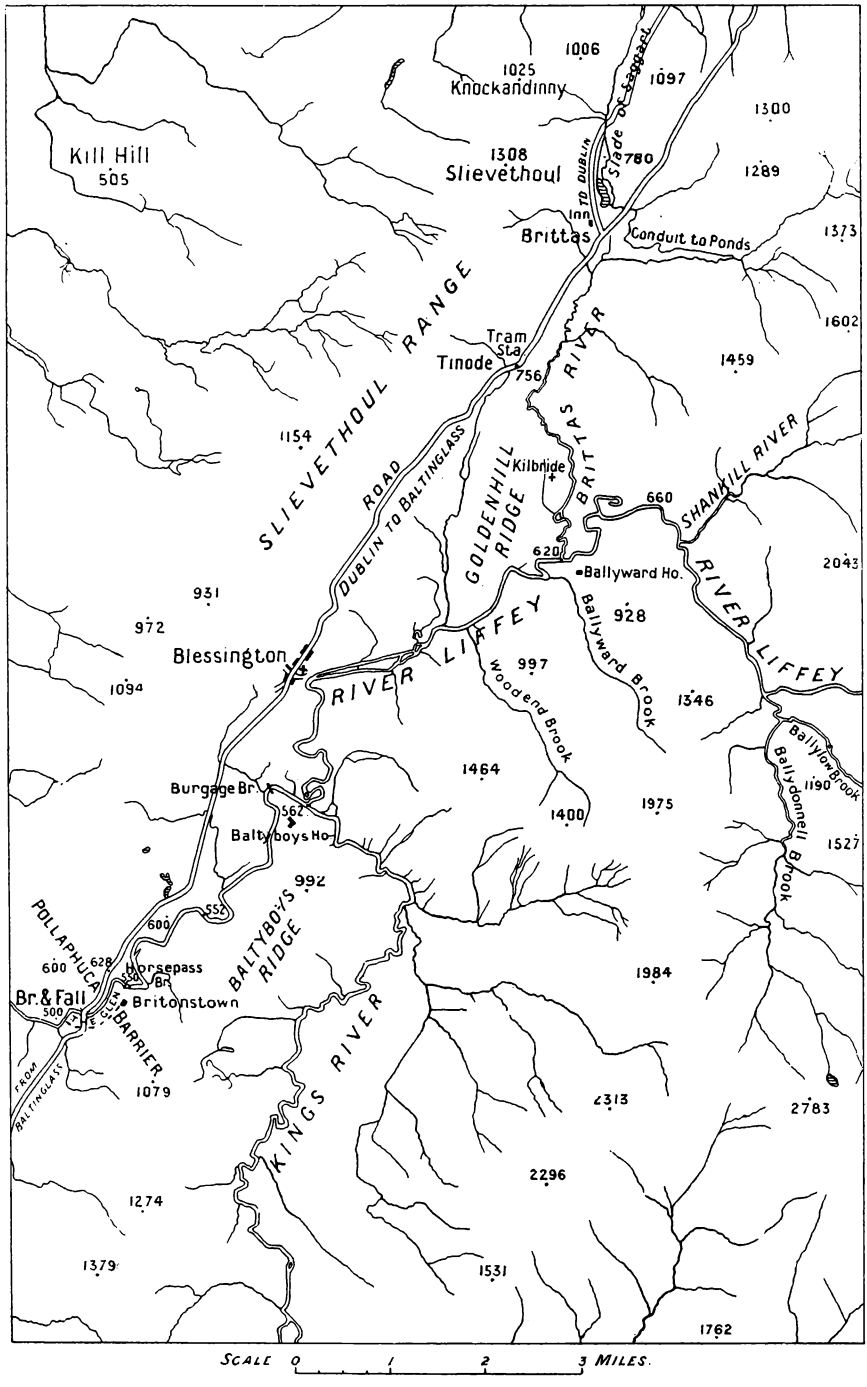
Fig.

1. Junction of the Liffey and the Kings River. The Liffey meanders in a broad drift-filled valley, descending from Kilbride. The Kings River crosses the view in front.
2. The Pollaphuca fall in flood-time.
3. Mature valley of the Brittas River, looking down from near Brittas towards the Liffey valley at Kilbride.
4. The Slade of Saggart; evening.
5. View looking south-east along the Pollaphuca barrier and across the Liffey gorge.
6. The Liffey gorge above Pollaphuca.

