SUMMARY OF GEOLOGIC HISTORY.

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Little is known of the Paleozoic and early Mesozoic history of the Republic. The schistose limestones of Tortue Island, which are probably marine, are of Paleozoic or early Mesozoic age, but the distribution of land and sea when they were laid down and later events in early Mesozoic time are not known. The intensely metamorphosed schists found as float on the North Plain and the Léogane Plain are altered igneous and sedimentary rocks at least as old as the schistose limestones. There may be relatively large areas of these ancient rocks in some of the unexplored rugged mountains, such as the Montagnes de la Hotte. They were formerly extensive in the eastern part of the Massif du Nord, as younger rocks contain material derived from them.

The known Mesozoic history begins with a long-continued period of vulcanism in the northern part of the Republic. There were extensive flows of basaltic lavas, followed by flows of andesitic and dacitic lavas. At some places, basaltic flows followed the andesitic lavas. The flows came from non-explosive vents, as very little pyroclastic material accompanies them. These volcanic rocks probably are largely of Jurassic age. The earlier basaltic lavas are very much altered and at places have been converted into greenstones and amphibolites. No trace was found of the Triassic sea that extended westward from the European Mediterranean to Cuba and Mexico, carrying with it a Mediterranean and later a north European fauna.

The early volcanic rocks of the northern part of the Republic were then attacked by weathering and erosion and the material derived from them was deposited along the flood plains of streams that carved wide, gently sloping valleys. Some of the material was laid down in shallow seas that extended over an unknown part of the country. These nonmarine and marine rocks are the argillites and limestones of supposed Lower Cretaceous age. At the same time shallow seas covered a large part of the present Southern Peninsula and the limestones found at many localities were laid down on a basement of unknown rocks.

In Upper Cretaceous time a shallow sea covered at least part of the northern part of the Republic. Its limits are not known, as the rocks of this age that were found probably are mere remnants. A typical Mediterranean fauna, consisting principally of Rudistid mollusks, flourished in this sea. At places the Upper Cretaceous limestone is a Rudistid reef, consisting of masses of valves, some of which are a meter or more in length. This fauna, apparently of late Upper Cretaceous age, has been found in St. Croix, Porto Rico, the Dominican Republic, Cuba, and Jamaica, but it seems to be most extensive in Jamaica.[1]

While this sea covered parts of the northern part of the Republic there were fissure eruptions in the southern part, covering low-lying lands with thick flows of basalt that is remarkably uniform from the Massif de la Selle westward to the end of the Southern Peninsula. Material derived from these flows and some of the flows themselves were deposited in shallow marginal seas.

Mesozoic time apparently was closed by a period of folding, but it is difficult to ascertain, in most places, what elements of the present structure are due to Mesozoic movement and what to later Tertiary movements. Intrusions of batholiths and stocks of quartz diorite accompanied or followed the folding in the northern part of the Republic, altering the old volcanic rocks near the contacts to amphibolites and to chloritic and talcose schists. These masses of quartz diorite are exposed by erosion from the Dominican border westward to the Northwest Peninsula. The largest exposed batholith is in the eastern part of the Massif du Nord, and this region was very rigid during later time.

Early Eocene time was a period of erosion, and if there were then any highlands they were rapidly worn down, exposing in the northern part of the Republic the batholiths and stocks of quartz diorite. During middle Eocene time the sea covered part of the Massif du Nord and the Northwest Peninsula, and in it the Plaisance limestone, which carries a Mediterranean fauna, was deposited. The trough in which this limestone was laid down probably was much larger than the present outcrop of the limestone, but its boundaries are not known.

The extensive transgression of the sea in late Eocene time is one of the outstanding features of the Tertiary geologic history. Its shallow waters covered almost the entire Republic except the northeastern and probably the western parts of the Massif du Nord. The many different kinds of limestone, which cover so large an area, were deposited in this sea. Foraminifera of Mediterranean aspect are the most common fossils in the rocks. At the end of Eocene time the sea withdrew and for a period there was apparently folding, the results of which, however, are almost as obscure as those of the folding at the end of Cretaceous time.

