THE TRENTON METEORITES

W. F. Read and H. O. Stockwell

Although meteorites are commonly named for the town large enough to have a post office nearest to their discovery location, the Trenton meteorites are an exception. Trenton is not a town but a 36-square-mile township in Washington County, Wisconsin. The center of the township is about four miles east of West Bend, or roughly 30 miles north of Milwaukee.

First published notice concerning the discovery of iron meteorites in this township was a short article by J. Lawrence Smith in the American Journal of Science for 1869. Smith reported that four specimens had been found, weighing 62, 16, 10, and 8 lbs., and that all had been acquired by the German Natural History Society of Wisconsin. F. Brennendecke reported to the Natural History Society in 1869 that the 62 lb. mass was found in 1858 and purchased by I. A. Lapham. The three smaller specimens turned up "in the years immediately following" and went into the Society's collection. A fifth piece was said to have been found but could not be located. The 62, 16, 10, and 8 lb. specimens will be referred to as Nos. 1, 2, 3, and 4.

In 1872, Lapham reported the finding of two additional specimens: one of 16 1/4 lbs. in 1869 and another of 33 lbs. in 1871. He purchased the first for his own collection. The second was sent to M. Von Baumbach "to be taken to Europe." The 16 1/4 and 33 lb. specimens will be referred to as Nos. 5 and 6.

Mr. Carl Gauger has advised the authors that about 1880 a specimen weighing approximately 10 lbs. was found on his property and taken to the Milwaukee Public Museum. This specimen will be referred to as No. 7.

H. O. Stockwell of Hutchinson, Kansas, visited the area in September, 1952, and went over considerable ground with a metal detector. Results were spectacular. On the second day he found one mass of 413 lbs. a few feet away from another of 527 lbs. Later he found a small specimen weighing 1 1/2 lbs., and purchased two more specimens from local residents. One was a 6 1/2 lb. mass reportedly found before 1890. The other, weighing 3 lbs., was said to have been found about 1933. The 6 1/2 lb. mass will be referred to as No. 8; the 3 lb. mass as No. 9; and the 413, 527, and 1 1/2 lb. masses as Nos. 10, 11, and 12.
Some notes concerning the disposition of Stockwell’s five specimens are in order. About 80 lbs. were removed from the 527 lb. mass and sold to Ward’s Natural Science Establishment. The remainder of this and the entire 413 lb. mass have been purchased by the U. S. National Museum. The 6½ lb. mass and half of the 1½ lb. mass were sold to R. A. E. Morley of Salem, Oregon.

In August 1964, W. F. Read and his son discovered another specimen of 9½ lbs. while working with a metal detector similar to the one used by Stockwell. This will be referred to as No. 13.

A summary of the finds to date is as follows:

<table>
<thead>
<tr>
<th>No.</th>
<th>Found</th>
<th>Weight</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>1858</td>
<td>62 lbs.</td>
</tr>
<tr>
<td>2</td>
<td>1858-68</td>
<td>16</td>
</tr>
<tr>
<td>3</td>
<td>”</td>
<td>10</td>
</tr>
<tr>
<td>4</td>
<td>”</td>
<td>8</td>
</tr>
<tr>
<td>5</td>
<td>1869</td>
<td>16½</td>
</tr>
<tr>
<td>6</td>
<td>1871</td>
<td>33</td>
</tr>
<tr>
<td>7</td>
<td>c. 1880</td>
<td>10?</td>
</tr>
<tr>
<td>8</td>
<td>c. 1885</td>
<td>6½</td>
</tr>
<tr>
<td>9</td>
<td>1933</td>
<td>3</td>
</tr>
<tr>
<td>10</td>
<td>1952</td>
<td>413</td>
</tr>
<tr>
<td>11</td>
<td>”</td>
<td>527</td>
</tr>
<tr>
<td>12</td>
<td>”</td>
<td>1½</td>
</tr>
<tr>
<td>13</td>
<td>1964</td>
<td>9½</td>
</tr>
</tbody>
</table>

**Location of finds**

The only finds whose locations have been recorded with any precision are those made by Stockwell and Read. Smith reported that the first four specimens were found “within a space of ten or twelve yards very near the north line of the 40 acre lot of Louis Korb”. Lapham’s manuscript notes include a map which shows that the Korb property was the SW¼ of the NE¼, Sect. 33, T 11 N, R 20 E, and that the meteorites were found near the center of the north line. Lapham’s 1872 report on the finding of Nos. 5 and 6 states only that they were found “in the same field”. His manuscript notes, however, say that No. 5, at least, came from “very near” the place where Nos. 1–4 were found. The approximate discovery sites of Nos. 7 and 9 were pointed out to W. F. Read by Mr. Carl Gauger, who now owns the property. According to information obtained locally by H. O. Stockwell, No. 8 was discovered on an old stone pile formerly about 500 ft. northwest of the Gaedeke barn.

Figure 1 shows with varying degrees of accuracy the discovery sites of all specimens except No. 8. Coordinates of the main site
(Nos. 1–6, 10–13) are Lat. 43° 22' 44''; Long. 88° 6' 30''. (Smith gives the latitude as 43° 22', and the longitude as 88° 8'.) The nearest town is West Bend, about 4 miles to the northwest, for which according to modern usage the meteorites should have been named.

