Chapter 10 The post-glacial and recent deposits

Historical and introductory

The detailed work as yet done on the Post-glacial deposits of the Island is scanty; and this is the more to be regretted since, from the persistence of fresh-water conditions in the hollows described in the last chapter, these alluvial beds afford excellent material for the study of the transition from glacial to present conditions. In certain localities in England and Scotland, where similar alluvial deposits have been carefully examined, great variety and perhaps alternation of climate is indicated during this period.<ref>See C. Reid "The origin of the British Flora", 8vo. Lond. 1899.</ref> Traces of considerable changes are also forthcoming in the Isle of Man, where, as Cumming pointed out, the occurrence of peat with forest-trees below present sea-level, on the one hand, indicates a stage of elevation; while on the other hand, the existence of an old beach above that level indicates a stage of depression since Glacial times, and consequently much alteration in the physical conditions of the district.<ref>"Isle of Man", p. 251–2; "Guide-book", pp. 171.</ref> As will be presently shown, it is, however, somewhat doubtful whether there has been a land connection with the mainland at any period since Glacial times.

In the earlier descriptions of the Island the alluvial deposits received greater notice than in later times, on account of their relatively greater economic importance when the peat-bogs afforded the main source of fuel and the marls were used for agricultural purposes. Bishop Wilson mentioned that the peaty curragh between Ballaugh and Ramsey, at one time bog, had become, since drained, one of the richest parts of the Island, supplying both bread and fuel'; and that in this place had been found "very large trees of oak and fir, some 2½ feet in diameter and 40 feet long… not promiscuously, but where there is plenty of one sort, there are generally few or none of the other"<ref>"History of the Isle of Man".</ref>. Henslow discussed the curraghs at considerable length, and noted that peat occurred also on the tops and sides of the mountains; besides oak and fir which, with hazels and their nuts, were the commonest remains in the peat, he recognised ash, walnut, black-alder, and in one instance, in a mountain curragh, holly; he also called attention to the statement by Sacheverell (see p. 16) and Bishop Wilson as to the majority of the trees having been snapped off and overthrown with their heads to the north-east; and described the submerged forest in Poolvash Bay<ref>Trans. Geol. Soc., vol. v., pp. 499–503.</ref>. His observations on the elk-beds at Ballaugh, and those on the same subject by subsequent investigators, were quoted in the preceding chapter (pp. 378–82).

Cumming's investigations have been already noted; and since his time, though the old observations have been frequently raked over, no real addition was made to our knowledge until the appointment in 1896 of the British Association Committee 'to examine the conditions under which the remains of the Irish Elk are found' (p. 383).

As the preceding account has shown, the fauna of the Post-glacial beds in the Isle of Man is extremely limited. Even including the elk-marls with these beds, the only mammal of which we have certain knowledge is *Cervus giganteus,* with doubtful records of *Bos longifrons,* and the red deer and horse (p. 377 and p.384); while of the carnivore of this age so frequently found on the mainland no trace has yet been discovered. The absence of bone-caves and fissures may be partly to blame for this deficiency; but it is more readily explained by the suggestion of Mr. Kendall that the Island may never have been connected with the mainland since the Glacial Period. Mr. Kendall was led to this conclusion by the striking poverty of the existing flora and fauna in species, this poverty affecting the plants as well as the mammals, reptiles, amphibia, and fresh-water fish; after commenting on this fact, he remarks as follows: "It seems to me that this extraordinary poverty of truly indigenous species in so many groups of organisms is well worthy of the careful consideration of naturalists and geologists, for, while to the former it presents an interesting problem for solution, to the latter it may not improbably prove of use as a check upon some of his speculations. For my own part, taking this evidence as it stands, the balance of probability seems to weigh heavily against any such complete connection with Great Britain as the oft-cited elevation of 600 feet would establish… and it seems to me incredible that if this whole tract [of intervening shallow sea] had been dry land during any considerable portion of the Post-glacial period, but two out of the thirteen reptiles and amphibia which inhabit Britain should have made their way across to the Island; that of the strictly fresh-water fishes three only should have been introduced; and of the forty British mammals but five should have made their way across. If a land connection was indeed established it must, I think, have been of very small extent and

brief duration".<ref>Yn Lioar Manninagh, vol. i., p. 435.</ref>

In the present state of our knowledge it is hardly possible to classify the Post-glacial deposits of the Island strictly according to age. The only practicable method is to group them according to their topographical position. Hence they will be described under the following heads: (1) Raised Beach (with Blown Sand); (2) Alluvium of the river-valleys; (3) Alluvium and peat of low-level basins; and (4) Hill-Peat. The general distribution of the first, second, and fourth of these divisions is implied in their titles; the third covers the northern Curragh, the western portion of the central valley, and parts of the low tract at the foot of the hills between Castle-town and Port Erin. Though the first is more restricted in age than the others, they are probably all more or less contemporaneous.

The less important local details are given, along with those of the Glacial deposits, in the next chapter.

