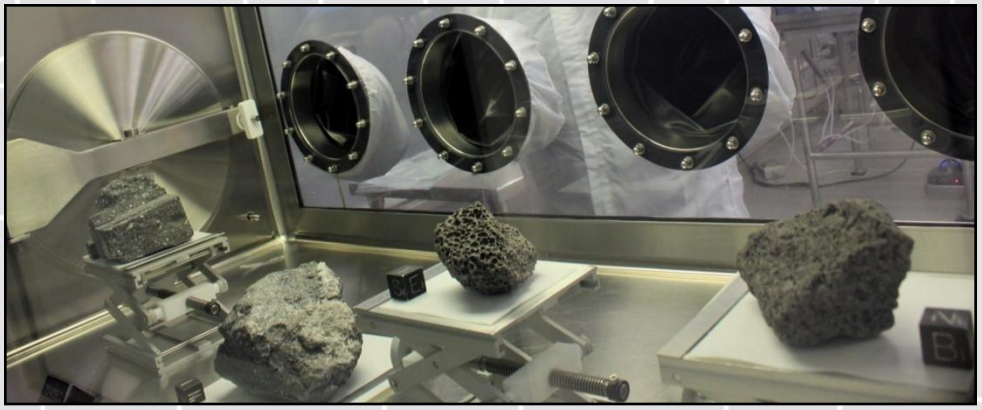
Curation of extraterrestrial samples: What are the main issues?

Ludovic Ferrière

(Natural History Museum Vienna, Austria)



What is CURATION?

"Definition": Collection, handling, documentation, preparation, preservation ("into the indefinite future"), and distribution of (a limited amount of) samples for research.

Samples:

*have a unique (and distinct) history and come from different environments.

*present specific and unique challenges for appropriate curation.

Curation of Meteorites versus Mission Returned Samples

The NHM Vienna Meteorite collection

The NHM Vienna Meteorite collection

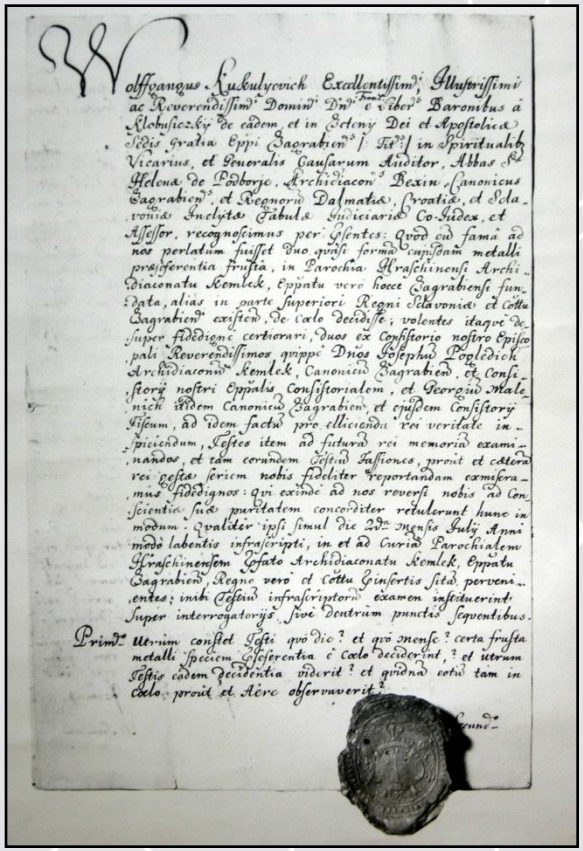
One of the world's largest meteorite collection
~ 8,500 pieces & ~ 2,400 locations represented.

Oldest collection in the world
Collection activities started in Vienna in 1778.

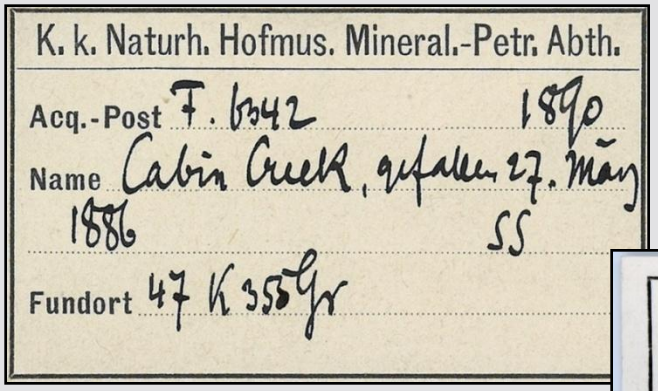
Largest meteorite display in the world
Currently, after a thorough renovation and modernization of the hall (in 2012), there are 1,100 meteorites on display, including 650 different meteorites (consisting of 300 falls and 350 finds).

Historic samples

The 39 kg iron meteorite Hraschina is the main piece of the meteorite fall of 1751 near Zagreb (Croatia).
It is the founding object of the Vienna meteorite collection.



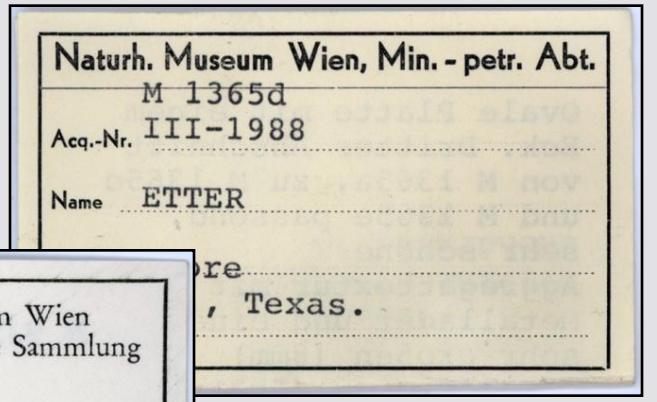
Inventory cards & numbers


K. k. Naturh. Hofmus. Mineral.-Petr. Abth.

Acq.-Post F. 6342 1890

Name Cabin Creek, gefallen 27. May 1886 SS

Fundort 47 K 355 Gr

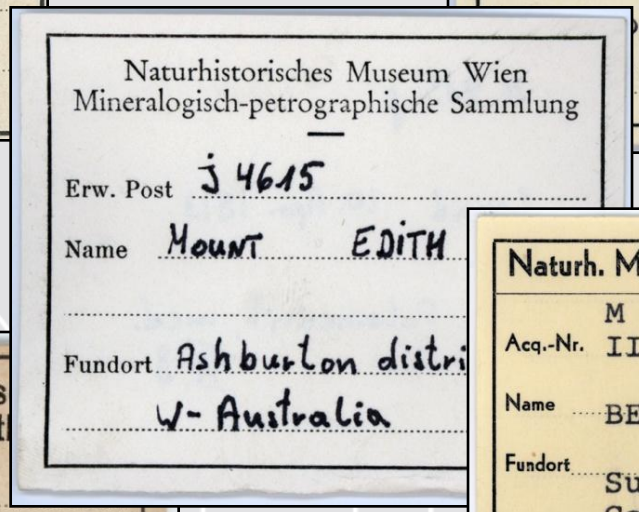

Naturh. Museum Wien, Min. - petr. Abt.

