

ADAPTIVE CURATION AT NASA JOHNSON SPACE CENTER – PREPARING FOR ARTEMIS SAMPLES BY LEVERAGING PROVEN PRACTICES AND INNOVATIVE SOLUTIONS

Andrea D. Harrington, Julianne Gross, Michael C. Huh, Ryan A. Zeigler, Alissa Madera, and Jemma Davidson. NASA Johnson Space Center, 2101 NASA Parkway, Mail Code X12, Houston, TX 77058. Andrea.D.Harrington@nasa.gov.

The proper curation of returned astromaterial samples is essential to ensure that high-quality scientific investigations can be conducted for decades, enabling future generations to address evolving research questions. The Astromaterials Acquisition and Curation Office at NASA Johnson Space Center (hereafter JSC Curation) is responsible for curating all of NASA's extraterrestrial samples. Under the governing document, NASA Procedural Requirement (NPR) 7100.5 "Curation of Extraterrestrial Materials", JSC Curation is charged with "The curation of all extraterrestrial material under NASA control, including future NASA missions." The Directive goes on to define Curation as including "...documentation, preservation, preparation, and distribution of samples for research, education, and public outreach."

JSC Curation has a long-standing legacy of curating extraterrestrial materials, including but not limited to Apollo and Luna lunar samples, Genesis solar wind samples, Stardust comet samples, asteroid samples (Hayabusa1, Hayabusa2, and OSIRIS-REx), and Antarctic Meteorite samples from a variety of parent bodies. Building on this foundation, the Artemis program introduces new challenges and opportunities for sample curation, requiring both the application of proven practices and the development of innovative solutions.

The Artemis Collection will be curated using established protocols refined through decades of experience with Apollo and subsequent sample collections, including but not limited to the utilization of cleanrooms, custom nitrogen gloveboxes, specialized storage containers and tools; all of which have strict material utilization and prohibition requirements. These practices provide a robust framework for contamination control, documentation, and long-term preservation. However, Artemis samples may present unique scientific and operational requirements, including enhanced contamination control measures (relative to Apollo) driven by evolving science objectives. To meet these needs, JSC Curation is actively developing new technologies and protocols that extend beyond traditional approaches, ensuring that the integrity of samples is maintained under increasingly stringent standards.

One critical area of innovation is the development of cold sample curation capabilities. Certain Artemis samples, particularly those from Permanently Shadowed Regions (PSRs) and cold environments, are expected to contain ices and volatile components that require preservation and handling at sub-zero or even cryogenic temperatures. JSC Curation is leveraging best practices from the cold and cryogenic sample industries, as well as other government agencies and academic experts, to design facilities and handling procedures that maintain sample integrity while enabling scientific access. The goal is to develop

capabilities to allow researchers to investigate volatiles and other temperature-sensitive materials while minimizing chemical and physical alterations from their returned state.

In summary, adaptive curation at JSC combines the reliability of proven methodologies with forward-looking innovations to meet the scientific and operational demands of Artemis. Through enhanced contamination control, advanced cold curation capabilities, and an understanding of known and evolving future science priorities, NASA is preparing to maximize the scientific return from Artemis samples and preserve their value for generations of researchers.