European Curation Strategy

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We are entering in a new era of space exploration signed by sample return (SR) missions.

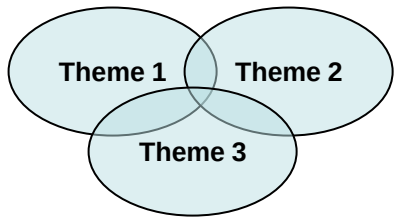
Almost all SR missions have to deal with following scientific themes:

Theme 1: ***What are the original conditions of the Solar Nebula;***

Theme 2: ***What are the evolutionary processes occurred during the Solar System lifetime;***

Theme 3: ***What is the role of extraterrestrial primitive materials in the origin of life on Earth and elsewhere.***

A challenging mission is motivated if answers to questions raised up by these three themes will be given simultaneously.



Sample Return mission opens new perspectives

Analyses of organic compounds that could be responsible for the origin of life on Earth;

Discovery primitive materials preserved during Solar System formation;

Understanding evolutionary processes occurred during the Solar System lifetime.

Development of Sample Return technologies suitable for future exploration: *Sampling mechanism, Earth return vehicle, re-entry capsule*.

Development of robotic systems able to make use of SR resources for human exploration.

Development of Curation Centers for analyses, delivery and storage of ET samples.

Educational Return

Public-Outreach

General activities of storage and curation facility

- To prevent mineralogical, chemical and physical alteration of samples;
- To protect samples from chemical (inorganic and organic) and particulate contamination;
- To catalogue and archive the samples;
- To document sample handling history;
- To perform and document the sample preliminary examinations;

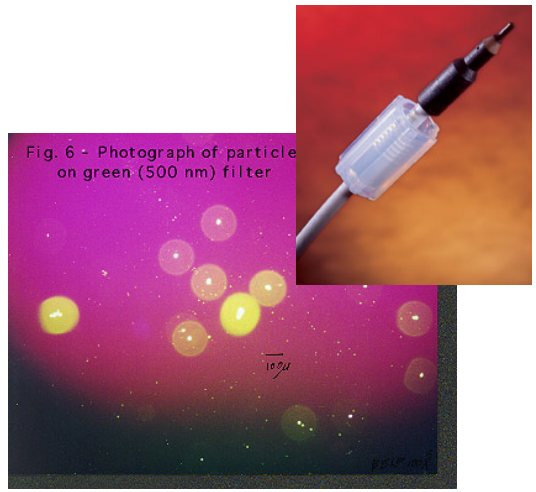
- To separate and section samples;
- To distribute samples to scientists around the world for detailed study;
- To preserve a portion of each sample collection for future study;
- To secure the samples;
- To spread information of scientific results to the public.

Collaboration and personnel sharing among curation facilities are envisaged.

Contamination control

Contamination control sequences will cover the following aspects:

- Trace chemical analysis;
- Trace metal analysis;
- Trace elemental analysis;
- Organic contaminant identification;
- Inorganic contaminant identification;
- Particulate contaminant identification.
- Biological contaminant identification.