Acq.-Nr. M 1365d III-1988

Name ETTER

...re

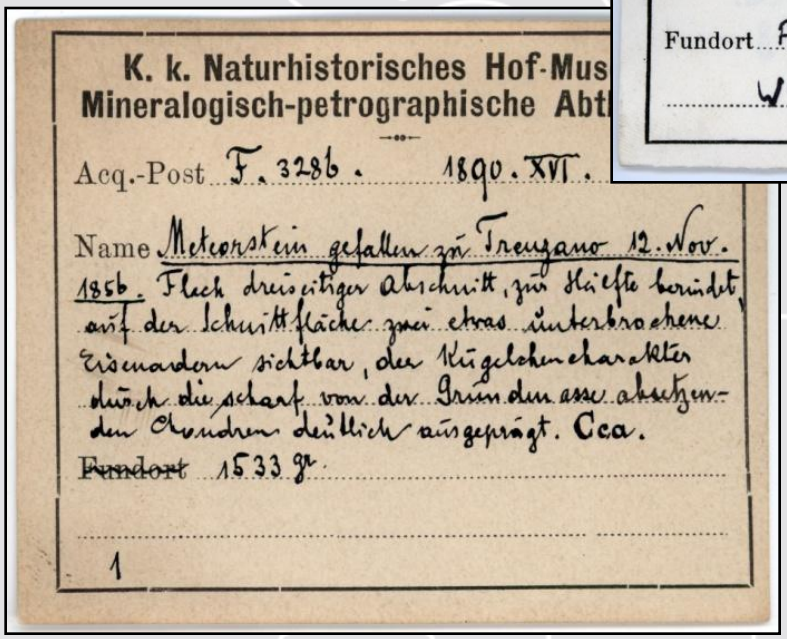
..., Texas.


Naturhistorisches Museum Wien
Mineralogisch-petrographische Sammlung

Erw. Post j 4615

Name Mount EDITH

Fundort Ashburton distri
W-Australia

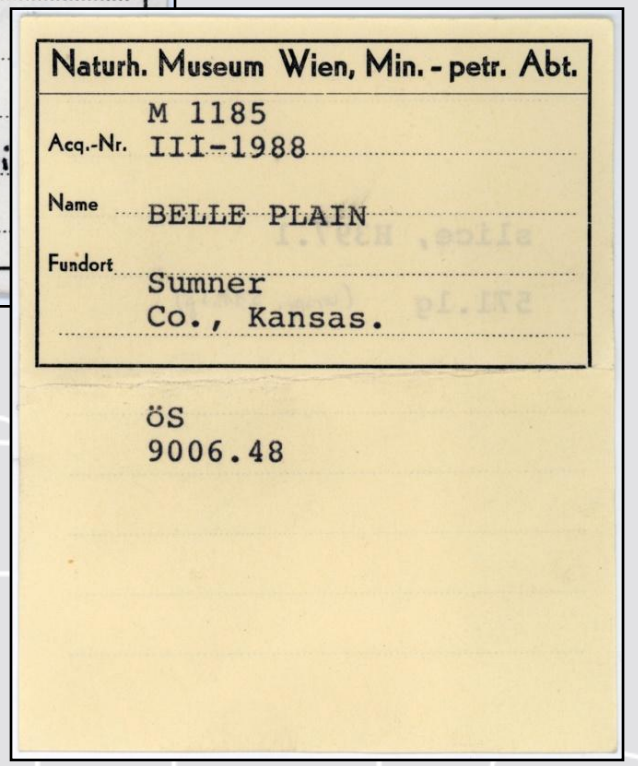

K. k. Naturhistorisches Hof-Mus
Mineralogisch-petrographische Abt

Acq.-Post F. 3286. 1890. XVI.

Name Meteorstein gefallen zu Trenzano 12. Nov. 1856. Fleck dreieckiger Abschnitt, zur Hälfte bedeckt, auf der Schnittfläche zwei etwas unterbrochene Eisenadern sichtbar, der Kügelchencharakter durch die scharf von der Grundmasse abstechenden Chondren deutlich ausgeprägt. Cca.

~~Fundort~~ 1533 gr.

1


Naturh. Museum Wien, Min. - petr. Abt.

