

# Development of a depository in an analytical facility — a sample-preservation mission

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# Outline of this talk

- Motivation of the project
- Development of a database
- Practical problems
- Project status
- Demonstration
- Problems and next steps

# Typical steps for analysis

- Sampling
- Process material for analysis
- Data acquisition and reduction
- Publish data
- Store with proper label
- Take over
  - sample itself
  - numerous info besides the data

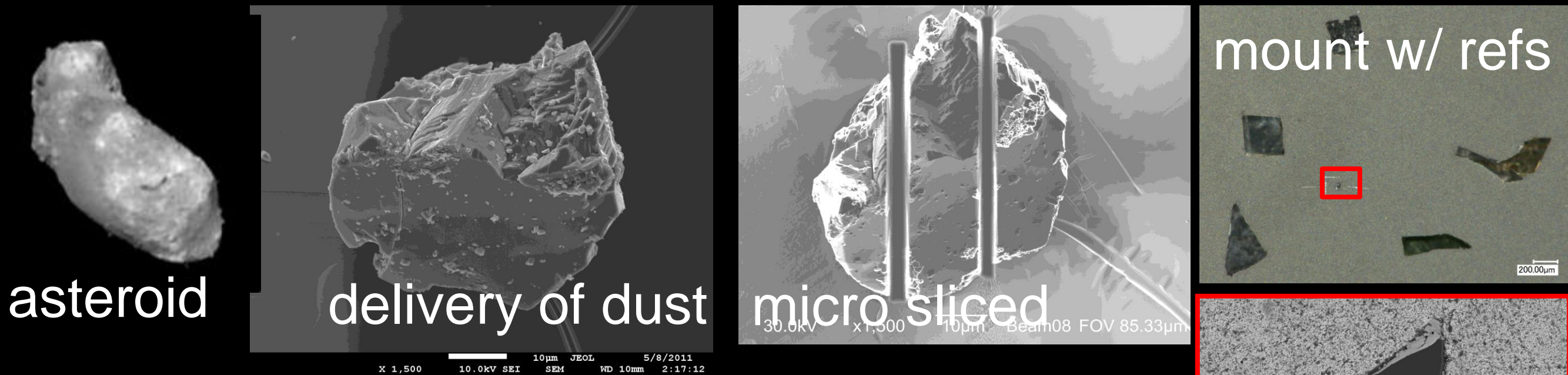
# Transformation of a material



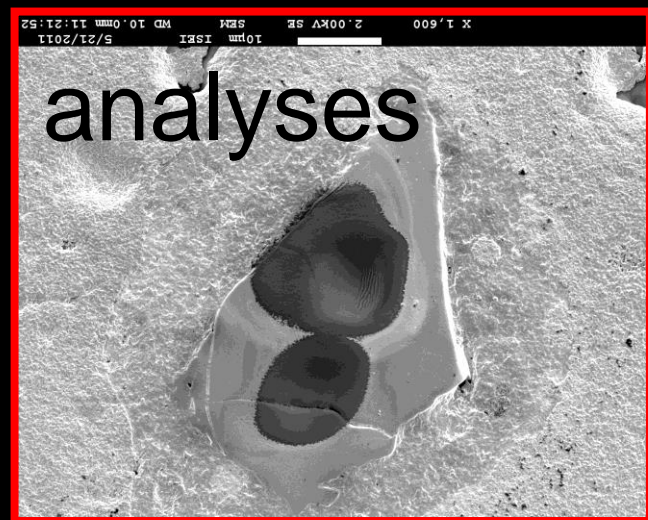
- Earth will be divided into pieces
- Brothers, children, and relatives are created (genetic hierarchy)
- They live in different laboratories



# Transformation of Itokawa



- Itokawa was divided and has many relatives as well
- With neighbor of different ancestor (tenant hierarchy)
- Spots inside of grains



