Journal of Cosmology, Vol,21, No,39 published, 4 February 2013

AUTHENTICITY OF THE LIFE-BEARING POLONNARUWA METEORITE

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ABSTRACT

We show that the Polonnaruwa stones that were collected on 29 December 2012 following a witnessed fireball, in which we found biological structures, do not possess properties that are consistent with fulgurites on the basis of X-ray diffraction studies, and other data. The existence of distinct diatom frustules fused into the rock matrix makes recent contamination unlikely.

Keywords: Polonnaruwa Meteorites, Fulgurites, Diatoms, Comets, Panspermia

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In two recent papers we reported the discovery of distinctly recognisable diatom frustules in rocks that were reported to have fallen over the skies in central Sri Lanka (Wickramasinghe, Wallis, Wallis et al, 2013a,b). The claim that this was a meteorite and the implied validation of the theory of cometary panspermia has, not unexpectedly, provoked criticism and controversy. We are of course aware that science must always proceed with cautious efforts to maintain a status quo until any particular convention or position is forced to collapse. Peer review is an essential component of this process, but vituperative personal attacks, such as we have seen on the internet and media do not contribute to the discussion and debate. In our opinion a vigorous scientific culture needs injection of new and challenging ideas as and when new facts demand them. It is in this spirit that we continue to support the *Journal of Cosmology* in its capacity to provide a platform for new ideas and interpretations that may otherwise become censored and prevented from being known.

The critics of our recent publications make two scientific points that we shall discuss in turn. First is the possibility that the stones in question are not meteorites, but fulgurites formed when sand is struck by lightning. If this were so we would have to discredit fully the weight of anecdotal and documented evidence that a fireball was seen, the fall witnessed, and stones collected by farmers in a rice field in Araganwila near Polonnaruwa. Two samples examined by us included one recovered by a farmer from his own property, and another that fell on a roof a few hundred metres away. Both stones, when examined using an electron microscope, displayed the diatom structures we described in our earlier papers.

