

NEW LIGHT ON THE GLORIETTA, NEW MEXICO, METEORITE.

H. H. NININGER.

ABSTRACT. The Glorietta meteorite was described in *This Journal* in 1885, Vol. 30, p. 235, and in 1886, Vol. 32, p. 311; by G. F. Kunz, as a siderite. Recent work in the location by the American Meteorite Laboratory resulted in discoveries which prove it to be a combination siderite and pallasite. These finds also indicate that the "Santa Fe meteorite" described by Henderson and the "Pojoaque meteorite" described by Brady, are only fragments of the Glorietta meteorite.

Some interesting light is also thrown on the rate of weathering in meteorites by these finds.

As a part of its program of collecting meteorites, the American Meteorite Laboratory constantly endeavors to collect and integrate all available data concerning falls whether they be new or old. Recently, some very important information came to light on the well-known Glorietta meteorite. This iron was described by Kunz (*This Journal*, 1885, Vol. 30, p. 235 and 1886, Vol. 32, p. 311). Eakins, Merrill, Cohen, Weinschenk, Brezina, and Meunier later wrote on this meteorite. R. C. Hills, in 1914, also described a fragment from Rio Arriba, New Mexico, which he assigned to the Glorietta fall. Ten fragments in all were described up to and including that described by R. C. Hills. The total weight thus recorded was 326 lbs. (148.4 kg.). The fall was classified by Kunz as a "holosiderite of Daubrée."

In February, 1931, L. F. Brady described "A New Iron Meteorite from Pojoaque, New Mexico" in *This Journal*. In 1933 Nininger showed that the Pojoaque specimen is a pallasite instead of a siderite (*The Mines Mag.*, August, 1933). Later in this paper evidence will be presented to show that this pallasite belongs to the Glorietta fall.

In November, 1934, E. P. Henderson described the Santa Fe, New Mexico, meteorite (*Pop. Astronomy*, 1934, Vol. XLII, No. 9, pp. 514-15). Upon reading this paper the writer noticed a close resemblance of the crystalline structure of Glorietta to that of Henderson's new "Santa Fe" iron. The resemblance was so striking that Mr. Henderson's attention was called to the probability of the identity of this newly found iron with the Glorietta meteorite.



GLORIETTA, COLLECTED 1937

An 18 pound iron of the Glorietta fall which showed a 4 inch pallasitic area in one side. The area is not visible in the picture. The Nininger Collection.

Ever since 1926, I have been urging the residents of the Glorietta neighborhood to watch for meteorites. My frequent trips through New Mexico allowed me to visit the locality several times each year. When next I passed that way I made it a point to look into the location of the find described by Henderson. After I had talked to a Mexican who had been with Rafael Sandoval at the time he found the club-shaped iron, he took me to the little arroya a few rods north of Sandoval's house where he said Sandoval was getting wood. He stooped to pick up a piece that protruded from the bank of the arroya and was surprised to find it as heavy as iron. This was picked up about a mile northeast of Canoncito. Kunz gave the original location of the find as "about one-half mile from a house a mile northeast of Canoncito." Brezina, in 1895, called attention to the tendency of the Glorietta meteorite to break into splinter-like pieces. Four of the individuals collected by the writer have been characterized by the splintery form. One of them is about the shape and size of a half-used lead pencil. The "Santa Fe" iron is a comparatively fresh-looking iron and exhibits the angular pitting pointed out by Brezina.

Among the specimens I have collected during recent years from this location, three are typical pallasites of the Rokicky group, just as is the Pojoaque specimen. Another 18 lb. specimen shows several inclusions of olivine in a depression about four inches long. These late finds were all made within a radius of about one and a half miles of the original Glorietta meteorite location. I learned also that numerous other small fragments had been gathered up by the inhabitants but had been lost previous to my instituting the search. All of the specimens gathered by me show angular pitting similar to that of the original find as described by Kunz. Foote has pointed out that this pitting is rare among irons, but is characteristic of Glorietta.

In referring to Kunz' original paper I find that in sectioning one of the irons he found grains of olivine;

"Olivine was observed at the upper end of No. 1, a surface about 10 cm. square being completely filled with it. The color in some instances was brownish-golden, or rich yellow, and as plentiful as in the Pallas iron."

It is strange that not more attention was given to this feature by Doctor Kunz.

