AUGER ANALYSIS OF IMPACT CRATERS FROM THE STARDUST INTERSTELLAR FOILS.

C. Floss, C. Allen, A. Ansari, S. Bajt, N. Bassim, H. A. Bechtel, J. Borg, F. Brenker, J. Bridges, D. E. Brownlee, M. Burchell, M. Burghammer, A. L. Butterworth, P. Cloetens, A. M. Davis, G. J. Flynn, D. Frank, Z. Gainsforth, E. Grün, P. R. Heck, J. K. Hillier, P. Hoppe, L. Howard, G. R. Huss, J. Huth, B. Hvide, A. Kearsley, A. J. King, P. Kotula, B. Lai, J. Leitner, L. Lemelle, H. Leroux, L. R. Nittler, R. C. Ogliore, W. J. Ong, F. Postberg, M. C. Price, S. A. Sandford, J. A. Sans Tresseras, S. Schmitz, T. Schoonjans, K. Schreiber, G. Silversmit, A. Simionovici, R. Srama, T. Stephan, J. Stodolna, R. M. Stroud, S. R. Sutton, R. Toucoulou, M. Trieloff, P. Tsou, A. Tsuchiyama, T. Tyliczszak, B. Vekemans, L. Vincze, A. J. Westphal, M. E. Zolensky, and >29,000 Stardust@home dusters. ISPE author affiliations are at http://www.ssl.berkeley.edu/~westphal/ISPE/.

Introduction: The interstellar tray from NASA's Stardust mission collected particles for 229 days during two exposures prior to the spacecraft encounter with comet 81P/Wild 2, and tracked the interstellar dust stream for all but 34 days of that time. Aluminum foils from this collector are being scanned using high resolution SE imaging and the first impact craters located on the foils have recently been identified [1, 2]. Because the number of impact craters found on the foils appears to be significantly higher than estimates made based on interstellar flux calculations [e.g., 3] (extrapolation of the crater densities on the foils examined to date suggests that as many as ~1000 craters may be present on the total exposed interstellar foil area [1]), the Science Council for the Interstellar Preliminary Examination Team (ISPE) recently approved Auger Nanoprobe, SEM-EDX and FIB-TEM analysis on several of these craters. Here we report the results of our Auger Nanoprobe analysis on three impact craters from the interstellar foils.

Experimental: The Auger measurements were done with the PHI 700 Auger Nanoprobe at Washington University, using a 10kV 10nA beam rastered over the crater interiors. Spectrum acquisition consisted of three cycles over an energy range of 30–2130 eV for a total acquisition time of 2 minutes. Based on measurements of a ~200 nm crater from a cometary side foil, these parameters were deemed sufficient for determining residue compositions on the crater bottoms if such residue is present.

Results and Discussion: Two impact craters from foil I1061N (036@33 and 188@24, diameters of 350 nm and 650 nm, respectively) and one crater from foil 1033N (11_175, diameter of 1.1 μm) were analyzed with the Auger Nanoprobe. In addition to C, O, and Al, all craters show the presence of Si. Crater 36@33 also shows evidence for Mg and Fe, while crater 11_175 also appears to contain a minor amount of Na. Spectra taken on areas of foil adjacent to the craters do not show evidence for these elements, although Fe is a common inclusion in Stardust foil. The elements observed in these crater residues are in broad agreement with results of SEM-EDX spectra from three other interstellar impact craters [4] and may suggest the presence of residue of extraterrestrial origin. Although Na is present in the residue of one crater, the absence of Ce and Zn suggests that these are not solar cell glass impacts; FIB-TEM analyses are planned to verify this.

References: [1] Stroud R. M. et al. 2011. *Lunar Planet. Sci. XLII*, #1753. [2] Floss C. et al. 2011. *Lunar Planet. Sci. XLII*, #1576. [3] Landgraf M. et al. (1999) Planet. Space Sci. 47, 10291050. [4] Stroud R. M. et al. 2011. This volume.