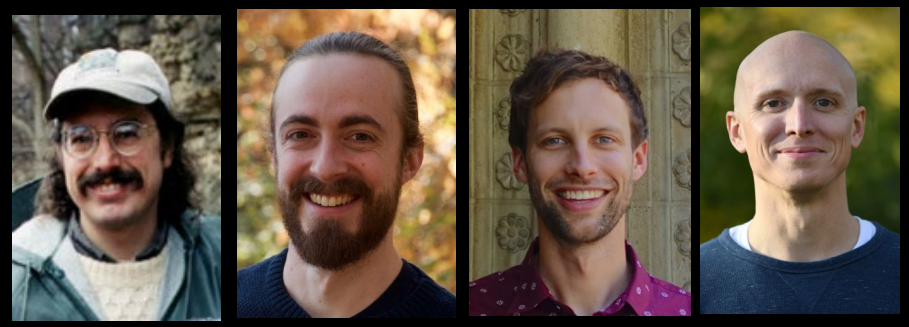
The Strabo Ecosystem

NSF EarthCube

Hannah Blatchford

Noah Phillips

Julie Newman
Andreas Kronenberg



Basil Tikoff
Nick Roberts
Alex Lusk
Randy Williams

Doug Walker
Jason Ash
Nathan Novak
Jessica Good Novak

Ulrich Mok
Matej Pec

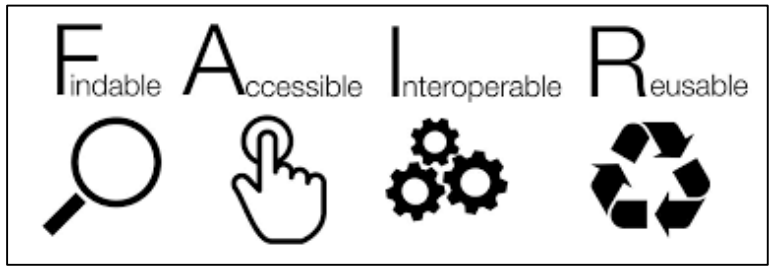
What is StraboSpot?

- A series of applications and associated databases for collecting, storing, sharing, and querying geologic data

