

## THE LADDER CREEK, HORACE, AND TRIBUNE METEORITES (GREELEY COUNTY, KANSAS)

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*The Ladder Creek, Horace No. 1, Horace No. 2, and Tribune meteorites were found within a comparatively small area of Greeley County, Kansas, between 1937 and 1958. Microscopic examination and analyses of the principal minerals show that Ladder Creek, Horace No. 2, and Tribune are essentially identical in composition and structure; it seems reasonable to conclude they are fragments of a single meteorite, a hypersthene chondrite. Horace No. 1 is essentially different, being a bronzite chondrite, and is evidently a distinct fall. The name Ladder Creek should be used for specimens previously called Horace No. 2 and Tribune, and the name Horace should be used for specimens previously called Horace No. 1.*

Horace and Tribune are a pair of hamlets in Greeley County in western Kansas, about two miles apart on the Missouri Pacific Railroad. A number of meteorites have been found in this vicinity, and their history, as far as it can be established from the literature and from unpublished records, is as follows:

No. 1: (Fig. 1) In July 1937 Edgar Linn recovered 35 kg of meteorite fragments from a small area in a plowed field between two branches of Ladder Creek and some 11 miles NE of Horace. He sold this material to Dr. H. H. Nininger, who gave it the name Ladder Creek. Specimens are widely distributed in collections.

No. 2 and 3: Two stones, one weighing 2900 g (No. 2) and one 9.2 kg (No. 3), were found near Horace by John Sawyer in 1940 and sold to Dr. H. H. Nininger. He gave the name Horace to them. I have determined olivine composition by X-ray diffraction in these two stones (Mason, 1963) and found that the smaller stone is a bronzite chondrite (olivine composition is 19 mole percent  $\text{Fe}_2\text{SiO}_4$  (Fa)), the larger one a hypersthene chondrite (olivine composition 25 mole percent Fa). Since they were evidently

