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TYPICAL METEORITIC WORM-LIKE FORMS SEEN IN THE POLONNARUWA METEORITE

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ABSTRACT

Fossilized “wormlike forms” were found in a putative new type of carbonaceous meteorite which recently fell on Polonnaruwa, Sri Lanka. Such worm-like forms have been found in other meteorites notably the Martian Allen Hills sample and a lunar meteorite. It has been claimed that such forms are fossilized bacteria, although this possibility is still disputed. The occurrence of worm-like forms in the Polonnaruwa sample adds weight to the view that it is a meteorite and not, as has been suggested, a fulgerite, formed by lightning striking the Earth’s surface.

Keywords: *meteorites, fossilized bacteria, Allen Hills meteorite, panspermia*

Introduction

Worm-like forms (WLFs) claimed to be putative fossilized bacteria have been seen in a number of meteorites as well as rock samples from ancient Earth (Schopf &Packker, 1987). The WLF seen in the Allen Hills (McKay et al.1996, Trieman, 1999) meteorite is the most well known of these, but such have also been found in lunar meteorites (Dalton, 2002, Sears & Kral, 1998, Vann Zuilen et al., 2001), in siliceous sinter deposits from Nevada (Lynne et al., 2008) and by Scopf and colleagues as claimed examples of the first ever fossilized Earth life forms. It has been suggested that these forms are fossilized bacteria although this has been disputed, as have claims that Schopf forms are fossilized early Earth bacteria (Brazier et al., 2002, Dalton, 2002).

During a recent scanning electron microscope study, WLFs were seen in what has been claimed is new type of carbonaceous meteorite which fell in Polonnaruwa, Sri Lanka in 2013 (Wickramasinghe et al.a,b,c). Here, we describe these WLFs and discuss their morphology and location within the claimed-meteorite in relation to the reports of similar forms being seen in both meteoritic and Earth-derived samples.

Materials and Methods

A portion of the Polonnaruwa meteorite was sectioned and then examined under the scanning electron microscope. Using a hot plate the sample was fixed to a polymer stub using wax which was then staged in the wire saw setup (Well 3241 Wire Saw). The wire saw uses a subtle slope to encourage the wire to gently press up against the front face of the staged sample and the gradient of this slope can be altered so as to increase or decrease the force which the wire places upon the sample. The wire used was approximately 0.17mm thick and coated with very fine diamond particles of mode size, circa 30 microns; when activated, the wire makes slow and delicate progress through the sample. After the sample was cut, one half was placed in a staging chamber with the face to be analysed flush to the base. Konductomet phenolic mounting compound (20-3375-016) was used to stage the sample. Surface grinding and then polishing of the sample surface is usually undertaken at this point however, in this case only an instantaneous grinding process was conducted. This was done to remove any build up that might be present on top of the surface to be studied and to ensure that only fresh sample material was exposed. The coarseness of pile used was 120 microns using a Bueler Automet 250 for 5 seconds with a touch force of 20N, a head speed of 50 RPM and a Platen speen of 140 RPM. Due to the relatively low conductive nature of the samples and in order to minimise charging effects and optimise image acquisition the samples was coated in gold using an Emscope gold sputter coater. The sample was coated for deposition duration of 1 minute at 15 milliamps. Before being introduced into the SEM (JEOL 6500F) the sample was placed in a vacuum chamber overnight to remove any remaining moisture.

Results and Discussion

A cross section view of a sample of the Polonnaruwa meteorite sample is shown in Fig.1. A large number of WLFSs having a morphology similar to those seen in the Allen Hills and lunar meteorites are clearly seen. The only major difference between the Polonnaruwa forms and those seen in other meteorites relates to their size, the Polonnaruwa forms being around 1 micron in size, compared to the much smaller nanobacteria-sized forms seen, for example, in the Allen Hills meteorites. One of the major concerns about the Allen Hills WLFs being fossilized bacteria relates to their size. It has been argued that such very small forms as are found in the Allen Hills meteorite could not contain large enough genomes to sustain a bacterium, a criticism which does not apply to the WLFs seen in Polonnaruwa, meteorite.