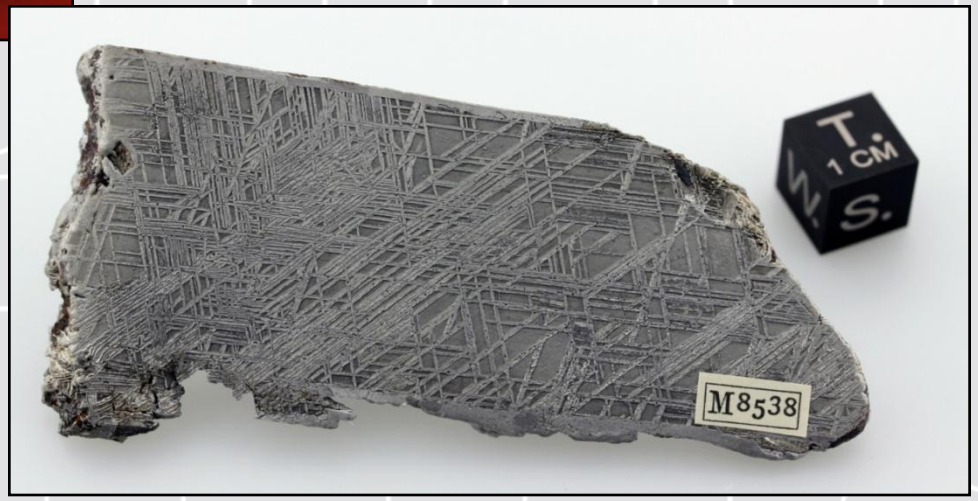
Acq.-Nr. M 1185 III-1988

Name BELLE PLAIN

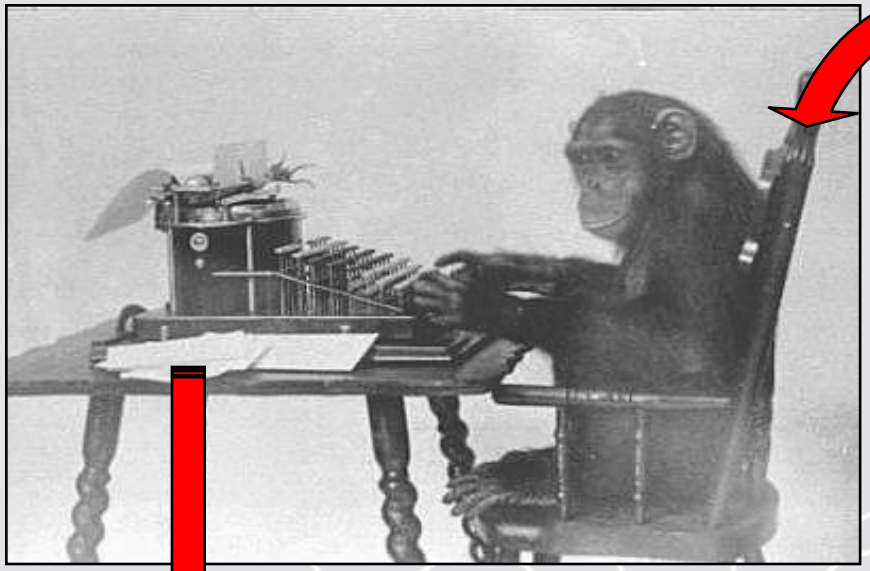
Fundort Sumner Co., Kansas.

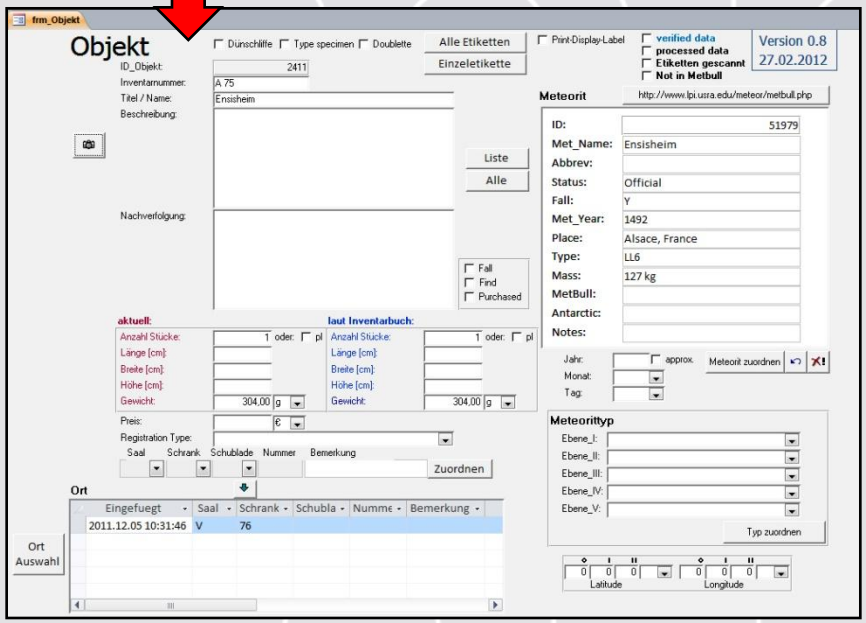
ÖS
9006.48

Inventory cards & numbers



Inventory & Database…

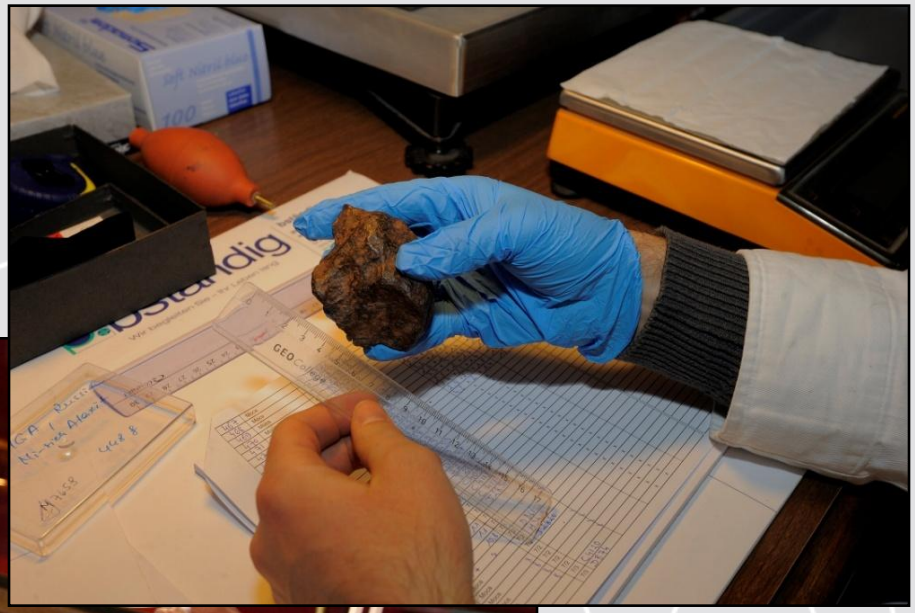




Inventory & Database…

Weighing, measuring,

photographing, etc.

