“Dedicated to Maximizing Planetary Sample Science While Protecting the Integrity of NASA Collected Extraterrestrial Materials”

Report to the Planetary Science Subcommittee
January 26, 2011
CAPTEM Committee
Chair: M. Wadhwa

Lunar sample allocation subcommittee
Chairs: Lars Borg (LLNL)

Stardust allocation subcommittee
Andrew Westphal (UC Berkeley)

Genesis allocation subcommittee
Andrew Davis (U Chicago)

Cosmic Dust allocation subcommittee
George Flynn (SUNY Plattsburgh)

Hayabusa allocation subcommittee
Scott Messenger (NASA JSC)

Facilities subcommittee: Chair, Dimitri Papanastassiou (JPL)
Additional Members: Justin Hagerty (USGS), Brad Jolliff (Washington U), Mac Rutherford (Brown U), Steven Symes (U Tennessee, Chattanooga), Allan Treiman (LPI)

Last meeting of the CAPTEM held November 17-18, 2010
Next meeting to be held in March 12-13, 2011

February 1, 2011
Sample Allocations Since July 2010

- Lunar Allocations:
  - 32 requests: 28 approved, total 366 samples

- Stardust Allocations:
  - 9 requests: 9 approved, total 32 samples

- Genesis Allocations:
  - Flown samples: 2 requests: 2 approved, total 6 samples
  - Reference materials: 2 requests: 2 approved, total 4 samples

- Cosmic Dust Allocations
  - 1 request: 1 approved, total 10 samples
Current Issues

• Spin up of the Hayabusa allocation subcommittee.
• Stardust sample curation review report completed.
• The Lunar Simulant Working Group report completed.
• Other CAPTEM sponsored activities:
  • Timed Collection Workshop scheduled after the Stardust II meeting (Timber Cover, CA; Feb 2011)
  • Workshop on the Importance of Solar System Sample Return Missions (Houston, TX; March 2011)
  • Workshop on “A Wet vs. Dry Moon” (Houston, TX; June 2011)
Hayabusa allocation subcommittee

• JAXA’s Hayabusa spacecraft was launched in May 2003, rendezvous with asteroid Itokawa in Sept 2005, sample collection, return to Earth in June 2010.

• As per the NASA-JAXA MOU, a random subset of the Hayabusa samples (10%) will be transferred to NASA (within 12 months of return as per agreement).
• **Hayabusa allocation subcommittee:** Chair, Scott Messenger (NASA JSC); other members: Conel Alexander (DTM), Rhian Jones (UNM), David Joswiak (UW), Tomoki Nakamura (Tohoku University), Andrew Westphal (UC Berkeley).

• Subcommittee is currently in the process of drafting the curation, handling and allocation policies document.
Stardust Curation Status

• Stardust returned samples of Comet Wild 2 in January 2006.

• CAPTEM initiated a review of the status of curation of these samples.

• Review Team: D. Burnett (Caltech, Chair), A. Brearley (UNM), L. Nyquist (NASA JSC), D. Papanasstassiou (JPL), S. Sutton (U Chicago/ANL).

• Report completed in November 2010.
Stardust Curation Review Report

FINDINGS:

• Curation and allocation of Stardust samples is the most difficult of all the returned sample collections.

• Perception of possibly serious problems with Stardust curation and allocation. At present, no crisis in allocation and curation processes and procedures, however...

• On a longer time scale, improvements are required.

• Unlike the other collections, basic characterization of Stardust samples requires instruments that are not routinely available to the Curatorial Facility.

• The Stardust Curatorial Web Site is a valuable source of information but needs a major upgrade to improve its content and searchability.
Stardust Curation Review Report

RECOMMENDATIONS:

• **Recommendation #1.** Implementation of allocations must not be single string. At least 2 persons must be available at all times with the skills necessary to provide samples to PIs.

• **Recommendation #2.** Simplify requests to PIs to the minimum required for future allocations, e.g. location, size estimate, and mineral identification. An email to the Curator close to the time of analysis is minimally inconvenient to the PI.

• **Recommendation #3.** Priorities must be set and resources allocated such that the Web Site upgrades are completed in 2010.
“The PSS recommends that a comprehensive study be undertaken by LEAG and CAPTEM to define the types of simulants that the various communities require in order to facilitate important lunar investigations, as well as to preserve the Apollo lunar sample collection for future generations.”

