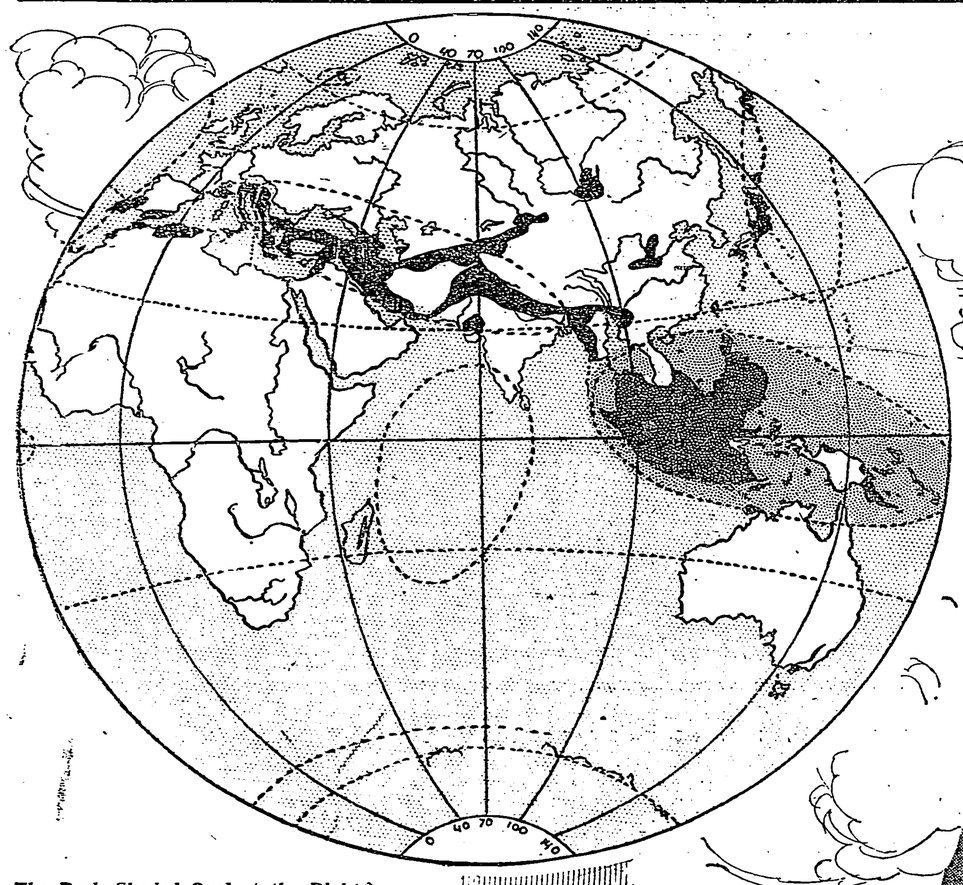
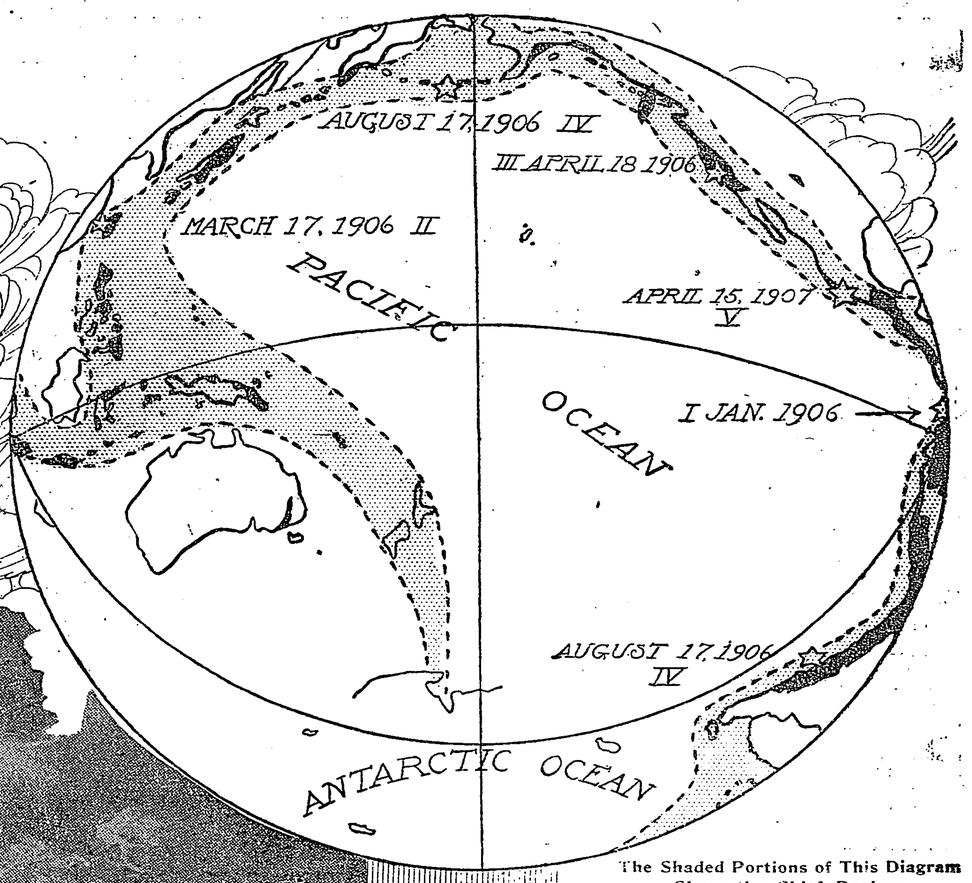
# A NEW CONTINENT MAY BE ADDED SHORTLY TO THE WORLD



