

THE SPRINGWATER METEORITE

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In August 1931 the writer received from Saskatchewan, Canada, a meteorite said to have been found in a field near the town of Springwater which is located about 100 miles west of Saskatoon. It was at once evident that this was a pallasite, which in itself was of interest since of the eleven hitherto known pallasites from North America none has come from Canada.

The meteorite weighed 41 lbs. (18,570 grams) and was about the shape one would obtain by cutting a standard baker's loaf through the middle on a plane vertical to its base, and departing about 10 degrees from a right cross section. Its base measuring 25×20 cm.,



FIG. 1. Side view of Springwater meteorite showing surface pitted by friction in the atmosphere. The white marking at the top represents an incrustation of calcium carbonate.

was in the form of a plane with numerous broad shallow depressions. From this base the two sides and one end arched upward to a height of 14 cm. giving the specimen a rather symmetrical appearance. This convex surface was beset with abundant small pittings in many of which olivine was observed at the bottom. A few areas showed evident traces of furrowing indicative of a steady oriented flight—the furrows always running from the apex or crown of the meteorite toward the margin of its base.

One end of the meteorite showed indications of having been broken, either after its arrival on the lithosphere or during the very last stages of its flight. Here a matrix of fresh-appearing honey-

yellow olivine was beset with numerous jagged, irregular, projections of metal. The metal, except where lately brightened by hammering, was tarnished to a dark rusty brown color.

Except for the more abundant exposure of fresh appearing light colored olivine this meteorite might easily have been mistaken for an individual of the Brenham (Kiowa County, Kansas) pallasite which it strongly resembles externally. However, its structure seemed to be on a smaller scale and the olivine seemed to be more in evidence forming a larger proportion of the mass.

The specimen was cut through near the broken end and five slices, $1\frac{1}{2}$ cm. thick, were removed all of which show a fairly uniform structure—a more or less complete reticulum of metal em-

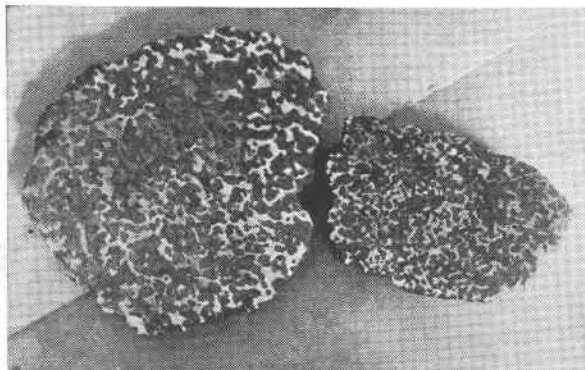


FIG. 2. Showing slices of Brenham and Springwater pallasites side by side.

bracing either singly or in groups, rounded crystals of olivine—a pallasite of the Krsaknojarsk type.

Fortunately, I have at hand for comparison a number of slices of Brenham freshly cut from a large individual of that fall. A comparison of the slices from the two falls shows the following points of difference:

1. The olivine inclusions average about a third smaller in diameter in the Canadian specimen. Typical areas of 27 sq. cm. were selected from the respective meteorites for measurements. In Brenham, this area included 33 olivine inclusions suitable for measurement with an average diameter of 5.5 mm. In Springwater, a similar area gave 49 inclusions suitable for measurement with an average diameter of 3.6 mm.

2. The metallic bands are notably narrower in the Canadian specimen than in Brenham. Six of the widest bands in a slice of Brenham showed an average width of 10.2 mm., while 8 of the widest in a slice of the Springwater meteorite averaged 5.7 mm.

3. The olivine in Brenham, as has been noted by several investigators, is much darker near the surface of a complete individual than in its interior. This shows conspicuously on a polished surface as a darker zone a cm. or more in width around the edge of the slice surrounding the lighter colored olivine of the central portion. Such is not the case in the Springwater meteorite, but in it the lighter and darker olivines are interspersed throughout.

4. The light colored olivine in Brenham shows a faint greenish tinge that is lacking from the lighter colored portion in Springwater.

