

# European Curation Strategy

John Robert Brucato  
INAF - Astrophysical Observatory of Arcetri, Florence, Italy

Ian Franchi  
PSSRI, Open University, Milton Keynes, UK

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

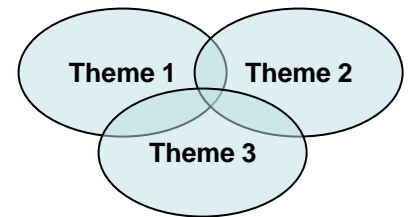
Almost all SR missions have to deal with following scientific themes:

**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;
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- 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.

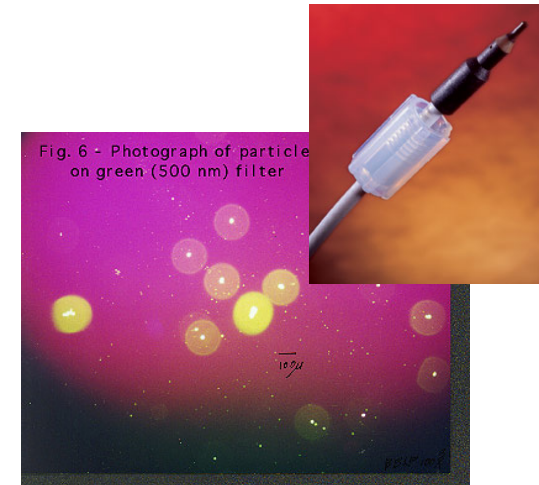
# Contamination control

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.

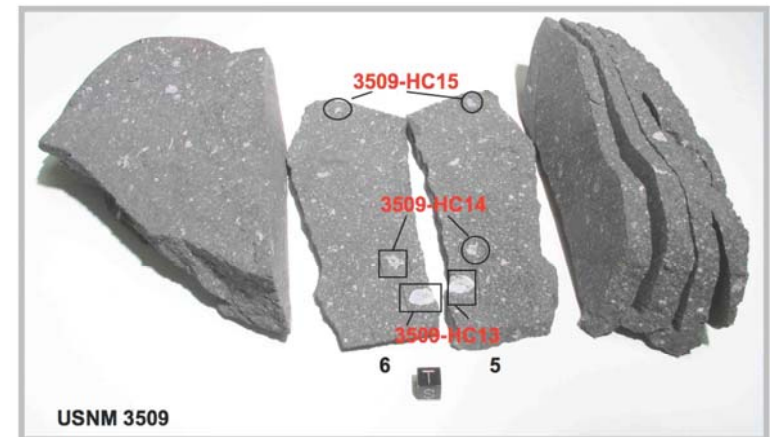
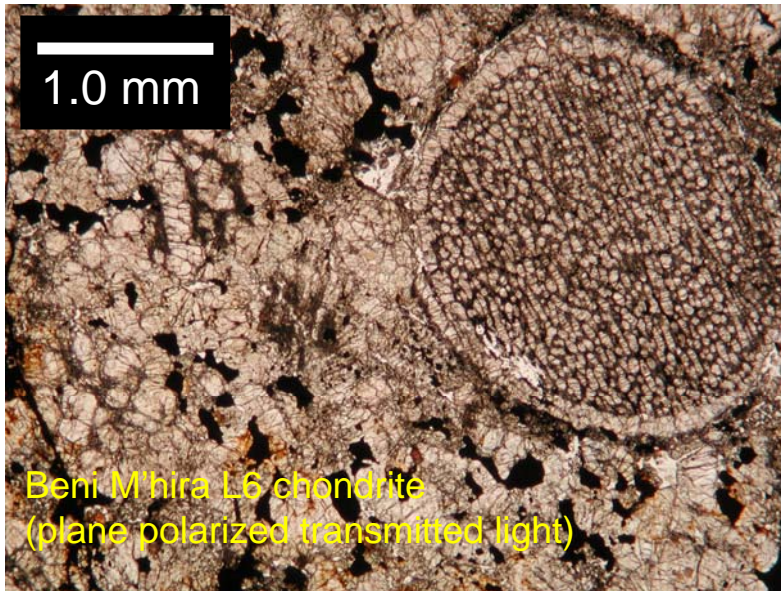
Contamination control will be performed on:

- Sample containers;
- Clean room environment;
- Processing cabinet;
- Witness plates flown (e.g. spacecraft fuel, lubricants, 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.



# Preliminary Characterization

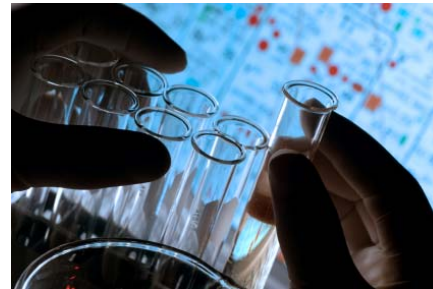
<b>Imaging</b>	<b>Optical microscopy</b> <b>Scanning Electron Microscopy (SEM)</b>
<b>Mineralogy</b>	<b>X-ray Diffraction (XRD)</b> <b>Visible-Infrared spectroscopy</b> <b>Microanalysis scanning Electron Microscopy (SEM-EDX)</b>
<b>Organic analyses</b>	<b>Visible-Infrared micro spectroscopy</b> <b>Micro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



# 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!

*S. S. S. S.*