**No. 5. External Form**

The Greene collection at Milwaukee–Downer College included a 16\(\frac{1}{4}\) lb. uncut iron meteorite identified in the catalog as from Washington County, Wisconsin. Presumably this is specimen No.
5, found in 1869 and acquired originally by Lapham. When and how it came into the Greene collection is unknown. When Milwaukee–Downer merged with Lawrence College in 1964, the bulk of the Greene collection was purchased by the University of Wisconsin–Milwaukee. This specimen was loaned to W. F. Read for study. Its external form is shown in Fig. 2. The original shape has doubtless been somewhat modified by oxidation. The bottom side in the upper photograph (same as upper two thirds of lower photograph) shows low knobs separated by shallow depressions and may be an ablation surface from the exterior of the parent mass. The other three surfaces are evidently the result of rupture, with no apparent subsequent modification by ablation. The one to the left of the label in the upper photograph is jagged and suggests rupture by pulling apart. The bottom surface in the lower photograph is smoothly curved, as if by shearing. The (poorly shown) top surface in the upper photograph is about two thirds smooth and one third jagged, suggesting a combination of shearing and pulling apart. Whether rupture took place on or before impact (or both) is not clear.

**No. 5. Structure and Composition**

Fig. 3 shows the appearance of an etched section. Kamacite bands are about 0.7 mm. wide, making this a medium octahedrite, as noted in the Prior–Hey Catalogue. Since the Widmanstätten pattern is continuous across the entire section, this is evidently a fragment from a single large Ni-Fe crystal.

An interesting feature of the kamacite bands is their tendency to show a certain amount of curvature. This can be seen by using a straight edge on Fig. 3. Presumably the bending is from stress encountered either (1) during the meteorite’s pre-terrestrial history, (2) while passing through the earth’s atmosphere, or (3) on impact. These alternatives are certainly not mutually exclusive. Along the upper right edge of the section as shown in Fig. 3, the Widmanstätten figure disappears in a jumble of irregular kamacite grains. These are transected by a small “fault”, clearly traceable for a distance of about 6 mm. The fault is quite tight, certainly not an open fracture, and suggests shearing under high pressure, presumably pre-terrestrial. The reason for the granular structure and its genetic relation, if any, to the fault, remains a question. The oxide-filled fracture visible along the lower edge of the section in Fig. 3 clearly differs in origin from the fault. It appears to be the result of incipient rupture under low confining pressure. Another indication of stress (Uhlig’s interpretation?) is seen in the occurrence of Neumann lines in many of the kamacite bands.
Perry* has called attention to the prevalence of "hatching" (regarded by him as a gamma-alpha transformation structure) in the kamacite of Trenton specimens at the U.S. National Museum. This is conspicuous also in the kamacite of Trenton No. 5.

Figure 2. Two views of Trenton No. 5. The side shown in the lower photograph is at the bottom in the upper photograph. Short lines indicate the position of the sawcut for the etched surface shown in Fig. 3.
Figure 3. Etched face of end piece cut from Trenton No. 5. The black "vein" at the bottom is oxidized material following a fracture.

Plessite fields are numerous and of variable structure. Some—usually the smaller ones—consist of "dense", apparently homogenous material etching dark grey. Some contain abundant small granules of kamacite in a dark grey matrix. And some show fine kamacite bands instead of the granules, the bands running in one or more directions conforming to the surrounding Widmanstätten pattern. When bands and granules occur in the same field, the bands tend to be disposed around the borders with granules toward the center.

Troilite occurs in Trenton No. 5 as nodules, thin plates, and small, irregular grains (See Fig. 4). The nodules (Fig. 4 shows two) lack a continuous envelope of swathing kamacite, but are surrounded by irregular kamacite grains that stand out clearly from the adjacent Widmanstätten pattern. It is well known that troilite undergoes a considerable volume increase by inversion at 130° C. This may explain the fact that some of the oxide-blackened fractures visible in Fig. 3 seem to be roughly radial to the troilite nodules. Note especially how the large fracture along the bottom edge turns upward at its right-hand extremity and terminates against the nodule in this vicinity. The thin plates of troilite may be straight or distinctly curved. They grade into more or less lenticular bodies. Some of the plates and small grains may have failed to show up
on the sulfur print from which Fig. 4 was taken. For example, the straight, black line extending toward the upper left from the left-hand nodule in Fig. 3 appears to be a completely oxidized thin plate of troilite.

TRENTON NO. 13

As noted above, Trenton No. 13 was discovered by W. F. Read and his son in August 1964. It lay at a depth of about 1½ ft., where the oxide crust was undisturbed by cultivation. The surface which appears at the top of the upper photograph in Fig. 5 is smoothly convex and was probably shaped by ablation. The opposite surface, shown in the lower photograph, is extremely irregular. It is heavily encrusted with limonite, locally forming short, finger-like protuberances. The surface of the metal underneath is apparently quite jagged, probably indicating a rupture surface formed by pulling apart. Trenton No. 13, which has not yet been sectioned, remains for the present at Lawrence University.

ACKNOWLEDGMENT

The *West Bend News* was most helpful in paving the way for Stockwell’s collecting work. Reuben Gauger, who then occupied the Gaedke farm, and Carl Gauger kindly permitted Stockwell to work parts of their farms with his metal locator. Subsequently Robert Gaedke and Carl Gauger extended similar hospitality to Read. For
the loan of Trenton No. 5, described in this paper, Read is indebted to Prof. R. A. Paull of the Geology Department at the University of Wisconsin-Milwaukee. Mr. R. A. E. Morley of Salem, Oregon, furnished valuable information on the history of Trenton finds. For data derived from Lapham's manuscript notes, the writers are indebted to Mr. Walter E. Scott of Madison.
REFERENCES


5. LAPHAM, I. A. Manuscript notes in possession of the Wisconsin State Historical Society.