# A request of local depository

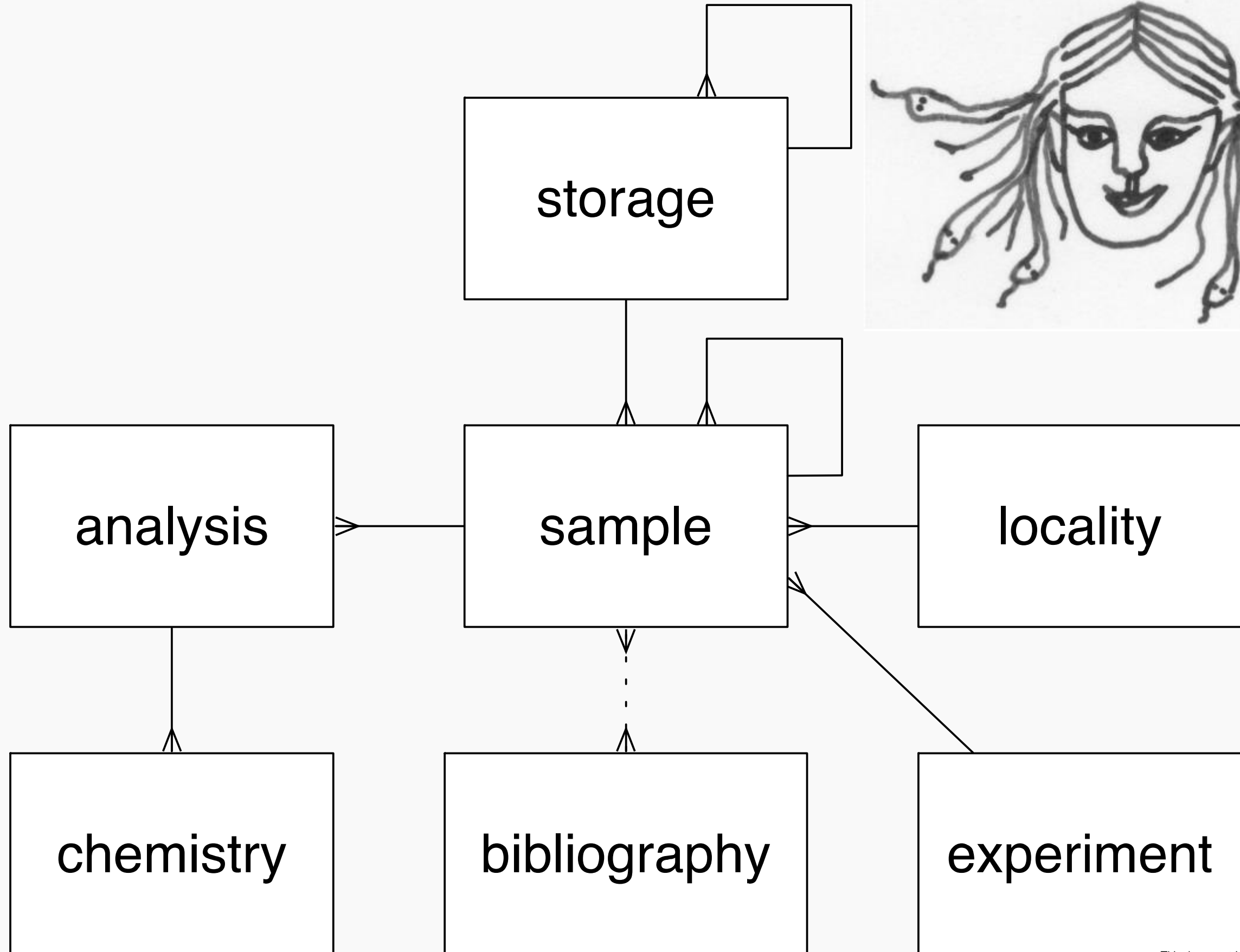
- Keep track status of materials
  - genetic hierarchy
  - tenant hierarchy
  - spots coordinate inside of material
  - newly obtained properties
- Assist laboratories where materials circulate
- Inheritance to the next generation