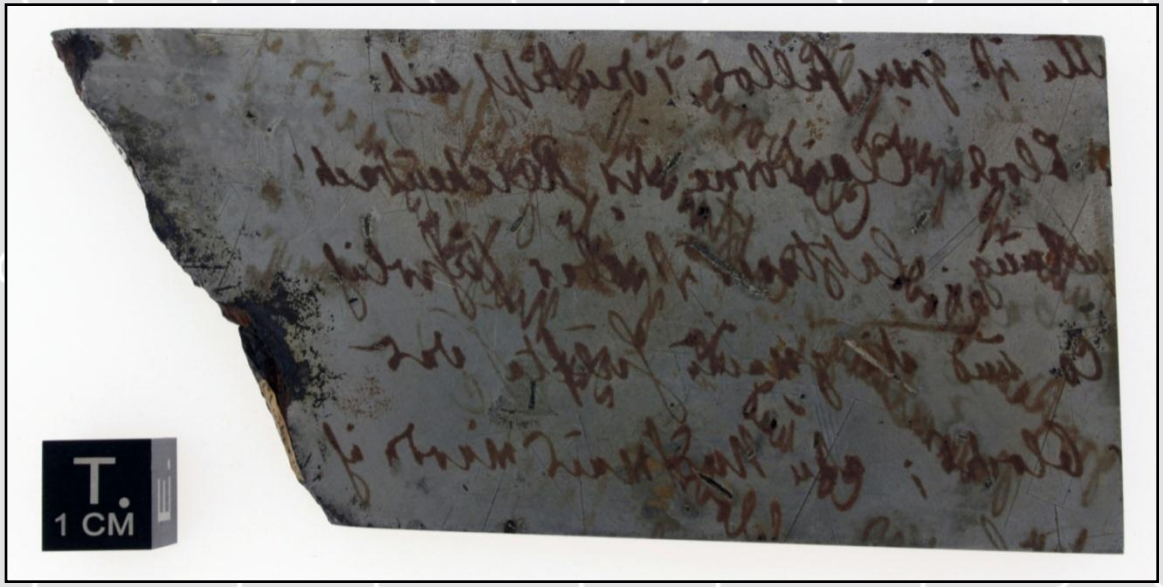


Important aspects to take into consideration

Meteorites arrive into collections either as samples recovered shortly after their fall on Earth, others (so-called finds) are collected mainly in hot and cold deserts and were exposed to Earth biosphere for hundreds or thousands of years.

All of these samples have interacted with the Earth atmosphere before being recovered on the ground.

Usually not much care is taken during the collection (excepted for most meteorites recovered in Antarctica) and then, the processing and traceability can be somewhat "chaotic".

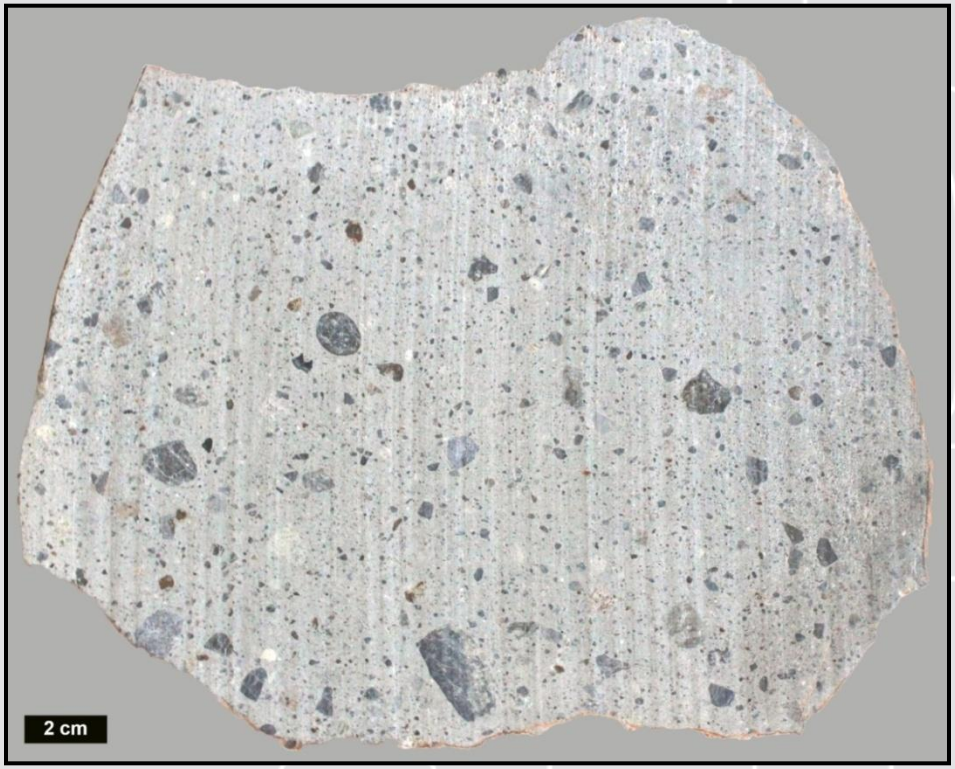


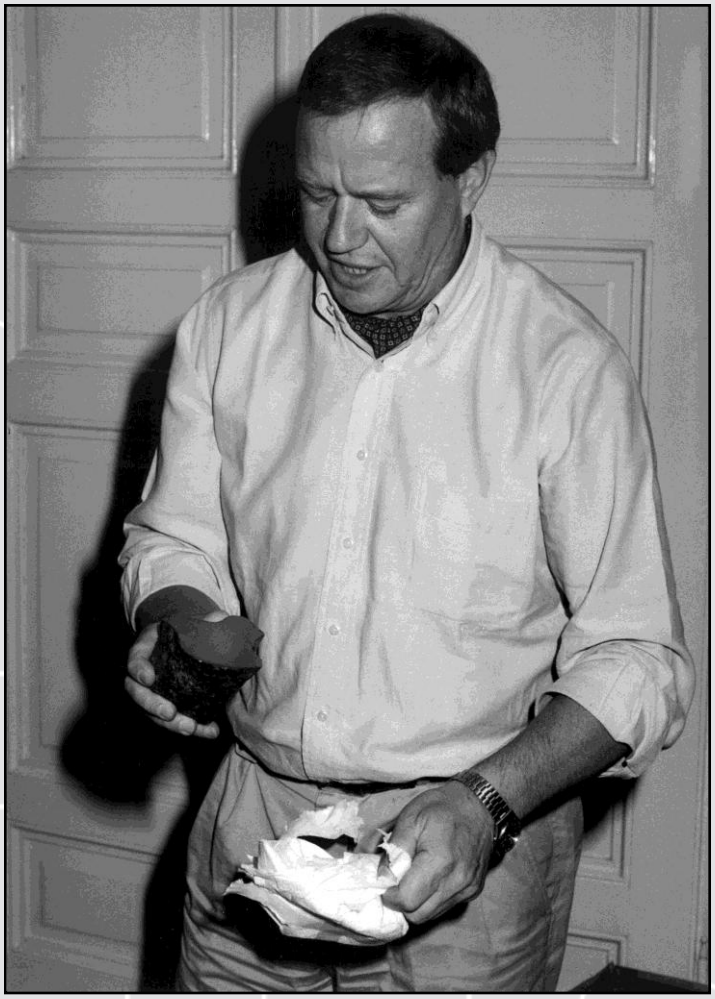
Lime Creek
(A 1026)

(Undocumented) Contamination

Meteorites are in contact with a large number of materials, liquids (in some cases the cutting is even done with tap water), and other unknown/undocumented contaminants.

