ALLOCHTHONOUS ADDITION OF METEORITIC ORGANICS TO THE LUNAR REGOLITH. K.L. Thomas-Keprta[1], S. Clemett[1], D.K. Ross[1], L. Le[1], Z. Rahman[1], D.S. McKay[§], E.K. Gibson[2], C. Gonzalez[1]; [1]JETS/NASA JSC Mail Code JE-23, Houston TX 77058. E-mail: kathie.thomas-keprta-1@nasa.gov [§]Deceased. [2]NASA JSC, Houston TX 77058.

Introduction: Papers presented at the first Lunar Science Conference [1] and those published in the subsequent Science *Moon Issue* [2] reported the carbon (*C*) content of Apollo 11 soils, breccias, and igneous rocks as ranging from ~50 to 250 parts per million. These values are unexpectedly low given that multiple processes should have contributed to the lunar *C* inventory. We estimate the contribution of *C* from exogenous sources (*e.g.*, cometary and asteroidal dust) alone is ~500 ppm, which is ~4× greater than the reported average. So while the assessment of indigenous organic matter in returned lunar samples was one of the primary scientific goals of the Apollo program, extensive analysis of Apollo samples yielded no evidence of any significant indigenous organic species. We have identified for the first time arguably indigenous complex organic matter on the surfaces of the 74220 pyroclastic beads, collected on the rim of Shorty crater during the Apollo 17 mission.

Results & Conclusions: Preparation of lunar samples 74220,861 was discussed in detail in [3, 4]. Our analysis sequence was as follows: optical microscopy, UV fluorescence imaging, μ-Raman, FESEM-EDX imaging and mapping, FETEM-EDX imaging and mapping of a Focused Ion Beam (FIB) extracted section, and NanoSIMs analysis. We observed fluffy-textured *C*-rich regions of interest (ROI) on three different volcanic glass beads. Each ROI was several μm^2 in size and fluoresced when exposed to UV. Using FESEM/EDX, the largest ROI measured ~3×6 μm and was located on an edge of a plateau located on the uppermost surface of the bead. The ROI was covered on one edge by a siliceous filament emanating from the plateau surface indicating it was attached to the bead while on the Moon. EDX mapping of the ROI shows it is composed primarily of heterogeneously distributed *C*. Embedded with the carbonaceous phase are localized concentrations of *Si*, *Fe*, *Al* and *Ti* indicating the presence of glass and/or minerals grains. μ-Raman showed strong D- and G-bands and their associated second order bands; intensity and location of these bands indicates the carbonaceous matter is structurally disorganized. A TEM thin section was extracted from the surface of a glass bead using FIB microscopy. High resolution TEM imaging and selected area electron diffraction demonstrate the carbonaceous layer to be amorphous; it lacked any long or short range order characteristic of micro- or nanocrystalline graphite. Additionally TEM imaging also revealed the presence of submicron mineral grains, typically < 50 nm in size, dispersed within the carbonaceous layer. NanoSIMs data will be presented and discussed at the meeting.

Given the noted similarities between the carbonaceous matter present on 74220 glass beads and meteoritic kerogen, we suggest the allochthonous addition of meteoritic organics as the most probable source for the C-rich ROIs.

References: [1] Apollo 11 LSC 1970. Houston, TX Jan 5-8; AAAS #70-71. [2] The Moon Issue 1970. *Science 167* - dedicated to the papers resulting from studies on Apollo 11 samples. [3] Thomas-Keprta, K.L. *et al*. 2012. 43rd *LPSC* Abst. # 2561. [4] Thomas-Keprta, K.L. *et al*. 2013. 44th *LPSC* Abst. # 2103.