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THE NAZARETH(b) METEORITE

TEXAS

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R. Gooley, C. F. Lewis, C. B. Moore

Center for Meteorite Studies
Arizona State University, Tempe

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Glenn I. Huss

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The Nazareth(b) meteorite was discovered in the fall of 1968 during the breaking out of a new quarter section of sod on the Elmer Schulte farm, 4½ miles northwest of Nazareth, Texas, lat 34° 31.6′ N.; long 102° 06.3′ W. Mr. Schulte evidently did not recognize the object as being a meteorite but since it was curiously very heavy, he took it home and put it on the front porch. Later that fall, a young dog was tied to it to curb his car-chasing tendencies. Upon the suggestion of a neighbor that it might be a meteorite, it was sent to the American Meteorite Laboratory in Denver, Colorado.

The meteorite measured 19.5 x 18 x 9 cm and weighed 11.31 kg. Much of its exterior appeared to contain a fusion crust. It was protected in a vault and when removed after several months, almost the complete exterior had either peeled off or was in the process of peeling. Hence, a greater degree of oxidation is now apparent than the original "dog anchor." Figures 1 and 2 show top and side views of the uncut specimen.

Figure 3 shows a cut, polished and etched section of the meteorite. Studies of polished sections indicate that it is a medium octahedrite with a mean width of kamacite bands of 0.94 mm. The polished and etched slice does not show a rim of atmospheric heating but the aforementioned peeling process may well have completely removed any evidence of this. Phosphides are numerous as schreibersite inclusions up to approximately 30 mm in length which often, but not always, are aligned with the Widmanstätten pattern.

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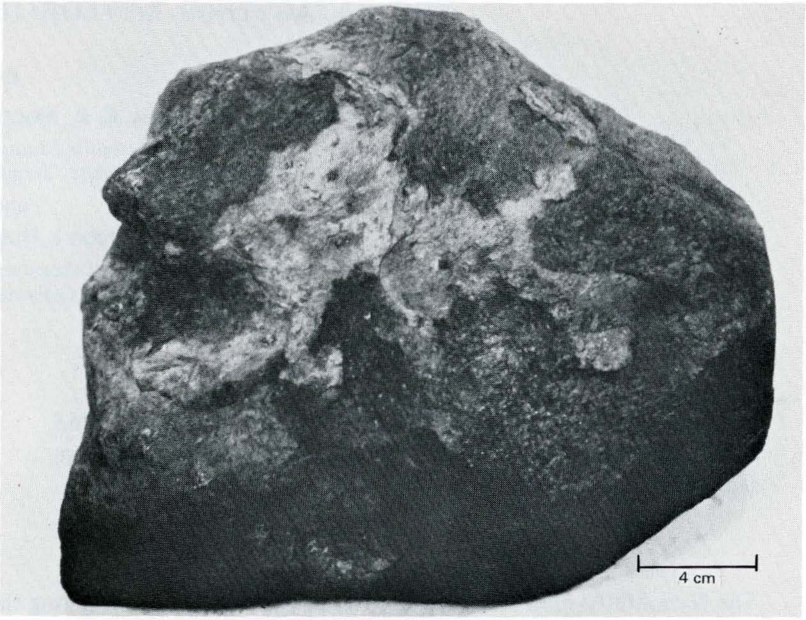

Fig. 1 **Top view of Nazareth(b) meteorite**

Fig. 2 **Side view of Nazareth(b) meteorite**

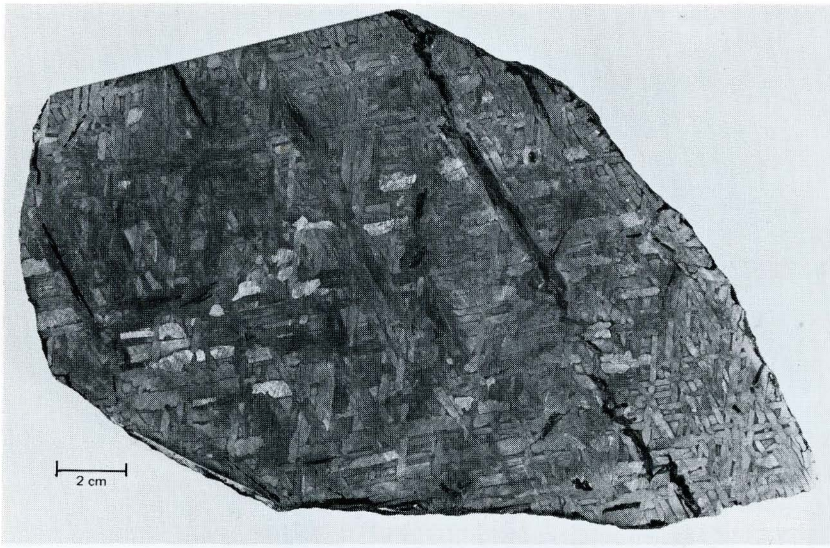

Fig. 3 Etched section of Nazareth(b) meteorite showing the Widmanstätten structure and the large fracture which runs through the meteorite