The Dark Shaded Oval at the Right of This Map Shows Where the New Continent Is Expected to Arise.




The Shaded Portions of This Diagram Show the Chief Regions of Earthquake.

## Result of Earthquake Activity in the Region of the Philippines Southeastward Toward the Middle of the Pacific Ocean.

THE earthquake has been harnessed. Scientists are keeping tally of them all over the world, recording not only the mighty upheavals, but vibrations that cannot be felt by people on the earth above them. Surveyors' levels and cameras are focused on landscapes to detect the slightest changes in the earth's surface. The observers are exchanging notes by a system of communication so complete that it reminds one of the hundred links in the little ropes by which the Lilliputians held Gulliver. A new seismology has arisen from this system and deductions from earthquake records extending back to the beginning of the Christian era obtained. And from this knowledge has arisen a big, impressive fact: There is reason to believe that another continent is rising from the sea, with Java, the Philippines and Northern Australia as its visible beginnings.

This startling suggestion was made at the meeting of the British Association for the Advancement of Science held in Sheffield, England, this month. The fact was imbedded in a statement so prosaic as the compilation of an earthquake catalogue. But when the data were compared with other knowledge at hand and simplified and explained by American scientists the awe-inspiring suggestion of the new continent rising above the waters became plausible, even convincing. In seeking this explanation, too, a story was developed of fascinating interest.

The announcement, as summarized in The London Times, was to the effect that Sir Archibald Geikie had presented to the Department of Geology of the British association a report drawn up by Prof. J. Milne, Secretary of the Committee on Seismological Investigations, which recorded the progress made with a new catalogue of large earthquakes.

The committee had completed, down to 1900, a list of all the destructive earthquakes recorded in history. They dated from the beginning of the Christian era and numbered more than 4,000. The record, continued the report, referred only to earthquakes which had been accompanied by changes of the earth's surface and extended over large areas. In many instances these disturbances had resulted in adjustments of the earth's crust of geological importance. The sources from which the materials had been drawn included Japanese and Chinese catalogues.

Continuing, the birth of the new continent was suggested. It was pointed out that the most pronounced earthquake activity of modern times is along a line or band of weakness in the earth's surface, running from the southern extremity of the Philippines and Java in an east-southeast direction toward the middle of the Pacific Ocean. In the islands that stud this area, with their intervening troughs, are seen the outcrops of mountain ranges of Himalayan proportions. A further upheaval of no greater relative importance, it was asserted, would mark the birth of a continent.

This statement was taken to Prof. Charles P. Berkey of the Department of Geology of Columbia University. He was asked to explain on what theories such a suggestion was based.

