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Gerzeh, a prehistoric Egyptian meteorite

D.Johnson¹, M.M.Grady^{1,2} and J.Tyldesley³ ¹PSSRI, Open University, Walton Hall, Milton Keynes, MK76AA, UK. E-mail: D.Johnson@open.ac.uk. ²Natural History Museum, Cromwell Road, London, UK. ³KNH Centre for Biomedical Egyptology, Manchester University, Oxford Road, Manchester, M139PT, UK.

One of the earliest examples of iron used by man was discovered in a prehistoric Egyptian cemetery. The site of Gerzeh, 40 miles south of Cairo, was excavated in 1911-1912, over 300 graves dating from around 3300 BCE were discovered [1]. A few of the graves contained rare and precious materials such as gold and lapis lazuli. Two graves, Tombs 67 and 133, were also found to contain iron beads; at the time of excavation these examples of Egyptian pre-dynastic culture were considered to be the earliest specimens of worked iron. Subsequent analysis revealed the iron to contain significant levels of nickel, leading to identification of their meteoritic origin [3]. Iron meteorites were also used to make other items later in Egyptian history, including a dagger blade from Tutankhamen's tomb (18th dynasty, 1340-1320 BCE), but no artefacts have been found to be made from meteorite iron after this date.

The most recently published analysis of the Gerzeh iron beads was in 1929 [3]. Our study is intended as an illustration of the non-destructive analysis of an intact artifact, in order to allow a better understanding of this historically rare and precious sample. Optical imaging, electron microscopy and EDS were used to both define and analyze the bead. A thick weathering layer of oxidized iron was easily seen; this incorporates rounded quartz grains that originated in the grave, which was filled with sand. Patches of the oxidized areas have degraded and partially fallen away, probably post-excavation, allowing us to examine underlying regions in which small areas of metal were observed. The metal has an average composition of 9 wt. % Ni. The tubular bead structure interior was also found to be filled with ferric oxides and sand, at one end of the bead plant fibres of the strand used to string the beads together were also observed.

This study explores one of the earliest examples of the use of meteoritic iron in artefacts. It is impossible to estimate the original mass of the meteorite: 9 beads were discovered in the two tombs, but because of the rarity of iron in early Egypt, it is assumed all beads were produced from the same meteorite. The meteorite must have fallen prior to approximately 3300 BCE, as this is the accepted date of the tombs. It is also possible that it fell beyond Egyptian borders as some of the other materials found in the tombs are believed to have arrived in Egypt through foreign trade routes.

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References: [1] Wainwright G.A. 1912. *Revue Archeologique*, 19, 255-259. [3] Desch C.H. 1929. Reports on the metallurgical examination of specimens for the Sumerian Committee of the British Association. Reports of the British Ass. for the Advancement of Science.