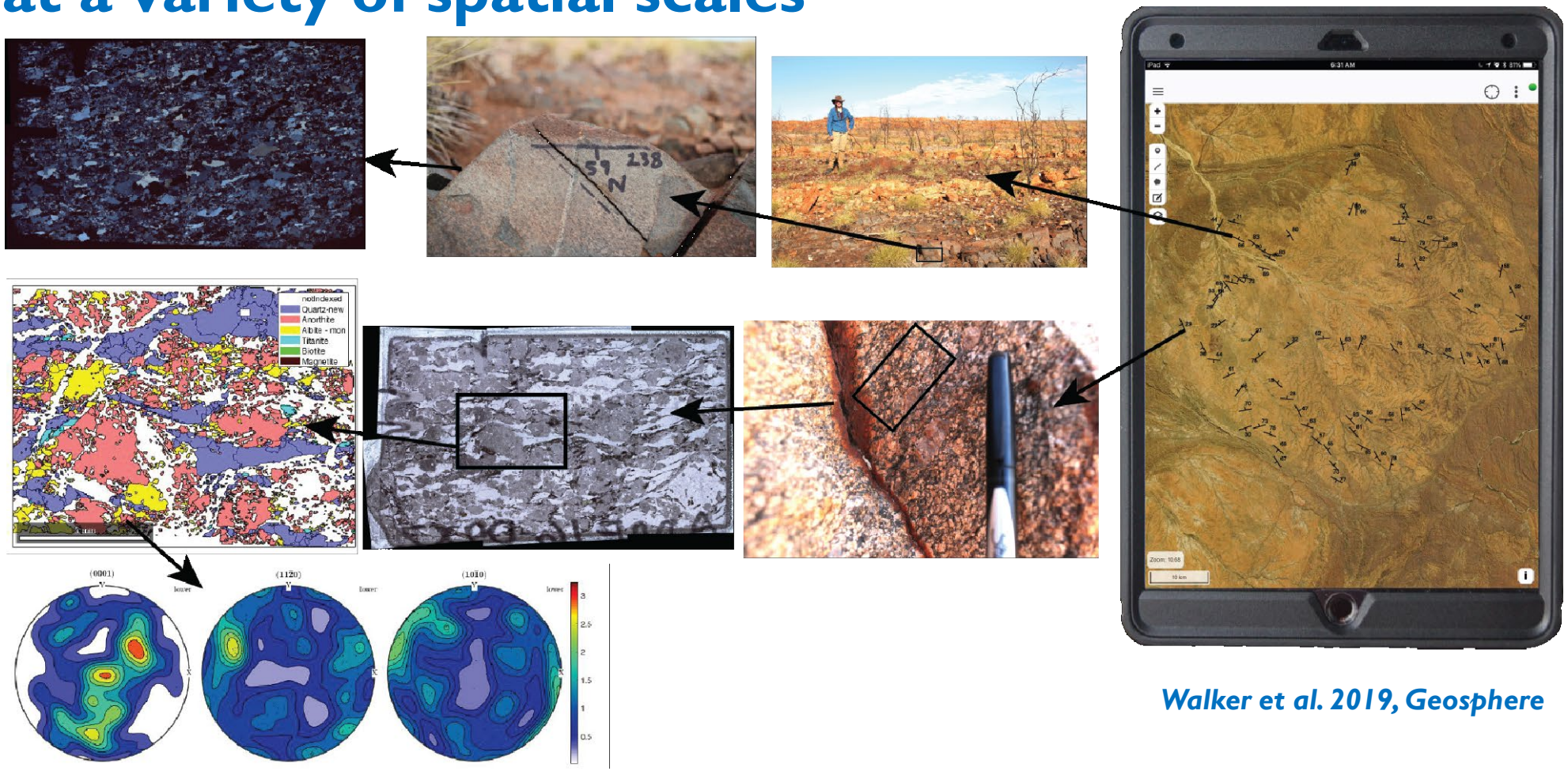
- Software are designed (*or being designed*) for **field**, **microstructural**, and **experimental** data sets

- Completely open source and open API

- ***Goal:*** Make field, microstructural, and experimental data increasingly FAIR



This is what we are trying to do: Bring in everything we do at a variety of spatial scales

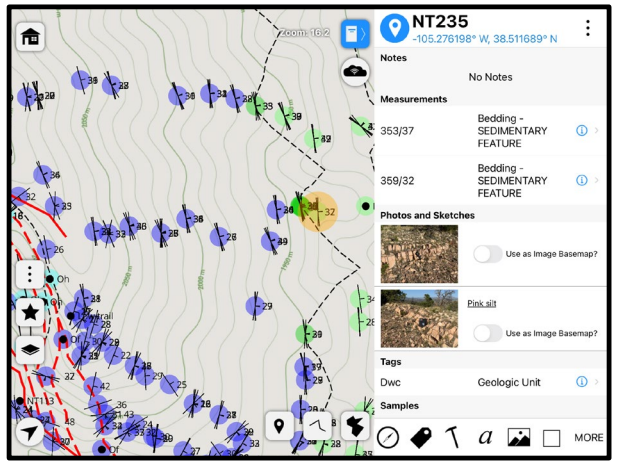


Walker et al. 2019, Geosphere

We do this with spots. Spots are points, lines or polygons that contain information. Spot data is primarily organized hierarchically.