The Raised Beach

This beach is the only Post-glacial marine deposit above present sea-level recognisable in the Isle of Man. Its surface is 10 or 12 feet above high-water mark, or say 17 to 20 feet above the Ordnance datum of mean-tide level at Douglas. It appears to be newer in age than the older portion of the fresh-water basin-deposits (p. 415), but older than the latest of these. It attains its principal development in The Ayre [NX 46597 04971] at the northern extremity of the Island, where it consists of a succession of low storm-beaches of coarse shingle derived from the waste of the glacial deposits, partly covered by blown-sand. It has here a breadth of 1½ miles in its easterly part, but tapers away gradually westward to 50 yards or less (see also pp. 417–22).

In one form or another this Raised Beach may be recognised on almost every part of the coast, except where it has been destroyed by the rapid encroachment of the sea, as between Jurby [SC 34448 98176] and Kirk Michael [SC 31243 90972] on the west, and between Cranstal [NX 46706 02221] and Ramsey [SC 45381 94558] on the east. In the deeper bays it often constitutes a low terrace only just above the reach of spring-tide storm-waves, on which the more ancient parts of the seaport towns have sometimes been established. In other places it may be represented only by a narrow rock-platform, occurring at intervals at the foot of the cliffs slightly above the present limit of erosion: or by caves and crannies whose excavation is now arrested. Numerous examples illustrative of these different conditions will be mentioned in the next chapter. Its shells, which are locally abundant, are those of the existing sea. It appears to surround the Island without perceptible difference of level.

The current belief, acquiesced in by Berger,<ref>Trans. Geol. Soc., vol. ii., p. 34. </ref> Henslow,<ref>Trans. Geol. Soc., vol. v., p. 504.</ref> and Cumming,<ref>"Isle of Man", p. 224.</ref> and based, no doubt, on the fresh aspect of the shingle, is that the Ayre beach is still growing rapidly seaward by additions to its margin (Berger mentioned two yards; in a year as the reported rate, while Henslow thought this should be reduced by one-half), but the idea appears to be unfounded.

In most places it is clear from the character of its margin that some degree of erosion has taken place, especially at the Point of Ayre, where the old straight-ruled storm-ridges stretching W.S.W. to E.N.E. are sharply truncated by the magnificent crescent of the present storm-beach curving boldly round the Point. At this place old plans of the lighthouse show that there has been no gain during the past century (see p. 417); and in several localities farther westward where the beach was recently paced, there has been no increase since the six-inch Ordnance map was made nearly thirty years ago.

We gain a valuable clue to the approximate age of this beach in the presence of Neolithic chipped flints on its surface in places. The shingle seems to have been resorted to by the ancient inhabitants for the sake of its pebbles of flint derived from the drift, which have sometimes been struck into flakes on the spot. So far as I could discover, after a search which may perhaps have been insufficient, these flakes though plentiful here and there on the inner part of the beach do not occur on its outer portion. Thus opposite Ballagenney [NX 43716 03531], where the beach is about 1,100 yards wide and in many places bare of blown sand, I found the chips as far outward from the old cliff as 700 yards, but in the remaining, 400 yards could detect none. Moreover, a little farther westward, I found in the outer part of the beach a single artificial flake which had been partially worn down by marine attrition, and must therefore have been in existence as a flake during

the accumulation of this portion of the beach. Between Rue Point [NX 40627 03236] and Blue Point [NX 39251 02532] I found these chips also, in one place, in the blown-sand covering the inner part of the old shore. These facts denote that, at any rate, part of the platform was in existence in Neolithic times, but that it may not have attained its full breadth until after the close of that period.

The development of the Ayre beach has been due to strong currents and prevalent winds causing the eastward transference of material derived from the rapid waste of the west coast, and to its accumulation as a broad fan under the shelter of the northern cliff-line, at a time when slow elevation was in progress. The storm-beaches formed during elevation will not, of course, be so liable to re-arrangement by later storms as those of a stationary period like the present. The method of its accumulation is shown by the arrangement of its coarse shingle ridges, which lie parallel to each other, and have evidently been piled up successively at full-tide mark.

Cumming was of opinion that the elevatory movement might still be in progress;<ref>"Isle of Man", p. 252; "Guide Book", p. 171.</ref> but for this there seems no evidence; and the relation of the modern river-alluvium to the present beach at the mouths of the principal streams, at Ramsey, Laxey, Douglas, Peel and Castletown, is even suggestive of a slight depression.

The Raised Beach formed a definite stage in the Post-glacial history of the Island, and indeed probably in that of the whole surrounding sea-basin, as an elevated margin of similar character occurs at about the same height in the east of Ireland,<ref>G. H. Kinahan, "Geology of Ireland", p. 252.</ref> and, slightly higher, in the south-west of Scotland,<ref>Mems. Geol. Survey of Scotland: Explans. of sheets 1 2, 3, 4.? 5, 7, and 9.</ref> and the north-west of England.<ref>T. V. Holmes, Mem. Geol. Survey, "Country around Carlisle", p. 49; see also C. E. De Rance, Quart...Journ. Geol. Soc., xxvi. (1870), p. 655.</ref>

The absence of the higher beaches which are found in Western Scotland (and in Ireland ?) is noteworthy, and the whole subject deserves closer investigation. It seems not impossible that the waning West-British ice-sheet, shielded in its later 'piedmont' stages by the piles of debris concentrated on its surface, may have lingered longer in its enclosed basin than on the more open shores to the northward, and may have obstructed the return of the sea until a later period.<ref>On parts of the coast of Alaska the sea is kept back in this manner at the present day; and a rich growth of vegetation, including forest trees, has established itself upon the morainic material which thickly covers the surface of the ice. (See I. C. Russell's description of the Malaspina Glacier in 13th Ann. Rep. U.S. Geol. Survey, pp. 19–21.)</ref> But differential uplift, increasing northward, has probably also taken place; and this alone may be the explanation of the facts. The tracing of this particular beach northward on the mainland could scarcely fail to give results of interest.