Report will address: 1) what is needed for lunar simulants; 2) what lunar simulants already exist; 3) protocols for their proper usage; and 4) needs for Apollo lunar samples.
LEAG-CAPTEM Simulant Working Group

Working Group members:

• Larry Taylor, Univ. of Tenn., LADTAG, Lunar Soil Expert (Chair)
• Yang Liu, Univ. of Tenn., Lunar Soil & Simulant Characterizer
• Jennifer Edmunson, MSFC, Simulant Engr.
• Carole McLemore, MSFC, ISRU/Dust Project Manager
• Doug Rickman, MSFC, Simulant developer and tester
• Gary Lofgren, JSC, Lunar Sample Curator
• Dave McKay, JSC, LADTAG, Lunar Soil Expert (Dust/Biomedical)
• Jerry Sanders, JSC, ISRU Head Honcho
• Bob Ferl, Univ. of Florida, Bio Expert
• Bob Gustafson – ORBITEC, Simulant Engr.
• Chip Shearer, (ex-officio) (CAPTEM Chair)
• Mini Wadhwa, (ex-officio) (CAPTEM Chair)
“Report on Status of Lunar Regolith Simulants and Demand for Apollo Lunar Samples”
LEAG-CAPTEM Simulant Working Group

SUMMARY OUTLINE:

Inputs: Documents from MSFC Simulant Office;
Visit to Lunar Simulant group at NASA/MSFC by Chair;
Lunar Applications of Mining & Mineral Beneficiation Workshop (MN, Oct 2010);

Simulant History: Minnesota Lunar Simulant (Paul Weiblen, 1970-);
JSC-1 (1993-4; all gone)

Engr./ISRU Studies: Major Problem = Little appreciation of uniqueness of lunar samples;

CURRENTLY AVAILABLE LUNAR SIMULANTS:
JSC-1A (= JSC-1) 2005; production = James Carter; ORBITEC/
JSC distribution;
Over 30 Lunar Simulants worldwide; most made by users;
NU-LHT (2009-2010; MSFC = 2nd simulant developed since 2005)

SUGGESTIONS FOR THE FUTURE:
Planetary Simulant Advisory Team
Existing Lunar Simulants:
There are >30 lunar simulants that have been produced to date
Users have developed a tendency to make their own simulants
Little to no control or knowledge by MSFC.

Need for Lunar Simulants:
Engg. Tests involving large scale soil moving; trafficability
Oxygen production
As TRL of project increases, so does the need for more closely
controlled lunar properties
Symbiosis between science and engineering is a major factor
that needs further work

Need for Apollo Lunar Samples in Engr./Bio/ISRU Studies:
Few needs for a real lunar sample with which to experiment
Needs include:
1) characterization of biological interactions, levels, including
human health and toxicity
2) mineral beneficiation studies using magnetic and electrostatic
processes (effects of nanophase Fe)
3) dust mitigation by electrostatic/magnetic means.
Suggestions to ESMD/SMD for the Simulant program in the future:

**Planetary Simulant Advisory Team (PSAT)**

An advisory panel of experts in lunar science and actual properties of lunar soils is absolutely and desperately needed, to mesh with simulant surface-system engineering (e.g., civil engr.).

**Location of PSAT:**
Possible Centralization of Lunar Simulant Program (~PSAT) into Astromaterials Research & Exploration Science (ARES) at JSC.

**What if the NASA AOs for relevant programs stated:**
~10% of project’s budget should be set aside for simulant development, *coordinated with the PSAT*, plus a statement that the *final product of the overall engr. project must meet PSAT approval*?
New Initiatives

• Finalization of curation, handling and allocation policies for the Hayabusa samples to be transferred to NASA. First Hayabusa samples are expected to be allocated by end of this year!

• Update of the Long-Term Curation and Maintenance Plan for the JSC curation facilities.

• New opportunities for upper stratospheric timed collections (new cometary materials).
Science Highlights
(Planetary Materials/Cosmochemistry)

- Return of the Hayabusa spacecraft with “micro” samples of asteroid Itokawa! New results anticipated at the Lunar and Planetary Science Conference in March.
Recent research highlights:

1) New insights into the origin of the Solar System

2) The Moon – wet or dry?