The Strabo Ecosystem – one database, 3 applications

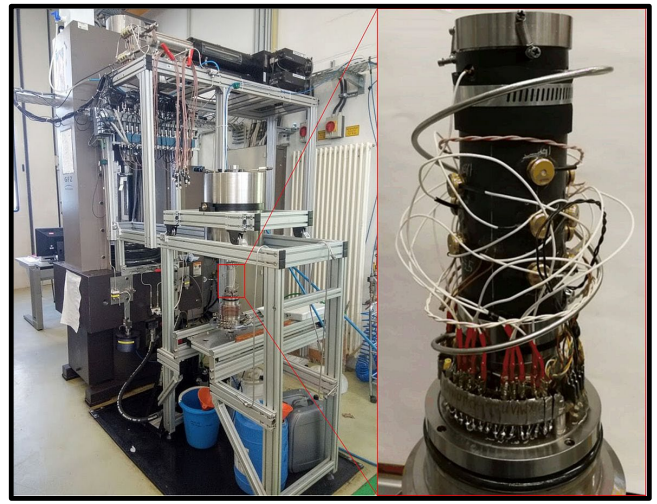
StraboSpot Field



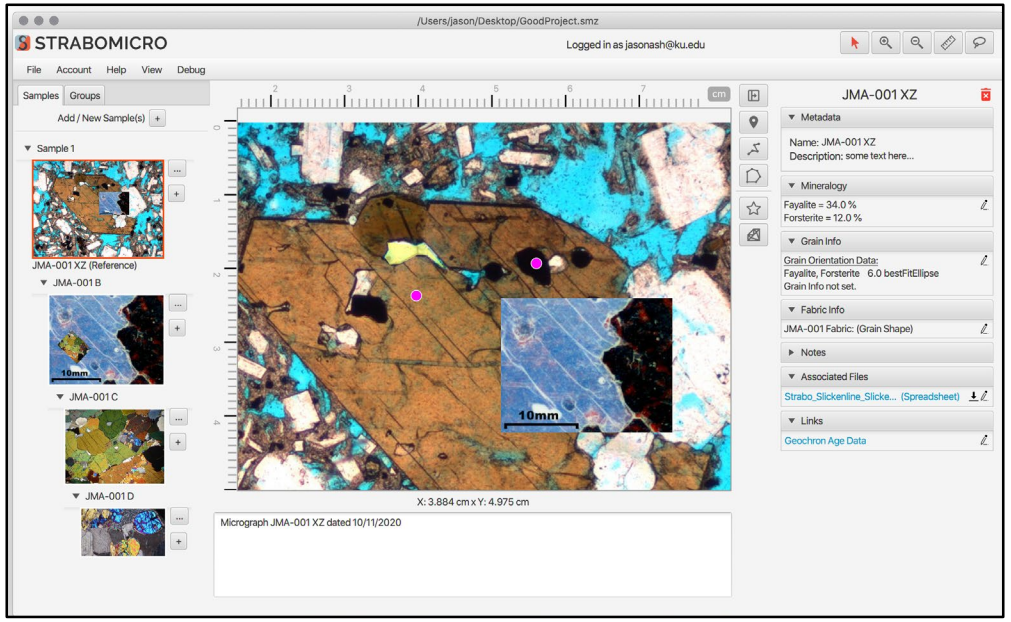
Field context for natural samples

Field context for experimental samples

StraboExperimental



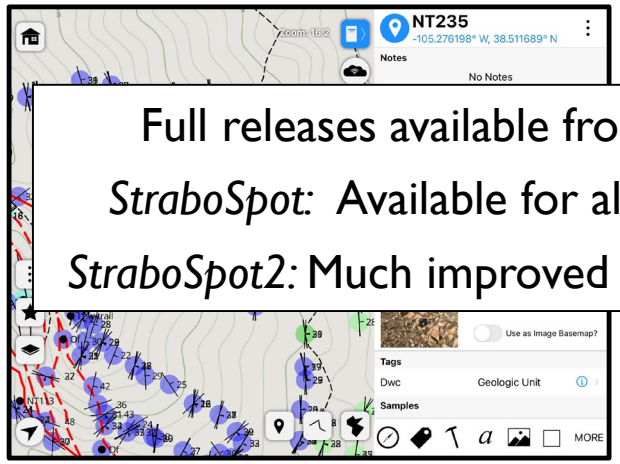
StraboMicro



Microstructural observations: Pre- and post-experiment