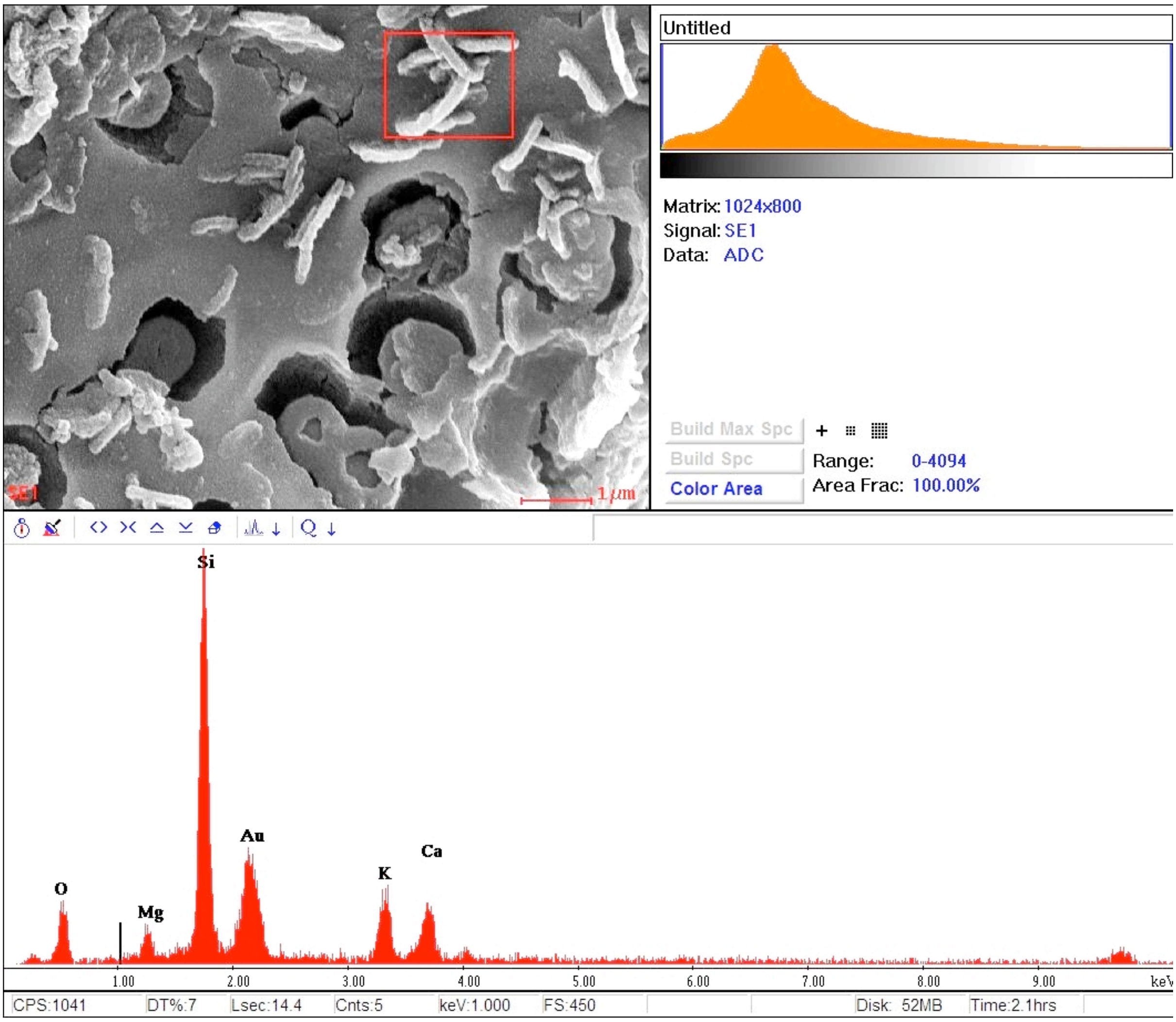

Fig.1. Scanning E/M and EDX of a cluster of WLFs seen in the Polonnaruwa meteorite showing the overwhelming dominance of Si in the putative microbial fossils.

Analysis, using EDX, of a group of WLFS shows that they, like the surrounding matrix consist primarily of silicon with smaller amounts of calcium, oxygen and potassium (Fig.1), a fact which shows that they are not living bacterial contaminants, but putative fossil bacteria.

The depletion of carbon is an indication of fossilization involving the replacement of C with Si and mineralisation of biological forms.

Wickramasinghe et al. 2003(a,b,c) Hoover, 2003 and Wallis et al., 2003) have provided evidence that the Polonnaruwa sample (PS) is a new type of meteorite. Wickramasinghe et al.,2003 (a,b,c) who also report the presence of fossilized diatoms in the surface of the Polonnaruwa meteorite (Wickramasinghe et al. 2013d). Internet-based critics have suggested that the Polonnaruwa meteorite is a fulgerite, formed by lightning striking the Earth's surface. The finding of WLFs, which are typically found in meteorites from Mars and the moon, in WLFs could not

The finding of WLFs, which are typically found in meteorites from Mars and the Moon, in the Polonnaruwa sample, adds weight to the view that the stones fell on Polonnaruwa, are indeed meteorites. Neither WLFs nor diatom morphologies would survive the lightening strike that could have formed fulgerites.

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