# Components of DREAM

Depository for References of Experimental and Analytical Materials

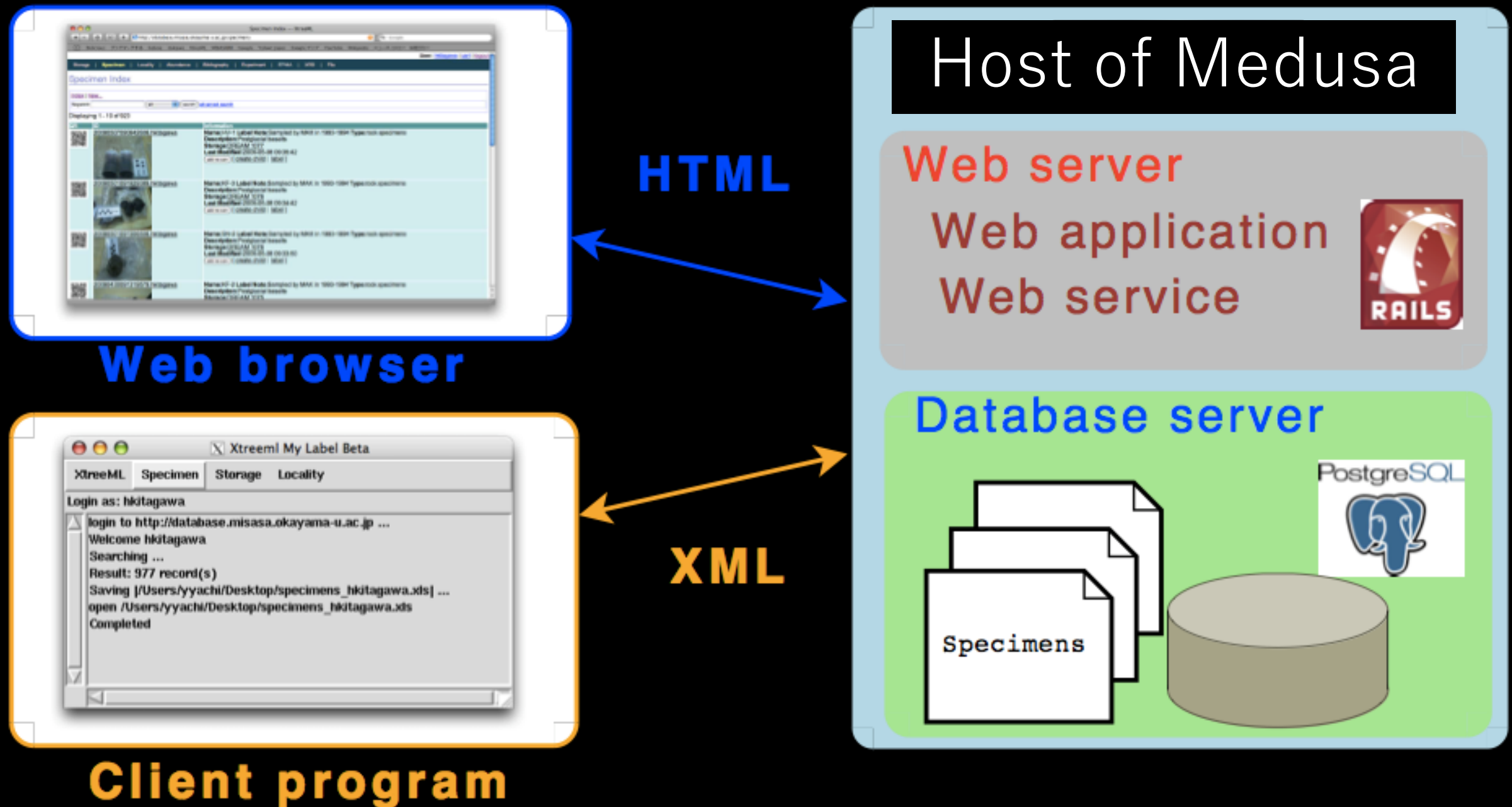
- Materials collected and synthesized
  - minerals, powders, solutions, 1' thin section, tissues & spots
- Storages
  - building, room, shelf, container, & 1' mount
- Properties
  - analysis data by bulk and in-situ
  - bibliography
- A database software that links all info

# Medusa will stone and link





# Interface of Medusa



- Web browser
- Web API

# Type-in interface on the run

IB1601

[edit](#) | [delete](#) | [system info](#) | [a card](#)

[ROOT](#) / [ISEI](#) / [Sample storage building](#) / [Room A](#) / [DREAM 5011](#) / IB1601

[at-a-glance](#) | [daughters](#) | [analyses](#) | [references](#) | [attachments](#)

20080616170023.hk



relatives

[IB1601](#) (aliquot on [container](#))

..... [IB1601](#) (powder on [container](#))

..... [IB1601](#) (powder on [container](#))

..... [IB1601](#) (thin section on [container](#))

..... [IB1601](#) (aliquot on [container](#))

neighbors

[DREAM 5011](#) (container)

..... [IB1601](#) (aliquot on [container](#))

..... [IB1602](#) (aliquot on [container](#))

..... [IB1603](#) (aliquot on [container](#))

..... [IB1604](#) (aliquot on [container](#))

..... [IB1605](#) (aliquot on [container](#))

..... [IB1606](#) (aliquot on [container](#))

..... [IB1607](#) (aliquot on [container](#))

..... [IB1608](#) (aliquot on [container](#))

..... [IB1609](#) (aliquot on [container](#))

..... [IB1610](#) (aliquot on [container](#))

- [me](#) / [daughters \(4\)](#)

- ID: 20080616170023.hk

- locality: 65.1300 N, 13.9450 W [more](#)

- classification: rock:igneous

- physical form: aliquot

- note: basalt lava

- bibliographies:

- H. Kitagawa, K. Kobayashi, A. Makishima, E. Nakamura, Multiple pulses of the mantle plume: Evidence from Tertiary Icelandic lavas, Journal of Petrology, 2008 [more](#)

- analyses:

