

## Report

### The Kansas University meteorite

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(Received 1996 September 3; accepted in revised form 1996 November 4)

**Abstract**—A new 2.8 kg meteorite find from the United States, Kansas University, is classified as an L6 (S3) chondrite based on optical microscopy and electron microprobe analysis of mafic minerals. Natural thermoluminescence (TL) and <sup>14</sup>C measurements suggest that the Kansas University meteorite has a short terrestrial age compared to other meteorite finds from this area and is not paired with the other local meteorite finds, Densmore (1879), Lawrence, Kansas and Long Island, Kansas.

#### HISTORY

Around the turn of the century, a single stone weighing 2.8 kg was recovered by Mr. Handel Tong Martin. Martin was curator of Paleontology at the University of Kansas at the time and acquired the stone while searching for fossils in an unknown location. The stone was given to Mr. William H. Martin, son of Handel Martin, who in turn gave the stone to his son, Mr. William H. Martin, Jr. The stone was brought to the University of Arkansas in December of 1990, where it was identified as a meteorite. The specific location of where the meteorite was found is unknown, but we presume it to be in the Lawrence, Kansas area. The main mass of the stone remains on loan at the University of Arkansas; a small sample weighing 8.0 g and the thin section studied are in the meteorite collection of the University of Arkansas.

#### PETROGRAPHIC DESCRIPTION

The Kansas University meteorite is roughly cube-shaped with one face covered by an extensively scalloped fusion crust (Fig. 1). There is no apparent fusion crust on the other faces. The meteorite is only moderately weathered, and one corner bears saw marks where a sample of >50 g was probably removed prior to its arrival at the University of Arkansas. Fragments broken from the main mass are fairly lightly colored, with only a few areas of rust stains, and metal grains are prominent on polished surfaces.

In thin section, the meteorite shows only scattered instances of weathering. In general, the meteorite displays an interlocking texture of olivine and pyroxene. A few chondrules were noted, but these were indistinct, with blurred edges. On this basis, we classify the Kansas University meteorite as petrologic type 6, following the scheme of Van Schmus and Wood (1967).

Examination of the thin section suggests that the meteorite is moderately shocked. Undulatory extinction and occasional planar fractures are noted in both olivine and pyroxene grains. A few small opaque shock veins were observed, but no melt pockets were noted in our section. Using the criteria of Stöffler *et al.* (1991), we suggest that the Kansas University meteorite is shock stage S3.

#### MINERALOGY

Electron microprobe analysis of the meteorite was conducted at Johnson Space Center (JSC) using a 15 keV,

30 nA beam. Marjalahti olivine was used as the standard. The olivine has a mean composition of  $\text{Fa}_{26.0}$  ( $N = 10$ ,  $\sigma = 1.4$ ), and the pyroxene has a mean composition of  $\text{Fs}_{21.5}$  ( $N = 3$ ,  $\sigma = 0.8$ ) and  $\text{Wo}_{1.2}$  ( $N = 3$ ,  $\sigma = 0.1$ ). Minor amounts of high-Ca pyroxene were noted. These data are consistent with the classification of this meteorite as an L chondrite.

#### PAIRING

The find location and discovery details of this meteorite are unknown. However, we have estimated a terrestrial age for this meteorite from both natural TL and <sup>14</sup>C abundances (Table 1). The natural TL level and the <sup>14</sup>C indicate a terrestrial age of  $5600 \pm 1300$  years (Benoit *et al.*, 1993).

Without find location data, we cannot rule out a pairing of this meteorite with other L6 chondrite finds from this part of North America, most of which have been only minimally examined. We have, however, ruled out pairing with three of the strongest candidates, Densmore (1879), Long Island and Lawrence. Densmore (1879) and Lawrence were studied because both were found close to the presumed Kansas University find location and because Densmore (1879) is a large meteorite. Long Island was chosen because it is very large



FIG. 1. The Kansas University meteorite. The left side of the meteorite displays the scalloped fusion crust. The dark area at the bottom shows saw marks that indicate where samples were apparently taken in the past.

TABLE 1. Natural TL and carbon-14 data for Kansas University and meteorites possibly paired to Kansas University.

	Natural TL 250 °C (krad)	<sup>14</sup> C (dpm/kg)	Terrestrial Age (ka)
Kansas University	7.6 ± 0.1*	26.0 ± 0.2	5.6 ± 1.3*
Densmore (1879)	0.54 ± 0.03*	0.27 ± 0.11†	43.5 ± 3.5†
Long Island	<0.1	39.2 ± 5.6	2.2 ± 1.3
Lawrence	0.3 ± 0.1	n.a.	n.a.

n. a. = not analyzed.

\*From Benoit *et al.* (1993).

†From Jull *et al.* (1993).

and heavily fragmented (~3000 pieces of ~1200 lb total weight; Graham *et al.*, 1985) and was found at about the same time as the Kansas University meteorite.

Table 1 shows the natural TL data and <sup>14</sup>C abundances in the four meteorites. Densmore has a low natural TL level and a low <sup>14</sup>C abundance, thus indicating a terrestrial age of 43 500 ± 3500 years, which is much greater than the 5600 year age of Kansas University (Benoit *et al.*, 1993). The <sup>14</sup>C abundance of Long Island indicates a terrestrial age of 2200 ± 1300 years, which is significantly less than that of Kansas University. Also, the natural TL level of Long Island is much lower than that of Kansas University, having essentially no measurable TL at 250 °C in the glow curve, which indicates that the meteorite had been reheated while in space. Lawrence was found some time later (1928) than Kansas University and has a much lower natural TL level of 0.3 ± 0.1 krad at 250 °C in the glow curve. This indicates that the meteorite either has a terrestrial age of >40 000 years or that it had been reheated while in space.

Kansas University has a short terrestrial age when compared to many of the other meteorites from the central United States. The ter-

restrial ages of these meteorites generally range from ~11 000 to >40 000 years (Jull *et al.*, 1993), as compared to 5600 years for Kansas University.

### SUMMARY

The Kansas University meteorite is a fairly typical L6 chondrite find of shock stage S3. Its most prominent feature is its well-preserved fusion crust. It has a terrestrial age of ~6000 years. Although its exact discovery site is unknown, it is not paired to some of the better known L6 finds from the region, and we suggest it is an independent fall.

*Acknowledgments*—We wish to thank Vincent Yang for access to the JSC electron microprobe laboratory and Steven Symes for the determination of olivine and pyroxene compositions. This work was supported by NASA grants NAGW 3479 and NAGW 3519, NSF grant DPP-915521, and NASA grant NAGW 3614 (A. J. T.).

*Editorial handling:* E. R. D. Scott

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