

SEISMOLOGY

Shocks Follow Quake

Nearly 10,000 aftershocks of the Alaskan earthquake are being studied in order to devise an advance warning system to predict when earthquakes may strike—By Barbara Tufty



American Museum of Natural History

MYSTERY STONES—Dr. Brian H. Mason, chairman of the department of mineralogy at the American Museum of Natural History, measures little pieces of dull black stone called tektites that he collected in Australia during recent expeditions.

SPACE

'Teardrops' from Space

► LITTLE PIECES of dull black stone are causing giant mysteries among earth and space scientists.

About the size of a dime or a quarter, these tiny glassy stones may have come from outer space or they may have originated on earth, stated Dr. Brian H. Mason, chairman and curator of the department of mineralogy at the American Museum of Natural History in New York.

Some scientists believe they were splashed off the moon by the impact of giant meteorites and sent flying earthward.

Other scientists believe that these tektites are actually melted pieces of the earth's crust that were first propelled into space by the force of meteorites hitting the earth, and then fell back again to the earth's surface.

Dr. Mason believes these tiny mystery rocks have come from space.

According to both theories, Dr. Mason stated, the stones were shaped and sculpted by atmospheric friction as they fell through the earth's atmosphere. For this reason, space scientists are interested in them since they might tell something about the problems of spacecraft reentry.

The stones have been found in different shapes, said Dr. Mason, who has made two expeditions to Australia and has added several hundred tektites to the museum's collection.

The stones from Australia are usually round, he said. However, some are oval

► THE CLOSE-TO-10,000 earthquakes that have shaken Alaska since the Good Friday disaster are being carefully recorded and studied in an effort to devise a system for advance warnings of when earthquakes will strike.

Over 9,200 aftershocks occurred in the first four months after the big quake of March 27, 1964, said Dr. S. T. Algermissen, head of the seismology division's data analysis branch of the Coast and Geodetic Survey, U.S. Department of Commerce.

"But we need to get a lot more data and information about earthquakes and make many more studies before it is even conceivable that we devise an advance warning system," Dr. Algermissen said.

An earthquake starts when rocks deep inside the earth fracture or shift. From this initial fracture, called the focus, great shock waves spread out through the earth in all directions, causing damage on the surface by vibrations or by breaking through the earth's surface.

Tremendous amounts of energy are released by these earth upheavals, said Dr. Algermissen, who heads the survey's study of the Alaskan earthquake area. For instance, the approximate energy released by the March 27 earthquake was equivalent to the energy released by 2,000 atomic bombs of the Hiroshima type, he said. This is equivalent to about 40 megatons or 40 million tons of TNT.

With data taken from eight seismograph stations working around the clock to record the tremors in the Alaska area, seismologists are finding that the frequency of aftershock following the earthquake is falling rapidly, Dr. Algermissen pointed out.

The aftershocks of the main Alaskan earthquake represented sudden releases of strain energy stored in crustal and upper mantle rock, Dr. Algermissen said. This is probably a readjustment of the earth.

Of the stronger aftershocks, 333 occurred during the initial 3½-day period right after the main quake, 349 occurred during the entire month of April, 100 during May, 37 during June and 32 during July.

These thousands of aftershocks took place in a band-shaped zone stretching from the Prince William Sound region, about 80 miles southeast of Anchorage, where the main earthquake occurred, to an area southeast of Kodiak Island, some 350 miles away.

Other studies at Montague Island and on the ocean floor around it show that part of the Island was raised as high as 31.5 feet, while oceanographic soundings indicate extensive fractures in the ocean floor—some marked by 50-foot cliffs.

Seismologists use a system of measuring the magnitude of earthquakes called the Richter scale.

In essence, this system uses numbers ranging from one to eight and higher. Number one is the measure of earthquakes than can be observed only with sensitive seismographs, and number eight is the measure of great earthquakes, noted Dr. Algermissen.

Major earthquakes usually occur in the magnitude around six to eight. For example, an earthquake rated at 6.3 on the Richter scale caused 120 deaths and \$50 million damage at Long Beach, Calif., in 1933. Last year, in Skopje, Yugoslavia, a temblor with a rating of 5.4 killed more than 1,070 persons.

The 1960 earthquake at Agadir, Morocco, with a 6.25 rating, killed 12,000. The March 27 Alaskan earthquake had a rating of 8.5 with 114 dead or missing.

In addition to the thousands of earthquakes being detected on the sensitive instruments many others which are not strong enough to be registered are undoubtedly occurring.

in the shape of teardrops or in fragments. They are usually smooth, except when they have become pitted from chemical reactions with water as they lay on the ground.

Approximately 75% of the rock's composition is silica, about 12% alumina, and the balance includes oxides of iron, manganese, calcium, sodium and potassium.

Most tektites are scattered in what scientists call strewn fields—as if a giant scattered handfuls of these stones across miles of ground. The stones are not uniformly distributed, Dr. Mason said. They occur in patches or elongated streaks. The location of every one of the hundreds of tektites gathered in the Australian expedition has been carefully tabulated.

Most tektites have been found in Australia and parts of Southeast Asia. A few stones have been picked up in Czechoslovakia and Africa. Several have been found in Texas and Georgia, and one in Martha's Vineyard, an island near Cape Cod.

To the untrained eye these tiny pieces of rock could look like bits of broken glass, Dr. Mason noted.

The ages of the mystery stones differ with the locations in which they were found, he said. For instance, tektites from Indonesia, Australia and the Philippines are calculated to be about 500,000 years old, those from Georgia and Texas about 30 million years, and those from Czechoslovakia about 14 million years.

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