tiles, but which at the same time cannot be satisfactorily separated from similar underlying strata which contain Upper Old Red Sandstone fishes. There occur also below the Lias on some parts of the west coast unfossiliferous red sandstones, conglomerates, and breccias which may possibly belong to the same system. These rocks attain their greatest thickness at Gruinard Bay on the west coast of Ross, where they must be several hundred feet thick. On the east side of the country, where so many fragments of the Second­ary rocks occur as boulders in the glacial deposits, a large mass of strata was formerly exposed at Linksfield near Elgin containing fossils which appear to show it to belong to the Rhætic beds at the top of the Trias. But it was not in place, and was almost certainly a mass transported by ice. Rhætic strata no doubt exist *in situ* at no great distance under the North Sea.

The Jurassic system is well represented on both sides of the Highlands. Along the east coast of Sutherland good sections are exposed showing the succession of strata. Among these the Lower and Middle Lias can be identified by their fossils. The Lower Oolite is distinguished by the occurrence in it of some coal-seams, one of which, 31/2 feet in thickness, has been worked at Brora. The Middle Oolite consists mostly of sandstones with bands of shale and limestones and includes fossils which indicate the English horizons from the Kellaways Rock up to the Coral Rag. The lower part of the Kimmeridge Clay is probably represented by sand­stones and conglomerates, forming the highest beds of the series in Sutherland. On the west side of the Highlands Jurassic rocks are found in many detached areas from the Shiant Isles to the southern shores of Mull. Over much of this region they owe their preservation in great measure to the mass of lavas poured over them in Tertiary time. They have been uncovered, indeed, only at a comparatively recent geological date. They comprise a con­secutive series of deposits from the bottom of the Lias up to the Oxford Clay. The Lower Middle and Upper Lias consist chiefly of shales and shelly limestones, with some sandstones, well seen along the shores of Broadford Bay in Skye and in some of the adjacent islands. The Lower Oolites are made up of sandstones and shales with some limestones, and are overlaid by several hundred feet of an estuarine series of deposits consisting chiefly of thick white sandstones, below and above which lie shales and shelly limestones. These rocks form a prominent feature underneath the basalt terraces of the east side of Skye, Raasay, and Eigg. They form the highest members of the Jurassic series, representing probably some part of the Oxford clay. The next Secondary rocks (Cretaceous) succeed them unconformably.

Rocks belonging to the Cretaceous system undoubtedly at one time covered considerable areas on both sides of the Highlands, but they have been entirely stripped off the eastern side, while on the western they have been reduced to a few fragmentary patches, which have no doubt survived because of the overlying sheets of basalt that have protected them. Some greenish sandstones con­taining recognizable and characteristic fossils are the equivalents of the Upper Greensand of the south of England. These rocks are found on the south and west coasts of Mull and on the west coast of Argyllshire. They are covered by white sandstones and these by white chalk and marly beds, which represent the Upper Chalk of England. Enormous numbers of flints and also less abundant fragments of chalk are found in glacial deposits border­ing the Moray Firth. These transported relics show that the Chalk must once have been in place at no great distance, if indeed it did not actually occupy part of Aberdeenshire and the neigh­bouring counties.

Above the highest Secondary rocks on the west coast come terraced plateaus of basalt, which spread out over wide areas in Skye, Eigg, Mull, and Morven, and form most of the smaller islets of the chain of the Inner Hebrides (Geology, vol. x. p. 362). These plateaus are composed of nearly horizontal sheets of basalt—colum­nar, amorphous, or amygdaloidal—which in Mull attain a thick­ness of more than 3000 feet. They are prolonged southwards into Antrim (Ireland), where similar basalts overlying Secondary strata cover a large territory. Occasional beds of tuff are intercalated among these lavas, and likewise seams of fine clay or shale which have preserved the remains of numerous land-plants. The presence of these fossils indicates that the eruptions were subaerial, and a com­parison of them with those elsewhere found among older Tertiary strata shows that they probably belong to what is now called the Oligocene stage of the Tertiary series of formations, and therefore that the basalt eruptions took place in early Tertiary time. The volcanic episode to which these plateaus owe their origin was one of the most important in the geological history of Great Britain. It appears to have resembled in its main features those remarkable out­pourings of basalt which have deluged so many thousand square miles of the western territories of the United States. The eruptions were connected with innumerable fissures up which the basalt rose and from numerous points on which it flowed out at the surface. These fissures with the basalt that solidified in them now form the vast assemblage of dykes which cross Scotland, the north of England, and the north of Ireland (Geology, vol. x. p. 312). That the