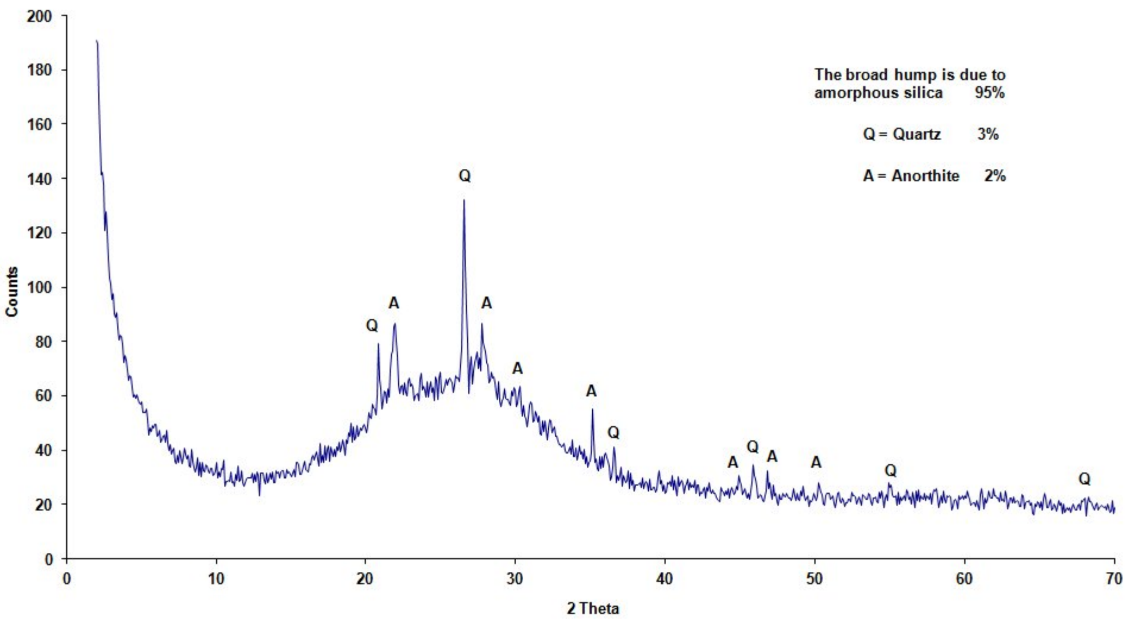

Fig.1 X-ray diffraction spectrum of powdered Polonnaruwa rock

The fulgurite hypothesis can be considered more closely by examining the rock by X-ray diffraction analysis. The sample was powdered, mixed with a small amount of acetone and pipetted out onto a glass slide. Analysis was carried out using X-ray diffraction. A scan was run using the Philips PW1710 Automated Powder Diffractometer using Cu Kα radiation at 35kV and 40mA, between 2 and 70 °2θ at a scan speed of 0.04 °2θ/s. From the scan, phases were identified using PC-Identify software and from the peak areas, semi quantitative analysis was performed and a percentage of each phase present calculated. The analysis showed the bulk (95%) of the sample to be amorphous silica as represented by the broad hump. The two crystalline phases were present in much smaller quantities and are identified as quartz (3%) and anorthite (2%). The results are displayed in Fig. 1.

The presence of anorthite appears to support earlier contentions on the origins of the Polonnaruwa stones (Wickramasinghe et al, 2013). Whilst this mineral is abundant in the Earth's crust its presence in surface rocks is far rarer due in part to its susceptibility to weathering (Goldich, 1938). Moreover, anorthite has been detected in Comet Wild/2 fragments obtained in the Stardust Mission (Simon et al, 2010) and its mineralogy, along with the observed low bulk density (< 1 g cm^{-3}) points to a cometary origin.

FTIR data (obtained using diamond ATR instrumentation) also provides initial evidence against the fulgurite hypothesis. The spectra, shown in Fig. 2, is dominated by silica (Si-O bending and stretching) vibrations in the 10μm region (800-1175cm^{-1}) found in amorphous as well as crystalline phases. However, there are also strong peaks in the 20 μm region (400 – 700 cm^{-1}) and these features correspond more closely with that of clay-type minerals not associated with fulgurites but thought to exist in IDPs and cometary particles (Lisse et al, 2005).