A beautiful pallasite fragment was found among the Indian curios in the store of Candelaria in Santa Fe. All I was able to learn of its source was that it had been found "in the vicinity of Glorietta." I now began to see a connection between the Pojoaque specimen and the Glorietta fall. Except for the fact that it is a bit more smooth on its prominences, the Pojoaque appears almost exactly like one of about the same size obtained by me from a Mexican who found it on the edge of the mesa south of Canoncito. The extra smoothness may be accounted for by assuming that the former had been long carried in the pouch of a medicine man, as has been suggested by Dr. H. P. Mera, who reported that the specimen had been found in a pot among the ruins of Pojoaque. This ruin is about 15 miles northwest of Santa Fe and Canoncito is about 15 miles east of the same city. It is not difficult to see that a specimen regarded as medicine would be transported from one location to the other. The etching pattern of Pojoaque shows a marked resemblance to that of Glorietta and the olivine appears exactly like that in my collections made in the Canoncito region.

I find the following reasons for assuming that the "Santa Fe" of Henderson and those recently found by the writer are all identical with the Glorietta meteorite:

1. Location. So far as I have been able to learn all of the irons have been found within an area not more than two or three miles long by about one and a half miles wide.

2. Distribution. All of the larger specimens have been found toward one end of the area, viz. the northern end and the smaller ones toward the southern end.

3. All of the irons appear comparatively fresh, showing considerable rust stain but no heavy scale and in most cases some of the original fusion crust was untarnished.

4. Pitting. All of the specimens found in the region show the unusual angular pitting which is comparatively rare among iron meteorites but as was early pointed out is characteristic of the Glorietta.

5. There have been occasional finds in the vicinity from the time of the original discovery in 1884 down to the present year and the later finds appear not to differ from the earlier ones.

6. A considerable percentage of both the early and the late finds were in form greatly elongated, indicating that at the time of its rupture the parent mass tended to break into splinters or slivers and not after the manner of most metallic meteorites.

7. The etching pattern of all of those examined conforms as closely as do those of the various individuals of other known falls. The pattern of Glorietta is sufficiently distinctive to render this fact conclusive evidence of their identity.

I find the following reasons for considering the several pallasite specimens found within the same area as belonging to the same fall:

1. Kunz records finding a pallasitic area in one of the irons which he sectioned in 1884.

2. One of the specimens which I collected in 1936 showed a pallasitic area in the midst of an otherwise typical sideritic individual.

3. Where the Widmannstätten figures have been studied in the pallasites they conform to those in the original description of Glorietta as closely as could be expected.

4. Other falls are known where siderite and pallasite individuals have been present. Brenham is an example.

5. The pallasites and siderites of the Glorietta location show about the same degree of freshness.

The Pojoaque specimen should be regarded as a part of the Glorietta fall for the following reasons:

1. Its general form and state of preservation are about the same as those found near Canoncito.

2. The Pojoaque specimen shows convincing evidence of having been separated from a larger mass. Pallasites tend to break up badly during flight, yet no other fragments have been found in the Pojoaque vicinity.

3. The facts that this specimen was found in a pottery vessel in an old ruin and that it showed evidence of having been carried or handled renders its location entirely compatible with its assignment to the Glorietta fall.

4. Pallasites are rare among meteorites. No other pallasite of the Rokicky group has been found within 400 miles in any direction from Santa Fe. In view of this scarcity it seems improbable that two of apparently about the same age should be found within 30 miles of each other.

In view of the facts set forth in this paper the writer suggests that hereafter the names Santa Fe and Pojoaque as applied to meteorites be used as synonyms for Glorietta. And that Glorietta be regarded as a siderite-pallasite fall instead of a holosiderite.

I wish also to call attention here to the fact that though a

period of 55 years is represented by the various finds in the Glorietta region there is no noticeable difference in degree of weathering between the earlier and the later finds. All appear comparatively fresh. This indicates that where there are not destructive constituents in metallic meteorites such as chlorine, the sojourn of the meteorites on the planet in semi-arid regions may be quite long before any evidence of age need appear in the form of heavy oxide scale. One should certainly hesitate to assign a date of fall to any iron meteorite that is encased in a heavy oxide scale, even though laymen insist that they saw it land where it was later found.

The writer has collected more than a hundred previously unknown falls of meteorites which show various degrees of weathering. He cannot recall a single case among them where some one could not be found who felt very sure that he or she had seen the meteor that accompanied its arrival.

COLORADO MUSEUM OF NATURAL HISTORY,
DENVER, COLORADO.