

MAGNETIC STUDY
OF
METEOR CRATER, ARIZONA

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Meteor Crater, a name officially designated by the U.S. Board of Geographic Names, is located some 20 miles west of Winslow, Arizona, in the semi-arid to arid region of the great American southwest.

Meteor Crater is variously known as Arizona Meteor Crater, Barringer Crater, Coon Butte, Meteor Mountain and Crater Mound. The feature is approximately 3 miles in circumference, $\frac{4}{5}$ of a mile in diameter and 600 feet deep. The crater rim projects above the surrounding flat desert-like area 120 to 168 feet.

The origin of the crater-like structure is explained by a list of theories almost as numerous as the names. Generally speaking, however, the theories can be classified into two distinct groups: on the one side we have those theories that explain the crater with a meteoritic origin. That is, the crater-like structure was formed by the impact or near surface explosion of a meteorite. On the other side we have those theories that explain the crater with a geological origin. That is, the crater-like structure was formed by normal terrestrial processes.

In this investigation of Meteor Crater, Arizona, an initial aerial magnetic survey was made at an altitude of 1000 feet above the terrain. This survey consisted of eight traverses, each beginning from the center point of the crater and extending in a continuous total intensity and inclination magnetic profile to a point six miles out. A second aerial survey was made at an altitude

of 3000 feet above the terrain. This survey consisted of two long profiles, each approximately forty miles in length. In addition to the aerial work, a value of the vector defining the earth's magnetic field was measured on the ground at five traverse points.

In an analysis of the above data, and an attempt to obtain the best possible fit between the measured magnetic features and the observed geology, the following points were considered: (1) the shape of the anomaly, (2) the pole depth of the anomaly, (3) the lateral size of the anomaly, (4) the magnitude of the anomaly, (5) the lack of metamorphism in the area, (6) the lack of any surface expression that might indicate intrusion, (7) the lack of a marked correlation between surface expression and magnetic effect, and (8) the relationship between the measured anomaly and model studies.

Considering all of these facts it would appear that the observed magnetic anomaly is caused by a thin tabular horizontal intrusion that is sill like in nature. The sill has an irregular thickness, is basic in composition and located at a depth of about 2000 feet.

The presence of the sill under Meteor Crater, Arizona suggests that the crater could have an igneous origin. It is believed that magmatic pressures uplifted the dome that forms the present crater mound, and that the crater-like structure was produced in the fractured dome by small phreatic explosions, and from hot magmatic water and gas from the intruded sill.