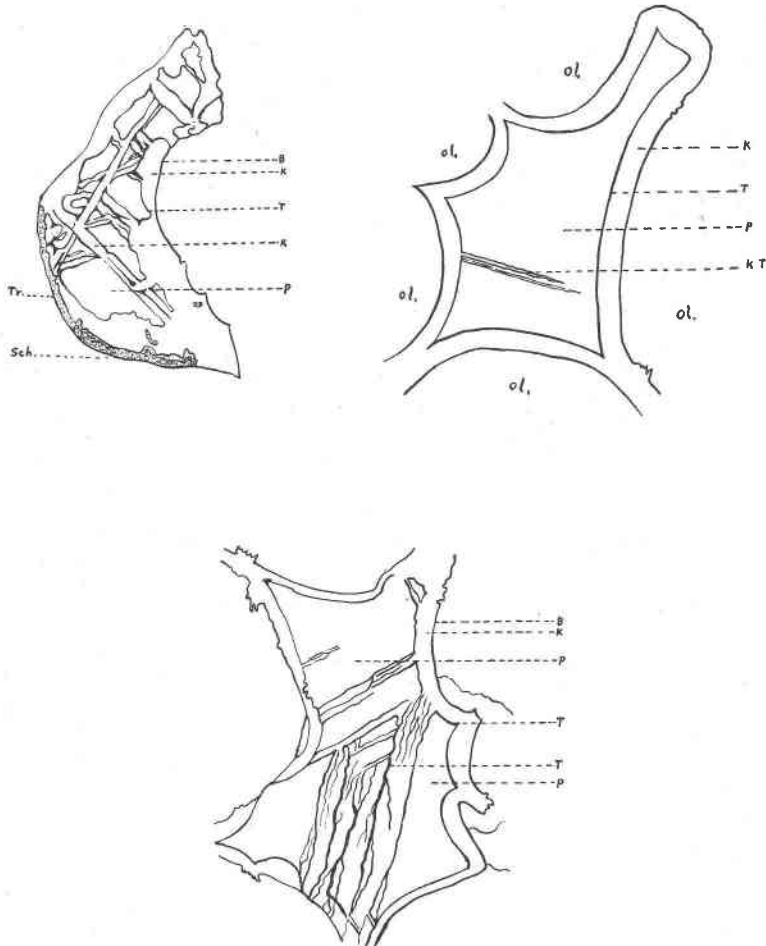
5. The metallic constituent in Brenham comprises a larger proportion of the mass than in the Canadian meteorite, and the reticulum formed by this constituent is correspondingly more complete in the Kansas specimen. In Springwater, areas of several sq. cm. are frequent in which the olivine crystals, though of the usual size, are not separated by metal foliae.

6. When areas such as those just mentioned are found in Brenham, the olivines are nearly always more or less perfectly separated by thin layers of troilite, often quite as perfectly as where the metallic reticulum is present. In Springwater such an arrangement of the sulphide is seldom to be found and never to the degree of completeness that is common in Brenham.

7. The metal of Brenham is very compact, very white, and does not stain seriously in etching with HNO_3 , if the acid is kept free from the visible inclusions of sulphide. In Springwater, even the briefest treatment with dilute acid produces a sulphide stain on all of the iron. Examination of the metal under a $10\times$ lens reveals that this is due to abundant minute inclusions of readily soluble sulphide throughout the metallic portion.

8. The etching figures are very much alike in the two meteorites but attain greater perfection in the Brenham where the metallic bands are thicker. In both the border metal is separated from the interior of the band by a bright taenite plate. The figures even where best developed in Springwater, are still much interrupted and very incomplete. The accompanying drawings represent two of the best crystallized areas found.

Schreibersite is present in the Springwater meteorite in about the same distribution and abundance as in Brenham. Troilite however is much less abundant in the former except for the minute inclusions mentioned above. No chromite nor graphite was found.



FIGS. 3-5. Three of the broadest metallic bands showing etching figures.

B, Contact with olivine; K, kamacite; T, taenite; P, plessite; Ol, olivine; KT, kamacite band with taenite border; Tr, troilite; Sch, schreibersite.

The cavities in which the olivines lie are lined by the same highly reflective, mirror-like film as has been noted in the descriptions of Brenham and other pallasites.

Nothing is known of the date of fall of this meteorite. It has evidently lain for many years in the soil. There is not, however, a heavy scale of oxide produced by weathering such as is common on Brenham and many other meteorites. Over much of the surface the original fusion crust is present and in a few places this crust remains unstained, showing clearly the flowage lines characteristic of fresh falls. Over most of the surface however it is completely discolored by a thin film of the products of weathering giving to the mass a rusty brown appearance.

The meteorite shall be known as the Springwater pallasite and is classified as a pallasite of the Krasnojarsk group.

The metallic portion was analysed by F. G. Hawley yielding the following results:

	Per cent
Fe.....	86.65
Ni.....	10.72
Co.....	0.53
Cu.....	0.09
Cr.....	0.025
Mn.....	faint trace
P.....	0.19
S.....	0.30
C.....	0.02
SiO ₂	0.44
O.....	1.20
Total.....	<u>100.165</u>

Pt. metals=0.38 oz. per ton.

Subsequent to the preparation of this description two additional masses of this meteorite have been discovered. One of 23 lbs. weight and the other of 85 lbs. These are in the Nininger Collection of Meteorites.