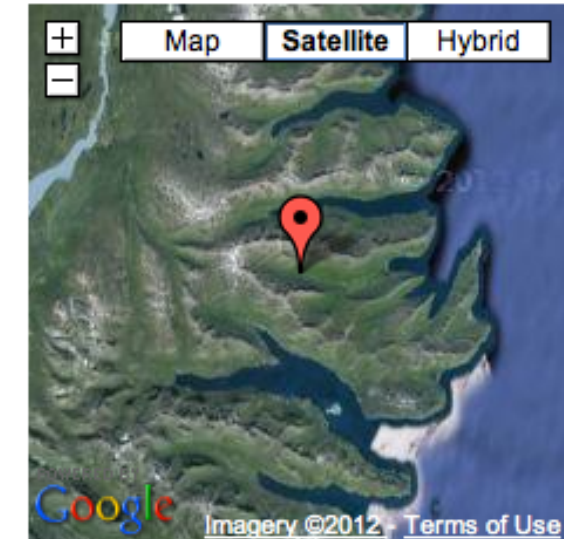
- [Cr]: 217.00, [Ni]: 79.80, [SiO<sub>2</sub>]: 47.11, [Al<sub>2</sub>O<sub>3</sub>]: 14.99, [Fe<sub>2</sub>O<sub>3</sub><sup>T</sup>]: 12.75, [CaO]: 11.75, [MgO]: 6.10, [TiO<sub>2</sub>]: 2.37, [Na<sub>2</sub>O]: 2.36, [K<sub>2</sub>O]: 0.35, [P<sub>2</sub>O<sub>5</sub>]: 0.28, [MnO]: 0.17 [more](#)

- [Sr]: 320.00, [Zr]: 125.00, [Ba]: 94.40, [Y]: 31.90, [Ce]: 29.90, [Nd]: 20.40, [La]: 11.60, [Nb]: 11.30, [Li]: 6.14, [Gd]: 5.87, [Dy]: 5.75, [Sm]: 5.25, [Pr]: 4.31, [Rb]: 4.19, [Hf]: 3.27, [Er]: 2.84, [Yb]: 2.58, [Eu]: 1.96, [B]: 1.19, [Ho]: 1.12, [Tb]: 0.98, [Pb]: 0.89, [Th]: 0.87, [Ta]: 0.72, [Tm]: 0.41, [Lu]: 0.36, [U]: 0.27, [Cs]: 0.04 [more](#)

- [H<sub>2</sub>O<sup>+</sup>]: 2.19 [more](#)

- [FeO]: 5.35 [more](#)

- <sup>208</sup>Pb/<sup>204</sup>Pb: 38.18, <sup>206</sup>Pb/<sup>204</sup>Pb: 18.45, <sup>207</sup>Pb/<sup>204</sup>Pb: 15.48, <sup>87</sup>Sr/<sup>86</sup>Sr: 0.70, <sup>143</sup>Nd/<sup>144</sup>Nd: 0.51 [more](#)



