National Aeronautics and Space Administration

CAPTEM

Presentation to the PSS NAC

March 3, 2008

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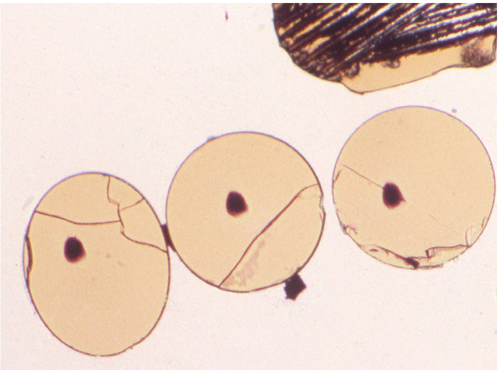
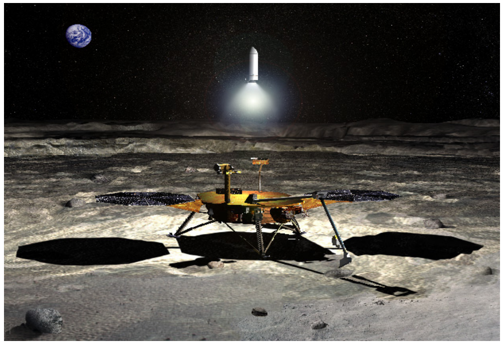
www.nasa.gov

Outline

- CAPTEM Function
- CAPTEM Structure
- CAPTEM Activities
  - Allocations
  - Moon
  - Stardust
  - Mars
  - Sample Return Technologies





CAPTEM

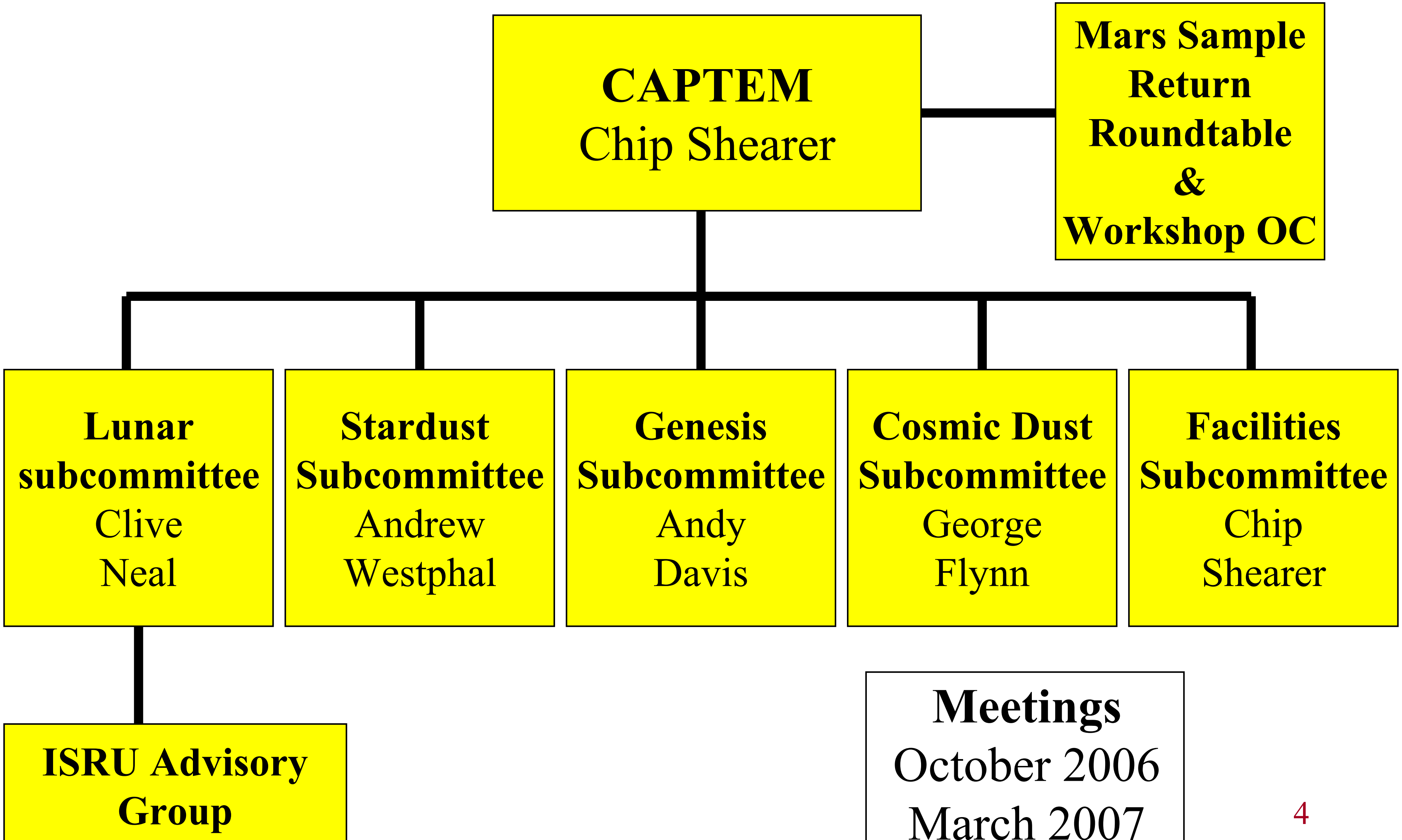
Curation and Analysis Planning Team for Extraterrestrial Materials