The Strabo Ecosystem

StraboSpot Field



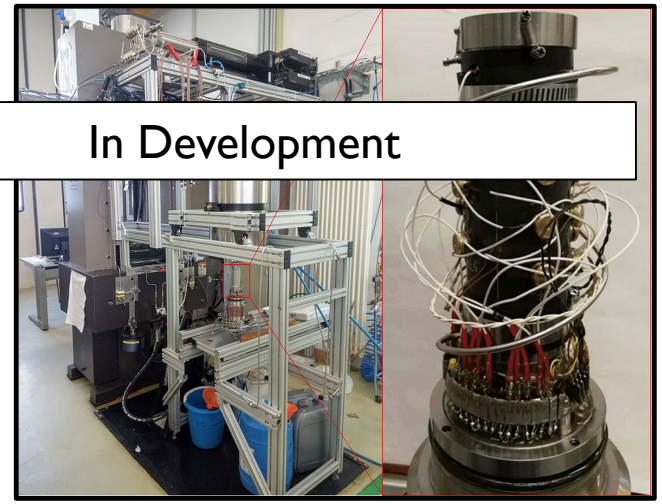
Full releases available from app stores -

StraboSpot: Available for all mobile devices

StraboSpot2: Much improved interface for iPads

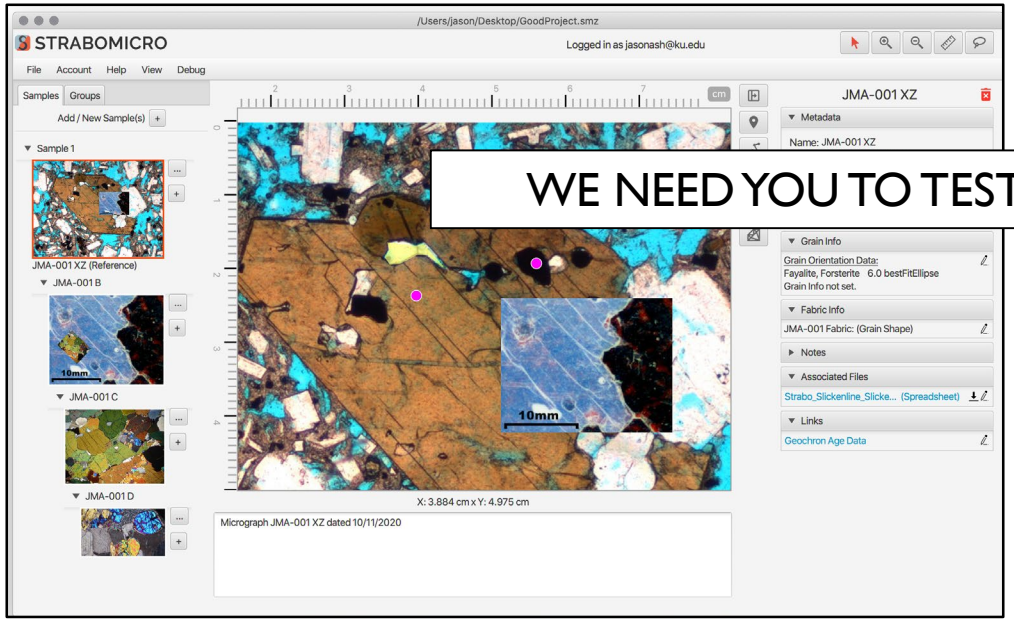
Field context for experimental samples

StraboExperimental



In Development

StraboMicro



WE NEED YOU TO TEST IT!!!

