

Astromaterials Acquisition and Curation Office (KT)

Overview

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<http://curator.jsc.nasa.gov/index.cfm>

The Astromaterials Acquisition and Curation Office has the unique responsibility to curate NASA's extraterrestrial samples – from past and forthcoming missions – into the indefinite future. Currently, curation includes documentation, preservation, physical security, preparation, and distribution of samples from the Moon, asteroids, comets, the solar wind, and the planet Mars. Each of these sample sets has a unique history and comes from a unique environment. The curation laboratories and procedures developed over 40 years have proven both necessary and sufficient to serve the evolving needs of a worldwide research community. A new generation of sample return missions to destinations across the solar system is being planned and proposed. The curators are developing the tools and techniques to meet the challenges of these new samples.

Extraterrestrial samples pose unique curation requirements. These samples were formed and exist under conditions strikingly different from those on the Earth's surface. Terrestrial contamination would destroy much of the scientific significance of extraterrestrial materials. To preserve the research value of these precious samples, contamination must be minimized, understood, and documented. In addition, the samples must be preserved – as far as possible – from physical and chemical alteration. The elaborate curation facilities at JSC were designed and constructed, and have been operated for many years, to keep sample contamination and alteration to a minimum.

Currently, JSC curates seven collections of extraterrestrial samples:

- Lunar rocks and soils collected by the Apollo astronauts
- Meteorites collected on dedicated expeditions to Antarctica
- Cosmic dust collected by high-altitude NASA aircraft
- Solar wind atoms collected by the Genesis spacecraft
- Comet particles collected by the Stardust spacecraft
- Interstellar dust particles collected by the Stardust spacecraft
- Asteroid soil particles collected by the Japan Aerospace Exploration Agency (JAXA) Hayabusa spacecraft

Each of these sample sets has a unique history and comes from a unique environment. We have developed specialized laboratories and practices over many years to preserve and protect the samples, not only for current research but for studies that may be carried out in the indefinite future.

Catalogs, images, compendia of research results, and instructions for requesting samples from each collection are published online at <http://curator.jsc.nasa.gov/>.

Space agencies and researchers around the world have recognized the value of sample return missions to further scientific understanding and support exploration of planetary bodies. The U.S. National Research Council's Planetary Decadal Survey listed the first lander in a Mars sample return campaign as the highest priority for a flagship-class mission, and sample return missions to the lunar South Pole-Aitken basin, the surface of a comet, and the surface of an asteroid are among its highest priority missions for the New Frontiers program. In 2011, NASA selected the Origins Spectral Interpretation Resource Identification Security – Regolith Explorer (OSIRIS-Rex), designed to return samples from a C-class asteroid in 2023, as its next New Frontiers mission. JAXA is preparing to launch Hayabusa 2, a second asteroid sampling mission, in 2014. President Obama has announced the goal of a human visit to a near-Earth asteroid, and the eventual goal of a human mission to Mars. Samples from any of these destinations would be invaluable for scientific research and for enabling human exploration across the solar system.

Lessons learned for the future from 40+ years of curating NASA's extraterrestrial samples

- The main point of any sample return mission is laboratory analysis.
 - Everything must be designed, built, and operated to get the highest quality samples to the best laboratories.
- Curation starts with mission design.
 - Samples will never be cleaner than the tools and containers used to collect, transport, and store them.
- We must be ready for contingencies.
 - Really bad things can, and do, happen – careful planning and dedicated people can sometimes save the day.
- Every sample set is unique.
 - Laboratories and operations must respond to the diversity and special requirements of the samples.
- We are in it for the long haul.
 - Samples collected years or decades ago are yielding new discoveries that totally change our understanding of planets, moons, and solar system history. These discoveries will inspire new generations of scientists and research questions, and will drive new exploration missions by robots and humans.

The following reports provide insight into the curation team's work and research in 2011 and 2012.