Astromaterial Curation and Research at NASA

Keiko Nakamura-Messenger, Ryan A. Zeigler

[1] NASA Johnson Space Center, 2101 NASA Parkway, Mail Code XI2, Houston, TX 77058

Astromaterial sample return missions from other planetary bodies (e.g., the Moon, asteroids, the Sun) and astromaterial sample collection missions here on Earth (e.g., Antarctic Meteorites, Cosmic Dust) have been a vital part of NASA's science vision since nearly its inception. Beginning with the Apollo missions to the Moon and extending to the recent successful sample collection by the OSIRIS-REx asteroid sample return mission, these astromaterials collections have been an invaluable resource to scientists and educators around the world. Sample studies continue to provide fundamental insight into how our solar system and its constituent bodies formed and evolved over the past 4.5 billion years. As evidence of their broad impact, there are over 19,141 samples on loan to 433 Principal Investigators in 24 countries [1].

As we plan for exploration missions through 2050, sample return missions will continue to play a vital role in NASA's science vision. Returned samples truly are the gift that keeps on giving. Having the samples accessible on Earth allows new generations of scientists and new generations of instrumentation to pursue ever evolving scientific questions. For example, the Apollo samples were collected ~50 years ago, yet our views of how the Earth-Moon system formed, the role of volatiles in the early inner solar system, and even the positions of the gas giants in the outer solar system have changed dramatically as a result of Apollo sample analyses conducted very recently.

Vital to the long-term viability of any sample return mission is the careful curation of the samples. Curatorial efforts need to begin early in the project lifecycle, not with the return of the samples, but at mission conception. The Astromaterials Acquisition and Curation Office at NASA Johnson Space Center is responsible for curating all of NASA's current and future extraterrestrial samples. Looking at possible sample return missions over the next 35+ years [2], many samples would require curation efforts a step beyond current capabilities, e.g., cold or cryogenic curation, organically and biologically clean curation, curation of gases and ices, and curation of samples with extreme pressure, temperature, or redox requirements.

During the lecture, we discuss the current curatorial efforts in JSC curation, as well as discoveries from the astromaterial research.

[1] Zeigler, R. A. et al. (2017) *Planetary Science Vision 2050 Workshop*.
[2] McCubbin F. M. et al. (2017) *Planetary Science Vision 2050 Workshop*.