



Johnson Space Center

## Studying the origin and evolution of our solar system

*Astromaterials Research and Exploration Science*

NASA's Johnson Space Center (JSC) is home to the Astromaterials Research and Exploration Science (ARES) Directorate. ARES is NASA's repository for current and future astromaterials collections. Inside ARES' world-class labs, scientists do extensive research on planetary materials and processes, as well as on the space environment. They focus on astromaterials research and



*This view of Earth, featuring the Lake Michigan area, was photographed by an Expedition 8 crewmember on the International Space Station. The photo also shows Chicago area; Illinois River; Mississippi and Missouri rivers meeting at St. Louis. Aircraft contrails are also visible.*

exploration science to investigate the origin and evolution of our solar system, the universe and the possibilities of how life might form on other planets. ARES researchers also participate in robotic planetary missions as principal or co-investigators or as instrument scientists. Scientists also support human spaceflight activities on board the space shuttle and the International Space Station.

### **NASA's home for materials from other worlds**

JSC is a Center of Excellence for astromaterials, samples of other bodies in our solar system. JSC and the ARES curatorial team are responsible for the preservation, protection and distribution of NASA's collection of astromaterials, which includes Apollo lunar samples, Antarctic meteorites,

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solar wind ions returned by the Genesis mission, cosmic dust and space-exposed hardware. Comet samples returned by the Stardust spacecraft will join the collection in 2006. Curation comprises initial characterization of new samples, preparation and allocation of samples for research and education, and clean, secure storage of samples at JSC or remote sites. ARES is also leading the planning for post-mission sample handling and curation of samples returned by future Mars missions.

### **Astromaterials: The building blocks of the solar system**

ARES scientists study various astromaterials to understand the origin and evolution of solid objects in the inner solar system, including asteroids, comets, the moon and Earth, and even Mars. ARES scientists incorporate a wide variety of professional skills in geology, chemistry, physics and astronomy. ARES laboratories support detailed mineralogical, chemical and isotopic analyses, as well as experimental studies, conducted by both in-house and visiting scientists. Broad science questions are addressed, such as the character of the earliest material present in the solar system, how solid planets and smaller bodies formed and evolved over time, and how life on Earth can be used to characterize possible life outside Earth. In addition, ARES scientists are involved in planning for possible future planetary investigations and missions.

### **World leader in orbital debris research and image analysis**

ARES is a world leader in orbital debris research, including modeling, monitoring and designing debris shielding. ARES researchers led the impact testing of the foam on space shuttle thermal protection surfaces that resulted in the conclusive demonstration of the cause of the *Columbia* accident. The ARES Image Analysis Team has been recognized as a world-class leader for its research, including its contributions to the *Columbia* mishap investigation. ARES scientists analyze space shuttle and space station mission imagery and research all anomalies.

### **Making the most from the view from above**

Crewmembers on board the space shuttle and the International Space Station enjoy spectacular views of Earth and capture them with digital photography. Thousands of pictures are catalogued and made accessible to the public. From their unique vantage point, astronauts have captured imagery of Earth's geologic and environmental features such as cities, mountains, glaciers, volcanic eruptions, floods and weather phenomena. More than 600,000 astronaut photos of the Earth exist. Photographic images taken by space crews serve as both primary data on the state of the Earth and as secondary data to be combined with images from satellites in orbit. These images also have tremendous educational value. Educators use the image database (<http://eol.jsc.nasa.gov/>) to help make future generations of children "Earth-smart."

### **Education and outreach**

Sharing our science with the public is an essential part of ARES programs. In more than a decade of partnerships with scientists and educators, ARES has produced materials and training programs used to connect classrooms and the public with NASA research in astromaterials, solar system science, astrobiology, Earth science and exploration of the moon, Mars and solar system. ARES long-term planetary science education and public outreach programs involve partnerships with universities, museums and formal and informal educators.

For more information, visit us on the Web at:  
[www.nasa.gov/centers/johnson](http://www.nasa.gov/centers/johnson) and

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