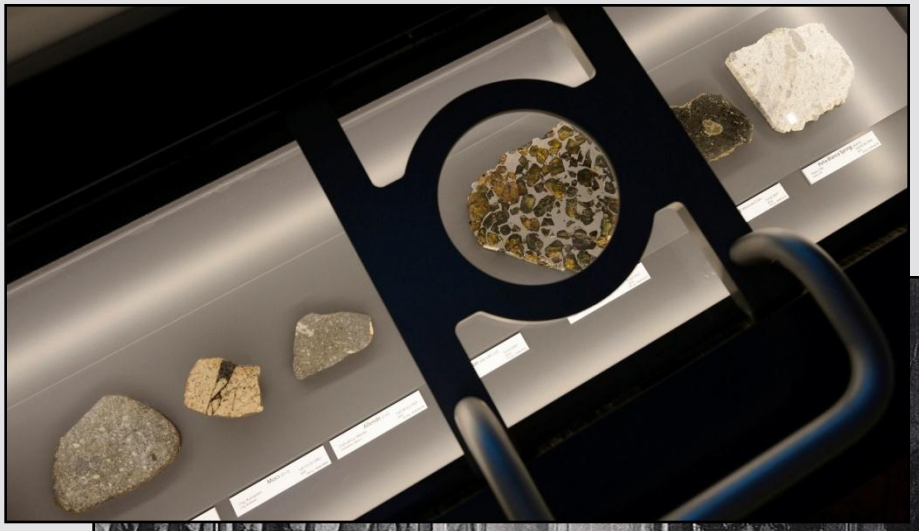
DAG 779 (N 838 ; 662 g)