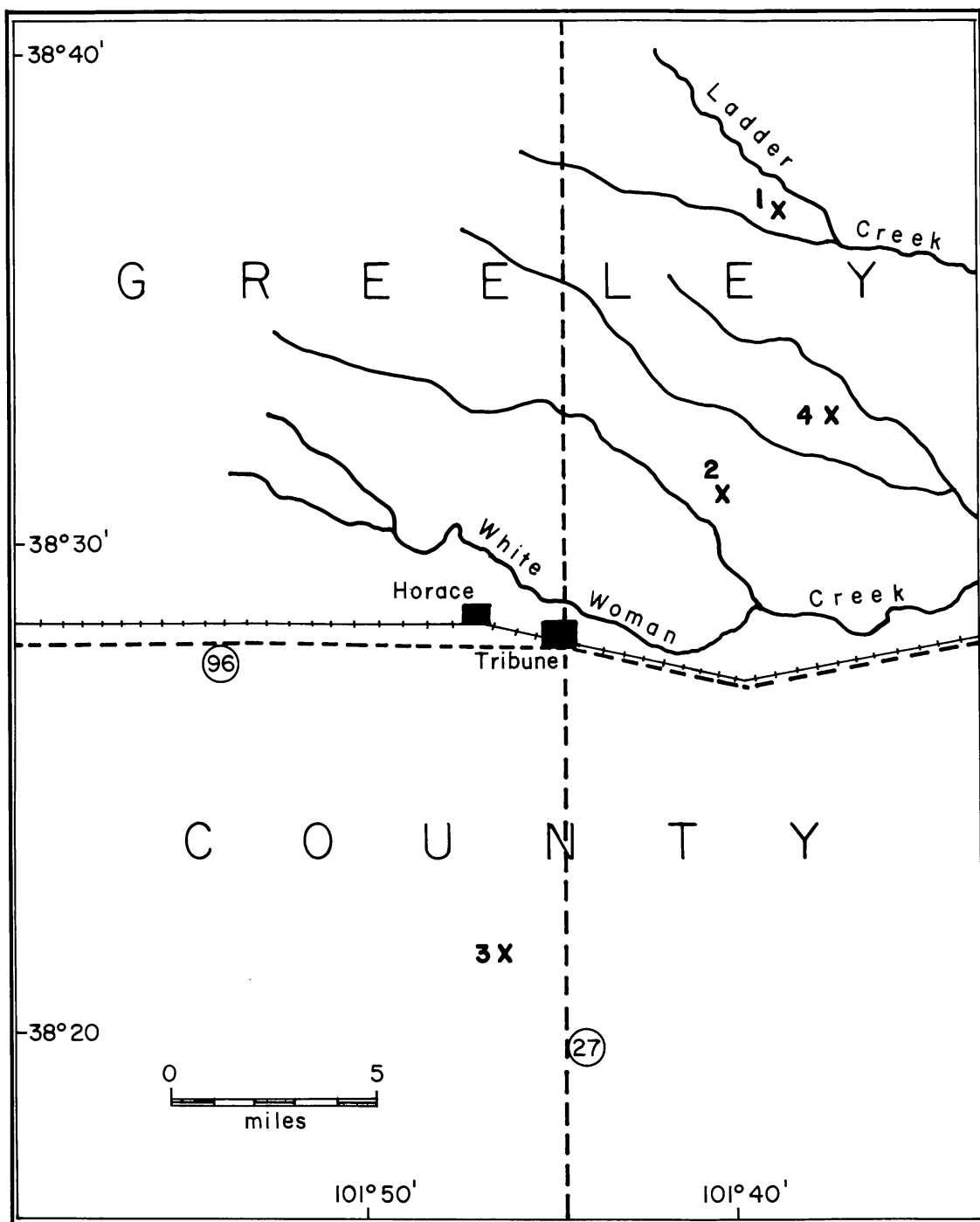


Fig. 1. Map of a portion of Greeley County, Kansas, showing locations of recovered meteorities: 1 = Ladder Creek; 2 = Horace No. 1; 3 = Horace No. 2; 4 = Tribune.

different meteorites, I referred to the bronzite chondrite as Horace No. 1 and the hypersthene chondrite Horace as No. 2.

No. 4: This stone, weighing 4.9 kg, was found by Emanuel Mai in 1958, about 8 miles NE of Horace. In 1962 it was submitted to Dr. E. P. Henderson of the Smithsonian Institution for examination. He identified it as a meteorite and arranged to purchase it for the museum's collection. It was entered in the collection under the name Tribune (UNSM 2176).

From correspondence in the files of the Smithsonian Institution and the Ninninger Meteorite Collection (at the Center for Meteorite Studies, Arizona State University) it is evident that other stones besides those described above have been found in this general area and disposed of to private collectors.

Comparatively few references to these meteorites have appeared in the published literature. In my 1963 paper (Mason, 1963) I also determined the composition of the olivine in Ladder Creek (25 mole percent Fa). Van Schmus and Wood (1967) classified Ladder Creek as an L6 chondrite. Zähringer (1966) reported rare gas data on Ladder Creek and Tribune; he reported the source of his specimen of Tribune as the meteorite collection of Arizona State University, but in a recent letter he recalled that he obtained his sample from a small piece obtained by Professor P. Ramdohr from the Smithsonian Institution. In his letter Dr. Zähringer comments on his rare gas data as follows: "From the spallogenic contents they can be identical. The radiogenic  $\text{He}^4$  and  $\text{Ar}^{40}$  is in both cases pretty low and comes from degassing. The degree is only different, what has been observed in other meteorites. I would say, the rare gas data tend to favor your suggestion (of) the identity of these two meteorites".

The olivine composition, as determined by X-ray diffraction, is identical in Ladder Creek, Horace No. 2, and Tribune, being 25 mole percent Fa. This figure has been confirmed by microprobe analyses. Structurally they are extremely similar, being poorly chondritic and with a well-crystallized groundness—typical L6 chondrites in the classification of Van Schmus and Wood (1967). They show the same degree of weathering.

Since L6 chondrites are very numerous, the chemical and structural similarities between these three meteorites are good

evidence but not absolute proof, that they are fragments from a single meteorite fall. However, when combined with their geographical contiguity, it seems reasonable to conclude that they are indeed pieces from a single meteorite. The greatest separation between any two specimens is some 20 miles, which indicates a large strewn field, but not exceptionally so. It seems probable that a careful search of this region would result in the discovery of additional specimens of this hypersthene chondrite, and possibly also of the bronzite chondrite.

My conclusion is that the meteorites known variously as Ladder Creek, Horace No. 2, and Tribune should all be united under the single name Ladder Creek. Horace No. 1 is a distinct meteorite and the No. 1 can be dropped from its designation.

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