"The best way to describe continent-building," said Dr. Berkey, "would be to say that the general masses of the land remain while parts of them have shifted from time to time, now at one point, now at another. From what we know it is reasonable to believe that the continents—North America, Europe, Africa, and the rest have always existed, although their contours have changed. These alterations are usually at the edges of the land masses. Parts of them would sink below the sea level, receive deposits of sediment, then be raised again, while other portions sank, and so on, sections rising and sinking many times. You may judge of how frequent these changes have been from the fact that between New York and the Catskills there are no less than thirty-five distinct strata, each representing a deposit while the land as we know it was submerged. Some of these strata, too, are 1,000 feet thick."

There could hardly be an example of this more striking than the site of New York City. The rocky ridges of Manhattan and the Palisades were once mountain tops. Between them the Hudson River flowed through a deep cañon. Reaching Staten Island, this river spread out over tide-swept marshes extending toward the sea. Through this the river wound a distance of 100 miles before it finally flowed into the ocean.

Then came a mighty cataclysm of nature. The marshes sank below the sea level. With them went the mountains and river bed. The tides of ages gradually filled the fissure with mud. Glaciers sweeping from the north, with an ice cap in the Adirondacks, transformed the interior of New York State into a great lake and left their terminal moraines in the heaps of gravel, pebbles, and rounded boulders on Staten Island, Long Island, and Connecticut.

This example also impresses another point in the story of the new continent in the Antipodes. While the land masses of a continent may be called roughly permanent in their outlines, the land that is visible above the sea and the continental platforms that are submerged vary so greatly from age to age that common ideas of geography would be entirely at fault while tracing their outlines on a modern map. The land masses remain, so far as the geologists are concerned, whether visible or submerged. They form a continental platform under water as distinguished from the deep sea.

To make this clear, Dr. Berkey referred to a statement on continent building by R. D. George, State Geologist of Colorado, in a standard work on geology by Thomas C. Chamberlin and Rollin T. Salisbury. Mr. George said:

"True continent-forming movements appear to have antedated the earliest known sediments. As far back as we can read the sedimentary records, the continents seem to have been well established, and there is little evidence that they have since been fundamentally changed.

"It is true that some very eminent geologists have rather freely connected formations on one continent with formations having similar faunas on an opposite continent by a hypothetical conversion of the intervening ocean bottoms into land or shallow water; but most such faunal relations can be explained almost equally well by migration around the coasts, or, at most by mere ridge connections.

"Dynamic considerations also offer grave difficulties. The doctrine of the persistence of continents probably ought not to be pushed so far as to exclude shallow water, or even land connections between South America, Antarctica, Australia, India, and South Africa, directly or indirectly, at certain stages of geological history. Without forming final conclusions as to the measure of the change which the continents have suffered during known geological history, it is safe to conclude that the continents and ocean basins were, in the main, formed very early in the earth's history, and that subsequent changes have consisted chiefly in the further sinking of the basins and the further protrusion of the land, save as the latter has been cut down by erosion.

Herein lies a significant point in the suggestion of the new continent to the British Association. Mr. George will not say that the persistence of continental masses excludes shallow waters or even land connections between Antarctica, Australia, and India. Do such possible connecting links belong to the past or to the future? According to Dr. Berkey there is reason to believe that the region centring around the Philippines and Java and thence east-southeast into the Pacific, visible and submerged, does not belong to the abysmal depths of the sea, but is a continental platform which now happens to be largely submerged.

The accompanying maps fix the place of this continental mass on the earth's surface. In one is outlined the "fire ring of the Pacific," or the circuit of greatest activity in earthquakes and volcanic eruptions on that ocean. More will be said of this later. But it will be noted that on the western side of the "ring" a long, tongue-shaped area of earthquake disturbance extends from China, through the Philippines and New Zealand, thence under the Pacific to the Antarctic continent. The other map shows the zones of the great seismic activity in the Eastern Hemisphere. The egg-shaped area in Oceania, southwest of Asia and extending into the Pacific, is the zone reported to the British Association as that of the most pronounced earthquake activity in modern times. Herein are included the lands above the waters and the submerged platforms comprising the new continent.