Field context for natural samples

Microstructural observations: Pre- and post-experiment

StraboSpot: Mobile Field Application

Community Buy-In

Over 4500 Users

~3,000 Projects

>450,000 Spots Over 6 Continents (*missing Antarctica)*

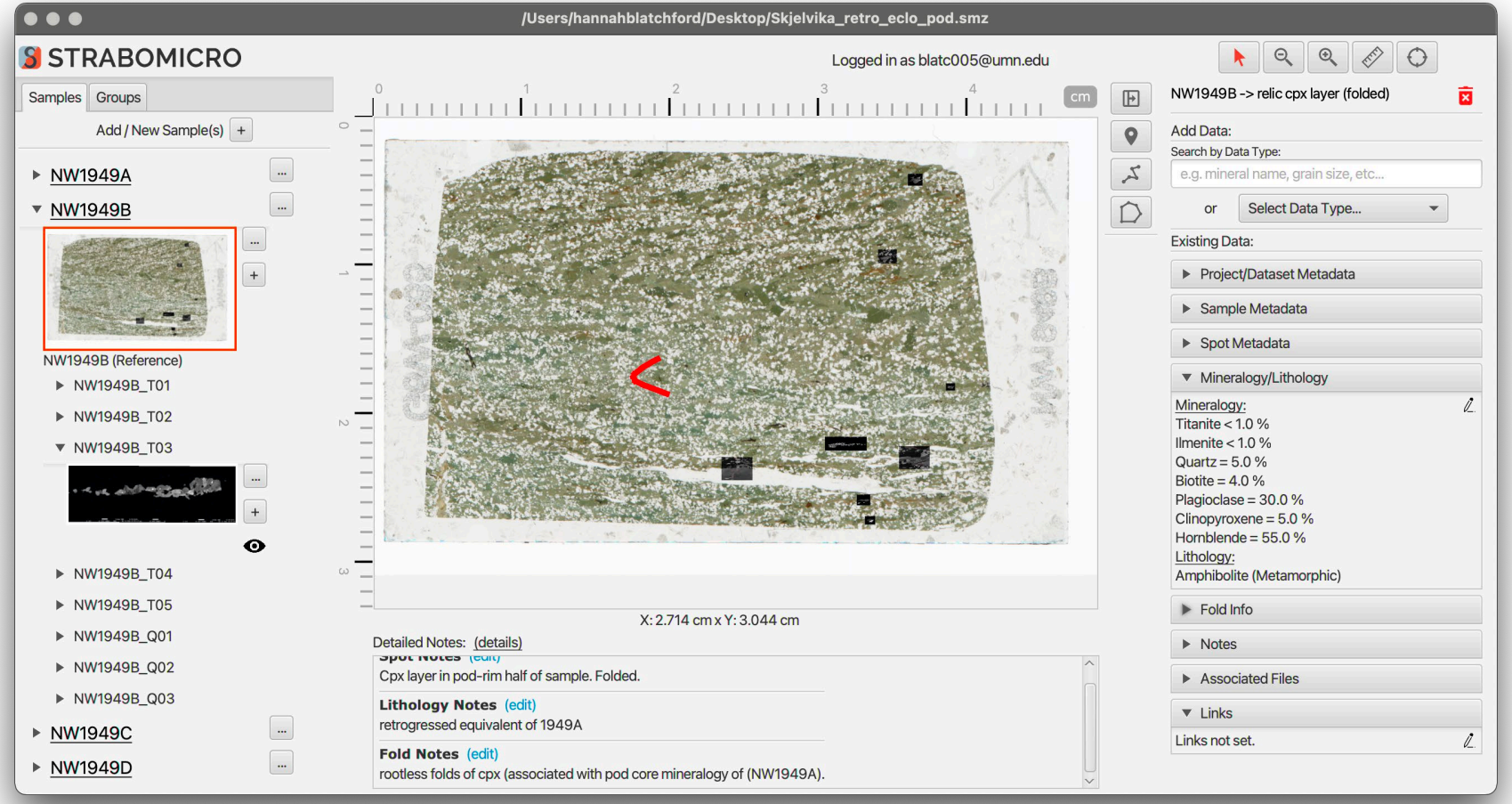
>650 Custom Maps Uploaded

Interested? Download StraboSpot2 from the app store

Visit the YouTube channel

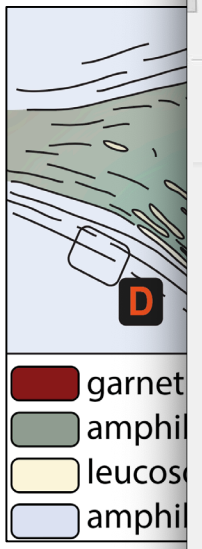
StraboMicro

- Image and petrographic data management system
- Hierarchical image organization
- **Option to store on a shared database**
- **Maintains association with field data**