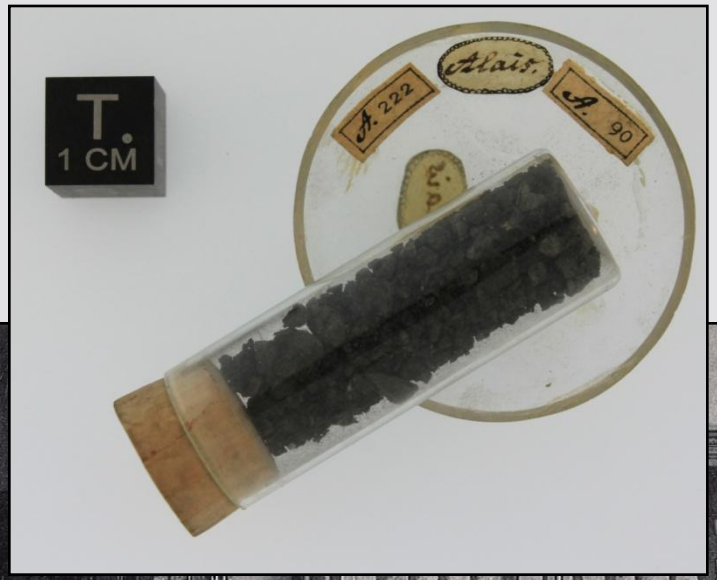


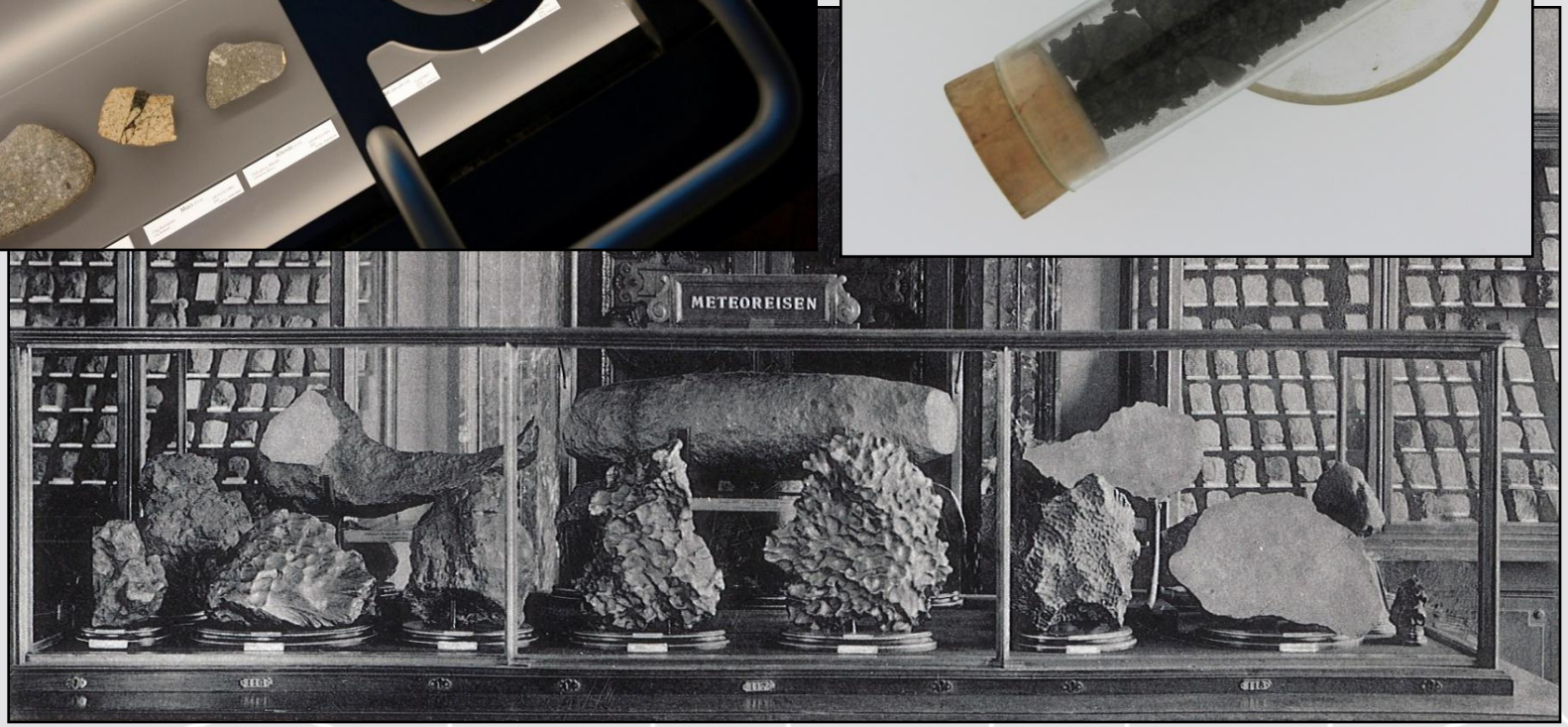


Storage of the samples

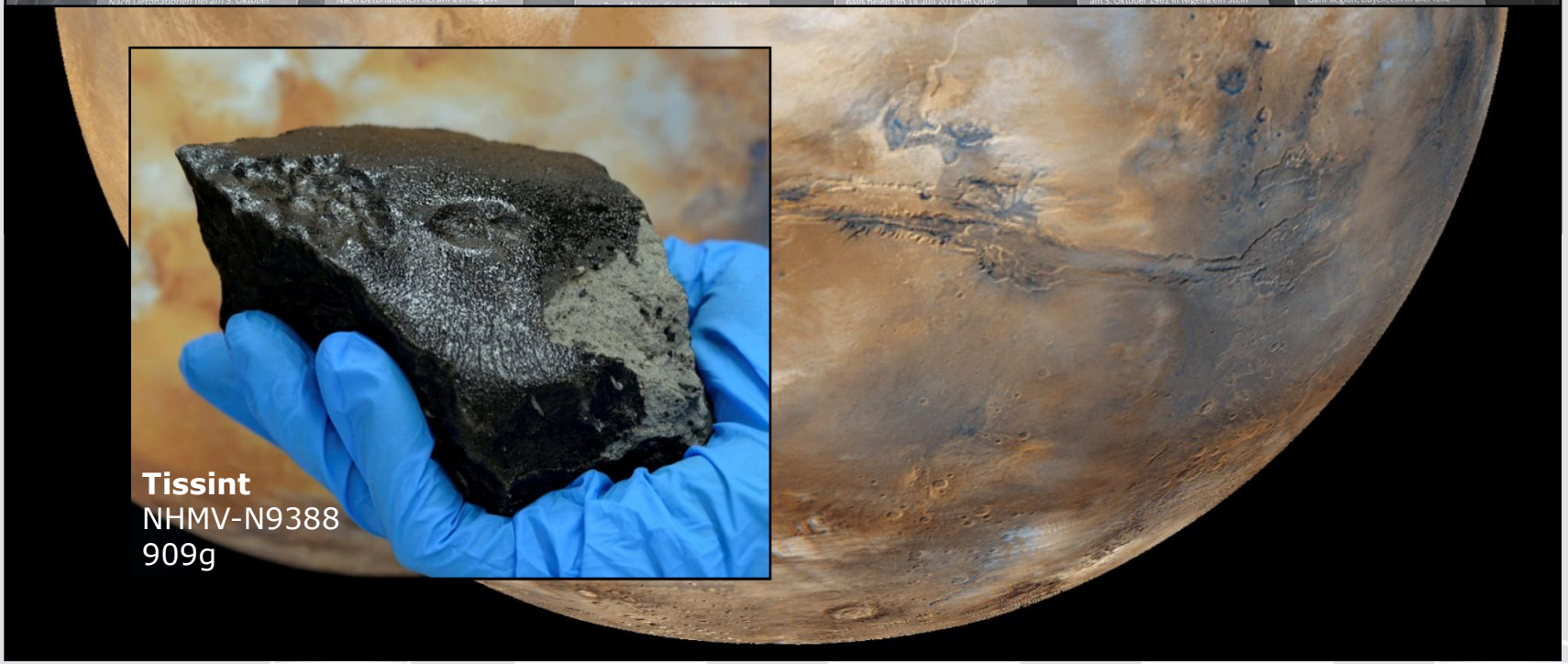
When it comes to the storage (or display), most meteorites are stored under uncontrolled atmosphere and to some extend in the same way as minerals, rocks, and other terrestrial samples.







