

PRELIMINARY NOTES ON A NEW METEORITE FOUND NEAR WOODBINE, ILL.

WILLIAM F. READ

Lawrence College, Appleton, Wis.

The town of Woodbine is in Jo Daviess County, Illinois, about 7 miles west of Stockton. While plowing in the spring of 1953, Mr. Henry Albrecht, whose farm is located a mile west of Woodbine, discovered a rusty, metallic "boulder" buried about 8 inches beneath the surface of the ground. This object, measuring about 8 x 12 x 13 inches, was kept in the farmyard as a curiosity. Some loose pieces were detached and given away. One of these pieces was taken to the Geology Department at Beloit College by Mr. Tyler Bastian, a student. It was sectioned, and correctly identified as a meteorite, by Professor Henry H. Woodard. In June, 1961, the writer learned of this discovery through correspondence with Dr. Woodard. A trip to the Albrecht farm resulted in the recovery of the main mass.

Thanks are due to Mr. Albrecht, Mr. Bastian, and Dr. Woodard for their assistance in making the meteorite available for study. Financial support came from the National Science Foundation under Research Grant C-18669. Dr. E. P. Henderson of the U.S. National Museum has offered constructive suggestions concerning the manuscript.

The main mass, when brought to Lawrence College, weighed 48.2 kg. A slice weighing 2.27 kg was cut off to reveal the internal structure. Both

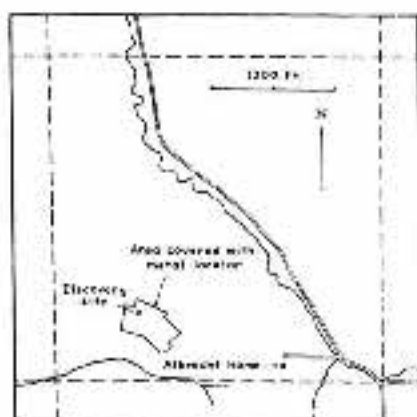


FIGURE 1.—Southeast quarter of Section 9, T 27 N, R 3 E, Jo Daviess County, Illinois. Cross indicates discovery site. The town of Woodbine is located one mile east of the Albrecht home.

the slice and the remainder of the main mass are now in the U.S. National Museum. Of the fragment originally given to Mr. Tyler Bastian, Beloit College has 21.7 g. The rest (77.4 g) has been returned to Mr. Albrecht. Nothing is known of the whereabouts of the other small fragments which were given away.

DESCRIPTION OF SITE

The Albrecht farm is located mainly in the SE $\frac{1}{4}$ of Section 9, T 27 N, R 3 E, Jo Daviess County. This is maturely dissected country drained by tributaries of the Apple River. Vertical relief is around 200 ft. The

precise discovery location is indicated in Figure 1. Here the ground slopes southward from the crest of a divide between two streams. Several old gullies on the slope have been filled with boulders and other debris, later covered with soil. It is possible that the meteorite may have been transported from some other location by an earlier occupant of the farm and dumped into one of the gullies. The writer's efforts to locate additional buried fragments in the vicinity by means of a specially constructed metal detector (Read, 1962) were unsuccessful.

Coordinates of the discovery location are Lat. $42^{\circ} 20' 48''$ N; Long. $90^{\circ} 10' 3''$ W. This is favorable ground for future detector work since it is in the Driftless Area and magnetic glacial boulders are lacking.

EXTERNAL FORM

Four views of the exterior of the meteorite are shown in Figure 2. In general, the shape is that of an angular block only slightly modified by atmospheric ablation. It seems probable that the original bolide broke

