

# THE GEOLOGICAL STRUCTURE AND GROWTH OF THE CARIBBEAN AREA\*

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## ABSTRACT

The greater and lesser Antilles owe their origin to the existence of mountain trend lines which are part of the Western Cordillera of North and South America. The relief of these mountains considered from the adjacent ocean deeps to the summit of Puerto Trujillo is greater than that between the Bay of Bengal and Mount Everest.

The development of the present Geology is connected to the erosion of the emergent peaks, the growth of fringing coral reefs and vulcanism.

The Caribbean Area is the connecting link between North and South America. It lies within the tropics. The Greater Antilles comprise Cuba, Jamaica, Hispaniola and Puerto Rico. The Lesser Antilles are formed of a great many islands which extend from the east end of Puerto Rico and swing in a great arc to the south and southwest and on to the shores of Venezuela.

The topographical features of the Greater Antilles are really on a grand scale especially if the underwater relief is taken into account.

To the north of the east end of Hispaniola and Puerto Rico there is the Nares or Brownson Deep. (Fig. 1.)

If one recalls that the height of Everest is 29,002 feet and allows a thousand feet for the depth of the Bay of Bengal, the relief from the top of Lona Tina (Punta Trujillo) to the floor of the Brownson Deep is between 7,000 and 10,000 feet greater. In a very real sense the peoples of the Caribbean islands are living on the mountain tops. (Fig. 2.)

We may now ask why are there these divergences from the Cordilleran trends of the two Americas? The answer involves the whole conception of mountain-building. We start with a trough or geosyncline whose course is determined by the Continental Shields or cores and the downwarps or presence of what some writers call the Siallic islands. (Douglas 1951, 1954)

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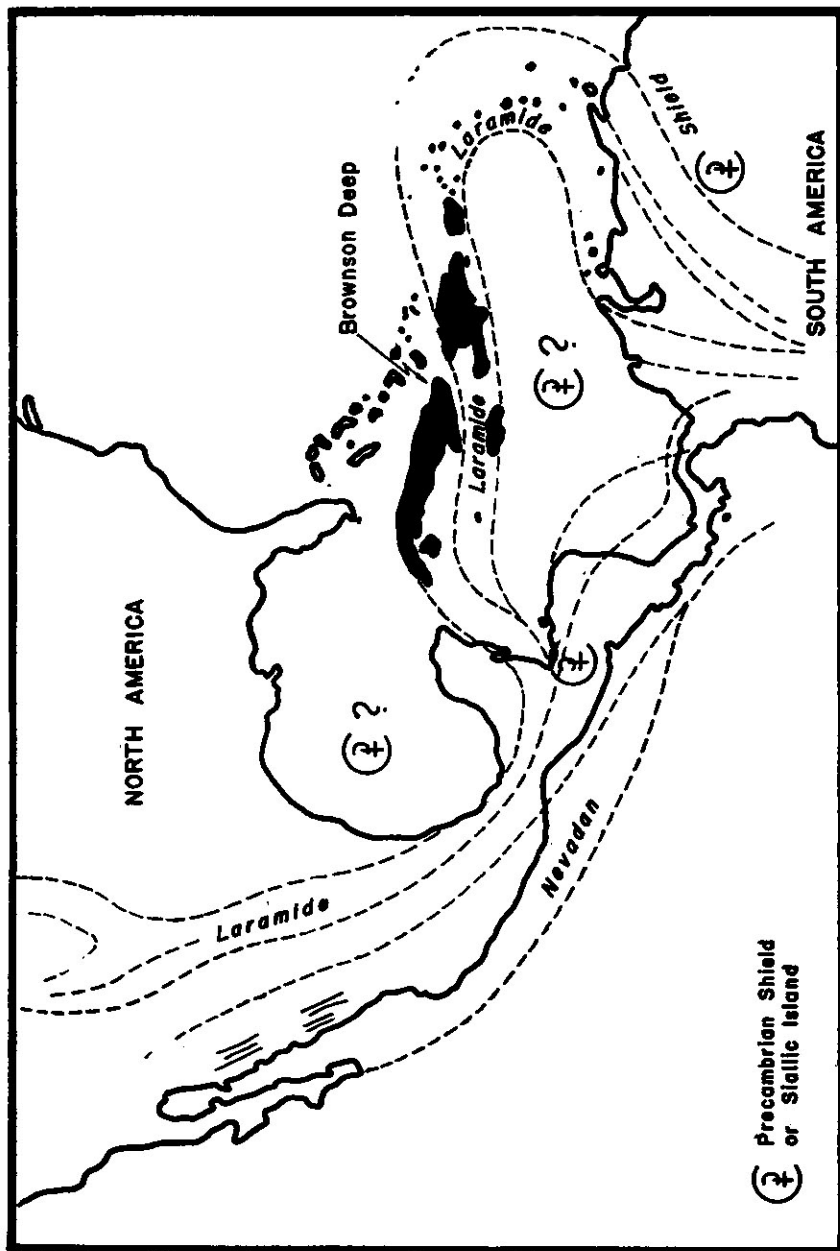


Fig. 1. Trend lines in the Caribbean Area.

