Rock Blisters Formed Continents

Geology

New ideas on the formation of continents, of the origin of the Gulf of Mexico, movies of the earth's activity and the future of a vanishing island, as presented to the geologists attending the A. A. A. S. meeting in New York are here described.

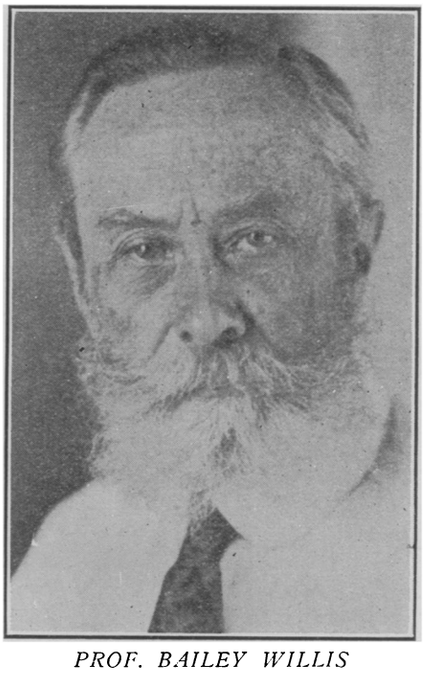
Immense blisters of molten rock, 30 to 100 miles below the surface of the earth, several hundred miles across and sometimes a million cubic miles in volume, taking several millions of years to form and burst, are the cause of continents forming on the earth, Prof. Bailey Willis of Stanford University postulated in his address as president of the Geological Society of America.

The compression of the interior of the earth by gravity is the source of heat that melts the rock to form these fluid masses, Prof. Willis explained in announcing this new idea of continental origin and development. Concentrations of the heat generated by the immense pressures, at places amounting to over twenty million pounds per square inch, occur under the surface layers of the earth and create the great blisters of molten material, to which Prof. Willis gives the name "asthenoliths."

"The cover of the blister consists of crystalline rock and when heated crystals change their form in response to pressure, even while they remain solid," Prof. Willis said in explaining how the asthenoliths break. "The lower part of the cover is heated and is squeezed between the weight of the upper layers and the incompressible magma. The crystals grow sidewise, horizontally, and in so doing exert pressure against the rigid portion of the Earth's crust around the margin of the blister. As the blister grows this pressure increases and the cover eventually presses out at the margins and breaks. The break will not be vertical, but sloping outward, what in mechanics is called a shear.

"Eruptions of magma follow the break and rising beyond the blister build up the adjacent surface. Partly emptied, the blister diminishes in volume and the cover must sink, cracking and allowing molten rock to rise through it. There will result a depression or basin, equal in volume to the magma that escaped at the sides.

"Such is the origin of the smaller depressions that are the deeper parts of ocean basins. Volcanic ridges, which often carry lofty volcanoes like Teneriffe, the Windward islands of the Caribbean, or the Hawaiian



PROF. BAILEY WILLIS

chain, surround them. Eruptions occur from time to time in their floors and the beds of the basins are known to consist of basalts, a common kind of magma."

During this process the more siliceous minerals of granite, the gray, pepper-and-salt rock, separate out first, Prof. Willis explained, forming the masses of rock that constitute the heart of continents.

"A very large number of eruptions, a great many asthenoliths, an enormous lapse of time must have been required to form Africa, Eurasia and the Americas in this way," Prof. Willis said. "But the ages need not embarrass us and the complex structure of each of the continents corresponds with the multiplicity of actions required by the theory.

"Is the Earth dead? Are the ocean basins and continents made and finished? Are there no active asthenolithes? And if there were what would you look for? Why a depressed area, margined in part at least by volcanic zones, bordered by lands composed in their foundations of older eruptive rocks.

"There is the great deep off Japan and the chain of volcanoes dominated by Fujisan. There is the deep off the Aleutian islands with Katmai and many another volcano. There is the Atacama deep off central Chile and the volcanoes that rise in the Andes. There are many others in the Pacific, and the East and West Indies. Only the Atlantic region appears now to be relatively cold, though perhaps warming up to become active some millions of years hence."

Mexican Gulf New

A hundred million years ago there was no Gulf of Mexico, Prof. Charles Schuchert of Yale declared in his vice-presidental address before the geological section of the American Association for the Advancement of Science.

Not until the geological age called Cretaceous, the end of the age of reptiles, when the dinosaurs were on the decline and the birds and mammals were in their childhood, did that deep water basin come into being and then it was at least three times its present size.

