PEEKING INSIDE FLANGED BUTTON TEKTITES USING XCT.

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Introduction: Flanged button tektites have a morphology indicative of stable flight through the atmosphere causing ablation and transport of forward-facing material to a surrounding flange [e.g., 1]. Complete well-preserved flanged button tektites are rare [e.g., 1,2]. The interior structure has previously been studied via thin-sectioning and examining etched broken samples, but non-destructive imaging methods such as X-ray Computed Tomography (XCT) provide the opportunity to examine the internal structures in 3-dimensions.

Methods: Two samples of button tektites from the Smithsonian (sample numbers USNM 7912-4 and USNM 7912-7) were scanned using the XCT facility of the Civil Engineering Department at the University of Strathclyde to understand their morphological and internal microstructures. The scans were acquired using a transmission head source, at 120 kV voltage, and a beam current of 95 µA. 3141 projections with a 2 second exposure time were acquired over a 360° rotation. A copper filter of 2 mm was used to prevent beam hardening in the acquired data. The final reconstructed voxel size was 14.07 µm.

Results: The XCT 3D renderings provide high resolution details of the morphology of the samples, including the flange and ringwaves on the front surface (Fig. 1a, b).

The interior hosts clear flow patterns highlighting density variations within the glass (Fig. 1b, c). These patterns show complex flow textures and provide insight into the internal structure of the samples. The XCT data also highlight the presence of small bubbles, and grains of sand trapped within a stress crack (in USNM 7912-7) and also within the gap between the flange the core (Fig. 1a,b).

Discussion: The imaged flow textures are not a new observation, having been reported in thin section or from broken and etched samples previously [e.g., 1,2,3 and references therein]. However, XCT provides 3D imaging of those textures, with further details into their spatial distribution and extent within the samples, and, more critically, demonstrates the utility of the method for examining fine-scale interior textures of naturally formed glasses.

References: [1] Baker G., (1956) *Memoirs of the National Museum of Victoria, 20,* 59 –172. [2] McColl D. (2017) *Australia's Little Space Travellers* Springer, 64pp. [3] von Koenigswald G. H. R., *Sp. Sc. Revs. 3,* 433-446.

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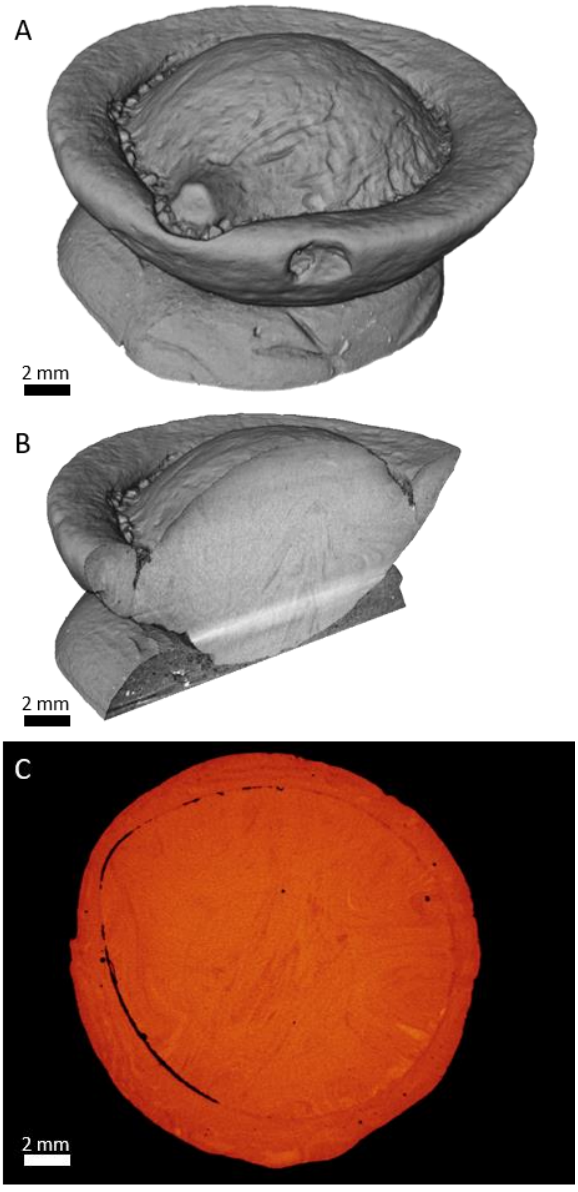

Figure 1: *XCT images of USNM 7912-4. A) 3D rendering of the sample showing full flange, original tear-drop shape, and trapped sand grains between the flange and the core. B) Vertical XCT clip of the 3D rendering showing internal texture. C) Horizontal cross section showing the core and lower part of the flange. The dark mass on the bottom of A and B is material holding the tektite for scanning. A bright XCT artefact is present at the bottom of the tektite in B.*