range the northern branch of the Shenandoah breaks, turning at right angles to its former course and uniting with the southern branch at Manassas Gap, below which, towards the Potomac, the valley is but slightly broken by hills. South of that portion of the Great Valley drained by the Shenandoah is a region about 50 miles in length, in which are the head waters of the James. The various branches of this river, coming from north-west and south, unite at the western base of the Blue Ridge, and there break through it. The remaining portion of the valley belongs partly to the Roanoke and partly to the New or Kanawha and to the Holston. The rise of the Great Valley to the south-west is very marked, the point where the Shenandoah enters the Potomac being only 240 feet above the sea, while the head of the New river is in a region ranging from 2500 to 3000 feet. According to the official report, “ the aspect of this region is singularly pleasant. The great width of the valley, the singular colouring and wavy but bold outline of the Blue Ridge, the long uniform lines of the Kittatinny Moun­tains and the high knobs that rise up behind them in the distance, the detached ranges that often extend for many miles in this valley, like huge lines of fortifications—all these for the outline, filled up with park-like forests, well-cultivated fanns, well-built towns, and threaded by bright and abounding rivers, make this a charming and inviting region.”

The next division of the Appalachians, which may be called the middle belt, is perhaps the most interesting and peculiar although not the most persistent portion of the system. It is not until Pennsylvania is reached that it becomes important. Its character of this division is thus indicated by H. D. Rogers in the report of the First Geological Survey of that State :—" It is a complex chain of long, narrow, very level mountain ridges, separated by long, narrow, parallel valleys. These ridges sometimes end abruptly in swelling knobs and sometimes taper off in long slender points. Their slopes are singularly uniform, being in many cases unvaried by ravine or gully for many miles ; in other instances they are trenched at equal intervals with great regularity. Their crests are for the most part sharp, and they preserve an extraordinarily equable elevation, being only here and there interrupted by notches or gaps, which sometimes descend to the water-level, so as to give passage to the rivers. The whole range is the combined result of an elevation of the strata in long, slender, parallel ridges, wave­like in form, and of excessive erosion of them by water ; and the present configuration of the surface is one which demonstrates that a remarkable, and as yet little understood, series of geological events has been concerned in their formation. The ridges, which are but remnants of the eroded strata, are variously arranged in groups with long narrow crests, some of which preserve a remark­able straightness for great distances, while others bend with a pro­longed and regular sweep. In many instances two narrow contigu­ous parallel mountain crests unite at their extremities, and enclose a narrow oval valley, which with its sharp mountain sides bears not unfrequently a marked resemblance to a long slender sharp- pointed canoe. ” The system of ranges thus described crosses north­western Maryland, and is largely developed in Virginia, with char­acters in many respects resembling those which it displays farther north. It is a region of long, narrow, parallel valleys, separated by narrow, straight, and quite elevated ridges, of which no one rises greatly above the others. The number of these diminishes as we proceed in a south-westerly direction, and the belt narrows in proportion. The drainage on the extreme eastern border is into the Great Valley. The interior valleys in the northern half of the belt are traversed by streams flowing into the Potomac ; the southern half is mostly drained by branches of New river. In some cases the waters flow towards a central depression in the valley, and then break through the enclosing range. The rocks are Silurian, Devonian, and Lower Carboniferous. In its north-eastern exten­sion this division includes the anthracite region of Pennsylvania. The ridges by which the Appalachian belt proper is traversed are the result of a series of flexures of the strata, along numerous axes of elevation and depression, not complicated in Pennsylvania by extensive dislocations of the crust, or faults, either longitudinal or transverse, but gradually becoming so as we proceed towards the south-west. It is a curious fact that, in following in a south­westerly direction the Appalachian belt proper, we find that it disappears or merges in the Great Valley, which in Tennessee occu­pies the entire space between the Blue Ridge and the Alleghany plateau, there called the Cumberland tableland, and is fully 40 miles in width. The rocks which underlie the Great Valley are of the same geological age as those of which the Appalachian belt is composed farther north, but more closely compressed together, and complicated by great longitudinal faults, the whole area being a comparatively depressed one, and not broken by marked ridges. The true Appalachian belt is therefore limited to Pennsylvania, Virginia, and a very narrow space in Maryland, and here the system has its greatest width and most intricate and interesting topo­graphical features, but not its highest elevations, which occur north and south of this portion, in regions of greater and more irregular disturbance, complicated by metamorphic changes and irregular intrusions of eruptive material on a grand scale, making the task of unravelling the geological structure extremely difficult.