Blown Sand

The chief development of Blown-sand in the Island is on the inner belt of the Ayre Raised Beach [NX 46212 04420], where it covers the shingle, sometimes evenly and sometimes in dunes. By heavily dressing the sand-covered surface with clay obtained from the adjacent old cliff of drift, some portions of this waste have been reclaimed and cultivated (p. 418). Although the sand is still in motion, its principal accumulation must have taken place long ago, as shown by the Neolithic flint chips which lie in or upon it, on The Ayre as already mentioned, and also at Ramsey (p. 430) and at Ballakinnag, near Ballaugh: as well as by its having been used for raising a pre-historic tumulus at Cronkbreck near The Lhen [NX 37581 00925]. Its distribution indicates that the prevalent winds have been from the westward ever since the period of the Raised Beach. In that quarter it covers the whole platform, in places even partly burying the ancient cliff and invading the margin of the drift-plateau above; while farther eastward it breaks up into small travelling dunes, leaving much of the shingle uncovered.

The narrow strip of Blown-sand, usually from 6 to 10 feet thick, which crests the high cliffs of drift for two miles northward from Orrisdale Head [SC 31823 92786], presents some peculiar features. It is derived entirely from the winnowing of the stratified glacial deposits. The cliffs, ranging up to 100 feet or more in height, have boulder-clay at the base (see (Figure 104), p. 424) with much incoherent sand and gravel above, and weather into long talus-slopes at about the angle of rest of the loose substances. Up these slopes the on-shore gales sweep with great violence, forming a veritable sand-blast, by which the top of the cliff is notched, the sand being dropped in the aerial eddy on the crest. Not sand alone, but flat

pebbles an inch or two in size, are sometimes carried up by this agency.<ref>On the northern side of Flamborough Head I have found platy fragments of chalk, up to 4 or 5 inches x 3 inches x 1 inch, which have been uplifted not less than 40 or 50 feet by the wind under similar- conditions. These wind-driven materials form an exception to the general rule that denudation acts in the direction of gravity.</ref> In this manner, though the cliff-line is receding rapidly under marine encroachment, it maintains a permanent sand-cap.

Precisely similar is the Blown-sand at a still higher elevation on Point Cranstal at the opposite side of the Island, though as east winds are less frequent than west winds, its extent is not so great.

In the south, minor tracts of Blown-sand, derived from the sandy shores of adjacent bays, are found at Castletown and on the isthmus leading to Langness; and at Kentraugh 3 miles farther westward.

Alluvium of the river-valleys

The present inert condition of the Manx rivers has been previously commented on (Chapter 1., p. 10), and their alluvial deposits practically all belong to conditions no longer, existing. Owing to the small size and rapid fall of the streams, the valley-bottoms are usually so narrow that in order to show their alluvial terraces on the 1-inch map it has often been necessary to exaggerate their actual breadth.

The presence of "flat terraces of rubbish" in some of the mountain-valleys was noticed by Macculloch, who recognised, from their prolongation on the lower slopes of the hills and on low ground, that these could not be assigned to ordinary fluviatile action.<ref>"Western Isles", vol. ii., p. 525.</ref> Cumming classed such high-level terraces along with the general drift of the hill-sides, as Diluvium; and accounted for them as accumulations " of an arctic climate existing at the period of the formation of the boulder-clay [of the lowlands]".<ref>Quart. Journ. Geol. Soc., vol. ii., p. 341.</ref>

To understand the position and mode of formation of these terraces, which overlie the drift at heights ranging up to 100 feet or more above the present streams, we must go back in imagination to the time when the ice-sheet first sank away from the hills, as described in the last chapter. Most of the hollows were then left deeply banked with local till and the slopes encumbered with slaty detritus; but the pre-glacial valley system had not been disturbed, and the flooded streams resumed their old courses, though generally at a considerable height above their former rocky beds. Wherever the flow of such streams was arrested, part of their load was discarded; and soon the boulder-clay of the valleys was overspread with sheets of subangular rubble amid which the streams shifted perpetually to and fro, like the rivers of Iceland nowadays.<ref>Dr. Tempest Anderson. Proc. Yorks. Geol. and Polytech. Soc., vol. pt. ii. (1892), p. 165.</ref>

But the main streams soon trenched for themselves more confined channels in the boulder-clay; and in doing so, abandoned the higher platforms, and built up others, of more limited dimensions, at successively lower levels; until at last the old rock-floor of the valley was reached. Meanwhile every stream was laden to the full extent of its carrying power, so that quantities of slaty debris out of all proportion to the size of the valleys was spread out in fans and bars around the foot of the hills in the manner already described. In this way we may, without difficulty, explain all the phenomena of Manx valley-deposits. The regular descent with the valley which characterizes the terraces shows that they cannot be assigned either to marine action or to ice-dammed fresh-water lakes, but are truly fluviatile. The higher of them may therefore be regarded as flood-gravels of Late-glacial times, equivalent to the gravel-platforms fringing the Curragh and other depressions, and they have been thus classified on the published map where broad enough to be separately distinguished.