# DREAM of Sisyphus

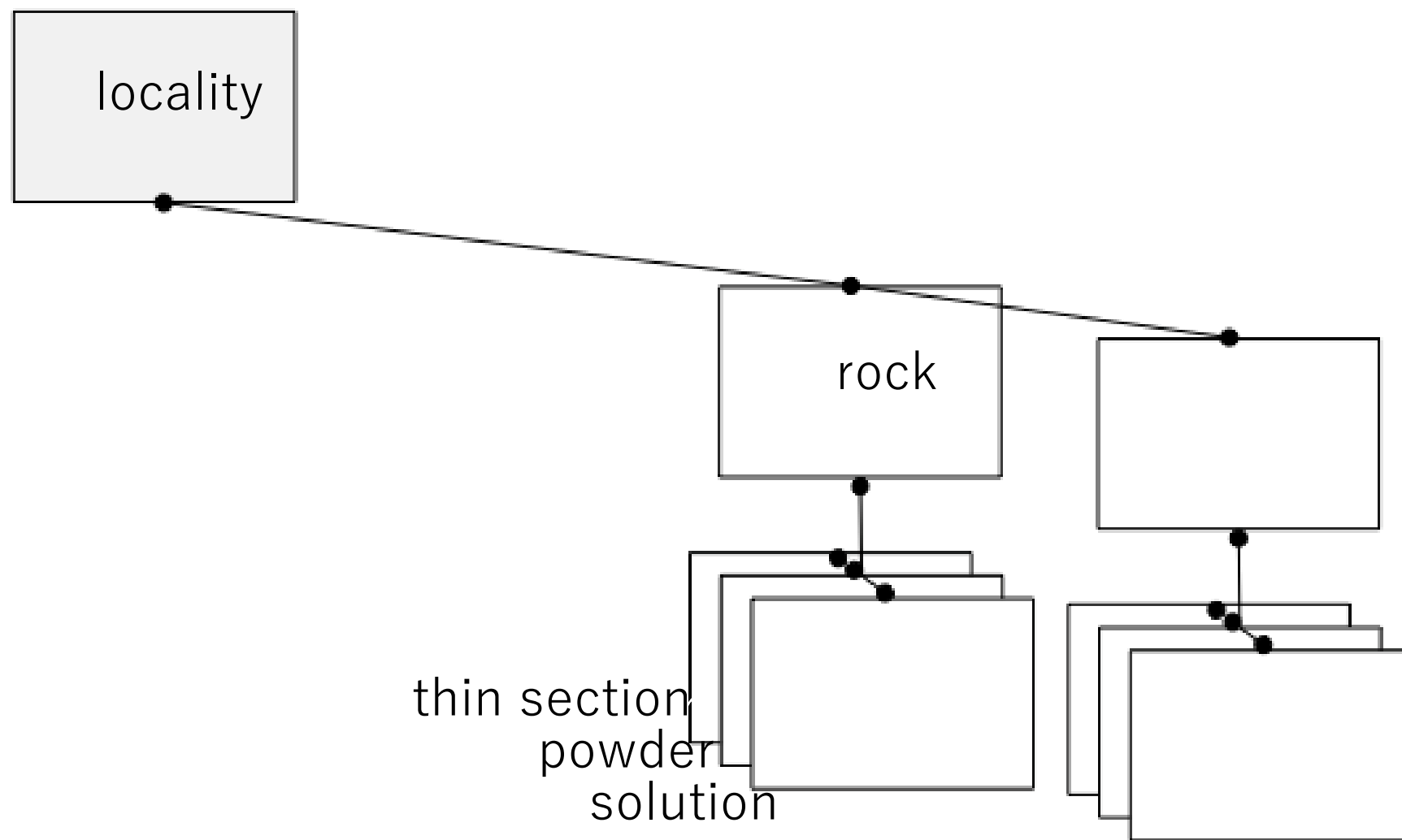
... registration of rocks is like.



The struggle itself toward the heights is enough to fill a man's heart (The myth of Sisyphus, Albert Camus 1942)

# Sisyphus' physical description

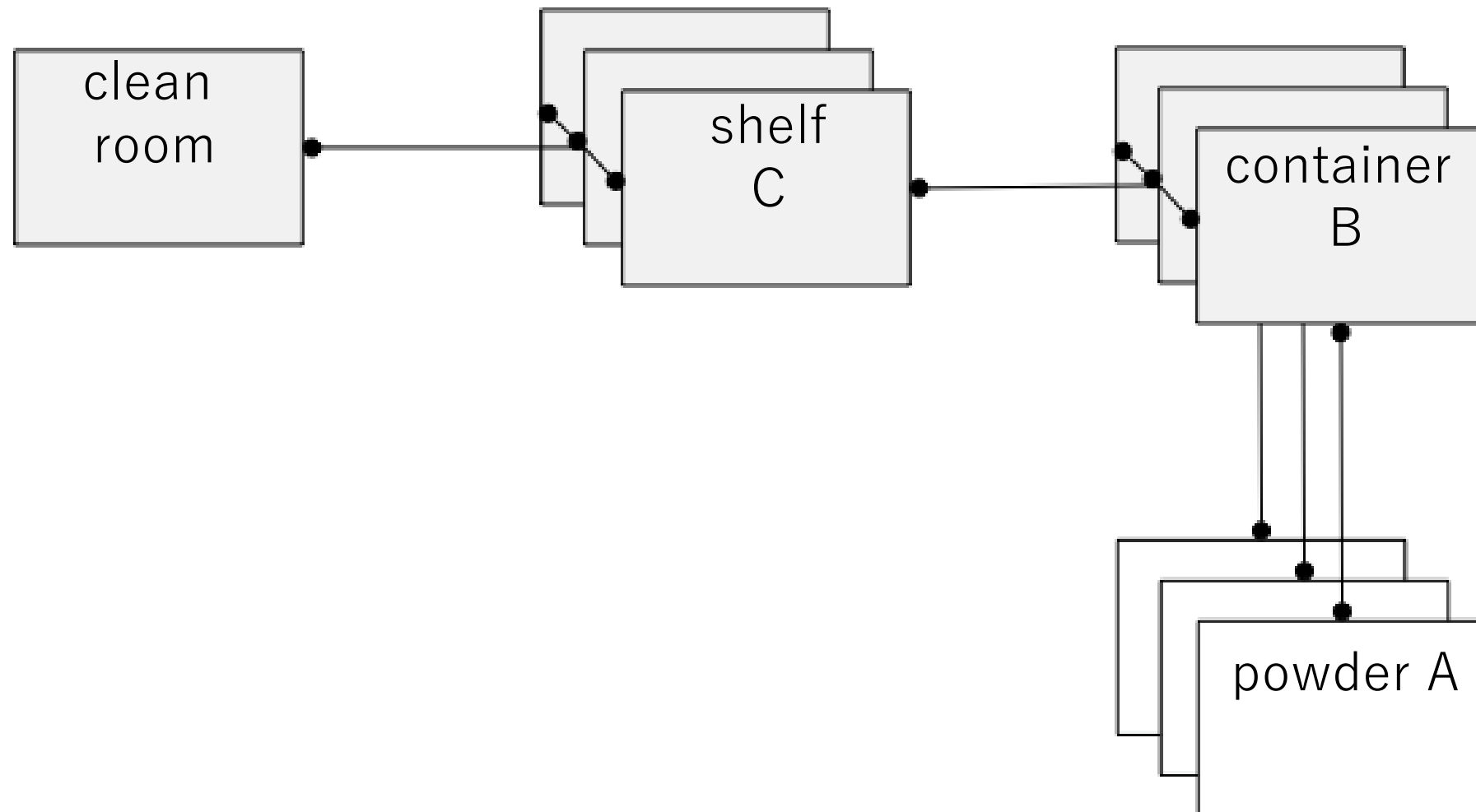
- Two rocks sampled in a locality
- processed into solution, powder, and thin section