The most western member of the Appalachian system—the plateau—is the one of which the geology is most easily made out, and, while its eastern border is an important topographical feature, it merges so gradually in the great central or Mississippi valley, that any definition of its limits in that direction is quite impossible. The position and elevation of this plateau region in New York have been already indicated. Farther south this tableland occupies the western portion of Pennsylvania, nearly all West Virginia, a part of Kentucky and also of Tennessee, in which latter State it is called the Cumberland tableland, or the Cumberland Mountains, since it here presents itself exceptionally with abrupt edges on the west, as well as on the east, but it is narrowed down to a width of not more than 30 or 40 miles in the northern portion of the State and of much less in the southern. The bold escarpment with which the plateau faces the east in Pennsylvania is known as the Alleghany Mountains. It is continued in Virginia, but with much less distinctness. It is from this tableland that the waters of the Susquehanna descend to the Atlantic, crossing the entire Appalachian system in its course, while with the New river the condition of things is reversed, since this stream heads on the eastern edge of the range and flows across it in the opposite direc­tion from that of the Susquehanna.

Since the dip of the strata in southern New York and western Pennsylvania is generally to the southward, newer rocks occupy the surface as we proceed in that direction. The Coal-measures appear soon after the line of division of these two States is passed, and it is largely with rocks of this age that the tableland is covered through the whole of its southern extension. In fact the Appa­lachian coalfield, as it is called, presents an almost continuous mass of coal-bearing strata, extending from northern Pennsylvania to Alabama. A part of this field, however, notably in Ohio, reaches far beyond the topographical limits of the Appalachian region.

The Appalachian tableland is, even in Pennsylvania, not entirely destitute of marked topographical features. The axes which char­acterize the system farther east are not wanting, but the strata are raised and depressed by gentle undulations, and not broken by precipitous ridges. Much intricacy is given to the topography, in a small way, by the streams cutting down into the soft rocks.

Before leaving the Appalachian region it will be desirable to add a few words on the belt of Mesozoic rocks occurring on the Atlantic slope, which, although not forming a prominent topographical feature, are of much geological and palaeontological interest. This belt consists chiefly of sandstones of reddish-brown colour, with which are associated shales, and occasionally, especially in the lower portion, coarser materials—conglomerates,—which are sometimes well rounded by water, but in places almost breccia-like in character. These rocks are first seen, on the north-east, in New Brunswick, in Nova Scotia, and on Prince Edward Island. In New England they are limited to the valley of the Connecticut river, with a small parallel area a little to the west of this in the towns of Southbury and Woodbury, Connecticut. The Connecticut valley Mesozoic area is about 150 miles in length, with a maximum breadth of about 14. The largest belt, however, is that extending from the west side of the Hudson river, along the south-eastern side of the South Mountains and Blue Ridge, through New Jersey, Pennsylvania, and Maryland, to about the centre of Virginia, having a maximum width of about 30 miles and a length of some­what over 300. There are other smaller areas of the same rock in Virginia and in North Carolina,—that of the last-named State extending a short distance into South Carolina. Associated with this sandstone is a considerable amount of igneous rock, which occurs in the form of dikes and overflows, which, as the sandstone has been worn away by erosive agencies, occasionally stand out quite conspicuously, although nowhere reaching an elevation of more than a few hundred feet. Some well-known and much visited localities, such as Mount Tom and Mount Holyoke in Massa­chusetts, the Hanging Hills and East and West Rocks in Connecti­cut, and the Palisades in New York, are of this character. The fossils which the sandstones contain are not numerous, but are of much interest, and the geological age assigned to this formation by most palaeontologists is the Triassic. In several localities, how­ever, great numbers of footprints of animals occur, which were long considered to be those of birds, but are now known to belong —in considerable part, at least—to the *Reptilia,* some of which had certain features allying them to birds. The paucity of fossil remains, other than footprints, found in these rocks has rendered the working out of their true relations a matter of considerable difficulty. The latest investigations of Prof. Fontaine show that the Mesozoic areas of Virginia are separable into two quite distinct groups, an older and a newer, the floras of the two being quite different. It is in the older Mesozoic of Virginia, and in the most easterly area, near Richmond, that the coal occurs which was the first worked in the United States. The stratigraphical relations of the Mesozoic sandstones are difficult of comprehension, and have been the occasion of much discussion.