"To what other continent could this continental platform be compared?" the reporter asked Dr. Berkey. "South or North America, Europe—"

"It is possibly as large as Australia," the geologist replied.

What such a continent would mean can hardly be appreciated by a glance at a map. The zone of earthquake activity in the egg-shaped area is more than 4,000 miles long. Within its boundaries are the Philippines, Siam, Sumatra, Borneo, Java, Celebes, portions of New Guinea, and the northern part of Australia, not counting hundreds of small islands.

Were it as large as Australia the new continent would have an area of 2,978,000 square miles. It would be about one-fifth smaller than Europe and comprise 80 per cent. of the area of the Dominion of Canada. Counting in only the larger islands and peninsulas, the continental platform would comprise nearly 1,000,000 square miles now above the level of the sea and about 2,000,000 square miles that are still submerged.

The areas of the larger countries within the zone are as follows:

| | Square Miles. |
|---|---|
| Philippine Islands | 127,853 |
| Siam | 220,000 |
| Sumatra | 161,612 |
| Borneo | 212,737 |
| Java | 50,554 |
| Celebes | 71,470 |
| New Guinea | 151,789 |
| Total | 996,015 |

While considering such vast land masses, whether above or below the level of the sea, the instability of the earth's surface and radical changes in the continents as we know them both play important parts. As has been hinted, one would hardly recognize the map of the world in some of the stages of continent building. The creation of North America will serve as an example.

Robert T. Hill, who is considered one of the most expert living geologists in connection with the southwestern sections of this country, recently described the building of North America to the writer substantially as follows:

The mountains we know as the Appalachian chain once followed the Atlantic Coast as at present, but continued across the Mississippi Valley, Arizona, New Mexico, and California, and out into the Pacific Ocean. In a great upheaval of nature the mountains in the interior of the country sank and a continuous inland sea was formed from the present Gulf of Mexico to Hudson Bay. The Rocky Mountains, upraised, rent the continuous ridges of the prehistoric Appalachian chain near the Mexican border. To these were added a third line of upheaval along the Pacific Coast. This is the earthquake belt which caused the San Francisco disaster. It emerges from the Pacific and intersects the Rocky Mountain chain and the ruins of the prehistoric Appalachians near the Mexican border, then extends eastward through the West Indies. In the meantime the bed of the inland sea, with its strata of mud and clay, was upraised until it became solid land again. Thus the present Mississippi Valley came into existence and North America began to assume its present appearance.

The theory of a continent upraised in Oceania becomes more reasonable when one reflects on changes such as those described in North America. To such general outlines, too, are added many historical instances of the instability of continents, especially along their borders.

Here are some of the most conspicuous examples in recorded history of earthquakes or volcanic eruptions adding to the land above the sea or swallowing it up in the waters:

1663—In an account of widespread earthquake in Canada in the "Jesuit Relations," a report is given of a "little mountain" near the Bay of St. Paul "on the river bank, a quarter of a league or nearly that in circumference" which was swallowed up in the waters and, as if it had only taken a plunge, came up changed into a little island." Further down the St. Lawrence River, near Pont Aux Allouettes, "a whole forest became detached from the mainland and slid into the river."

1692—The former city of Kingston, Jamaica, was submerged.

1751—During an earthquake in San Domingo, twenty leagues of seacoast suddenly sank into the sea and the site has since formed a bay.

1755—In the great Lisbon earthquake, costing 60,000 lives in six minutes, portions of the sea coast between Cape da Roca and Cape Carvoeiro fell into the sea. The new Lisbon quay suddenly sank into the water with an immense crowd of people.

1762—Sixty square miles of the coast of Hindustan was permanently submerged.

1783—An earthquake shook Calabria and Northeastern Sicily, costing 30,000 lives. Rocks rose on the Calabrian plain. Neighboring mountains were elevated. Houses were depressed or swallowed up in fissures. Wells were forced out of the ground until their copings resembled small towers. From the rock of Scilla large sections of cliff were broken off and at one place a section a mile long was thrown into the sea.

