above the sea are mere remnants of a continuous sheet of red sandstone that once spread far and wide over the western Highlands.

Stratified rocks when they have not been much disturbed from their original approximate horizontality weather into escarpments. Such cliffs may run for many miles across a country, rising one above another into lofty terraced hills. In Scotland the rocks have been so dislocated and disturbed as to prevent the formation of continuous escarpments, and this form of rock-scenery is consequently almost entirely absent, except locally and for the most part on a comparatively small scale. The most extensive Scottish escarpments are found among the igneous rocks. Where lava has been piled up in successive nearly horizontal sheets, with occasional layers of tuff or other softer rock between them, it offers conditions peculiarly favourable for the formation of escarpments, as in the wide basalt plateaus of the inner Hebrides. The Carboniferous lavas of the Campsie and Fintry Hills and of the south of Dumfriesshire and Roxburghshire likewise rise in lines of bold escarpment.

The lakes and water-basins may be classified in four groups, each with its own peculiar scenery and distinct mode of origin— (1) glen lakes, (2) rock-tarns, (3) moraine-tarns, (4) lakes

of the plains.

1. *Glen lakes* are those which occupy portions of glens. They are depressions in the valleys, not due to local heaping up of detritus, but true rock-basins, often of great depth. Much discussion has arisen as to their mode of origin, but it is probable they were caused by the erosive action of ice, since glaciers occupied the glens where they occur and wore down the rocks along the sides and bottom: but it is a point of difficulty in this theory whether ice could have eroded the deepest of the hollows. In any circumstances the lakes must be of recent geological date. Any such basins belonging to the time of the folding of the crystalline schists would have been filled up and effaced long ago. Indeed, so rapid is the infilling by the torrents which sweep down detritus from the surrounding heights that even the existing lakes are visibly diminishing. Glen lakes are almost wholly confined to the western half of the Highlands, where they form the largest sheets of fresh water. Hardly any lakes arc to be seen east of a line drawn from Inverness to Perth. West of that line, however, they abound in both the longitudinal and the transverse valleys. The most remarkable line of them is that which fills up much of the Great Glen, Loch Ness being the largest. Other im- portant longitudinal lakes are Lochs Tay, Awe, Ericht and Shiel. The most picturesque glen lakes, however, lie in transverse valleys, which being cut across the strike of the rocks present greater variety and, usually, abruptness of outline. Lochs Lomond, Katrine and Lubnaig in the southern Highlands, and Lochs Maree and More in the north, are conspicuous examples.

2. *Rock-tarns* are small lakes lying in rock-basins on the sides of mountains or the summits of ridges, and on rocky plateaus or plains. Unlike glen lakes, they have no necessary dependence upon lines of valley, but are scattered as it were broadcast, and are by far the most abundant of the Scottish lakes. Dispersed over all parts of the western Highlands, they are most numerous in the north-west, especially in the Outer Hebrides and in the west of the shires of Ross and Cromarty and Sutherland, where the surface of the Archean gneiss is so thickly sprinkled with them that many tracts consist nearly as much of water as of land. They almost invariably lie on strongly ice-worn platforms of rock, and are obviously hollows produced by the gouging action of the sheets of land-ice by which the general glaciation of the country was affected. In the Southern Uplands, owing to the greater softness and uniformity of texture of the rocks, rock-tarns are comparatively infrequent, except in Galloway, where the protrusion of granite and its associated metamorphism have reproduced Highland conditions of rock-structure. In the rocky hill-ranges of the Central Plain rock-tarns occasionally make their appearance.

3. *Moraine-tarns*—small sheets of water ponded back by some of the last moraines shed by the retreating glaciers—are confined to the more mountainous tracts. Among the Southern Uplands the best-known and one of the most picturesque is the wild and lonely Loch Skene, lying in a recess of Whitecoomb at the head of Moffat Water. Others are sprinkled over the higher parts of the valleys in Galloway. None occurs in the Central Plain. In the Highlands they may be counted by hundreds, nestling in the bottoms of the corries. In the north-western counties, where the glaciers continued longest to descend to the sea-level, lakes retained by moraine-barriers may be found very little above the sea.

4. The *Lakes of the Plains* lie in hollows of the glacial detritus which is strewn so thickly over the lower grounds. As these hollows were caused by original irregular deposition rather than by erosion, they have no intimate relation to the present drainage-lines. The lakes vary in size from mere pools to sheets of water several square miles in area. As a rule they are shallow in proportion to their extent and surface. They were once more numerous than they are now, but some have disappeared through natural causes and others nave been drained. The largest sheets of fresh water in the Lowlands are lakes of the plains as Loch Leven and the Lake of Menteith.