Storage of the samples: The case of Martian meteorites

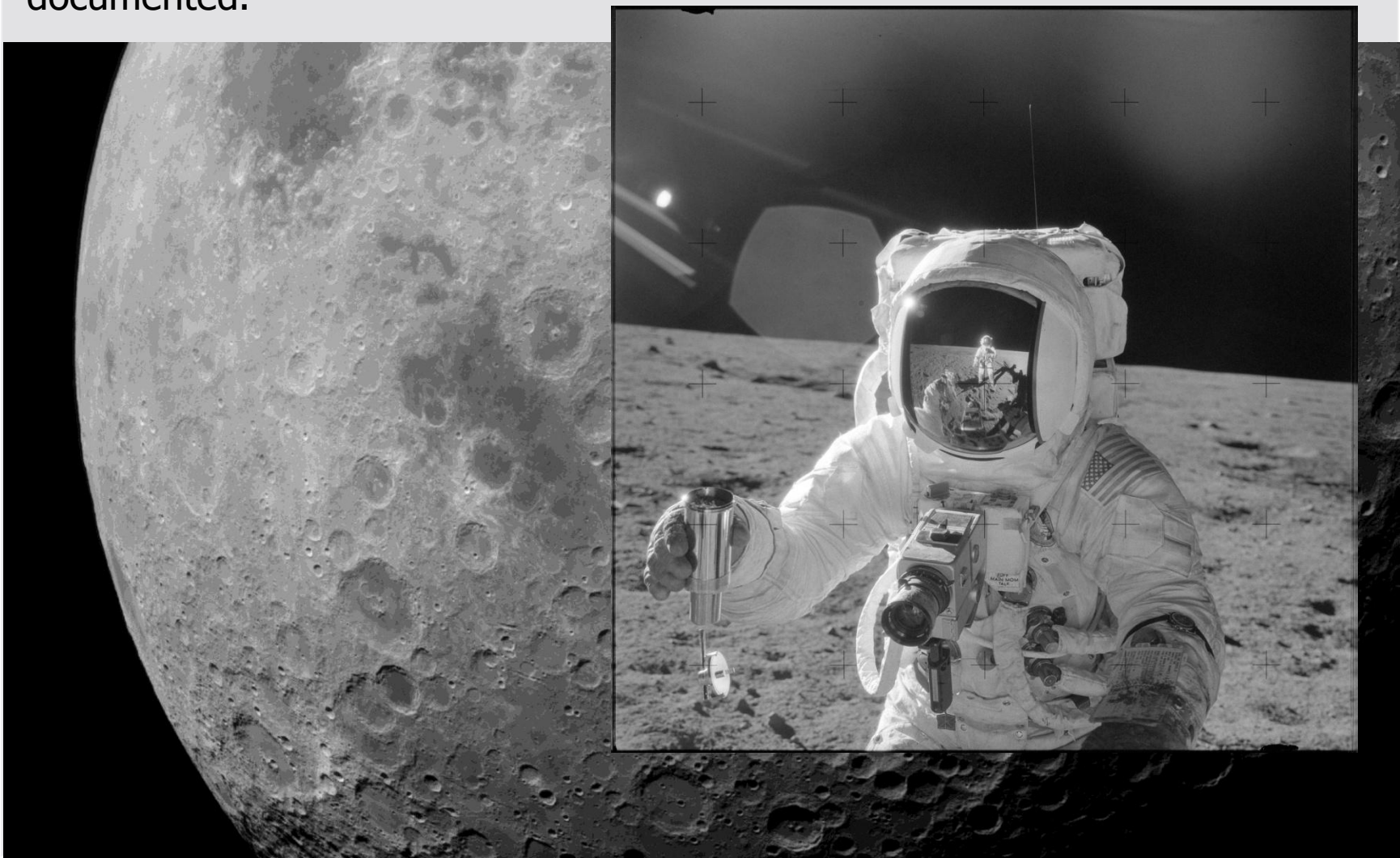


Storage of the samples

Preparation of the samples

Mission Returned Samples

In the case of sample return missions, all steps, from the collection of the samples until the arrival in the specific facility, are (can be/) properly documented.



Mission Returned Samples

Each of the collected and curated samples have a unique (and distinct) history and come from different environments, therefore, the different types of samples present specific and unique challenges for appropriate curation and to insure their integrity.

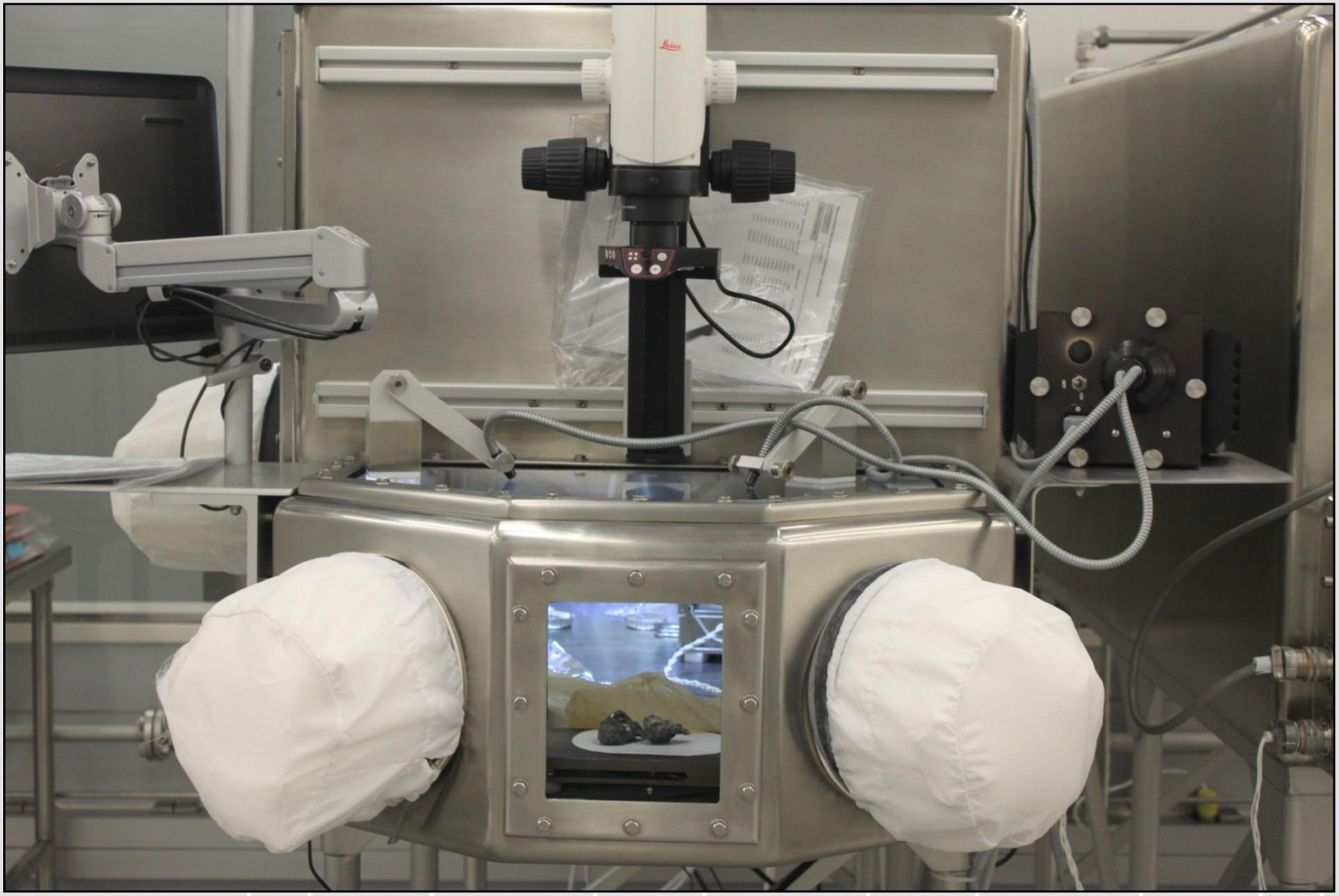
Mission Returned Samples

In order to preserve the scientific value of these precious samples, contamination, but also physical and chemical alteration must be minimized, understood, and properly recorded. Different documentation, handling, preparation, and storage technologies were designed, developed, and tested in the last decades.

