FROM OUTER SPACE?—ORIGIN OF TEKTITES IS A MYSTERY

By ALBERT W. FORSLEV
ASSOCIATE CURATOR, MINERALOGY AND PETROLOGY

EVENTS of recent months have focused considerable scientific interest on the behavior of objects entering the earth's atmosphere from outer space. Scientists have concentrated on the study of extraterrestrial material known to have landed on our planet. There can be no doubt that meteorites are of cosmic origin since they have been observed to fall from time to time and are commonly picked up on radar screens. Study of the surface, shape, and composition of meteorites has afforded valuable information to the scientists and engineers engaged in designing rockets, missiles, and artificial satellites.

Meteorites are generally classified according to their composition; thus we have iron, iron-stone, and stone meteorites. Another class of objects that many people believe also to be meteoritic in origin is the tektites. These are small pieces of silica-rich glass found in widely scattered parts of the world. Whether or not they are cosmic in origin is still highly problematical since no one has ever seen them fall and there is evidence favoring both a cosmic and a terrestrial origin.

Tektites have been found in southern Australia, Czechoslovakia, the Ivory Coast, Java, the Libyan Desert, the Philippine Islands, and Texas. Specimens from most of these localities are in the collection of Chicago Natural History Museum and a collection of 200 Philippine tektites has recently been donated to the Museum by Prof. H. Otley Beyer of the University of the Philippines. According to Prof. Beyer this collection is the best representation of Philippine tektites yet deposited in an institution outside the Philippines with the exception of the Koenigswald collection at the University of Utrecht in Holland. It is planned to exhibit these tektites in Clarence Buckingham Hall (Moon, Meteorites, and Minerals—Hall 35), which is presently being reinstalled.

Tektites occur in sedimentary deposits of Eocene to Pleistocene age and seem to be otherwise unrelated to these deposits. Generally, tektites are rather small; most of them are less than an inch in diameter and weigh only a few ounces. They are usually found in great numbers at each locality (approximately 20,000 have been found at the Australian locality alone), but only in the case of the Libyan Desert material do the true size and shape of the strewn field appear to be known. The tektites are relatively unweathered and may be rounded, elongated, or irregular in form. The glass composing them is green, brown, or black and the surfaces of many of them exhibit "flow patterns," an indication that they have solidified from a viscous melt.

Scientists engaged in research on tektites have proposed various hypotheses for their origin. Those which seem most practical are summarized herewith.

VOLCANIC ORIGIN

Tektites are very similar in appearance to the volcanic glass, obsidian. Their chemical composition, however, is quite different from it and other volcanic rocks. Also, the water-content of tektites is approximately one-tenth of that of obsidians, indicating that they were formed in a water-free environment or at a very high temperature (over 2000° C.) on the earth's surface. This, coupled with the fact that they are found in areas where there is no associated vulcanism make a volcanic origin seem very unlikely to most investigators.

TEKTITES—A NATURE MYSTERY

These are some characteristic forms of strange glassy objects suspected to be of extraterrestrial origin. Their shapes indicate that they have cooled from a molten state.

"IMPACTITE" ORIGIN

One possibility is that tektites were formed as a result of the collision with the earth of a large meteorite, which fused and scattered terrestrial rock material when it hit. This hypothesis is supported to some extent by the fact that tektites are similar in chemical composition to certain terrestrial sedimentary rocks, and the forms exhibited by tektites could have resulted from such an event. A similar hypothesis that has been suggested is that the head of a comet collided with the earth and produced the tektites by also fusing terrestrial material.

"LUNAR IMPACTITE" ORIGIN

It has been proposed that the collision of a meteor with the moon would produce fused material similar in nature to the tektites, and if the scattered molten material entered the earth's gravitational field it could account for the tektite-strewn fields observed. Astronomical calculations are now being programmed for electronic computers in order to ascertain whether or not this is a valid hypothesis.

METEORITIC ORIGIN

The idea that tektites are meteoritic matter originating from the disruption of another planet has been entertained by many scientists for years. The low water-content of tektites and a radioactivity that could have been induced by cosmic rays seem to substantiate the hypothesis. Since it is difficult to account for their distribution and occurrence on geological grounds, this fact has also been used as evidence for a cosmic origin. Many scientists consider it very unlikely, however, that a swarm of particles would stay so close together on their flight through space as to produce the small, tektite-strewn areas on the earth's surface. On the other hand, some have suggested that a solid glassy meteor would break up into smaller molten particles upon hitting the earth's atmosphere and thereby account for the small areal distribution of the tektites. The difference in chemical composition of tektites from that of known meteorites is explained by assuming that the tektites are fragments of a thin crust of a disrupted planetary body, perhaps similar in composition to our terrestrial rocks.

The question of whether these glassy bodies are of cosmic or terrestrial origin is by no means settled. Much work remains to be done to establish the validity or nonvalidity of each of the above hypotheses. This includes the accurate mapping of the pattern of distribution of tektites on the earth's surface, field observations on the association of tektites with meteor craters, volcanoes, and other geologic features. Chemical analyses of many more tektites must be carried out in order for a valid comparison to be made between their composition and that of terrestrial materials and meteorites. A comparison of tektites with known "impactite" glasses may also provide much useful information.

Primitive Art Special Exhibit Continues Through September

The special exhibit entitled "What Is Primitive Art?", which opened July 1, will remain on view in Stanley Field Hall throughout August and September. The display, which has proved especially popular with visitors, aims to provide an answer to the question in its title, and serves as an introduction to the vast collections of primitive art from many parts of the world scattered through the halls of the Department of Anthropology. Art objects from African tribes, peoples of Pacific islands, Indians of the Americas, and other primitive societies are included in the exhibit.