ANGSA IN ACTION. UPDATES ON ACTIVITIES OF THE APOLLO NEXT GENERATION SAMPLE ANALYSIS INITIATIVE. C.K. Shearer1,2, F.M. McCubbin3, R.A. Zeigler4, I. Gross5, A. Meshik6, F. McDonald7, R. Parat7, Z. Sharp1, P. Lucey6, L. Sun6, R.V. Morris8, H.H. Schmitt9, M. Neuman9, K. Wang10, B.L. Jolliff10, K. Joy5, M. Cato5, S. Eckley11, S.B. Simon12, J. Simon12, K.C. Welten9, J.J. Barnes10, M. Dyar11, K. Burgess12, N. Petro13, N.M. Curran13, J.E. Elsila13, J. Gillis-Davis4, A. Sehlke14, O. Pravdivceva4, J.A. McFadden15, M.S. Thompson15, J.L. Valenciano16, C.R. Neal16 and the ANGSA science team17. 1Dept. of Earth & Planet. Sci., Institute of Meteoritics, University of New Mexico, Albuquerque, NM 87131; 2Lunar and Planetary Institute, Houston TX 77058; 3ARES, NASA Johnson Space Center, Houston TX 77058-3696; 4Washington University in St. Louis, St. Louis, MO 63130; 5ESA/ESTEC, Noordwijk, Netherlands; 6University of Hawaii at Manoa, Honolulu, HI 96822; 7University of Wisconsin-Madison, P.O. Box 90730, Albuquerque NM 87199; 8University of Manchester, Manchester, UK; 9Space Sciences Laboratory, University of California, Berkeley, CA 94720; 10Lunar and Planetary Laboratory, University of Arizona, Tucson, AZ 85721; 11Department of Astronomy, Mount Holyoke College, South Hadley MA 01075; 12United States Naval Research Laboratory, Washington DC 20375; 13NASA Goddard Space Flight Center, Greenbelt, MD 20771; 14NASA Ames Research Center, Moffett, CA 94035; 15Purdue University, West Lafayette, IN 47907; 16University of Notre Dame, Notre Dame IN 46556, 17ANGSA Science Team list at https://www.lpi.usra.edu/ANGSA/teams/. (cshearer@unm.edu).

Introduction: The Apollo Next Generation Sample Analysis (ANGSA) initiative was designed to examine a subset of Apollo samples that were collected or preserved in unique containers or environments (e.g., Core Sample Vacuum Container (CSVC), frozen samples) and have remained unexamined by standard or advanced analytical approaches. The initiative was purposely designed to function as a proxy for a new sample return mission with processing, preliminary examination, and analyses utilizing new and improved technologies as well as modern lunar mission observations. The ANGSA initiative links the first generation of lunar explorers (Apollo) with the next generation lunar explorers (Artemis). Here, we highlight recent progress made by ANGSA.

ANGSA Updates:

Gas extraction from CSVC 73001: To extract any potential gas phase from the CSVC, which was sealed on the lunar surface, the European Space Agency (ESA) designed, built, tested, and delivered to JSC a CSVC piercing tool. To collect and store the gas phase, WUSTL designed, built, and delivered to JSC a gas manifold system. In March 2022, these two tools were used to successfully extract gas from the outer vacuum container and the CSVC.

CSVC Gas analysis: The gas samples collected from the CSVC were sent to UNM and WUSTL for preliminary analysis to determine if any lunar gas was successfully collected and preserved by the CSVC. This has implications for lunar science and applications for collection of volatile-rich samples during Artemis.

Extrusion of 73001: Following extraction of gas using the piercing and manifold tools, the lower part of the double drive tube was imaged by XCT and extruded in March 2022. Core dissection began in March 2022 and should finish in June 2022. First samples from 73001 should be released to the science team in May 2022.

Stratigraphy of 73001: First results (e.g., multispectral analysis, micro XCT, grain size analysis) of the stratigraphy of the lower part of the double drive tube sample from the South Massif landslide deposit will be reported at this meeting [e.g., 1].

Frozen samples: The cold curation facility for processing Apollo 17 frozen samples was approved in mid-December 2021. These special samples have been processed and allocated to the ANGSA science team in the first quarter of 2022.

Stratigraphy of 73002: The upper portion of the double drive tube collected at Station 3 was extruded and dissected in 2019 and samples have been allocated to the ANGSA team. Its stratigraphy has been documented by XCT imaging [2], reflectance properties [3], I$_{Fe}$FeO [4], major, minor, and trace element geochemistry [5,6], grain size and modal proportions [4,7,8], continuous thin sections [9], and cosmogenic radionuclides [10].

Analysis of lithic fragments: Unique and unusual lithics were identified in 73002. Lithic fragments >4 mm in size were removed during Passes 1-3 from 73002 and imaged via micro-XCT [2]. The less than 1 mm size fraction was examined in grain mounts [7,8,11,12].

Volatiles and Space Weathering: Unique analyses of volatiles and surface weathering at the micro- and nanoscale have been reported by ANGSA team members [e.g., 13-17].