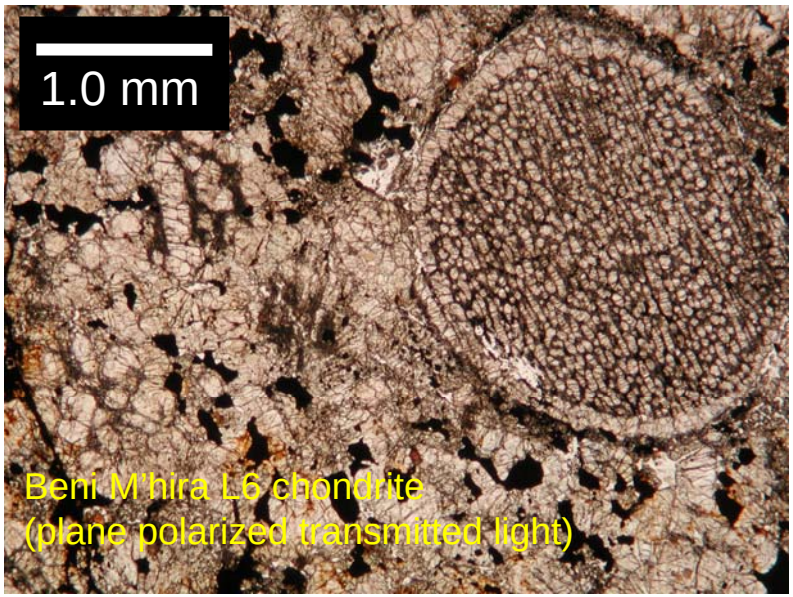


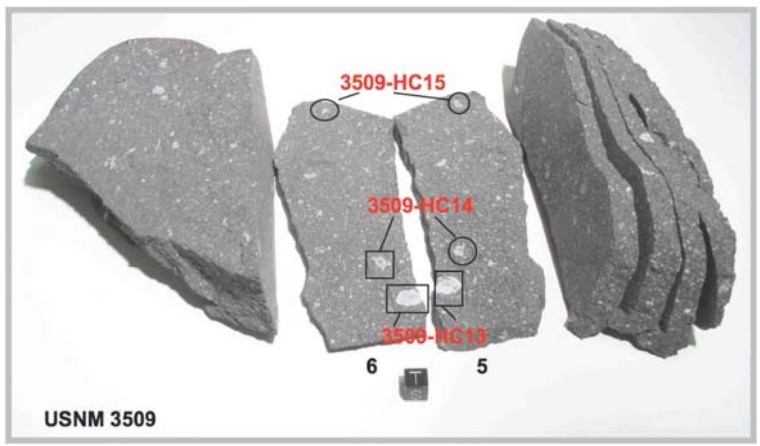
Contamination control will be performed on:

- Sample containers;
- Clean room environment;
- Processing cabinet;
- Witness plates flown (e.g. spacecraft fuel, lubrificants, etc.);
- Flight hardware
- Testing samples.

Sample Preparation

- Separation of pebbles and dust;
- Sample preliminary examination;
- Sample classification;
- Polished sections of pebbles and dust;
- Separation of samples to be delivered to laboratory for studies and those stored indefinitely in the facility;
- Sample allocation in special holders for delivering to worldwide laboratories.





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Preliminary Characterization

Imaging	**Optical microscopy** **Scanning Electron Microscopy (SEM)**
Mineralogy	**X-ray Diffraction (XRD)** **Visible-Infrared spectroscopy** **Microanalysis scanning Electron Microscopy (SEM-EDX)**
Organic analyses	**Visible-Infrared micro spectroscopy** **Micro Raman spectroscopy**
Fluid Inclusion	**Micro-Raman Spectroscopy** **Optical petrography**

Preliminary Curation Database

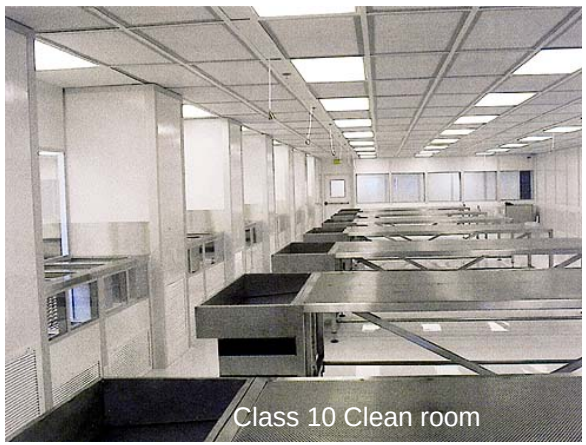
Samples will be catalogued in order to set up a series of self-consistent describing elements according to:

- Specimen description: name, physical properties, preliminary investigation data set, classification.
- Sample description: name, type (e.g. rock, pebbles, dust), form (e.g., single chip, cube, plate, fragments, many grains, powder, etc.).
- Sampling site (e.g., outer part, inner part, central, etc.).
- Sample allocation.

Curation basic equipments

A dedicated sample return storage and curation facility will be equipped with the following characteristics:

- Clean room environment of class 10;
- Maintenance of ambient temperature in the laboratory;
-Containment cabinets with positive-pressure in controlled atmosphere (e.g. GN2, Ar);
- Humidity control;
- Dedicated processing cabinets (e.g stainless steel gloved cabinet);
- Combination of human and robotic processing;


Class 10 Clean room


The Stardust Curation class 100 cleanroom at JSC

Curation Design

Infrastructures

Procedures and protocols

Personnel recruitment and training

Facility Operation Training

Outreach


Thank You!