StraboMicro

A four-sample example



StraboSpot Web

app.strabospot.org/indexWeb.html#/app/map

StraboSpot Spots Attributes Maps Project Help User

Skjelvika retrogressed ... pod

StraboSpot Web

app.strabospot.org/indexWeb.html#/app/image-basemaps/16555663318063

StraboSpot Spots Attributes Maps Project Help User

/Users/hannahblatchford/Desktop/Skjelvika_retro_eclo_pod.smz

STRABOMICRO

Logged in as blatc005@umn.edu

Samples Groups

Add / New Sample(s)

- NW1949A
- NW1949B
  - NW1949B (Reference)
  - NW1949B_T01
  - NW1949B_T02
  - NW1949B_T03
  - NW1949B_T04
  - NW1949B_T05
  - NW1949B_Q01
  - NW1949B_Q02
  - NW1949B_Q03
- NW1949C
- NW1949D

cm

X: 2.714 cm x Y: 3.044 cm

NW1949B -> relic cpx layer (folded)

Add Data:

Search by Data Type:

e.g. mineral name, grain size, etc...

or Select Data Type...

Existing Data:

- Project/Dataset Metadata
- Sample Metadata
- Spot Metadata
- Mineralogy/Lithology

Mineralogy:
Titanite < 1.0 %
Ilmenite < 1.0 %
Quartz = 5.0 %
Biotite = 4.0 %
Plagioclase = 30.0 %
Clinopyroxene = 5.0 %
Hornblende = 55.0 %
Lithology:
Amphibolite (Metamorphic)

- Fold Info
- Notes
- Associated Files
- Links

Links not set.

Detailed Notes: (details)

Cpx layer in pod-rim half of sample. Folded.

Lithology Notes (edit)
retrogressed equivalent of 1949A

Fold Notes (edit)
rootless folds of cpx (associated with pod core mineralogy of (NW1949A).