With the dwindling of the rivers as time went on, the alluvial flats of the re-excavated channels became more and more restricted, and the material carried to the mouths of the valleys less and less in quantity; until the present conditions were reached, in which the streams even at flood can, for the most part, only struggle feebly with the ancient detritus in their beds. In their lower reaches, this enfeeblement may be due in part to the artificial robbery of their power for purposes of mining, milling and water-supply; but the fact that the heads of the glens generally have their banks grass-covered, even where formed of easily erosible drift, and their bottoms mere mossy bogs if not actually dry, is indisputable testimony of the changed conditions.

Alluvium of the Curragh Basins

The early history and evolution of the great hollow at the foot of the slate hills have been recorded in the preceding chapter, and it is only with the later phases that we have now to deal. In the wider sense the depression extends southward up to the ancient cliff-line of the solid rocks (p. 6), and northward and westward up to the steep bank which marks the edge of the upper platform of drift (pp. 434 and 437).

But the broad fringe of flood-deltas and terraces of Late-glacial age which have been thrown into it, especially in the west, have restricted the more recent alluvium to its central portion; and even in this part the flood-gravels stretch out from all sides in low banks and spurs which separate the tract into a series of more or less confluent basins differing somewhat in level. The most westerly of these basins is the peaty depression under the foot of Gob y Volley, one mile west of Sulby, at present the boggiest tract of the whole Curragh. though its surface in the lowest part is about 36 feet above O.D. and 15 to 20 feet higher than the easterly basin. Its infilling is principally peat of considerable thickness, which has been extensively dug for fuel; it is bounded on the west by the slaty gravels from Glen Dhoo and on the east by a partly buried spur of similar gravel from Sulby Glen. It drains to the west coast through an artificial trench leading into the Killane River, but might as readily have been connected with Lhen drainage going northward, or with that going eastward to Ramsey; and the same alternatives exist for all the western portion of the Curragh [SC 36617 95000].

Another partly independent basin at about the same elevation lies around the southern end of the Lhen and extends westward in a narrow strip towards the Killane, having on all sides an ill-defined boundary on the gentle slopes of the sandy portion of the Late-glacial platform (p. 435); it contains but little true peat, its alluvium consisting chiefly of peaty sand, with a little gravel towards the margin. This appears to be the site of the 'Balla Lough' of ancient maps (p. 408); it is now drained and cultivated, part of its water going into the Killane and part into the Lhen.

The large irregular hollow farther to the eastward constitutes the chief portion of the Curragh [SC 36617 95000]. It is the tract over which the Sulby river has once expanded after leaving the hills and before finding its northward outlet by the Lhen; indeed, if it were not for the barrier of flood-gravel opposite the mouth of Sulby Glen, which now dams out the river and diverts it eastward, the hollow would still receive this water, its surface being for the most part 20 feet or more below the level of the river at the barrier. There are traces of a dry channel across the gravel-bar, 200 yards east of Sulby Church [SC 38101 94427] ?, which probably denotes a comparatively recent overflow of the flooded Sulby into this part of the Curragh; three-quarters of a mile farther east, where the barrier sinks, the river still occasionally overflows into another portion of the depression. The subsoil of the tract is variable, consisting mostly of peaty sand towards the northern margin, where the drift-slopes disappear very gradually beneath the alluvium; and in other places often of blue silt or mud (no doubt the finer waste of the slate-reeks), which frequently overlies peat containing large trees (see p. 439). The presence of this forest-peat shows that the area cannot have been continuously submerged, and may betoken a period during which, as at present, the river failed to cross the barrier, with a return of flood-water conditions at a later stage. The general level of the surface in this part of the Curragh is a little over 30 feet above O.D., with a rise of several feet toward the mouth of the Sulby. East of Closechyrrim [SC 39408 95376], irregular islands of dry sandy ground, probably elevations of the underlying uneven drift-surface, rise above the alluvial flat, and form a partial barrier separating the Sulby Curragh [SC 36666 95029] from that of Lezayre [SC 40606 95822], which is on an average 10 feet lower in level, or about 20 feet above O.D. The latter depression expands northward into an embayment which appears to correspond to the 'Malar Lough' of ancient maps, and in part to the 'Lake Mirescogh' of the still more ancient chronicle (p. 439). The chief drainage-channels of the Andreas drift-platform now terminate in this embayment, which forms a flat alluvial meadow, underlain for the most part by greyish or bluish marl or sandy silt, with peat in a few places only.

This flat is bounded sharply on the east by higher sandy and gravelly drift-ground, which rises to over 90 feet above O.D. near the coast at North Ramsey, while on the south the alluvial basin is encroached upon by the delta-platform of slaty gravel lying around the mouth of Glen Auldyn. The tongue of alluvium thus narrowed is continued along the course of the Sulby River eastward into Ramsey Harbour, where we find that it merges insensibly into the Raised Beach (p. 440), though the sediments remain of fresh-water type close up to the town and within reach of high spring-tides.

