CAPTEM
Curation and Analysis Planning Team for Extraterrestrial Materials

“Dedicated to maximizing planetary sample science while protecting the integrity of NASA-collected extraterrestrial materials”

Report to the
Planetary Science Subcommittee
March 12, 2014
Hap McSween, Chair
CAPTEM activities since last PSS meeting

- Still negotiating the 3-agency (NASA, NSF, Smithsonian) agreement that governs the Antarctic meteorite program; the new agreement will place the Meteorite Working Group (MWG) within CAPTEM

- No Antarctic meteorite delivery to JSC this year; an ice pier used to load cargo on a ship collapsed, so this year’s ANSMET collection will be stored (frozen) at McMurdo until next year
CAPTEM activities since last PSS meeting

- Conducted a rapid study (submitted Jan 23, 2014) of the Asteroid Retrieval Mission (ARM) – requested by the Robotic Concept Integration Team to provide recommendations regarding astronaut EVA activities relevant to selection, collection, stowage, and transport of samples back to Earth. Report identifies 10 findings to maximize science content of these samples.
CAPTEM activities since last PSS meeting

- Presently conducting an inspection and review of JSC curatorial facilities, with a focus on evaluating whether current practices ensure that lunar samples are preserved in a state appropriate for new advances in analytical methods (especially organic compounds, non-standard isotopic analyses, micro-analytical techniques) – requested by the JSC Astromaterials Curation Office

- CAPTEM (and MWG) will meet in Houston on March 22-23, following the Lunar and Planetary Science Conference
New Analytical Technology Provides New Discoveries in “Old” Apollo Samples: Basin-Forming Impact-melt Rocks at Apollo 17

- Two distinct types of impact-melt rock were found at the Apollo 17 site: “aphanitic” and “poikilitic.”
- Long thought to represent 2 different basin-forming impacts 3.9 billion years ago.
- New study examined HSEs - “highly siderophile elements” - by thermal ionization mass spectrometry.
- HSEs derive from the impactor forming the melt.
- Finding: “There is no statistical difference between the aphanitic and poikilitic samples in terms of HSE ratios.”
- Hence, there’s no evidence for two for 2 different impacts.

Reference

The group answered a four decade old question by showing that hydrogen ions in the solar wind, react with oxygen in the silicate minerals of interplanetary dust particles (IDPs) to form water. Some of these IDPs, collected by NASA high-altitude research aircraft, are the most primitive samples of early Solar System material available for laboratory examination (Ishii et al., Science, 2008). The water was detected in the ~100 nanometer thick rims, roughly one-thousandth the width of a human hair, produced on the surfaces of these IDPs by solar wind irradiation. The rims were analyzed by valence electron energy-loss spectroscopy, a technique that probes the 0 to 50 eV region of the energy loss spectrum, where features from –O-H and H$_2$O can be detected. This result demonstrates that the solar wind can produce water in the silicate surface materials of airless bodies including the Moon and asteroids, and that the high flux of IDPs early in Solar System history could add water to the Earth and to other planets and moons.