The eastern and western seaboards present a singular contrast. The eastern **is** indented by a series of broad arms of the sea—the firths of Forth and Tay, Moray and Dornoch firths—but is otherwise relatively unbroken, The land slopes gently to the sea or to the

edge of cliffs that nave been cut back by the waves. The shores are for the most part low, with few islands in front of them, and culti- vation comes down almost to the tide-line. The western side, on the contrary, is from end to end intersected with long narrow sea lochs or fjords. The land shelves down rapidly into the sea and is fronted by chains and groups of islands. The explanation of this contrast must be sought in geological structure. The west side, as we have seen, has been more deeply eroded than the eastern. The glens are more numerous there and on the whole deeper and narrower. Many of them are prolonged under the sea; in other words, the narrow deep fjords are seaward con­tinuations of the glens. The presence of the sea in these fjords is an accident. If they could be raised out of the sea they would become glens, with lakes filling their deeper portions. That this has been their history hardly admits of question. They are submerged land- valleys, and as they run down the whole western coast they show that this side has subsided to a considerable depth beneath its former level. The Scottish sea lochs must be considered in connexion with those of western Ireland and Norway. The whole of this north- western coast-line of Europe bears witness to recent submergence. The bed of the North Sea, which at no distant date in geological history was a land surface across which plants and animals migrated freely into Great Britain, sank beneath the sea-level, while the Atlantic advanced upon the western margin of the continent and filled the seaward ends of what had previously been valleys open to the sun. In this view the Outer and Inner Hebrides were formerly one with themselves and the mainland, and the western isles therefore are truly grouped with the Highland province of Scotland. Nearly the whole coast-line is rocky. On the east indeed, the shores of the estuaries are generally low, but the land between the mouths of these inlets is more or less precipitous. On the west the coast is mostly either a steep rocky declivity or a sea-wall, though strips of lower ground are found in the bays. The cliffs vary in character according to the nature of the rock. At Cape Wrath, precipices 300 ft. high have been cut out of the Archean gneiss. The varying texture of this rock, its irregular foliation and jointing, and its ramifying veins of pegmatite give it very unequal powers of resistance. Here it projects in irregular bastions and buttresses, there retires into deep recesses and tunnels, but shows everywhere a ruggedness of aspect eminently characteristic. In striking contrast to these precipices are those of the Cambrian red sandstone a few miles to the east. Vast vertical walls of rock shoot up to a height of 600 ft., cut by their perpendicular joints into quadrangular piers and projections, some of which stand out alone as cathedral-like islets in front of the main cliff. The sombre colouring is relieved by vegetation along the edges of the nearly flat beds which project like great cornices and serve as nesting-places for sea-fowl. On the west the most notable cliffs south of those of Cape Wrath and the Cambrian sandstones of Sutherland are to be found among the basaltic islands, particularly in Skye, where a magnificent range of precipices rising to 1000 ft. bounds the western coast-line. However, the highest cliffs are found among the Shetland and Orkney Islands. The sea-wall of Foula, in Shetland, and the western front of Hoy, in Orkney, rise like walls to heights of 1100 or 1200 ft. Caithness is one wide moor, terminating almost everywhere seaward in a range of precipices of Old Red Sandstone. Along the eastern coast most of the cliffs are formed of rocks belonging to this formation. Beginning at Stonehaven, an almost unbroken line of precipice varying up to 200 ft. in height runs to the mouth of the estuary of the Tay. On the east the Southern Uplands plunge abruptly into the sea near St Abb’s Head in a noble range of precipices 300 to 500 ft. in height, and on the west terminate in a long broken line of sea-wall, which begins at the mouth of Loch Ryan, extends to the Mull of Galloway, and reappears again in the southern headlands of Wigtown and Kirkcudbright. Among the most picturesque features of Scottish sea-cliffs are the numerous *stacks* or columns of rock which during the demolition and cutting- back of the precipices have been isolated and left standing amidst the waves. These remnants attain their most colossal size and height on the cliffs of Old Red Sandstone. Thus the Old Man of Hoy in Orkney is a huge column of yellow sandstone between 400 and 500 ft. high, forming a conspicuous landmark in the north. The coast of Caithness abounds in outstanding pillars and obelisks of flagstone.

The low shores on the west coast are frequently occupied by *sand- dunes,* as on the western margin of North and South Uist, and in many bays from the north of Sutherland to the coast of Ayrshire. They are more abundant on the east coast, however, especially on the shores of Aberdeenshire, between the mouths of the two Esks in Forfarshire, on both sides of the mouth of the Firth of Tay, and at various places on the Firth of Forth. Raised sea-beaches likewise play a part in the coast scenery. These alluvial terraces form a strip of low fertile land between the edge of the sea and the rising ground of the interior, and among the western fjords sometimes supply the only arable soil in their neighbourhood, their flat green surfaces presenting a strong contrast to the brown and barren moors that rise from them. Most of the seaport towns stand upon platforms of raised beach. Considerable deposits of mud, silt and sand are accumulating in many of the estuaries. In the Tay, Forth and Clyde, where important harbours are situated, great expense is involved in constantly dredging to remove the sediment continually brought down from the land and carried backwards and forwards by the tides.