In reviewing the facts in regard to the Curraghs as a whole [SC 36666 95029], [SC 40606 95822] it becomes evident that after the shrinking back of the ice-sheet from the immediate vicinity of the island, the lake which had occupied the

depression up to the 40ft. level found a fresh outlet eastward, and sank until its waters could no longer flow into the Lhen channel. Ridges and islands of dry land then emerged and broke up the water-surface into separate shallow basins, draining irregularly into each other, with a general fall eastward. The area of these lakelets varied greatly according to the season, only a few limited patches being permanently submerged.<ref>Exactly analogous conditions prevailed at this period in Holderness in East Yorkshire. See Mem. Geol. Survey, "Holderness", p. 77, and Proc, Yorks. Geol. and Polytechn. Soc., vol. vin. (1883), p. 249.</ref>

Old maps of the Island, such as that of 1595 "performed by Thomas Durham", reproduced by Cumming ("Isle of Man, pl. IV.) from Speed's "History of Great Britain", or that of Chaloner of 1656, reproduced by Hibbert (Edinb. Journ. Sc., vol iii., pl. IV) show three lakes on the northern plain, viz., one to the west of Andreas, draining to the Lhen; the second, named Balla Lough, to the north of Ballaugh, draining to the west coast by the Killane river; and the third, named Malar Lough, between Lezayre and Andreas, draining into the Sulby River and thence to the east coast at Ramsey. Owing to the imperfections of the maps these localities are not easy to identify, but the second and third, as pointed out above, probably occupied respectively the western and eastern portions of the Curragh, while the first seems to have been an extension of the present Lagagh Mooar [NX 40952 01544] (p. 432). Lake Myreshaw, or Mirescogh of the older records (see Cumming, "Isle of Man", p. 216), with its three islands, was probably an earlier condition of Malar Lough when its waters extended up to the Sulby River.

That these lakes were in existence in Neolithic times is indicated by the occasional discovery of implements of that age under the old alluvium, as recorded by Cumming in the following note: "In some portions of the drained Curragh have been found stone celts and other relics of more ancient times, such as coracles which were probably sunk in these ancient lakes. I have in my possession a celt of the simplest kind, found under the peat on the edge of the Curragh near East Nappin [SC 35093 98761]. In a meadow adjoining Close Mooar, the property of Professor E. Forbes, were found a short time ago a stone axe and sharpening or edge stone, a few feet asunder. They lay upon a bed of fine sand, covered over with a stratum about 4 feet thick of peat-trunks of oak trees, etc., and over the peat was a bed of blue alluvial clay to the depth of 3 or 4 feet". (Op. cit. p. 216, footnote.)

There are several small alluvial hollows and flood-basins in the drift-platform to the north of the Curragh which are sufficiently described in the chapter of local details (p. 434–7); others of still smaller dimensions occur in the curious depression between Port e Myllin and Port Mooar south of Ramsey (p. 444), and near the west coast south of Orrisdale.

Alluvium of the Central Valley

<ref>Trans. Geol. Soc., vol. ii., p. 33.

Berger used the designation "Glen of Mullin-y-Chlea" for this valley, from the hamlet of that name near St. John's, but the term if ever in common use is now forgotten. </ref>

Much of the alluvium which covers the floor of the central valley throughout the greater part of its course can scarcely be assigned to ordinary fluviatile action. The original preglacial excavation of this valley by streams flowing respectively east and west from the central hill-range has been discussed in an earlier chapter (1., p. 8). The ice-sheet deposited thick masses of drift in the hollow, of which that west of St. John's is mainly of the extra-insular type, while that east of Greeba [SC 30114 81059] is chiefly of local origin.

Upon the withdrawal of the ice, this infilling material underwent active erosion by the swollen waters from the hills; and was constantly being scooped out in one place and redeposited in another, until it reached the temporary lakes which, in this area as in the Northern Curraghs, were formed from time to time in different parts of the valley and emptied again as both eastern and western outlets deepened. The waters outpouring westward during the later stages missed the original valley for a short space at Glenfaba [SC 24176 83073], ¾ mile S. of Peel, and cut a new gorge through slate and conglomerate, the preglacial channel probably lying a little farther eastward (p. 457). The check which this accident gave to the rate of erosion led to the development of a wide alluvial flat above the barrier. This flat is fringed on both sides by successive terraces, the highest of which, like those of the Curragh, probably date back to the period immediately subsequent to the retirement of the ice-sheet, while the lower deposits carry on the record through Late-glacial and

Post-glacial times, down to the institution of artificial drainage at dates within the reach of history. To unravel the sequence of events in this tract as fully as it deserves would have required longer time than could be devoted to it during the present survey, especially as the lack of contours on the Ordnance map would have greatly impeded such work. While, therefore, the separate terraces have been indicated as far as possible on the published map, either as "Glacial platforms of sand and gravel" or as "Late-glacial Flood-gravels", it is not unlikely that different portions of the same or contemporaneous terraces may have lost their identity on the map.

As in other parts of the Island, the chief deposits of gravel form deltas around the mouths of the tributary valleys which open into the depression. Hence the largest is found near St. John's [SC 26855 81746], where the Neb River comes in from the north and the Foxdale River from the south, the united deltas having apparently constituted a barrier across the valley which held up a narrow lakelet extending back to the col at Greeba, 2 miles farther east. The village of St. John's stands on the highest terrace (coloured pink on the map) at 150 feet above O.D. A large sand-pit in this terrace east of the railway-station shows 6 feet of rough slaty gravel with a few foreign pebbles, resting on 20 feet of cross-bedded sand containing crumbs of marine shells. Traces of a similar terrace exist here and there on both sides of the valley farther east; and during its accumulation there was probably an overflow across the Greeba watershed, but whether from west to east or from east to west has not been determined.

