SCIENCE BACKROOM SUPPORT FOR SUSTAINED LUNAR SURFACE. C. A. Evans[1], M.S. Bell[2], T. Graff[2], and M. Calaway[2], [1]NASA Johnson Space Center (cindy.evans-1@nasa.gov), [2]Jacobs Engineering, JETS, NASA Johnson Space Center.

Introduction: Sustained surface operations on the lunar surface will be supported by the Foundational Surface Habitat (FSH) at the Artemis Base Camp. Planning for FSH is still preliminary but includes notional science outfitting that will enable lunar science and support the science conducted during EVA traverses.

Operational Tests: Analog missions conducted from 2010-12 tested habitat science operations that inform ideas about backroom support from Earth-based scientists during sustained lunar surface operations. During a series of Desert RATS analog tests, we conducted preliminary operational scenarios with a habitat (Habitat Demonstration Unit) equipped with several utilization facilities, including a multi-purpose workstation to support Intra Vehicular activities, and a geological glovebox, GeoLab [1]. GeoLab was modelled after the gloveboxes in the Lunar Curation Lab (Fig. 1), and equipped with sample transfer ports, instruments and avionics systems to support preliminary assessments and data integration of geological samples collected during traverse segments of Desert RATS. GeoLab was configurable, and we tested operations with different instruments, variable communications, data recording, and robotic operations. One goal was to test GeoLab operations and assess the value of the analytical data collected in a shirtsleeve environment for selecting samples for Earth return and guide future EVA plans. We also tested the way the astronauts conducted analyses in the glovebox and interacted with and exchanged data and information with a remotely located science back room (Fig. 2).

Figure 1. GeoLab glovebox

Specific operational scenarios tested sample handling and analysis functions, remote monitoring and backroom guidance of sample treatment and analysis, sample analysis using an approved sequence on selected samples for later review by the science backroom, analysis with time delays that tested various communications protocols, and remote-controlled manipulation of samples using a programmable robotic sample handling device that enabled controlled sample handling and data collection that was provided to the science team [2,3]. Results of the GeoLab tests with backroom support will be presented.

Figure 2. Science backroom assessing GeoLab data

Future Work: Today, advances in data integration and augmented/hybrid reality applications (e.g., [4]) could provide an immersive collaborative environment between a science backroom and an astronaut crew working in the FSH for collecting preliminary data on subsets of lunar samples to guide sample return decisions and future investigations on the Lunar surface.

References: [1] Evans, C.A. et al. (2013) *Acta Astronautica, 90,* 289–300. [2] Evans, C.A., et al., (2013) 44th *LPSC,* Abstract #1357. [3] Bell, M.S. et al. (2013) 44th *LPSC,* Abstract #2134. [4] Morse, Z. et al. (2020) *Am. Geophys. Union Fall Meeting, P063-02*.