CAPTEM's Function

- Plays an important role in the allocation of NASA collected planetary materials.
- Provides Analysis and Guidance for NASA Sample Curation.
- Provides Sample Science Expertise.
- Sponsors of sample science based initiatives & workshops.

CAPTEM
Curation and Analysis Planning Team for Extraterrestrial Materials

CAPTEM STRUCTURE



Meetings
October 2006
March 2007

Allocations

October 2007-March 2008:

Lunar Samples = Request for ~60 samples.
Increase in requests for ISRU experiments.
Curator allocations to be reported at CAPTEM meeting.

Stardust = 25 requests for Wild 2 comet samples.

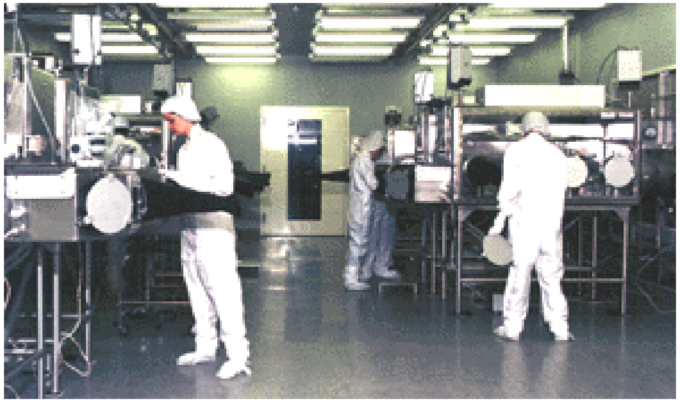
Genesis = 17 requests

Cosmic dust = allocation lab open for short duration to fulfill 10 requests.

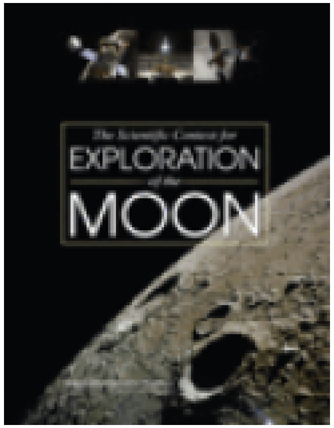
Moon I

- Review handling and allocation approaches for “new” Apollo samples.
    - A17 Freezer samples.
    - Special Environmental Sample Containers.
    - Availability of samples announcement.

- Review (March) engineering study for the air handling system in lunar sample facility.