1887—An earthquake at Sonora, on the northern border of Mexico, was accompanied by geological changes which make it rank among the greatest of world upheavals. A range of mountains, the Sierra Teras, were uplifted between faults which opened on either side. Millions of cubic feet of rock were thrown down from the slopes into the cañons and water courses, the largest amount of vertical displacement being about 20 feet.

1899—In September of this year the contour of a large area in Alaska was modified by a serious earthquake. Geologists visiting Yakutat Bay in 1905 realized its intensity for the first time. Sections of the beach had been raised from 5 to 12 feet, others from 30 to 47 feet. Other sections of the coast were submerged. A new island, 450 feet long and 75 feet wide, rose apparently from deep water. Reefs formerly visible at low tide projected above the sea at high tide.

1907—In the Jamaica earthquake, on Jan. 14, 100 yards or more of the new city was submerged to a depth of from 8 to 25 feet, and the depth of the harbor was increased at some points.

All of these facts in continent building, interesting as they are, would probably have to be dismissed were they unsupported by other investigations. They would form bases of interesting theories but be in no sense proofs. That other evidences of the most positive sort are forthcoming, however, forms another striking phase of the announcement in Sheffield. These deductions belong to the new seismology, which has harnessed the earthquakes and brought to men a knowledge of Mother Earth and her methods hardly possible otherwise. They deal with world-making as a whole and a branch of investigation which has probably made more amazing progress in the last twenty years than any other in science.

The progress of seismology has been along the same lines as the modern methods employed in other sciences, particularly surgery. The idea is to cast aside the abstract theories based on isolated groups of cases, and collect examples by thousands, bind them together by comparisons, cut out the exceptions, draw up averages that are universal, and on these base a positive and unavoidable truth.

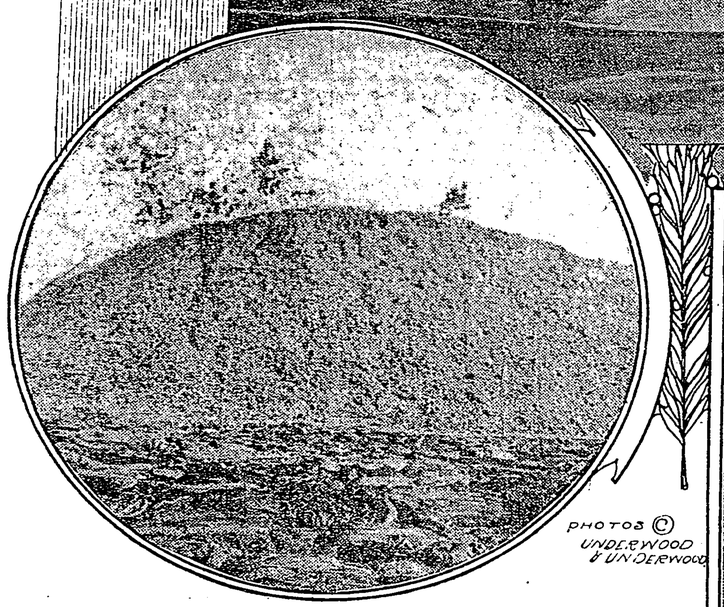
Before the new seismology was developed by Prof. Milne, and his associates, there were nearly as many theories about earthquakes as there were fashions in philosophy. The ancients thought, for instance, that the upheavals were caused by monsters moving through the earth or rising from the Biblical "waters under the earth." The theory of Greek philosophers that earthquakes were caused by air rushing into the fabric of the earth, by exploding vapors, and falling masses of rock and soil was reflected in the ideas of the mediaeval savants. Von Humboldt connected earthquakes with volcanic eruptions. As late as 1857 Robert Mallet elaborated the modern theory that earthquakes and volcanoes were parts of co-related upheavals along lines of weakness in the earth's surface.

By such means earthquakes and volcanic eruptions became better known. But it could not be said that earthquakes were harnessed. That feat has been made possible by the perfection of the seismoscope, the delicate instrument suggesting the idea of the pendulum, by which earth tremors are recorded in tracings of the vibrations with a pencil on a strip of paper. These seismoscopes have often been described in detail, so that they are familiar to most newspaper readers.