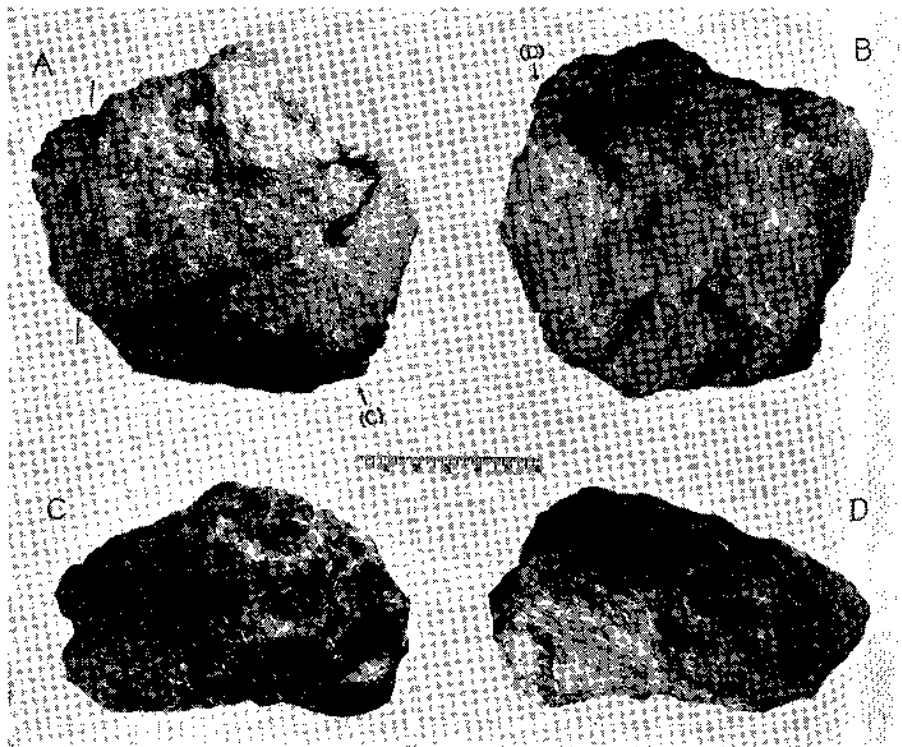


Figure 2.—Exterior views of the Woodbine meteorite. Scale reads in inches. A and B are opposite sides. Camera directions for C and D relative to A and B indicated by arrows. The short lines adjoining A show location of saw cut for surface illustrated in Figure 3.

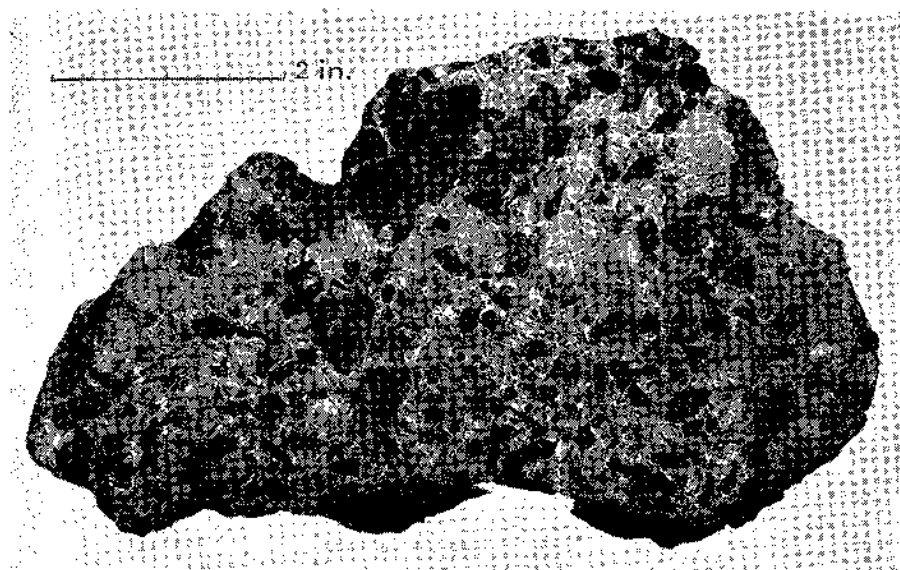


FIGURE 3.—Etched surface of the Woodbine meteorite. Stony fragments appear nearly black. Adjoining dark grey areas are mainly troilite, plus a little schreibersite. Nickel-iron is light grey, with crosshatching. Two thick remnants of the weathered crust (appearing black) are present on the lower edge.

up at a fairly high level in the atmosphere and that other pieces of it lie yet undiscovered in the Woodbine area. The original fusion crust and its detailed flight markings have been obliterated by weathering. The principal ablation features now remaining are the characteristic shallow pits known as regmaglypts. A number of these, closely spaced, may be seen near the bottom of surface A. Three or four large pits, somewhat irregular in shape, appear on the lower half of surface B, and there are others of the same kind on surface C. The remaining surfaces lack clearly defined depressions of this type. Possibly they were exposed, by rupture, so late during passage through the atmosphere that ablation had little time

to operate on them. There is nothing in the overall shape of the meteorite, or in the form and arrangement of the regmaglypts, to suggest oriented flight.

On the right side of surface A, Figure 2, there is a notch about 6 inches long, 2 inches wide, and an inch or two deep. According to Mr. Albrecht, this is the place from which the loose pieces were detached. One surface of the notch (brightly illuminated in fig. 2a) is fairly flat, suggesting a fracture. There is some indication that the opposing vertical surface is also fracture-controlled—probably by more than one fracture. All surfaces of the notch are now heavily rust-coated and were probably in this condition when the loose pieces were broken away.