Moon II



The Scientific Context for Exploration of the Moon: Final Report

Committee on the Scientific Context for Exploration of the Moon, National Research Council

ISBN: 978-0-309-10919-2, 120 pages, 8 1/2 x 11, paperback (2007)

Finding 4R: The NASA curatorial facilities and staff have provided an exemplary capability since the Apollo program to take advantage of the scientific information inherent in extraterrestrial samples. The VSE has the potential to add significant demands on the curatorial facilities. The existing facilities and techniques are not sufficient to accommodate that demand and the new requirements that will ensue. Similarly, there is a need for new approaches to the acquisition of samples on lunar missions.

> **Recommendation 4R:** NASA should conduct a thorough review of all aspects of sample curation, taking into account the differences between a lunar outpost-based program and the sortie approach taken by the Apollo missions. This review should start with a consideration of documentation, collection, and preservation procedures on the Moon and continue to a consideration of the facilities requirements for maintaining and analyzing the samples on Earth. NASA should enlist a broad group of scientists familiar with curatorial capabilities and the needs of lunar science, such as the Curation and Analysis Planning Team for Extraterrestrial Materials (CAPTEM), to assist it with the review.

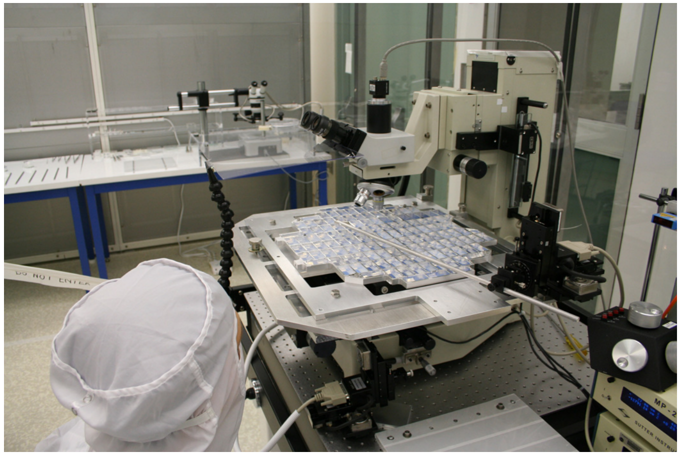
Stardust

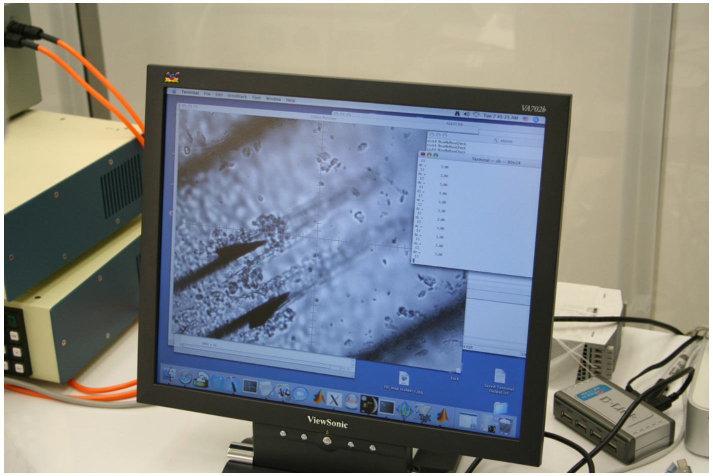
- **Plan for Preliminary Examination of Stardust Interstellar dust samples.**

Non-destructive analysis of samples.

  - Prepare for allocation within a year of the start of PE.
  - Allocations to consortium with well documented logic for destructive analysis.

- **First test sample extracted from collector.**
- **Future Workshop:**
  - Stardust Science Workshop (2008).





Mars

- .Provided sample relevant information to MSL caching design.
    - Sample characteristics.
    - Sample documentation and preservation.
    - Materials and cleaning.
- Sponsoring Mars sample return roundtable and MSR workshop (April 20-23, 2007).