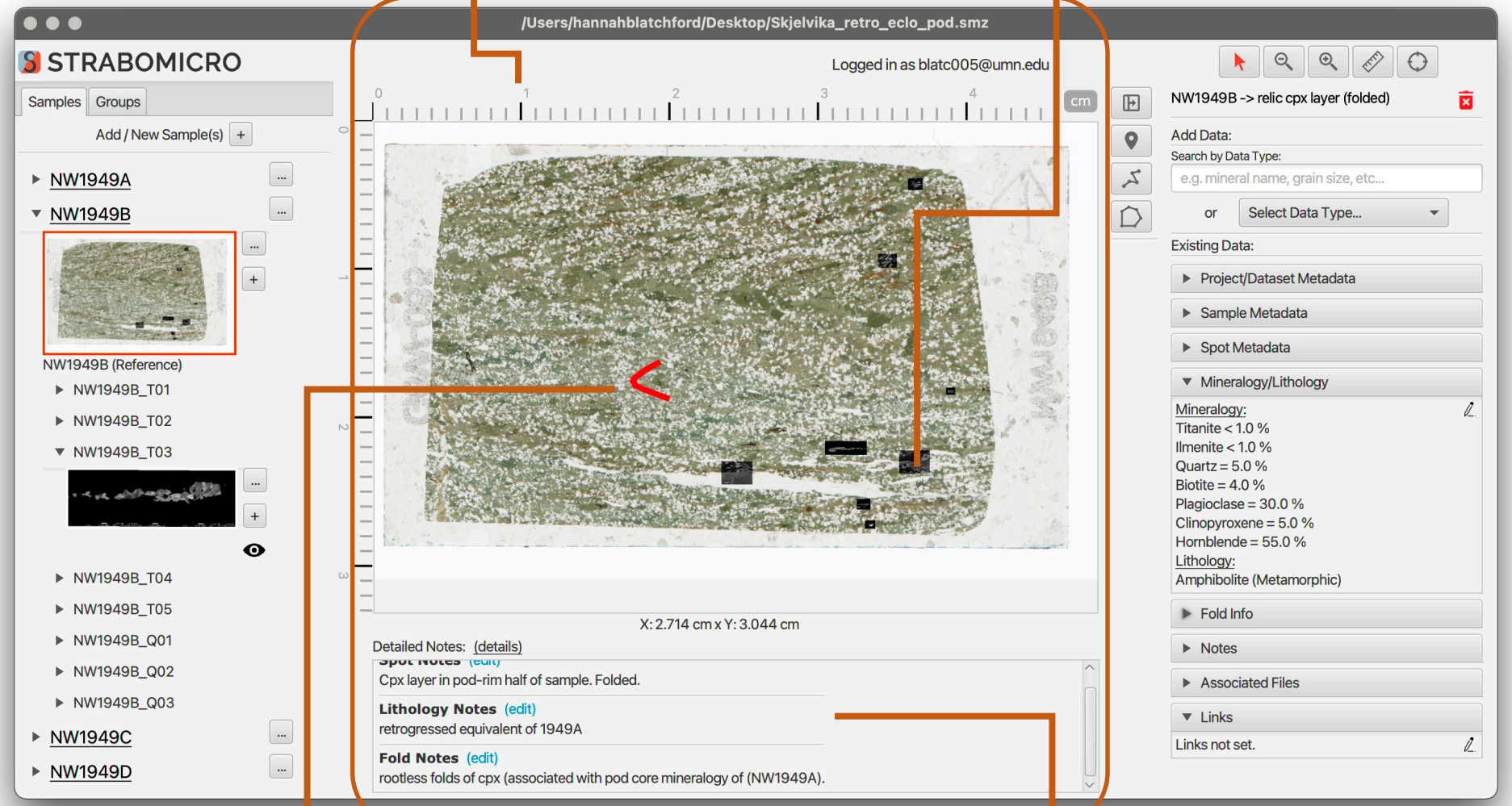
StraboMicro

A four-sample example

Reference photomicrographs

Dynamic scale

Positions of associated micrographs



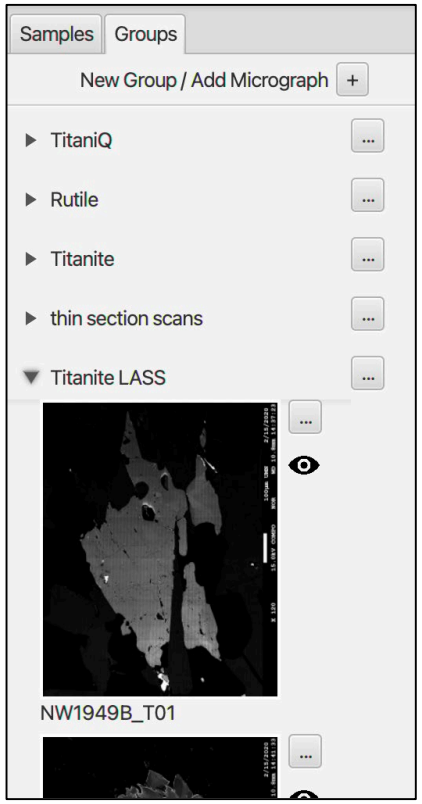