# Sisyphus' storage description

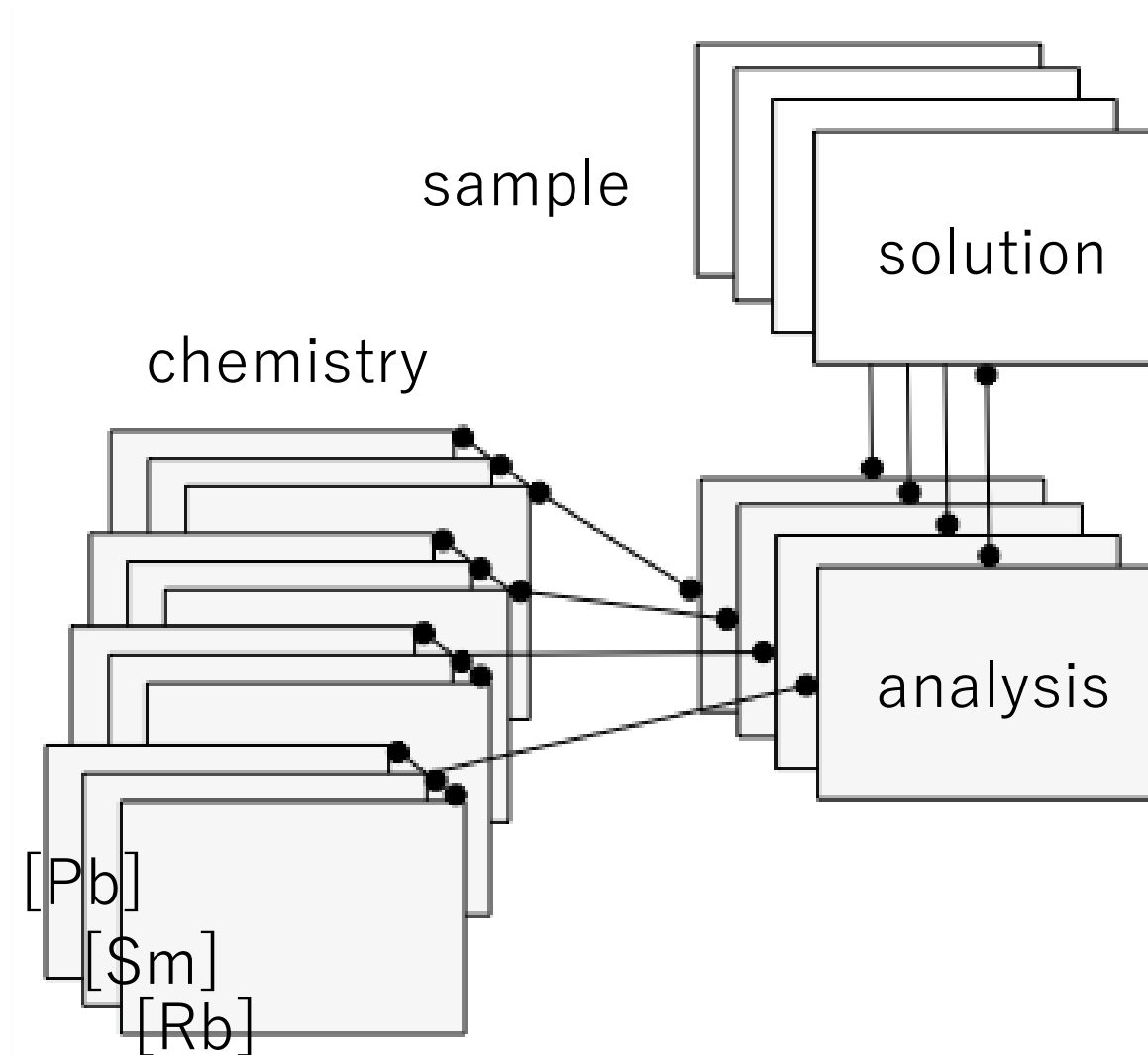
- powder A in the container B on the shelf C in the clean room