A lower terrace occurs on both sides of the Neb where it joins the main valley, at an elevation of 110 feet above O.D., falling westward to 90 feet or under on the northern side of the flat before ending off against the steep drift-bank east of Glenfaba. The little boggy basin which yielded the elk-remains at Close-y-Garey [SC 26890 82585] (p. 384) and other similar basins in the drift-plateau at Ballalough [SC 26338 83440] drain down to this terrace, which has been mapped as of Late-glacial age. On the opposite side of the valley, around Kirk Patrick [SC 24417 82184] and Ballamoore [SC 25040 82245], we find traces of several terraces rising step by step from 40 to 50 feet above O.D at the river-flat, to 110 feet at Kirk Patrick. The highest, which has been coloured on the map as glacial' (pink), runs up into the depression leading into Glen Meay (p. 458) and probably indicates a former inflow or outflow through the gap, but has been partially destroyed by later erosion. The little streams descending the steep northern slopes of Slieau Whuallian have each their delta of flood-gravel, associated with one of the higher terraces; and these have been cut into on the subsequent lowering of the main valley. Similar features are seen at numerous points farther east, and are the outcome of conditions which have been described on a previous page (p. 406).

As the present river-flat rises eastward towards the confluence of the Neb and Foxdale streams, there attaining a level of 100 feet above O.D., the lower terraces merge into it and are no longer seen. The gravel-dam athwart the valley. at St. John's [SC 28244 81721] is notched by a trench 30 to 50 yards wide, now artificially deepened, which permits the outflow of the arrested drainage above, where in ancient times lay the boggy lake of Curraghglass [SC 31479 80239], in which, according to Cumming, it was the custom to plunge persons accused of witchcraft.<ref>"Isle of Man", p. 182.</ref> Though drained, the bottom of the valley between this point and Greeba is still for the most part boggy, and its alluvium consists of silt and peat, indicative of stagnant water. Its surface is now at from 135 to about 155 feet above sea-level; there is no evidence as to the depth of the superficial deposits upon the old rock floor, but it must be considerable.

In the Greeba pass [SC 31212 80399] the alluvial flat contracts, and at the same time begins to assume a gradual fall eastward. At the constriction it ends off on both sides against steep slopes of slate or drift, without terraces excepting at the mouths of the tributary waters which unite to form the River Dhoo, presenting characters more akin to those of an ordinary river-flat, except that its size is altogether disproportionate to its present drainage. The Ordnance map marks a level on its floor opposite Cregbeg [SC 31688 80006] with an altitude of 140 feet; another on the road across it at Ellerslie, 1½ miles lower down, 117 feet; and the 100-foot contour<ref>The six-inch Ordnance map is contoured at 100 feet intervals, up to 1,000 feet only, in the parishes of Braddan, Onchan, Marown, Lonan, and Santon, but not elsewhere in the Island.</ref> crosses it ¼ mile below the Ellerslie road.

An expansion of the valley in the last-mentioned neighbourhood, down to the constriction west of Union Mills [SC 35313 77794], may have been occupied by a temporary lakelet. Its alluvium consists of 4 to 6 feet of silt with peaty layers towards the base, resting on slaty gravel. Down to this point the present River Dhoo is confined in a more or less artificial channel trenching the old flat; but after leaving this basin it has a natural course, with a more rapid fall, and down to its junction with the Glass near Douglas is bordered by narrow strips of the usual stream-alluvium. It is interesting to find,

however, that in this lower part, terraces of flood-gravel reappear—at first ½ mile west of Union Mills [SC 35313 77794], at about 100 feet above O.D. and not much above the level of the alluvium, but as usual with these terraces, falling less rapidly than the present valley-floor, and therefore gradually rising higher above it. The terrace is confined to the north bank at Union Mills, but sets in on the opposite side also below that place; and continues, with slight interruptions, to the outskirts of Douglas. Small pits have been opened upon it on both sides of the valley below Snugborough, revealing rough slaty gravel, loamy in places, with beds of sand and a sprinkling of foreign stones. It corresponds in all respects to, and is indeed apparently conterminous with the upper or Late-glacial terrace of the Glass valley above its confluence with the Dhoo (p. 456).

Since the level at which this flood-terrace sets in below the constriction so nearly corresponds to that of the flat floor of the valley above, where no terrace is seen, it seems highly probable that the alluvial flat between Union Mills [SC 35313 77794] and Ellerslie [SC 32835 78326] may itself represent the terrace, covered by more recent lacustrine or fluviatile sediments.