CONVENERS

Charles (Chip) Shearer, University of New Mexico

Carl Agee, University of New Mexico

David Beaty, Jet Propulsion Laboratory

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www.lpi.usra.edu/meetings/msr2008

MSR Workshop

ENABLING SAMPLE RETURN: PRIORITIES, MISSIONS, AND STRATEGIES

SAMPLE REQUIREMENTS FROM THE ASTROBIOLOGY POINT OF VIEW

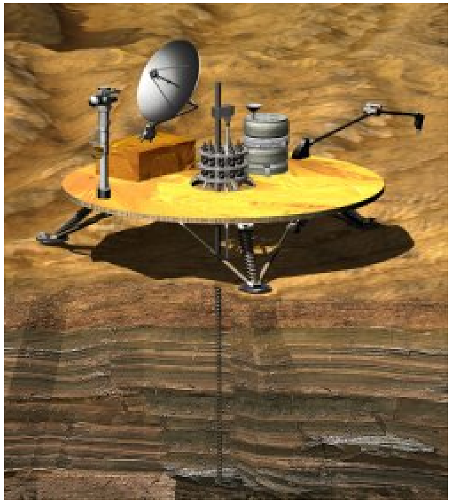
SULFATES AS RECORDERS OF MARS NEAR SURFACE PROCESSES AND THE MER SITES AS FIRST SAMPLE RETURN LOCALITIES

UNDERSTANDING THE EVOLUTION OF MARS: CORE, MANTLE, CRUST, SURFACE, ATMOSPHERE

HYDROUS MINERALS AS RECORDERS OF FLUID-ATMOSPHERIC EVOLUTION AND SECONDARY ALTERATION

Sampling the Solar System

Analyze buying down risk and increasing competitiveness of sample return missions.

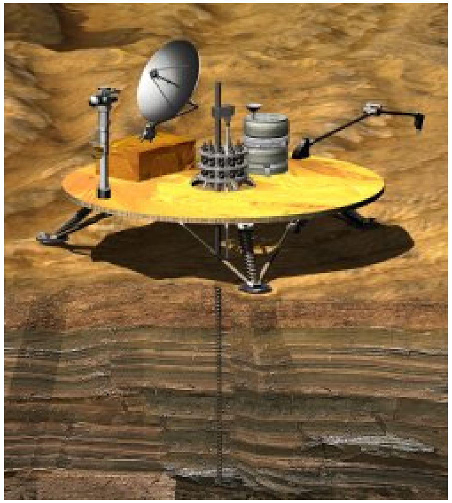


Approach

- Identifying components fundamental to carrying out sample return missions
- Defining how potential pathways will feed forward through different classes of sample return missions
- Analyzing what investments would reduce risk and cost of sample return.

Report and Findings will go on the CAPTEM website following the Spring CAPTEM meeting.

Extra slides



Sampling the Solar System

Finding 2.

Higher risk and cost is commonly associated with sample return missions relative to other types of solar system exploration missions. This is a result of a sample return mission commonly being more complex and the necessity for the spacecraft to return to its point of origin.

However, sample return has many important attributes. First, it is the closest approximation to a human exploration mission. Second, samples provide a unique perspective of a planetary body that cannot be obtained by any other mission approach.
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The mitigation of cost and risk with a mission puts an even higher priority on early technology development for sample return missions than for more conventional mission types.

Sampling the Solar System

Finding 3. There are technology linkages among different types of planetary missions that provide feed forward to increasingly complex sample return missions. Investing in developing and flying these technologies will increase the rate of success of sample return missions and lower the overall cost.

Sampling the Solar System

<u>Finding 5.</u> There are several types of technology/capability linkages that either are appropriate for several missions with minor modifications or feed forward to more complex missions:

<u>Between non-sample return and sample return missions:</u>

Autonomous robotic capabilities

<u>Among all sample return mission types:</u>

Environment control of sample containment.

<u>Among Flyby missions:</u>

Inert sample collection material

<u>Among Touch-and-go missions:</u>

Sample collection and verification

<u>Among surface landing missions:</u>

Variety of sample collection tools (drill, rake)

Adaptable sample containment

<u>Feed forward from sample return to human exploration:</u>

Mars Ascent Vehicle

Rendezvous around distant planetary body