Early Oligocene time, it seems, like early Eocene time, was a period of widespread emergence and erosion. The sea returned again in middle Oligocene time, but its transgression was less extensive than in late Eocene time. A shallow sea covered large areas, particularly in the central part of the Republic, which was very mobile during Tertiary time. The rocks of middle Oligocene age, like the Eocene rocks, are limestones, indicating that the waters were clear. The history of the events between middle and upper Oligocene is rather obscure. During this interval there were flows of

[1] See recent articles by C. T. Trechmann, The Cretaceous and Tertiary question in Jamaica: Geol. Mag., vol. 59, no. 699, pp. 422-431, 3 text figs., 1922; The Barrettia beds of Jamaica: Geol. Mag., vol. 59, pp. 501-514, pls. 18-20, 1 text fig., 1922.

nephelite basalt in the Montagnes du Trou d'Eau. Farther west, near Saut d'Eau, the volcanic activity may have been of Miocene age. The nephelite basalt and other basalts interbedded with Miocene sedimentary rocks on the southwest slope of the Chaîne des Mateux represent the last known period of volcanism. The late Oligocene sea covered a smaller area than the middle Oligocene, the largest areas being in the mobile central part of the Republic. The upper Oligocene rocks are limestones. The most common fossils in both the middle and upper Oligocene limestones are Foraminifera and corals of Mediterranean aspect.

The end of Oligocene time was a period of extensive elevation except possibly in the central part of the Republic. Detrital débris derived from the highlands was carried into the Miocene sea as it advanced. Near old land masses, as in the Central Plain, the Miocene rocks consist almost entirely of detrital material, although clearer waters at intervals permitted the establishment of coral reefs. The early Miocene trangression was the most extensive except that in the late Eocene. The sea covered all of the Northwest Peninsula except the central part, all of the central part of the Republic, and parts of the Southern Peninsula. This was the last extensive transgression and also the last appearance of a Mediterranean fauna. It would be more correct to consider the Mediterranean Tertiary faunas as having a West Indian aspect. Many of the genera of mollusks found in the Miocene Tertiary faunas of the West Indies and the Mediterranean region are now living in the West Indies but are extinct in the Mediterranean Sea. The present Mediterranean fauna is the result of invasions of northern genera in Quaternary time. The sea probably covered the Cul-de-Sac Plain and marginal parts of the Southern Peninsula in middle Miocene time. Nonmarine deposits in the interior of the Southern Peninsula seem to be of the same age.

Toward the end of Miocene time there was a period of folding that determined the tectonic features of a large part of the Republic. Intrusions of quartz diorite and granodiorite in upper Eocene beds may have accompanied or followed this folding in the Montagnes de Terre-Neuve. The mountain ranges in the central part of the Republic coincide with anticlinal arches formed at the end of Miocene time. It is not known whether the arches were elevated as mountains at the same time. Miocene and even older rocks are completely removed from their crests, and in the Chaîne des Mateux there is evidence of peneplanation. All this erosion may have taken place when the present mountains were at a lower altitude. The mountains in the northern part of the Republic and in the Southern Peninsula probably have been highlands since the end of Oligocene time, although they may have shared in the elevation after the Miocene folding. The normal faults bounding the Trois Rivières trough seem to be later than the folding and may be genetically related to the elevation of the mountains that followed the folding.

During middle or late Miocene time the West Indian islands were apparently larger than they are now, and they may have been joined to South or Central America, thus permitting the invasion of a mammalian fauna of South American aspect, principally rodents and ground sloths. These mammals are represented by Quaternary remains found in caves, such as those explored near St.-Michel de l'Atalaye. The folding and faulting begun toward the end of Miocene time probably outlined the island of Haiti as we now know it.

So far as known the sea covered only small areas near Jacmel and Petit-Goave in Pliocene time. The corals and mollusks in the beds in these areas are very similar to living West Indian species. The period of folding begun in Miocene time continued after these beds were deposited.

At the beginning of Quaternary time the sea covered the western part of the Northwest Peninsula, the Cul-de-Sac trough (which divided the island into two parts), and other smaller areas along the present coast. These regions have emerged since then. In the Northwest Peninsula and the mobile central part of the Republic, where the emergence apparently is still continuing, the marine Quaternary rocks, or reef caps, are at a higher altitude on the crests of the anticlines, indicating that folding is still continuing. If observations could be extended over a long period it might be possible to determine the rate of emergence in the Northwest Peninsula, where Quaternary reef caps have an altitude of 400 to 450 meters above sea level.

In the San Juan Valley of the Dominican Republic basaltic lavas of Pliocene or Quaternary age rest on Pliocene gravels. No trace of these lavas was found in the Central Plain.

Folding and mountain-making have been active in the Republic since late Tertiary time and therefore earthquakes are frequent. There is no reason to believe that their frequency will diminish.