Alluvium of the Southern Lowland

In the low ground at the foot of the hills in the south of the Island many of the phenomena of the Curragh depression of the north are repeated, though on a smaller scale; and may be similarly explained as the result of the more rapid melting of the ice where impinged upon by land-drainage during the closing stages of the Glacial Period. Gravel platforms derived in part from the ice-sheet and in part from the hills, occupy much of the tract (pp. 470–2), while in the shallow depressions upon and around them later alluvial deposits have collected. Of these, the alluvial strips along the courses of the Silverburn and the Colby do not differ much from ordinary river-flats, though in places expanding to a greater breadth than such small streams could have produced under present conditions. On the plain between these rivers are two separate depressions which appear to have been in part occupied by standing water until artificially drained. The more easterly, about one-third of a square mile in extent, lies between Billown [SC 26036 69572] and Balakeigan [SC 25574 68612] <ref>See p. 417, as to meaning of italics.</ref> (Sheet 16), a half-mile N.W. of Castletown, and has a floor of silty alluvial wash. This tract is shown as a lakelet on the old maps of the Island (p. 408). It drains to the sea at Poyll Vaaish [SC 24619 67534]; and Cumming mentions that in this vicinity, between Balladoole [SC 24117 68586] and Scarlet House [SC 25785 66697], sand with marine shells was found, which he considered to represent the Raised Beach,<ref>Quart. Journ. Geol. Soc., vol. ii., p. 345.</ref> and to be probably continuous with a similar sand found in a neighbouring section to overlie blue marl with elk-remains. There is, however, no trace of marine conditions in the basin itself.

A gentle rise, covered with boulder-clay, intervenes between the above depression and the next basin about a mile farther west, where we find a low tract extending continuously from Arbory [SC 24944 70443] (Ballabeg of new Ordnance map) up to the Colby River south of Colby village [SC 23083 70300]. On Cumming's map ("Isle of Man", pl. III.) the whole of this tract is shown as alluvium; but on the Survey map, after some hesitation, only the more easterly portion of the depression, where the subsoil is a gravelly or silty wash, has been thus represented. There is no doubt that the whole tract has been at times submerged by floods, mainly from the over flow of the Colby; but the western portion does not appear to have been covered by any deposit which could be defined as true alluvium, the chief subsoil being a dark blue clayey earth, full of stones, mostly sub-angular fragments of slate and quartz, with a few rounded foreign pebbles. Though not strictly boulder-clay, this material seems to be essentially a re-arrangement of boulder-clay, probably by storm-wash. In most but not all cases the slate fragments have lost their glacial striae, but have not been worn into rounded pebbles. This re-arrangement of the boulder-clay appears to have taken place after the deposition of the Glacial platform-gravels which border the hollow, but at a comparatively early stage in Late-glacial or Post-glacial times. To such material, in mapping the ground, I provisionally applied the term 'Colby Wash,' and thought that it might eventually prove necessary to represent its occurrences by a separate symbol or colour; but, though widely distributed wherever slaty drift formed flat ground whether at low or high levels (see p. 453, and p. 471), the material was not elsewhere found in so large a tract as the present instance, and was too limited in extent to indicate on the map. Indeed, as the 'Colby Wash' so nearly resembles the boulder clay in composition, and as the tracts in which it is developed are usually underlain and surrounded by that deposit, any separation between the original and modified condition of the clayey drift would have been difficult and of little practical utility. In this particular instance, however, it is not improbable that the 'Colby Wash' may in places cover fresh-water sediments of Late-glacial age equivalent to the elk-marls of the Ballaugh and

Close-y-Garey sections [SC 26890 82585] (pp. 375, 384), though no direct evidence to this effect was obtained.

The greater part of the above-described depression drains through a little valley excavated in drift and limestone, which opens to the sea at Strandhall [SC 23434 68761] in the eastern corner of Bay ny Carrickey. At this place there is a gap in the limestone-scars on the foreshore just opposite the mouth of the brook, in which peat with trunks of trees is revealed when the beach-material is swept aside. This 'submerged forest' is mentioned by Macculloch<ref>"Western Isles" vol. ii., p. 527.</ref> and Henslow<ref>"Trans. Geol. Soc"., vol. v., p. 500.</ref> as having been exposed some time previously to their examination, but was not seen by them, Cumming describes it as follows: "In the autumn of 1845 I discovered, about a mile to the east of Mount Gawne, at the mouth of Strandhall Brook [SC 24015 68593], betwixt high and low water, a bed of turf one foot thick, and the trunks of trees (oak, ash and fir); of which I counted eight in an erect position, and traced the roots of one (an oak) several feet in the stiff alluvial blue loam, which was evidently the subsoil upon which the trees grew. The alluvium (which is not more than 3 feet thick) rests in part upon the nearly horizontal limestone and in part on a denuded bed of the boulder clay, and is situated at the opening towards the sea of one of the valleys of denudation. A few yards to the east and west of this submerged forest we have a raised beach of a recent period. It is possible at this particular spot to explain the phenomenon by supposing the bank driven back upon the land, and that formerly it intervened between the forest and the sea, and by a partial damming up of the water of the stream formed a swamp, and the alluvial deposit in which the turf and trees grew. However this may be, it is certain that this same alluvial marl is covered up in the neighbourhood by a recent marine formation".<ref>Quart. Journ. Geol. Soc., vol. ii., p. 344. See also "Isle of Man", p. 139.</ref> In a footnote he adds, "It is singular that the trunk of an oak-tree which has been removed from the submerged forest at Strandhall exhibits upon its surface the marks of a hatchet". In another publication he states: "On removing the boulder clay into which the roots of these trees strike down, distinct glacial groovings may be noticed on the subjacent limestone".<ref>"Guide Book" p. 88.</ref>