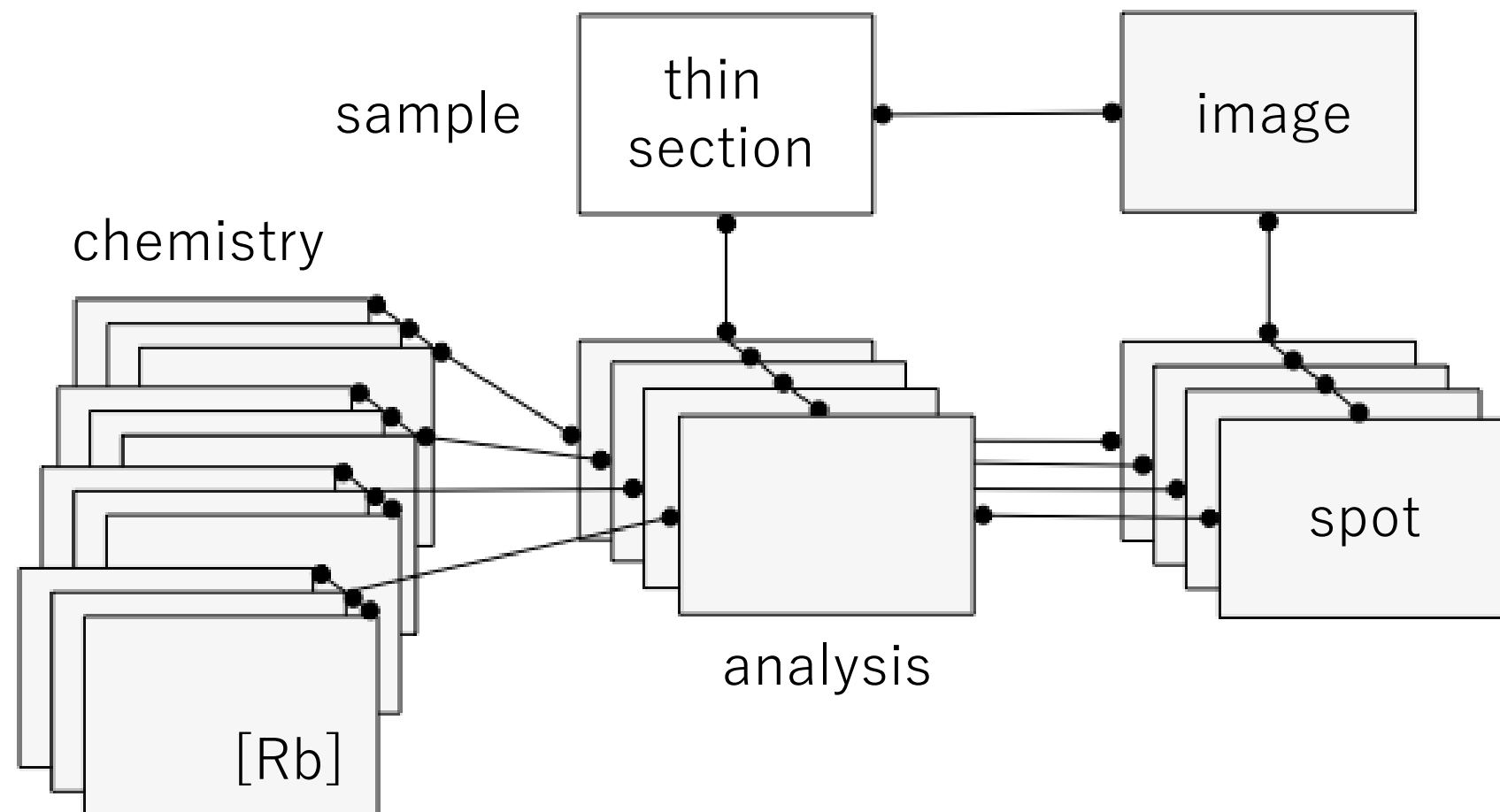
# Sisyphus' bulk analysis

- Three element abundances obtained by a analysis of 4 solution made by 4 analyses



