A METALLIC METEORITE FROM OGALLALA, NEBRASKA

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In November 1930 the writer recieved as an exchange from the Colorado School of Mines a small meteorite weighing 3300 grams said to have come from the town of Brule, Nebraska, in 1918. There is no doubt but that this is the meteorite referred to in G. T. Prior's Catalogue of Meteorites under the name of Brule.

A visit to the village of Brule a few months later, however, revealed the fact that though it had been sent in from the village of Brule this meteorite had been plowed from a field about $3\frac{1}{2}$ miles northeast of Ogallala, which is the county seat of Keith county and is situated about 11 miles east of Brule. This gives the location of the meteorite as Lat. 41° 10′ N.; Long. 101° 40′ W. between the north and south branches of the Platte river in Keith county, Nebraska. The meteorite is therefore being described as Ogallala which is a larger village than Brule and is 11 miles nearer the location of the find.

This meteorite possesses some striking surface markings. The greater part of its surface is strongly pitted, but the pittings, instead of being circular, are noticeably angular and show evident traces of octahedral cleavage. These angular depressions remind one of the jagged surfaces of the great Chupaderos irons of Mexico where the two faces of those great irons seem to have been once united. It seems likely that the Ogallala iron is but a portion of a larger mass which "split up" during its flight, but travelled far enough subsequent to the "split up" so as to glaze over the angular octahedral breaks. These depressions are absent from only about one-fourth of the surface where are found the usual shallow pittings. So far as known none of the other fragments (if any) of this fall have ever been discovered.

The general form of this iron is that of a very oblique pyramid, roughly quadrangular in cross-section and tapering from the basal dimensions of 11.5 cm.×9.3 cm. to 3.2 cm.×2.2 cm. as the mass was when it came into my possession. There had been, however, a small tip of the iron previously removed by sawing. See Fig. 1.

In places the original untarnished, thin, bluish-black fusion crust shows on the ridges which separate the pittings. In the depressions the crust is much thicker and for the most part somewhat discolored by the exudation of oxide. In a few places the fusion crust is drawn out into thin wavy thread lines such as have been noted on several freshly fallen iron meteorites. These small areas are usually located on the ridges and by their orientation and distribution indicate quite certainly that the body fell with a whirling motion.

Upon cutting this small iron shows an almost uniformly compact structure with only a few small nodules appearing in the five thin slices removed. Several of these were small irregular masses of schreibersite and others inclusions of troilite, the largest a mass of schreibersite comprising only 7 sq. mm. in cross-section. The metal takes a high polish.

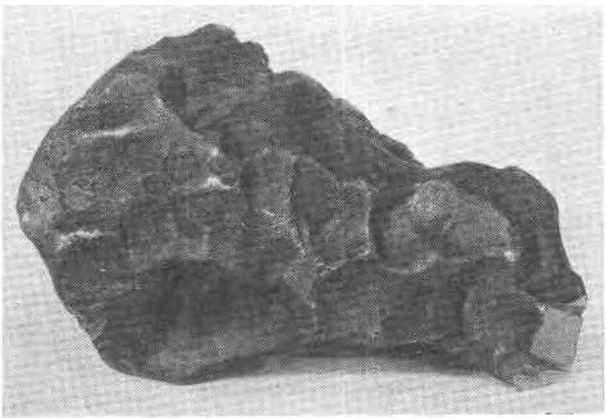

FIG. 1. External view of the Ogallala iron as it came from the Colorado School of Mines showing angular surface pittings.

Etching in weak HNO_3 quickly reveals octahedral arrangement of kamacite; but the plates are of variable thickness and are irregular in outline, the form known as swollen kamacite. For the most part they are less than 2 cm. in length and vary in width from .5 mm. to 3.5 mm. Not infrequently the plates taper at one or both ends and some are so exceedingly irregular in outline that they would not be suspected of being a part of a crystalline structure were they not definitely connected up with more symmetrical figures. The kamacite is of the hatched variety.

The intra-lamellar structure of this meteorite is really more clearly defined than the figures just described. Under a ten-power lens one finds that the bands of kamacite are each traversed by a set of very straight, clean cut, fine lines of the Neuman pattern. These are usually less than .25 mm. apart and in some cases are so near together that 32 were counted in a distance of one mm. The orientation of this intra-lamellar structure is somewhat varied but usually several adjoining plates are so uniform that the bands of an etched slice can be divided into about three groups according to the direction of the Neuman lines. This grouping is responsible for strongly contrasted areas on an etched slice showing either dull or bright according to the direction of the light. The lines vary in length from a cm. to less than a mm. on the surfaces examined.

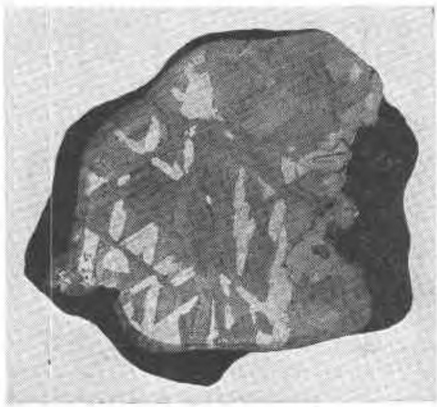

Fig. 2. An etched slice of the Ogallala iron showing swollen kamacite forming Widmanstätten figures and a zone of alteration around its edges resulting from the heat of friction during its fall.

All of the sections which were cut from near the small end of this iron show a zone of altered structure due to the heat developed during its passage through the atmosphere. The depth to which such alteration has penetrated grows less as the diameter of the iron increases and shows its greatest depths on the angular ridges or corners of the mass where it reaches a depth of 4.5 mm. near the smaller end. See Fig. 2. In the zone which has been thus effected the Widmanstätten figures show less distinctly than in the interior of the same slices and under a lens the kamacite appears distinctly flaky or granular, the numerous flakes or granules being variously oriented so as to give it a variable appearance in different lights.

The taenite in Ogallala is typical of octahedrites of this variety. In many places the thin laminae seem to be made up of two very thin sheets placed side by side. Frequently, as in several other medium octahedrites these laminae seem to thicken towards their ends and in some cases spread apart enveloping a small amount of plessite.

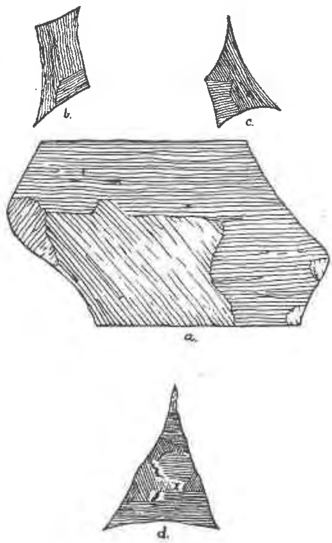

FIG. 3. Four typical plessite fields. Enlarged 5 diameters.

The plessite fields show no striking characteristics in this meteorite. Four which may be considered typical have been sketched to illustrate their structure. In some the laminae are much finer than in others. There are, however, comparatively few plessite fields and none are very large. Apparently this alloy is present in less than the normal proportions for this type of octahedrite.

A chemical analysis by F. G. Hawley gives the following:

Fe	90.10
Ni	7.93
Co	0.34
Cu	0.04
Cr	0.031
Mn	nil
P	0.164
S	0.045
C	0.048
Si	0.024
Cl	trace
O	0.48
Total	99.304

Pt. metals per ton 0.40 oz.

The main mass is in the Nininger Collection of Meteorites in the Colorado Museum of Natural History.