Fig. 4 Feathering and multiplication of Neumann bands in kamacite

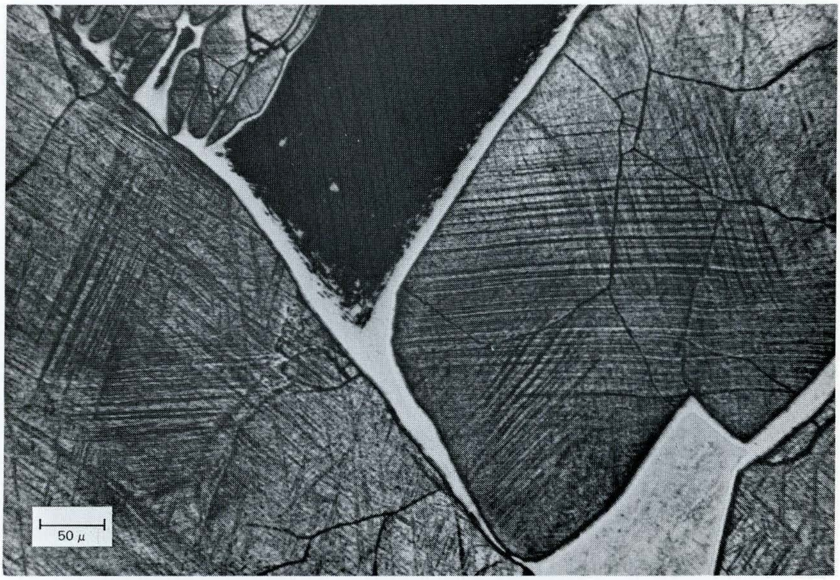

Fig. 5 Hatched pattern in kamacite indicating shock intensity in the 600 kb range. The light area is taenite and the dark area (top center) is a plessite field.

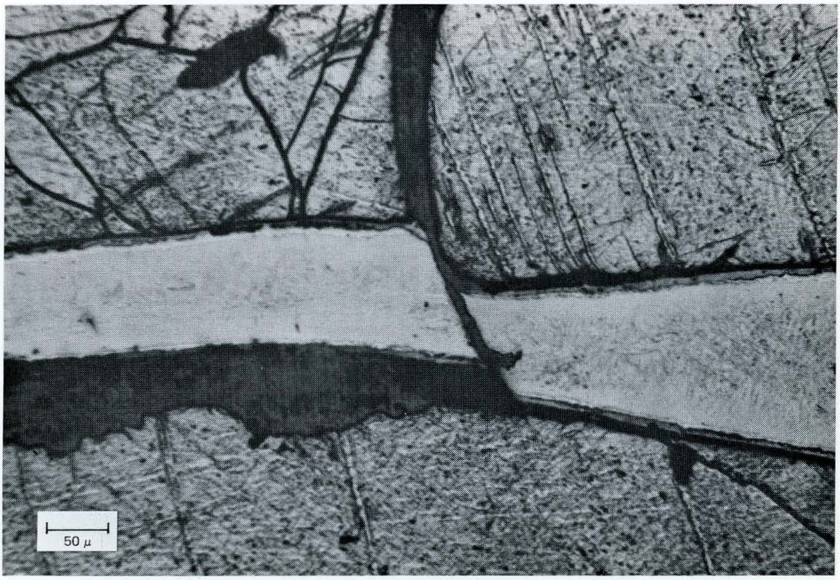

Fig. 6 Offset taenite band with oxidized material running along and through it

Heymann et. al. (1966) have described a classification of meteorites according to shock history. The Nazareth(b) meteorite fits into their scheme as a moderately shocked specimen. Neumann bands are abundant in all of the kamacite fields and there are numerous areas where the transformation structure appears, resulting from the conversion of α- to ϵFe (Smith, 1958; Maringer and Manning, 1962). Figure 4 shows multiple Neumann bands with some band feathering, indicating intensities in the $\geqslant$ 190 kb range. In several localized areas of favorable grain orientation, the Neumann bands show the well-developed transverse hatching of the 600 kb shock intensity range, Fig. 5. The "matte" structure described by Maringer and Manning was not observed, and due to the absence of carbide minerals, the carbon diffusion zones of the 1,000 kb intensity range are not present.

When the meteorite was cut, a large crack or tear running nearly one-half the length and completely across its width was discovered. Several small fissures emanate from the major tear. Material partially filling the fissure has been studied and shown to be terrestrial in origin. It appears as though this fracture is the result of a violent impact, as it does not follow grain boundaries as would be the case if it were the result of oxidation. This is again evident in studying the small emanating fissures. Figure 6 shows a "faulted" and displaced taenite field with a zone of oxidation running along the "fault." Preliminary examination of the material filling this crack indicates it is composed of iron oxides with small inclusion of high silica content. A detailed description of this and related material in other meteorites will be described in a future paper.

Wet chemical analyses showed the meteorite to contain 8.75% nickel and 0.53% cobalt. Phosphorous from two different pieces gave values of 0.3 and 0.8%. The analyses were made on small chips cut from the meteorite. No attempt was made to obtain a representative sample and the variation most likely reflects inhomogeneity with respect to schreibersite distribution. There is 0.004 weight percent sulfur. No sulfide inclusions were found.

Based upon the kamacite band width of 0.94 mm, and the Ni content of 8.75%, the cooling rate of Nazareth(b) is calculated to be 2 °C per million years using the method of Short and Goldstein (1967). The Nazareth(b) meteorite thus falls in the common average medium octahedrite group as defined by Goldstein (1969).

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