Now "earth autographs" are made all over the world simultaneously. Under Prof. Milne, the British Association has established forty-five stations at widely separated points with observations regularly made upon Milne standard instruments. These are forwarded to a central commission of the association for listing and co-ordination.

In this country there are seismological stations at Washington, in New England, the Mississippi Valley, California, Alaska, Panama, Honolulu, Tutuila, Manila, Guam, Cuba, and Porto Rico. Working in co-operation with

(Continued on Page 8.)



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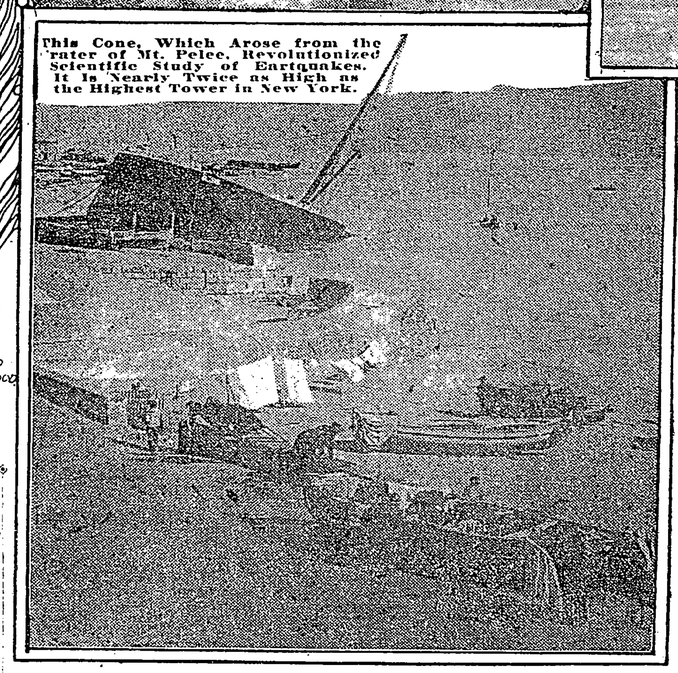
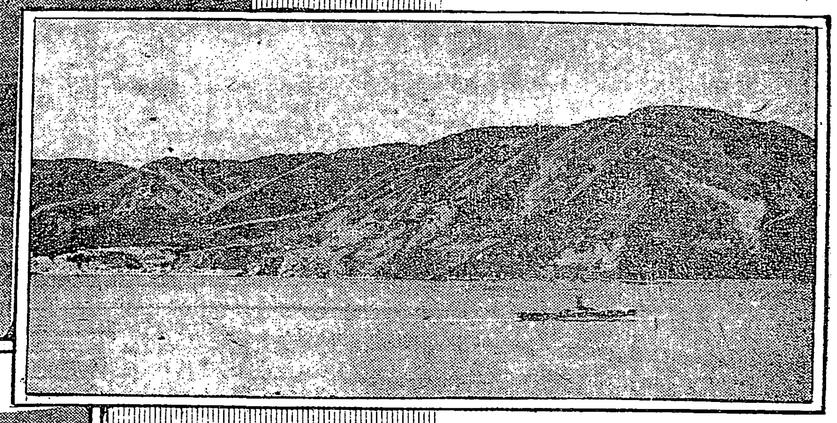
Continent Building in Oceania Showing How Lava and Stones Are Thrown Up by a Volcano.



This Cone, Which Arose from the Crater of Mt. Pelee, Revolutionized Scientific Study of Earthquakes. It Is Nearly Twice as High as the Highest Tower in New York.

The Quay and Harbor at Messina After the Earthquake, Showing Effect on Beaches and Recession of Water.



At Messina Strait Large Sections of This Cliff Were Thrown into the Sea in 1873. One Section Was a Mile Long.

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# A NEW CONTINENT MAY BE ADDED SHORTLY TO THE WORLD

(Continued from Page 5.)

even the Government is a committee of thirteen members from the American Association for the Advancement of Science.

In Japan there are 71 stations of the higher class and 1,437 minor points of observation. Germany has 12 stations, with headquarters in Strasburg. In Italy there are 15 stations of the first class and 800 correspondents. Chile has 3 stations of the first rank.

