

KAPOETA

Howardite



Fell April 22, 1942
31° 10' S., 127° 45' E.

An 11.355 kg stone ~18 cm in diameter fell in Equatoria, Sudan at 7:00 in the evening. The mass was recovered on the Kapoeta-Nathalani Road. The main mass currently resides with the Sudan Geological Survey in Khartoum.

Kapoeta has a typical howardite composition as a microbreccia formed from the reworked, compacted regolith of its parent body. It is a mixture of mineral and rock fragments, mostly diogenite and eucrite, but contains some black carbonaceous chondrite xenoliths. These are composed of a fine-grained matrix with embedded chondrules resembling those of the CM type. Also present in the breccia are impact melt clasts of howardite material. All of these disparate fragments were mixed together over eons of continuous bombardment to the surface of the parent asteroid, probably 4 Vesta.

As evidenced by the presence of solar-wind-implanted noble gases, Kapoeta was part of a regolith on its parent body for a time. This was followed by a period of burial lasting several million years which eliminated ^{26}Al . Based on data from the cosmogenic radionuclide ^{36}Cl , a cosmic-ray exposure age of ~3 m.y. was derived. This data also suggests that the meteoroid had a preatmospheric diameter of ~40 cm, and that the Kapoeta meteorite had been located several cm within this meteoroid.

Studies of orthopyroxene crystals from selected howardites indicate a magnesium concentration in Kapoeta consistent with that of diogenites (*MAPS* vol 35, no 2). The presence of exsolved augite along with a slow cooling rate points to a formation region within a deep diogenitic source. A more detailed scenario on the formation of the HED clan can be seen on the [Millbillillie](#) page.

The basaltic achondrite group is a complicated one to classify due to the diversity in the structural and mineralogical relationships among its members. This group is composed of brecciated and unbrecciated, monomict and polymict, eucrites, diogenites, and howardites, and has recently undergone a redefinition.

The monomict subgroup containing eucrites, cumulate eucrites, and diogenites is further subdivided into brecciated and unbrecciated members. The polymict subgroup samples a compositional and textural continuum of regolith and surface breccias consisting of eucrites, cumulate eucrites, diogenites, and howardites. Those meteorites containing more than 90% of a single component are given the prefix "polymict" attached to their present description (e.g. polymict eucrites contain less than 10% non-eucritic material; polymict diogenites contain more than 90% orthopyroxenite or hypersthene). Those meteorites that contain less than 90% of any single component are defined as howardites. While the 10% level is still an arbitrary dividing line based simply on mineral proportions, it is an amount of orthopyroxene that can easily be detected by X-ray diffraction techniques. An additional tool to distinguish between polymict eucrites and howardites involves pyroxenes in the basaltic clasts; within howardites they are mostly unzoned whereas in polymict eucrites they are usually zoned.

The number of howardites in our collections is about two-thirds the number of eucrites and over three times the number of diogenites. Their rarity is a close match to that of the ureilite achondrites. The KAPOETA specimen pictured above is a 2.4 g partial slice. The reverse side is shown below.



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