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THE STEINHEIM SUEVITE

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Introduction: The 3.8 km Steinheim Basin [1] in SW Germany is a complex impact crater with central uplift thought to have formed simultaneously with the 24 km and 14.4 Ma Ries crater [2, 3] by the impact of a double asteroid. The crater is hosted by a sequence of Triassic to Jurassic sedimentary rocks [e.g., 2]. The Steinheim Basin exhibits a well-preserved crater morphology, intensely brecciated limestone blocks that formed the crater rim and shatter cones in limestones of excellent quality. In addition, a fallback breccia ('Primäre Beckenbrekzie') mainly composed of Middle and Upper Jurassic limestones, marls, and sandstones is known from drilling in the Steinheim Basin [1, 4].

Samples and Observations: The samples were taken from a drill core (B26, depth 76–77 m) that was constructed in the 1970s [1] at the flank of the central uplift and went through 'Primäre Beckenbrekzie' and the crater floor. We recently discovered small particles (mm in size) in the basin breccia that turned out to represent glass particles now altered and transformed into phyllosilicates. The altered glass particles are rich in SiO_2 (~50%), Al_2O_3 (~22%), CaO (~12%), and contain Fe-sulfides rich in Ni (up to 1.2%) and Co (up to 0.1%) [5], as well as target rock clasts (shocked and unshocked quartz, feldspar, limestone) and recrystallized droplets of calcite [6]. The melt particles exhibit distinct flow structures and relicts of schlieren and blasen (Fig. 1).

Conclusions: No impact melt lithologies have so far been reported from the Steinheim Basin. Due to the geochemical composition and the textural features, we interpret the particles analyzed as melt fragments widely recrystallized and/or altered. On the basis of impactite nomenclature, layers of glass-bearing impact breccias in the drill core studied can be denominated as Steinheim suevite. The geochemical character of the altered glass particles (high amount of Fe and Ti) point to Middle Jurassic sandstones ('Eisensandstein') that crop out in the central uplift as the source for the melt fragments.

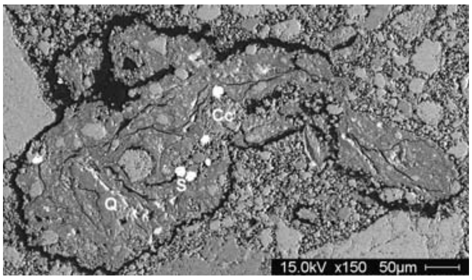

Fig. 1. BSE image of a fluidally textured glass particle (altered to hydrous phyllosilicates) in Steinheim suevite (drill core B26); Q: quartz grain, Cc: droplet of recrystallized calcite; S: Fe-sulfides rich in Ni and Co.

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MYTHOLOGICAL ARTIFACTS MADE OF CELESTIAL BODIES—A BUDDHIST DEITY OF METEORITIC IRON

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Introduction: Meteorites have been regarded as devotional and ritual objects by multitudinous cultures since prehistoric times. Artifacts made of meteoritic iron were found in old Egyptian king tombs and in Mesopotamian sanctuaries. In the Buddhist art in the Middle and Far East [e.g., 1], meteoritic iron used to be carved, but that tradition died out a long time ago, and only ancient artifacts are known. Figurative illustrations or religious sculptures of gods carved in meteorites are not reported in the literature. We here present a sculpture made of an iron meteorite that displays a unique particularity in religious art.

The Sculpture: Origin and age of the "iron man" sculpture, carved from one piece of iron meteorite (now ~10.6 kg and about 24 × 13 × 10 cm), is still a matter of speculation. The Swastika on the cuirass of the statue is a minimum 3000 years old Indian sun symbol and is used as an allegory of fortune to date; the scale armor was originally gilded. The sculpture possibly portrays the Buddhist god Vaiśravana (also called Jambhala or Namthöse in Tibet, or Hindu Kubera), and which can be either a God of fortune and wealthiness or a God of war [e.g., 2]. To our knowledge, the statue originates not from China, India, or Tibet. The provenance of the meteorite strongly points to the border region of eastern Siberia and Mongolia.

The Meteorite: A plate (~1 cm thick, ~500 g) was cut from the base of the statue. The texture of the metal is that of a Ni-rich ataxite with strait and curved schlieren bands visible at the etched surface. It fits in detail that of the Chinga (IRUNGR) meteorite. The metal consists of a very fine-grained intergrowth of kamacite and taenite (Ni 15.7 wt%, Co 0.5 wt%), which includes a few sulfide grains of varying size (<1–10 mm) consisting of daubreelite ($FeCr_2S_4$) and chromian troilite lamellae, and small (<1 mm) kamacite spindles (Ni 7 wt%, Co 0.7 wt%). A fissure contains brecciated metal, daubreelite and troilite embedded in rust.

A preliminary analysis revealed: Fe 83.5 wt%, Ni 15.9 wt%, and Co 0.6 wt% with Cr and platinum group elements (PGE) significantly enriched [3]. All data suggest that the "meteorite man" is the third largest piece from the Chinga strewn field discovered in the boarder region of Siberia and Mongolia in 1912. One can speculate whether this specimen was discovered earlier as a single find.

Since March 2009, the sculpture is owned by an anonymous Austrian. Part of the cut socket plate is at the Naturhistorisches Museum, Vienna. Detailed studies are under way.

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