# Sisyphus' ion probe analysis

- Three element abundances obtained by a line profile with four spots



# Demonstration on web

- List
- Search “Itokawa”
- Genetic hierarchy
- Analytical results
- Spots in sliced grain
- Tenant hierarchy
- Track ref. materials

# Software & hardware development

- Batch image uploader
- Relation maker using QR
  - Perl
  - Android
  - iOS
- Mobile improvements
  - can print label via PC
  - macro lens & non-contact charge
  - simplification
- All-in-one cart



# Our sample registration now






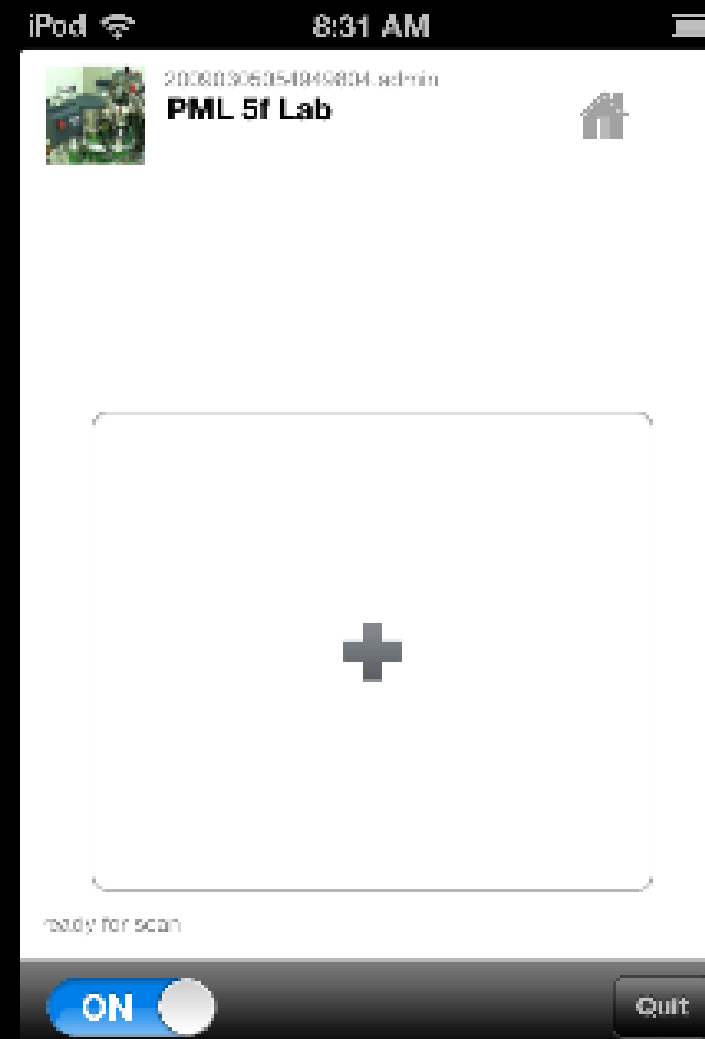
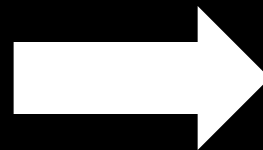
# Transportation in the lab



# Practical headache on site

- OK interface for developer is far from good for rest; we still are Sisyphus
  - Sample should be ALWAYS with ID label; to create label on sample registration is the limiting process
  - camera + PC + printer
  - mobile + PC + printer
- 
- Polish, simplify, & thinkless interface
  - Direct label print from mobile device

# Simplification in progress



- After parent is set, one button fits all
- Demo on [web](#): return particles to JAXA

# Project status — 2013

- Records in Medusa
  - 12,500 rocks on 1,100 storages
  - 300 thin section
  - 100 reference materials for ion probe
  - Equipment and consumables
  - Software licenses
- Utilities for iPod and Android
- Description of spot analysis implemented
- Our Hayabusa initial analysis open
- Paper finally accepted after 3 rejections

# Concerns and next step

- Open to public
  - Source code: available
  - Manual: working
  - Data: only published ones
- Registration process: mobile direct-print
- Interface improvement: working
- Upload data from labs
  - Authorization protocol: under debate
  - Easy way to upload data: this year



# Summary

- A rock depository we call DREAM with associated information, is under construction.
- A software to curate rocks was developed and handles 12,500 rocks, 1,100 storage locations, 300 localities, 1,200 analyses.
- Medusa code and documentation semi officially available at <http://dream.misasa.okayama-u.ac.jp/>