COMPOSITION

Figure 3 shows the appearance, after polishing and etching, of the flat surface of the slice cut off at Lawrence College. In general, it exhibits about 30% stony fragments, 10% troilite (FeS), and 60% nickel-iron. These percentages are based on Rosiwal analysis.

The weathering crust is now a mere film around most of the etched surface. However, on the lower edge as shown in Figure 3 there are patches as much as 6 mm in thickness. It seems likely that the entire specimen had a crust of this or greater thickness when first dug up and that all but a few remnants were flaked off during subsequent handling on the farm. Hairline veinlets of limonite penetrate well into the interior. A conspicuous example follows the inner border of the string of troilite extending down from the upper right edge in Figure 3. Here oxidation penetrates to a depth of 4 cm.

Fractures can be seen cutting across stony fragments in the upper and lower right corners in Figure 3. These fractures continue through patches of troilite but disappear in the nickel-iron.

The stony fragments are of a fairly uniform dark brown color. The largest encountered in the plane of sectioning has a measurable maximum diameter of 18 mm. As shown by the photograph, the fragments tend to be distinctly angular. Their contacts with surrounding metal are not truly sharp, however, but minutely spongiform, suggesting incipient replacement by the metal. Some of the smaller fragments appear to

have had their angularity considerably reduced by this process.

Composition of the stony material appears to be fairly uniform — a mosaic of tiny silicate grains interspersed with fine disseminated nickel-iron and sulfide. Occasional crystals up to 2 mm in diameter are visible, more abundantly in some fragments than in others. Chondritic structures, if present, are not easily recognized.

Isolated silicate grains, or small groups of grains, occur both in nickel-iron and in troilite. Some of these may represent dissolved material later rejected by the metallic phases. Others may simply be last remnants of thoroughly absorbed inclusions.

Troilite commonly surrounds groups of the stony fragments. In addition, troilite patches show a fairly marked tendency to be connected. Thus, an irregular, branching "vein" of troilite may be seen extending down from the upper right edge in Figure 3. It is possible that the series of troilite patches extending to the left from this edge are, or were, connected beyond the plane of the section.

That the sulfide, as well as nickel-iron, has replaced silicate inclusions is clearly indicated by the condition of the large stony fragment just to the right of the big notch in the top edge as shown in Figure 3. In addition, contacts between troilite and nickel-iron have an embayed appearance strongly suggesting replacement of the former by the latter. "Headlands" of troilite are in some instances capped by small stony fragments which appear to have protected the sulfide from attack. If

so, replacement of silicates by nickel-iron must have been a slower process than replacement of troilite. In a few places, troilite and nickel-iron are separated by a band of schreibersite (Fe_3P) $\frac{1}{2}$ to 1 mm wide. Where schreibersite is present, evidence of replacement of the sulfide is lacking.

Within the troilite, a faint light-dark color variation can be discerned. Lighter material tends to surround darker, or cut through it along hairline veinlets. Apparently the lighter phase is of later origin. It may be the result of recrystallization to a coarser grain size.

In addition to the borders around troilite, mentioned above, schreibersite occurs in small patches attached to the larger stony inclusions or surrounding clusters of tiny ones. The total amount of schreibersite present is less than 1%.

As in the case of the Four Corners meteorite which is also highly charged with stony inclusions (Merrill, 1924), the nickel-iron is divided into a large number of distinct grains with different crystallographic orientations. Each grain has a continuous border of kamacite (the low-nickel component) approximately 1 mm in width. Within this border the usual Widmanstätten figure is evident. Typical kamacite bands are only about $\frac{1}{2}$ mm in width—tapering toward their extremities. Thin strips of plessite (undifferentiated nickel-iron) with taenite (high-nickel) borders are commonly present between adjoining parallel bands. Larger plessite "fields" of triangular or quadrangular shape occur between bands running in different directions. The thin strips

etch black. Small fields show black margins and brownish-grey interiors. The larger fields usually contain segregated strips of kamacite, either in very fine lamellae paralleling the coarser bands outside the fields or in more or less irregular dendritic growths.

The largest individual grains of nickel-iron encountered in the plane of sectioning measure about 15 mm in diameter. These appear in the upper half of the photograph, Figure 3. Toward the bottom of the photograph, where stony fragments are more closely spaced, the grains are correspondingly smaller.

After several days of exposure to the atmosphere, the uncoated etched surface showed small patches of fresh rust, mainly around some of the stony inclusions and areas of schreibersite. These indicate the presence of lawrencite (FeCl_2).

SUMMARY

The Woodbine meteorite is the fifth reported from the state of Illinois. It is a rare type, characterized by the presence of abundant angular stony fragments between which the nickel-iron has crystallized in different orientations. The best-known other example of this type is the Four Corners meteorite from New Mexico.

LITERATURE CITED

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