GEBEL KAMIL: THE IRON METEORITE THAT FORMED THE KAMIL CRATER IN EGYPT.

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The 45 m-diameter Kamil impact crater (eastern Sahara, Egypt) was formed <5000 years ago within Cretaceous quartz-arenites of the Gilf Kebir Formation [1,2]. Most of the pristine features of the impact structure are exceptionally well preserved, including thousands of fragments of the iron meteorite impactor, the Gebel Kamil meteorite. With the exception of a single 83 kg regmaglypted individual showing remnants of the fusion crust, all specimens of Gebel Kamil are explosion fragments (shrapnel) weighing from < 1 g to 34 kg. The shrapnel shapes vary from flattened, twisted and jagged to rounded and equidimensional. Gebel Kamil is an ungrouped Ni-rich (about 20 wt% Ni) ataxite characterized by high Ge and Ga and relatively low Ir contents (~ 120, ~ 50 and ~ 0.5 μg g^{-1}, respectively), and by a fine-grained duplex plessite metal matrix. The metal matrix often contains spindles of kamacite (15-25 μm in width) nucleated onto small schreibersite crystals, and arranged in a micro-Widmannstätten pattern. Accessory minerals are, in order of decreasing abundance, schreibersite, troilite, daubréelite and native copper. Schreibersite and troilite are typically enveloped in swathing kamacite. Terrestrial weathering is extremely low and confined to the portions closest to the external surface. Shrapnel fragments are invariably cross-cut by curvilinear shear bands formed during the explosive impact on Earth. These structures are not observed in the individual specimen which detached from the main body prior to impact. In terms of structure and bulk chemical composition Gebel Kamil is similar to the Morradal ungrouped Ni-rich ataxite [3].

Systematic search around the crater revealed that meteorite fragments have a highly asymmetric distribution, with greater concentrations in the southeast sector. A broad maximum in meteorite concentration occurs in the 125°-160° N sector at about 200 m from the crater rim. The mass of meteorite specimens >10 g recovered in the field is 1700 kg, whereas the total mass inferred from the density map compiled in this study is 3400 kg. Field data indicate that the iron bolide approached the Earth's crust from the northwest (305°-340° N), travelling along a moderately oblique (30°-45°) trajectory, following [4]. Upon hypervelocity impact, the projectile was disrupted into thousands of fragments. Shattering was accompanied by some melting of the projectile and of the quartz-arenite target rocks, which also suffered variable degree of shock metamorphism (formation of planar fractures, mosaicism and planar deformation features in quartz). Interestingly, some of this melted and shocked material stuck onto the shrapnel surfaces and was occasionally preserved from the erosive action of wind-driven sand.

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