### PLATE III.

7. The Glen in Britonstown, looking up. Former course of the Liffey across the Pollaphuca barrier.
8. The Pollaphuca barrier from the north. The head of the dry ravine opens beyond the white house among the trees in the middle distance on the left. The present ravine of the Liffey is seen on the right.
9. The drift-filled basin of Blessington, looking north-east from the Pollaphuca barrier. The head of the Liffey gorge lies in the foreground.
10. Drift terrace in process of erosion by the Liffey, showing the glacial infilling of the Blessington basin. View north from above Horsepass bridge.

(*The figures are from photographs by the author*).




Drainage-map of the country between Saggart and Pollaphuca. (Based on the maps of the Ordnance Survey.)

Fig. 1.

Fig. 2.

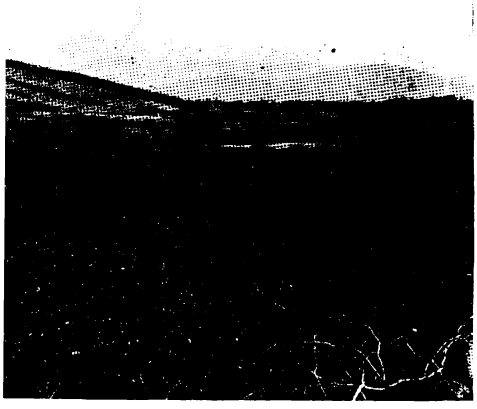


Fig. 3.

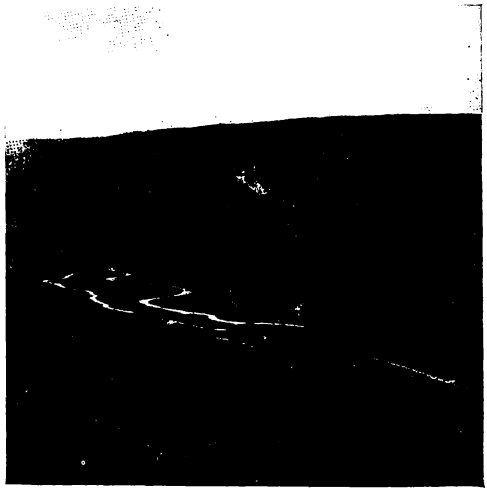


Fig. 4.

Fig. 5.

Fig. 6.

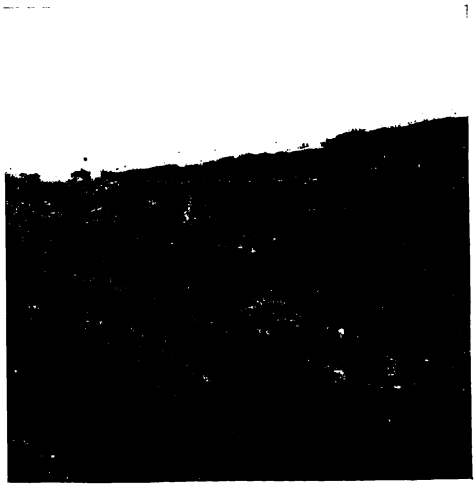


Fig. 7.

Fig. 8.

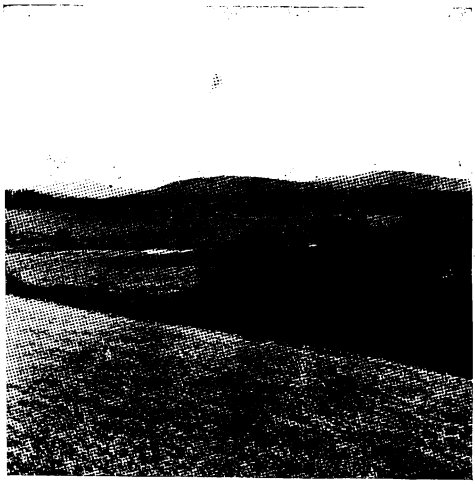


Fig. 9.

Fig. 10.