volcanic period was a prolonged one is shown by the great denuda­tion of the plateaus before the last eruptions took place. In the Isle of Eigg, for example, the basalts had already been deeply eroded by river-action and into the river-course a current of glassy lava (pitch- stone) flowed. Denudation has continued active ever since, and now, owing to greater hardness and consequent power of resistance, the glassy lava stands up as the prominent and picturesque ridge of the Scuir, while the basalts which formerly rose high above it have been worn down into terraced declivities that slope away from it to the sea. A remarkable feature in the volcanic phenomena was the disruption of the basaltic plateaus by large bosses of gabbro and of various granitoid rocks. These intrusive masses now tower into conspicuous groups of hills,—the Coolins in Skye, the moun­tains of Rum and Mull, and the rugged heights of Ardnamurchan.

Under the Post-tertiary division come the records of the Ice Age, when Scotland was buried under sheets of ice which ground down, striated, and polished the harder rocks over the whole country and left behind them the widespread accumulations of clay, gravel, and sand known as glacial deposits. The nature of the evidence and the deductions drawn from it have been already stated (Geology, vol. x. pp. 365-368). The youngest geological formations are the raised beaches, river-terraces, lake-deposits, peat-mosses, and other accumulations, which are related to the present configuration of the country and contain remains of the plants and animals still living on its surface (Geology, vol. x. pp. 256, 290, 369).

Physical Features.

The physical features of Scotland may be best realized by regard­ing the country as composed of three distinct belts of territory, differing from each other in their geological structure and con­sequently presenting striking contrasts in their scenery.

1. The Highlands, for convenience of description, are here re­garded as embracing all that part of the country which lies west and north of a line drawn along the Firth of Clyde, and thence diagonally in a north-easterly direction from the mouth of the river Clyde to the east coast at Stonehaven. Nearly the whole of this region is high ground, deeply trenched with valleys and penetrated by long arms of the sea. The only considerable area of lowland lies in the north-eastern counties, embracing the eastern part of Aberdeenshire and the northern parts of Banff, Elgin, and Nairn. Along both sides of the Moray Firth a strip of lower land intervenes between the foot of the hills and the sea, while farther north the county of Caithness is one wide plain, which is prolonged into the Orkney Islands. Seen from beyond its southern margin, the area of the Highlands presents a well-defined chain of hills, which rise abruptly from the plains of the Lowlands. This is best observed in Strathmore, but it is also conspicuous in the estuary of the Clyde, where the low hills on the south contrast well with the broken line of rugged mountains to the north. From any of the islands of the chain of the Inner Hebrides the Highlands along their western sea­front rise as a vast rampart, indented by many winding fjords and rising up to a singularly uniform general level, which sinks here and there and allows glimpses to be had of still higher summits in the interior. The northern margin is hardly less striking when looked at from the Moray Firth, or from the plains of Caithness or Orkney.

From a commanding summit in the interior the Highlands are seen to differ from a mountain chain such as the Alps, not merely in their inferior elevation, but essentially in their configuration and structure. They are made up of a succession of more or less nearly parallel confluent ridges, which have, on the whole, a trend from north-east to south-west. These ridges are separated by longitudinal valleys, and each of them is likewise furrowed by transverse valleys. The portions of ridge thus isolated rise into what are termed mountains. But all the loftier eminences in the Highlands are only higher parts of ridges along which their geological structure is prolonged. It is singular to observe how the general average of level of the summits of the ridges is maintained. From some points of view a mountain may appear to tower above all the surrounding country, but, looked at from a sufficient distance to take in its environment, it may be found not to rise much above the general uniformity of elevation. There are no gigantic dominant masses that must obviously be due to some special terrestrial disturbance. A few apparent exceptions to this statement rise along the western seaboard of Sutherland, in Skye, and elsewhere, but an examination of their structure at once explains the reason of their prominence and confirms the rule.

The general surface of the Highlands is rugged. The rocks pro­ject in innumerable bosses and crags, which roughen the sides and crests of the ridges. The forms and colours of these roughnesses depend on the nature of the rock underneath. Where the latter is hard and jointed, weathering into large quadrangular blocks, the hills are more especially distinguished for the gnarled bossy character of their declivities, as may be seen in Ben Ledi and the chain of heights to the north-east of it formed of massive grits and mica-schists. Where, on the other hand, the rock decays into smaller debris, the hills are apt to assume smoother contours, as in