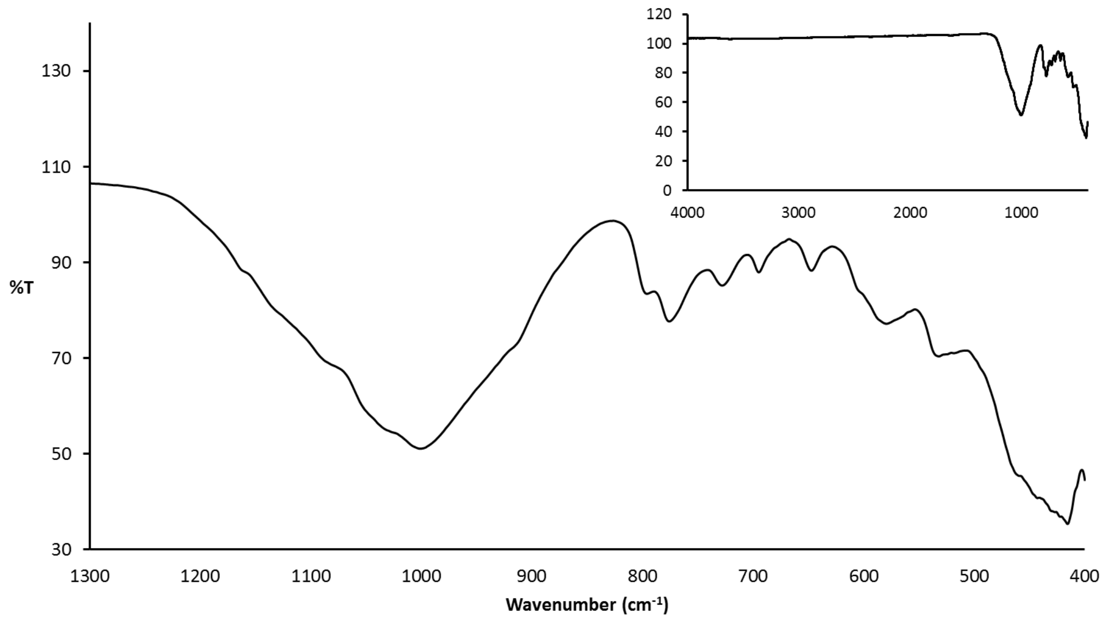

Figure 2. FTIR spectra using of Polonnaruwa rock

The presence of quartz at 3% was considered against all the possible explanations on the origins of the stones. Whilst quartz is associated with terrestrial rocks it should be noted that it has been found in some meteorites (Leroux and Cordier, 2006) and is also thought to exist in asteroids (Treiman et al, 2006). The 3% composition is larger than the trace amounts that we would expect following a shock event and previously reported in fulgurites (Saikia et al, 2008). However, we have not discounted the possibility that surface sand particles are responsible for the observed peaks and correlations between the percentage quartz compositions and distance from the stone's surface is being investigated.

An average carbon content of a few percent combined with data from preliminary GC-MS studies show the presence of several organic fragments (retention time ranging from 2.79 to 29.84 minutes) consistent with high molecular weight PAHs and thus merit its classification as "a carbonaceous meteorite of unknown type." This presumes that we accept the weight of anecdotal evidence in favour of the stones falling from the skies. Work on analysis of oxygen and carbon isotopes is in progress and we expect confirmation of the claim that the rocks did in fact emanate from the fireball event and fell from the skies.

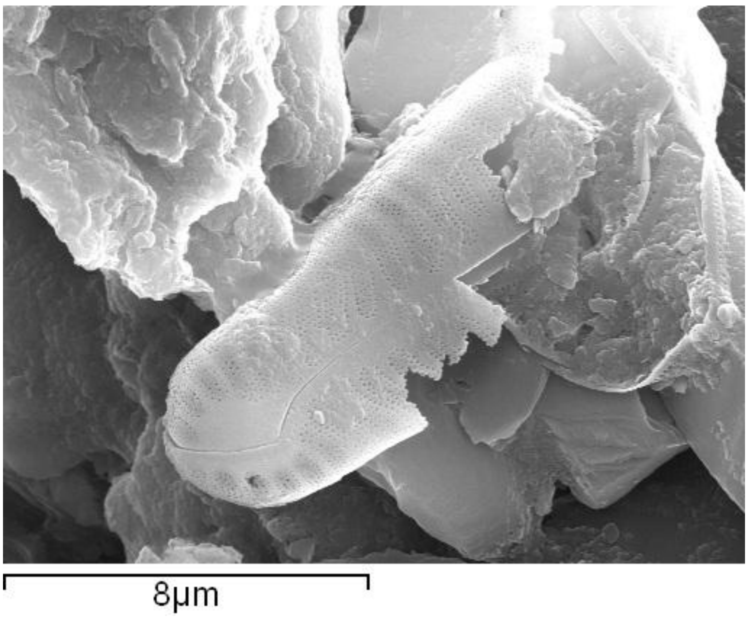

Fig.3. Distinct fossil diatom frustule fused into the rock structure

Another point of contention relates to the evidence of well-preserved seemingly modern diatom frustules covering a wide range of genera and species. The possibility of these being introduced into the rocks after landing on Earth appears to be excluded by the presence of fossil diatoms that are firmly entrenched in the rock matrix as depicted in Fig 3. The absence of strong water bands in the IR spectra (see Fig. 2) also counter arguments of recent terrestrial freshwater contamination. The further claim of critics that the presence of modern genera of terrestrial diatoms is inconsistent with their introduction from an alien cometary habitat, becomes less secure if terrestrial evolution is an externally driven process (Wickramasinghe, 2013). The sudden late appearance in the fossil record of diatoms is consistent with such a hypothesis.

Acknowledgement: We are grateful to Mr. Nadika Udyakantha for assistance in connection

with the collection of meteorite samples.

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