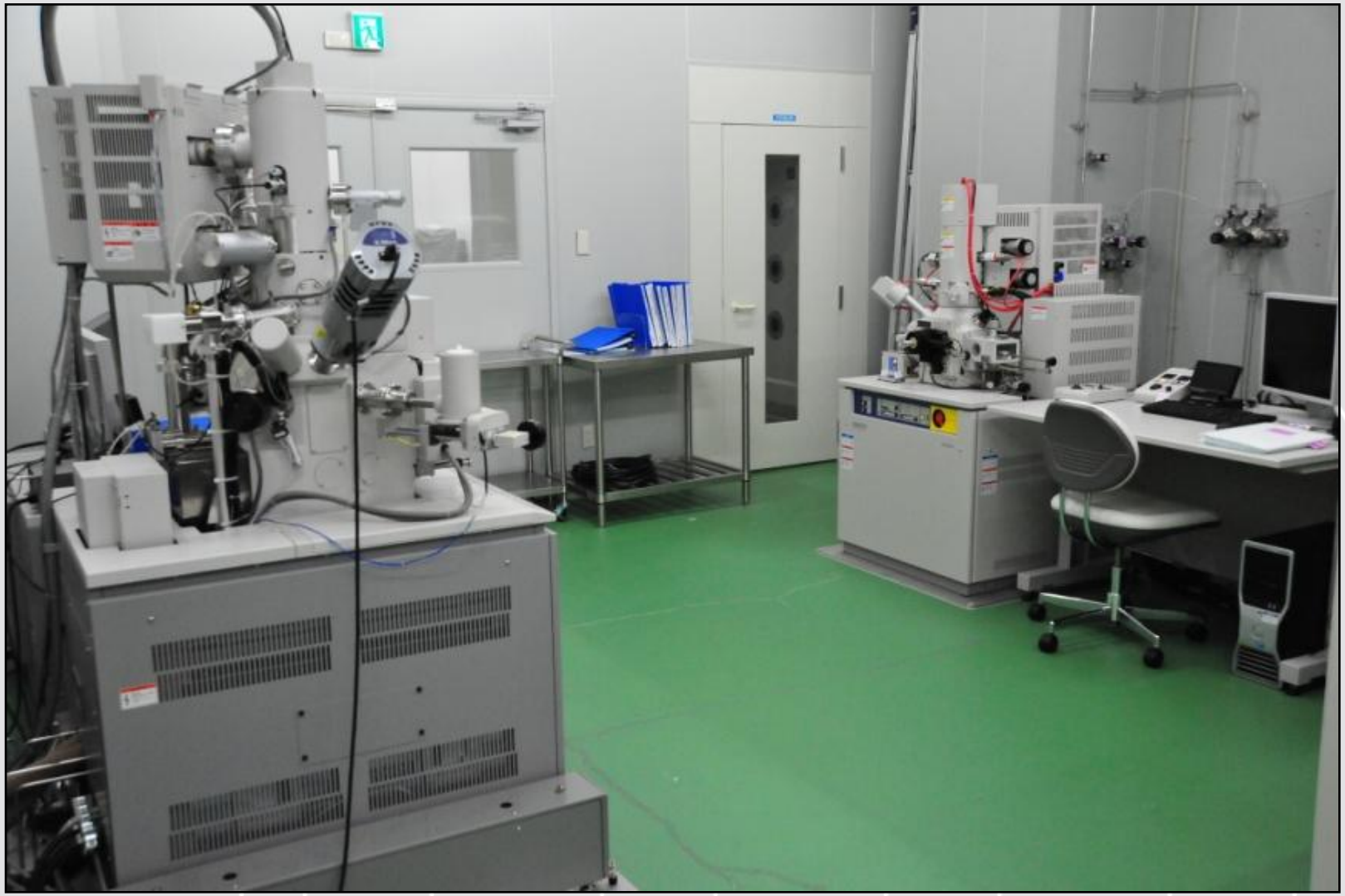
These facilities operate at controlled pressure, temperature, and atmospheric environment.

Preparation & Characterization of Mission Returned Samples

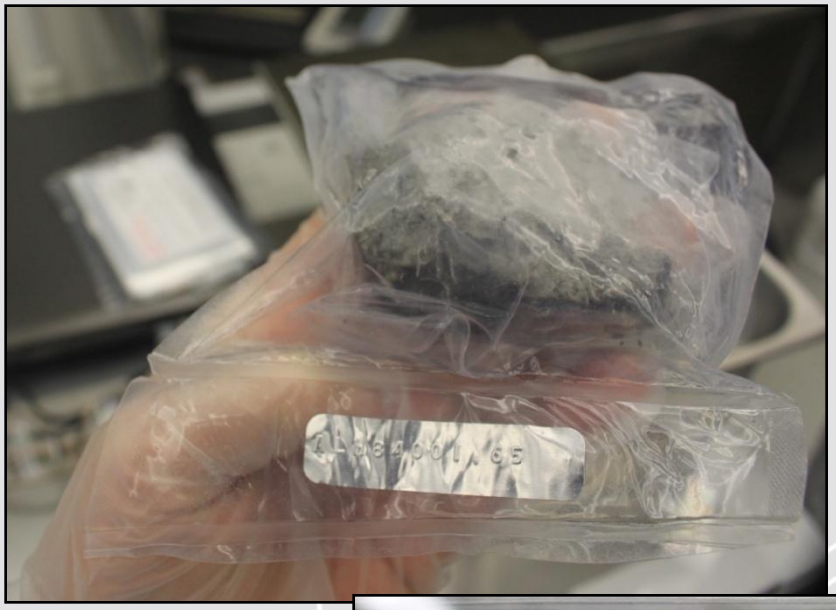
Preparation & Characterization of Mission Returned Samples



Preparation & Characterization of Mission Returned Samples



Storage of Mission Returned Samples



Mission Returned Samples on display

Questions? / Comments?