PARENT ROCK AND SECONDARY STRUCTURES IN MUONG NONG-TYPE TEKTITES: IN-SITU MELTING BY A COMET MASER?

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Introduction: New observations of numerous specimens of c. 770 Ka Australasian Muong-Nong tektites reveal that their well-known layering can in some cases be recognised as delicate sedimentary bedding, cross-lamination, cross-bedding and primary current lineation. The layering of these tektites is thus inherited from sedimentary precursors and unrelated to the tektite-forming melting event. Remnant lateritic material that commonly sticks to tektite surfaces was heated, bloated and sintered along vents emanating from the tektite interiors and must also predate the melting event. Bubbles in the tektite glass are spherical, flat-headed or spindle-shaped with two pointed ends. Together with previously reported tektite flow structures, the bubble shapes constrain the minimum viscosity and hence maximum temperature of the glass to 2000–2200°C. There is no observable temperature gradient from top to bottom of the tektites, although frothy, light tektite layers with remnants of unmelted quartz are less thoroughly melted than dark layers. It follows from all these observations that the Muong-Nong tektites were pieces of sedimentary rock lying on a lateritic surface, presumably forming ordinary lag deposits, and were melted in situ by a differential heating process without ejection. Our interpretation is in agreement with early descriptions of find sites on buried lateritic surfaces [1], which are likely to represent the actual sites where the Muong-Nong tektites were originally formed.

Conclusions: The in-situ melting of the Muong-Nong tektites with vent-heating of adherent laterite seems best explained by irradiation of heat from the sky, possibly by emission of 22.4 GHz microwaves from a short-lived cometary water maser. This requires a preceding cometary airburst, in agreement with the contemporaneous, several metres thick, gravity-sorted Yasothon sand deposited on ferricrete in NE Thailand and with the apparent absence of a large impact crater.

Reference: [1] Barnes, V. I. and Pitakpaivan, K. 1962. *Proceedings of the National Academy of Sciences of the United States of America* 48:947–955.

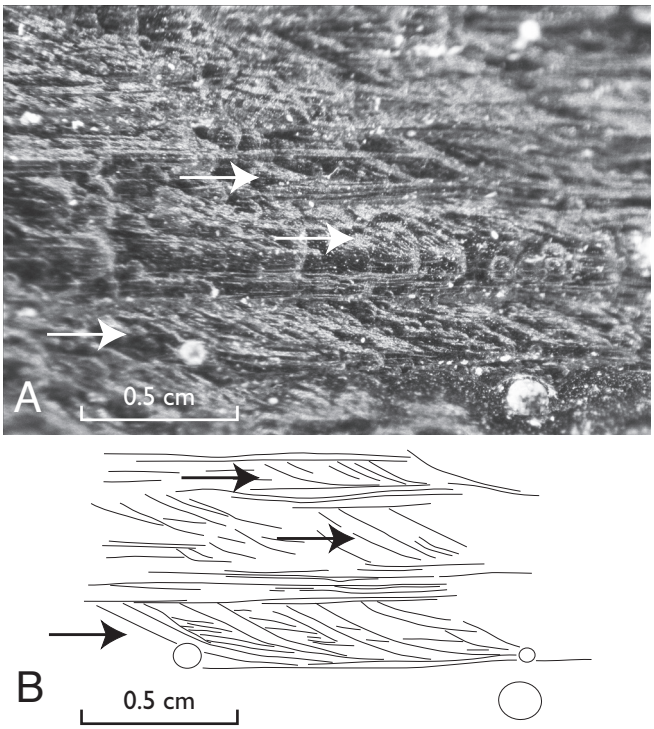

Fig. 1. Cross-laminated sedimentary units in MN tektite with gas bubbles, shown with depositional younging upwards. A: Photo of weathered surface showing foresets and bottomsets in cross-laminated units (arrows), indicating current transport from left to right. B: Tracing of details in cross-laminated units (same image at same scale).