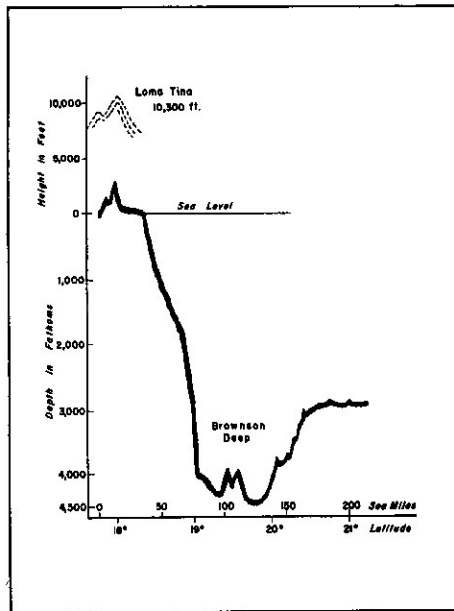


Fig. 2. Section from Hispaniola to N.E. Vertical Scale greatly exaggerated.

The detritus from the erosion of these old masses supplied the material for the veneer of sediments which is deposited in the troughs. As these shields and siallic islands are unloaded so they tend to rise and as the troughs are loaded so they sink. A time approaches when the earth's mantle must occupy a smaller area because the interior is shrinking. The shields and siallic islands act as units, to a great extent incompressible within themselves, for they have previously been compressed almost to the limit, and therefore they act as units. As these units approach each other they wrinkle up the veneer of sediments deposited in the troughs and these wrinkles constitute the great mountain trend lines of the earth's surface. (Fig. 3.)

If these concepts be now applied to the Caribbean area it will be seen that the presence of these old nuclei must be sought. In South America we have the Brazilian and Guianan Shields. (Fig. 1.) In Central America there is an ancient core in Honduras.

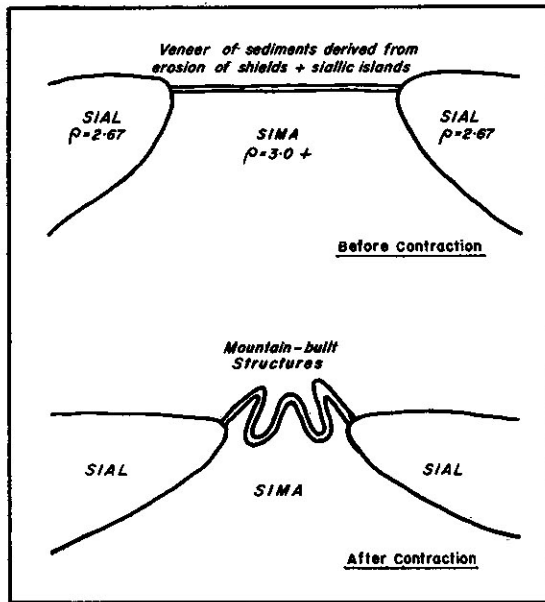


Fig. 3. Hypothetical Sections illustrating formation of mountains as result of movement of strong blocks of Earth's crust.

A deep bore in Florida encountered metamorphic rock at over a thousand feet. It is suggested here that the Gulf of Mexico and the elliptical area underlying the Caribbean Sea are sunken siallic blocks. (Fig. 1.)

In the greater Antilles there is some doubt about the age of any rocks older than the Mesozoic. It is as if we in Nova Scotia knew nothing older than the new red sandstones of the Triassic which can be seen near Truro and in the Annapolis Valley.

At various times in the history of North America there have been periods of mountain-building. Some of these periods have definitely affected the Caribbean area. Two are certain:—the Laramide which occurred at the close of the Mesozoic and the beginning of the Tertiary and an uplift in the Miocene.

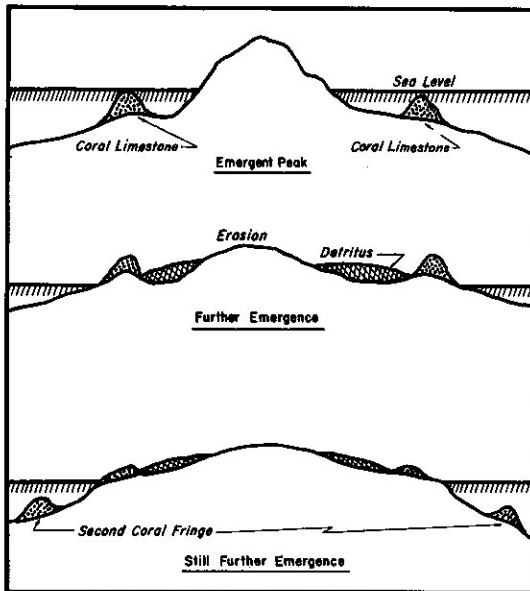


Fig. 4. Stages in growth of a tropical island.

Let us now consider the effects of a mountain peak emerging from the surface of the sea and trace the general processes which are in operation.

A study of the islands, especially Jamaica, shows that emergence is followed by erosion and that because of the position of these islands in the tropical waters with their abundant forms of life, fringing reefs begin to grow in the surrounding shallow waters. (Fig. 4.)

The Rochelois Bank off Port au Prince, Haiti, furnishes an excellent example of what happens.

If the emergence is of considerable dimensions the erosion produces detritus in the form of conglomerates and coarse sediments which fill in the moat-like depression between the emergent peak and the coral fringe.

Successive uplifts or depressions add to this simple picture but the principles involved remain the same.

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