THE KAMIL CRATER, EGYPT.

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We report the detection in southern Egypt of a rayed impact crater 45 m in diameter on a Cretaceous sandstone target. The ejecta rays highlight the exceptional freshness of the structure. The crater, identified by V. De Michele during a Google Earth survey in 2008, is named Kamil Crater after the nearby peak Gebel Kamil. A geophysical expedition undertaken in February 2010 revealed that the crater is bowl shaped and has an upraised rim (~3 m above pre-impact surface) typical of simple craters [1]. The true crater floor depth is 16 m and is overlain by a ~6 m-thick crater-fill material. Morphometric parameters agree with those predicted by models [2] for explosive impact craters generated by an iron meteorite 1.3 m in diameter (equivalent to 9.1 x 10^3 kg) impacting at a velocity of 3.5 km s^{-1}, assuming an average meteoroid entry velocity and entry angle of 18 km sec^{-1} and 45°, respectively. Centimeter-scale masses of scoriaceous impact melt glass occur in and close to the crater, and indicate local shock pressures >60 GPa [1]. We identified over 5000 iron meteorite specimens totaling ~1.71 tons in the crater and surrounding area during systematic searches. They consist of <34 kg shrapnel produced by the explosion of the impactor upon hypervelocity collision with the target, except one individual fragment of 83 kg. This indicates that the Kamil Crater was generated by an impactor that landed nearly intact without substantial fragmentation in the atmosphere. The meteorite, named Gebel Kamil, is classified as an ungrouped Ni-rich ataxite (Ni ~ 20 wt%, Ga ~ 50 µg g^{-1}, Ge ~ 120 µg g^{-1}, Ir ~ 0.5 µg g^{-1}; data by ICP-MS analyses following [3]). Magnetic anomaly data show no evidence of buried meteorites larger than some tens of centimeters.

Based on systematic meteorite search, the estimated total mass of the impactor is of the order of 5-10 x 10^3 kg, corresponding to a pre-atmospheric mass of ~20-40 x 10^3 kg [4]. According to geophysical models [4], iron masses <3 x 10^6 kg normally fragment upon impact with the Earth's atmosphere, thereby reducing the energy of the impact at the Earth's surface. The present statistics, which include the recently discovered Whitecourt Crater [5] and the Kamil Crater, suggest however that ~35% of the iron meteorites in the above mass range are not disrupted in the atmosphere. Details of this work are published in [6,7].

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