CRISTOBALITE INCLUSIONS IN LIBYAN DESERT GLASS; CONFIRMATION USING RAMAN SPECTROSCOPY. J. F. McHone[1], M. Killgore[2], and A. Kudryavtsev[1], [1]Astro and Solar System Physics Program, Department of Physics, University of Alabama at Birmingham, Birmingham AL 35294-1170 (jmchone@hotmail.com), [2]Southwest Meteorite Laboratory, P.O. Box 95, Payson AZ 85547.

***Introduction*:** Libyan Desert Glasses (LDG) are widely regarded as byproducts of an undetected extra-terrestrial impact event and are normally classified with tektites and/or impactites. Masses of yellowish translucent-to-transparent, wind sculpted silica-rich glass were first reported by Clayton [1] during his 1932 expedition into the Libyan Desert of southern Egypt. Individual glass nodules are still found scattered over the surface of some 7,000 square kilometers of remote desert sands and rock. Although a few boulders may weigh up to 8 kilograms, most fragments are gravel to-cobble in size. Occasional masses contain small, 0.1 to 2 mm wide white, opaque spherulites dispersed as individuals (Fig. 1) or, less commonly, in rows or in clusters.

Fig 1. Straw-colored transparent Libyan Desert Glass iluminated from behind. Opaque spherules of white cristobalite appear as dark spots imbedded within silica-rich glass.

Early workers using techniques of specific gravity and optical properties [1], and X-ray photography [2], identified these spherulites as cristobalite, a high temperature silica polymorph. Cristobalite inclusions were also found in Indochinite tektites [3]. Although these analytical methods are usually reliable, they can be ambiguous if applied to small samples of possibly multiphase material.

Experiment: In this study, we confirm cristobalite spherules in LDG samples using unambiguous, non-destructive microbeam Raman spectroscopy [4]. Our instrument, a Dilor 0.8 m triple-stage Raman system, was configured for microbeam spot analysis. Sample preparation is minimal; a clean bulk specimen is placed in air upon a microscope stage and in the path of a 568.2 nm laser beam. Raman spectra are collected through the same optics. Two reference samples verified cristobalite identification bands: 1) a chip of impactite from Wanapitei Crater in Canada [5] and 2) a "pigeon egg" nodule in obsidian supplied by the late R.S.Dietz. Both standards produced three sharp peaks at characteristic cristobalite Raman shifts of 112-114, 230-231, and 415-418 cm-1 wave numbers.

Results: A spherule-bearing LDG sample was then examined. Long-focus objective lenses permit focusing a laser beam as deep as 4 mm *beneath* transparent glass surfaces to allow collecting spectra from completely enclosed inclusions. LDG spherules produce three strong Raman peaks at 114, 231,and 418 cm-1, confirming a dominant presence of cristobalite. A weak, broad peak at about 500 cm-1 may indicate a trace of tridymite [6], another high-temperature silica polymorph. Cristobalite in volcanic obsidians is interpreted to result from a high silica content with a history of strong temperatures. Its presence in LDG is from silica glass devitrification enhanced, perhaps, by about 0.1% water content [7] and Saharan temperatures.

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