Cumming also obtained information indicating the existence of the old forest on the shores of the bay farther westward. Writing in 1848 he says, "Twenty-one years ago, according to the testimony which I have received from living witnesses, after a violent storm of three days the sands opposite Mount Gawne were swept away and discovered a vast number of trunks of trees, some standing upright, others laid prostrate towards the north, as if overthrown by some violent incursions of the sea. Nay, it has been further stated to me by those whom I am bound to believe, that the foundations of a primitive hut were laid bare, and that therein were some antique uncouth-looking instruments, once the property, it may be, of the primitive woodcutters".<ref>"Isle of Man", p. 140.</ref>

The presence of traces of man in the- peat at Strandhall [SC 23521 68763] is also affirmed by Mr. J. M. Jeffcott of Castletown, who, in 1889, writes as follows: "About eighteen years ago, and soon after the fragments of antlers [of the Irish elk, see p. 386] were found at Strandhall, a stream in that locality after a heavy fall of rain became swollen, overflowed its banks, and made a deep excavation in the sea-beach. Having visited this excavation on the day after its occurrence I found in the debris fragments of human skulls and other human bones. These were associated with the jawbone of a deer, believed by Professor Busk, to whom it was afterwards shown, to have been that of a red deer. The excavation made by the stream was, in some places, perhaps 6 feet deep. I afterwards caused the cavity to be further deepened to the extent of about four additional feet. On reaching this depth I discovered the recumbent trunk of a large pine. Close to the prostrate tree were quantities of oak leaves pressed flatly together, and forming immense flakes from 8 to 10 inches thick. Some of the leaves in the interior of a flake still partially retained their green hue. In one of the flakes I found, between some leaves, elytra of beetles".<ref>Presidential address to the Isle of Man Nat. Hist. and Antiq. Soc., Mch. 1883, printed in Yn Lioar Manninagh, vol. i., p. 56.</ref>

There was a small exposure of the peat in the upper part of the shore in 1892, during the present Survey, and some specimens of wood then collected were submitted to Mr. Clement Reid, who recognised, 'oak and a conifer, probably yew.'

While the position of this peat might be explained without postulating a change of level, by supposing, as Cumming suggested, that it was accumulated behind a protecting bank of shingle since swept aside, the hypothesis would fail to account for the channel excavated in the limestone, in which the peat lies. This channel, like instances of the same kind in other parts of the Island (p. 457, etc.), shows that some degree of elevation above present level must have occurred since Glacial times; and it is probable that the low-level forest grew during this period of elevation.

Though the relationship is not distinctly seen, the general run of the evidence strongly supports Cumming's idea that the adjacent Raised Beach is newer than the submerged forest; and if we accept the above-quoted evidence as to the presence of man in the Island during the formation of the peat-bed, it follows that depression succeeded by partial re-elevation has taken place since man's incoming. Moreover, as there is no reason to believe that Paleolithic man ever reached this region, and since it has already been shown (p. 403) that the Raised Beach may belong to the closing stages of the Neolithic period, it seems reasonable to conclude that these oscillations of level may have taken place during Neolithic times.

Another more irregular hollow occurs in the gravel platform 1½ mile west of Colby, curving northward from the vicinity of Port St. Mary Railway Station [SC 20650 68447], and extending past Trinity Church [SC 20858 69301] nearly to Bradda Mooar [SC 19138 70235]. This hollow, again, is only in part occupied by true alluvium, the stony 'Colby Wash' forming the subsoil in all except its central portion. The ridges of gravel which border the alluvium towards the head of the depression recall those around Close-y-Garey [SC 26890 82585] (p. 458). At Cronk Mooar [SC 20446 69690] (Sheet 16) a portion of one of these has been artificially shaped into a mound in prehistoric times.

Hill Peat

The hill peat has not been separately shown on the published map, as its distribution is too ill-defined to be marked out by boundary lines; but where it attains exceptional thickness the word PEAT has been engraved. The higher ground of the central massif is more or less overspread with a peaty covering, varying from a single sod to a few feet in thickness, according to the shape of the surface. It is more prevalent in the slack between the principal or Snaefell [SC 39758 88087] hill-chain and the ridges to the westward then elsewhere, and is best developed where the slaty till has lodged. The northern slopes of Beinn-y-Phott [SC 38182 86669], and particularly the long shoulder running out between Glen Crammag [SC 37063 87380] and the east fork of the Sulby River [SC 38403 87542] afford the most extended ground in which hill peat is comparatively thick (p. 449), while smaller tracts of thick peat are found at the gathering-ground of the drainage on the northern side of Snaefell [SC 38403 87542]; on the northern side of Colden [SC 34177 84945]; and to the westward of South Barrule [SC 25339 76841]. Though it is still accumulating in a few places, the climate nowadays does not seem so favourable to its growth as the past has been; and it has been further checked by the drainage of the hillsides for sheep farming.

The hill peat and that of the lowland hollows were once the chief fuel of the island, but their use is confined now to a few of the older farmers and cottagers in places remote from the ports. The turf seems in the past to have been largely obtained by paring the surface of the nearest hill, and only partly from excavation of the thicker deposits. There is no record of human or animal remains having been found in the hill peat, but it contains fragments of wood larger than the present natural growth of the hills.