Then the area of the Gulf of Mexico, northern Central America, most of the Greater Antilles, all of eastern Mexico and all of the Gulf States from Texas north to Illinois and east to Florida was submerged by this greater gulf of marine waters. This condition endured for some tens of millions of years, and then in Miocene time began elevating movements that have continued intermittently to the present, bringing on the geography as we now know it.

"When the flood was greatest, Costa Rica and Panama had grown from the bottom of the Caribbean Sea through Vulcan's outpourings until they had piled up the land bridge uniting North and South America," Prof. Schuchert said. "Costa Rica, however, soon subsided and the Caribbean again sent its Gulf Stream into the Pacific during another ten million years. Then came permanent closure through elevation, along with more volcanic activity. The Gulf of Mexico shortly afterward, geologically speaking, began spilling across the Tehuantepec region, and this new portal remained an open seaway into the Pacific for a few million years. Decided elevation then set in almost everywhere and soon all was land again between Central America and Mexico; and the plants and animals have had dry land for intermigration between North and South America ever since.

"When Costa Rica-Panama became dry land (*Turn to next page*)

Geological Meetings—*Continued*

for the first time, at the eastern end of the Caribbean Sea there also began to rise from the depths of the Atlantic Ocean a long string of submarine volcanoes, and about 50 million years ago the northern half of them appeared as the Caribbee volcanic islands, many of which have ever since retained intermittently active volcanoes. The newest of these volcanoes are the southern Caribbees.

"The present geography came into existence more than a million years ago, but during this short geological interval the islands grew somewhat larger when northern North America and Europe were deeply covered by ice, but shrunk to their present dimensions when these ice sheets melted back into the ocean, thus returning the water that had been taken from it."

Earth's Activity in Movies

The earth growing before one's eyes, streams in flood, volcanoes erupting, waves smashing, portrayed on a motion picture film, will play an important part in the education of future geologists, Prof. Kirtley F. Mather of Harvard predicted to the Geological Society of America in exhibiting special reels of educational motion pictures.

Laboratory experiments can be made once under ideal conditions and shown to large classes many times without the danger of failure if they are recorded on movie film, Dr. Mather said. Animated drawing showed how earthquake vibrations travel through the interior of the earth and record themselves on seismographs.

Island to Vanish Again

Falcon Island, the jack-in-the-box of the Pacific, which has two disappearances and three volcanic reappearances to its credit, will be again destroyed by the waves within a few years if there is no further volcanic action, the Geological Society of America was told.

Profs. J. Edward Hoffmeister and Harold L. Alling of the University of Rochester and Prof. Harry S. Ladd of the University of Virginia reported the results of a visit paid the South Pacific volcano last summer just two weeks after a violent eruption. The island, two miles in diameter and 365 feet high at its peak, rose above the sea in October, 1927. It is composed entirely of ash and other volcanic material. The crater is occupied by a boiling sulphurous lake that rises and falls with the tides.

Science News-Letter, December 29, 1928

The Origin of "Protoplasm"

Biology

D. F. Fraser-Harris in *Coloured Thinking* (Brentano's):

We cannot think nowadays of living things without thinking of the name for the living substance itself, protoplasm, or "the physical basis of life", as Huxley called it in his famous definition. The word protoplasm, which is the Greek for the "first formed thing", was first used by a Bohemian physiologist, J. E. Purkinje, in the year 1839 to describe the living substance composing animal embryos as in the egg, material not as yet even differentiated into the embryo. Soon biologists began to use "protoplasm" to describe living substance wherever found, whether in plant or animal, in the embryo, in the young or in the old.

No less a man than Goethe himself coined the word "morphology", which is the proper term for the science of the study of the form or structure of an animal. "Anatomy" is the more familiar term, but anatomy means merely a cutting up. As a term, "anatomy" has no reference to the structures laid bare by the cutting up, whereas morphology means precisely a discourse about forms.

From visible forms we may pass to invisible, and at once think of "microbe." This is rather an interesting word, because, as it stands, it means in Greek a short life rather than a small living thing. It is, however, always in the latter sense that it is used, and in this sense it was coined by a friend of Pasteur, the French surgeon, Charles Sedillot, in 1878. The allied term "bacterium", now in such general use for one of the species of microbes, was first employed in its present meaning in 1865 by the well-known French physician, Dr. Casimir Davaine, the discoverer of the germ of anthrax.

Science News-Letter, December 29, 1928

A bronze tablet has been placed on the house at Oberlin, Ohio, where Charles M. Hall, a young college graduate, discovered the first commercial process for making aluminum, in 1886.