Hardly less important than these observations are the earthquake records. Japan ha the bet of the earthquake lists. The records go back nearly 1,500 years. From them Prof. Milne prepared a catalogue of more than 8,000 shocks. Next in importance is the historical data found in Italy. The earthquaké catalogue for the Province of Baratta in that country, issued recently, covers 1,000 pages and contains memoranda running back as far as the year 1000, with scattered data until the beginning of the Christian era.

Pioneer work with these lists and the early records of seismoscopes led to the establishment of vital general principles regarding the weak points in the earth's surface. A French officer of artillery, Count de Montessus de Ballore, spent the better part of his lifetime compiling the beginnings on an earthquake geography. He combined 170,000 records of shocks to show the districts in which they occurred most frequently. His maps indicate that the earthquake belts encircle the earth in two great belts or zones. One of them is outlined by the Alps and the Mediterranean, the Caucasus and Himalayas. The other surrounds the Pacific Ocean and extends from New Zealand downward to the Anarctic. This is the so-called "fire ring of the Pacific." By its delineations the theory of an inter-relation of earthquakes or volcanic disturbances at widely separated points was established.

In the meantime E. O. Hovey of the American Museum of Natural History in this city had visited Mount Pelé, Martinique, after the eruption, and made observations which set the seismologists thinking in a new direction. In the Winter and Spring of 1902-1903, just after the eruption, a monster spine was forced up from the crater of Pelé. It soared upward like a mountain summit 1,174 feet in air, or nearly twice as high as the tower of the Metropolitan Life Building. It was a thick, pasty mass of lava and ash, hardening too rapidly to form a stream and flow away. The spine fell to pieces under the action of the elements and disappeared in the latter part of 1903. But this most remarkable feature of any volcanic eruption known to science explained a transitory stage of continent building.

In six years, between 1899 and 1905 there were enough unfelt earthquakes listed to enable Prof. Milne to draw the ovals on the map of the world where such disturbances were most frequent. Prof. Milne's expedition to Oceania and the Antarctic in the steamer Discovery added more information regarding earthquakes in regions little known to science. During this trip, from March 14, 1902, to Nov. 23, 1993, detailed observations were made of seismatic conditions in the Antipodes.

Certain elements, still to be accurately defined, both aid and complicate this issue. One of the aids is the system of detecting very slight changes in the earth's surface when no perceptible sensation of shock is noted. These are supposed to accompany the "brantide," literally an Italian word meaning "like thunder"—the rumblings sometimes faint, sometimes like a discharge of artillery, frequently reported in all parts of the world.

One way to detect these slow adjustments in the earth's levels is by sighting a point between two trees or similar objects, then testing them from time to time with a surveyor's level. Another series of experiments to the same end is being conducted in Italy by the use of a camera. The instrument, with a powerful telephocal lense, is adjusted to conform with the lines of a hill, a mountain top, or other permanent feature of a landscape. From the variations in this adjustment, as it appears on the glass screen of the camera, it is hoped to compute the variations in surface levels.

With the aid of this new science Prof. Milne was able during the voyage of the Discovery accurately to record the seismic activities of the site of the supposed continent. His chart shows that in this zone, from 940 to 1,071, seismic disturbances were noted in twenty months from March 14, 1902, to Nov. 23 of the following year. This means an average of from forty-eight to fifty earthquakes a month.

To this evidence of the earth's unrest the charts of the region add the outlines of the continental plateau to which Dr. Berkey referred. It is bordered on the west and south by a rock-ribbed crescent formed by the Malay Peninsula, Sumatra, Java, Celebes, and Bornet. Thence it extends by a submerged ridge to the Philippines. It may be generally defined as comprising the southwestern half of the China Sea. The plateau, it is believed, sank beneath the ocean in comparatively recent geological times. It seems like an extension of the continental shelf of Asia to the northward, once connecting Java, Sumatra, and Borneo with that mainland.

Surrounded by abysmal ocean depths, the water over the plateau is hardly more than 300 feet deep. In the sea north of Java the depth of water over the plateau was found to vary from 66 to 302 feet. On the other side of the rim of mountainous land, 125 miles to the westward, the sea has been sounded to a depth of 18,000 feet.

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