Add data as points, lines, polygons

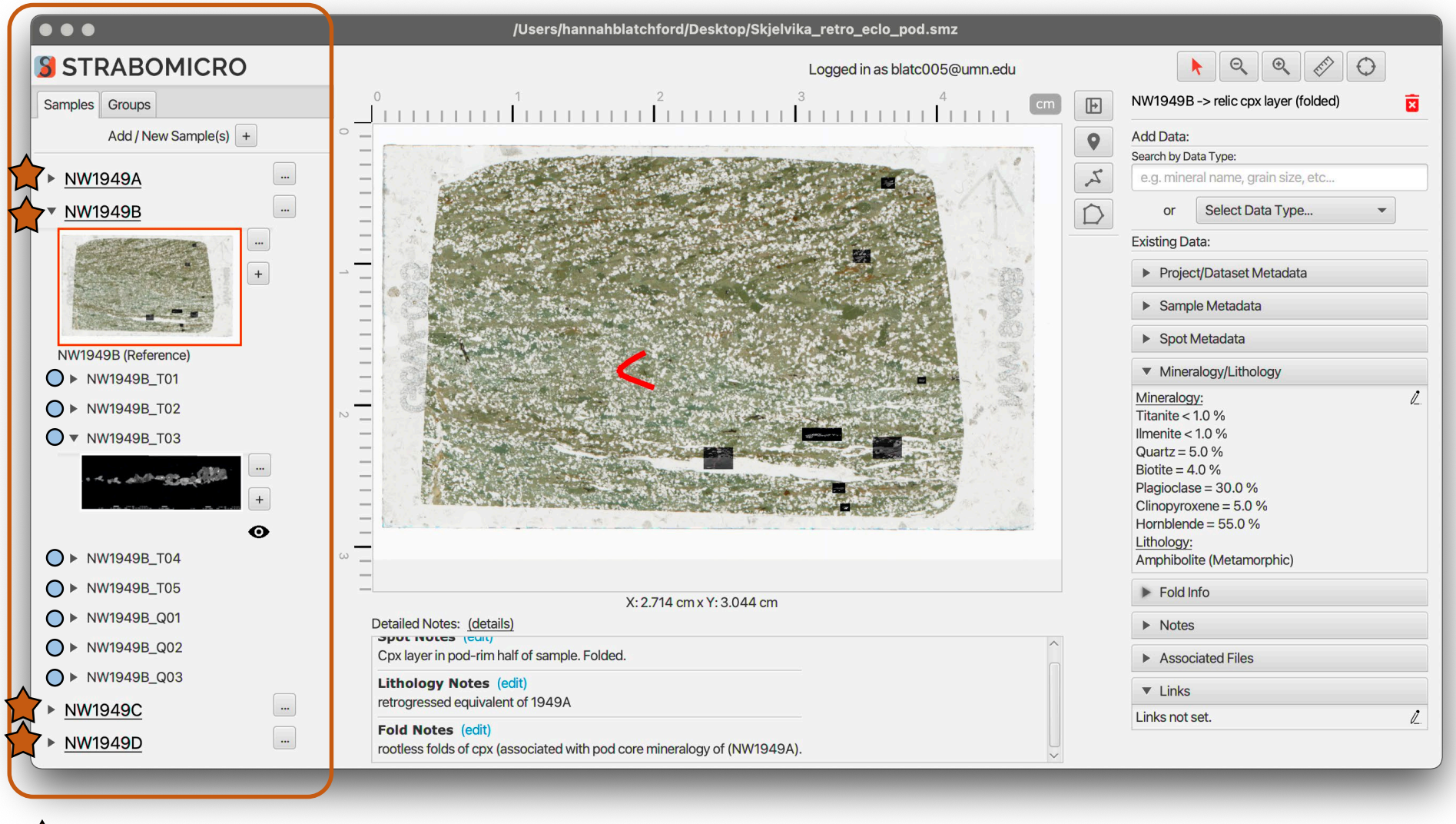
Details of selected data

StraboMicro

A four-sample example

Image hierarchy and grouping





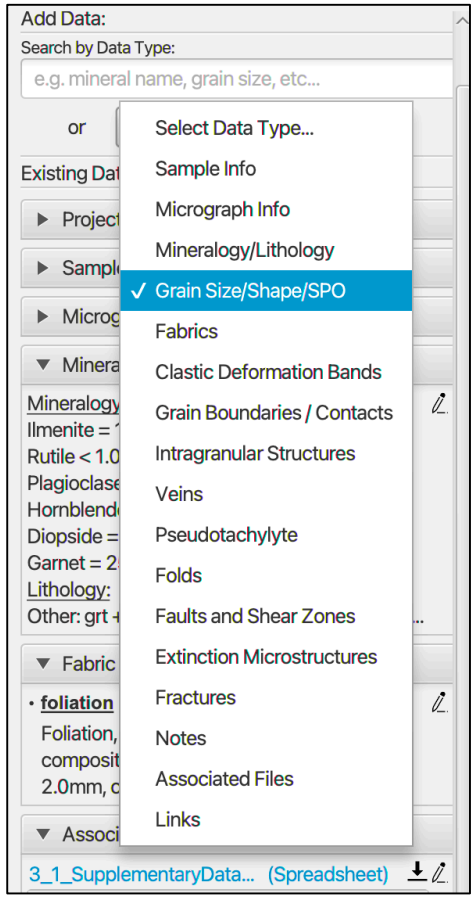
Reference micrograph

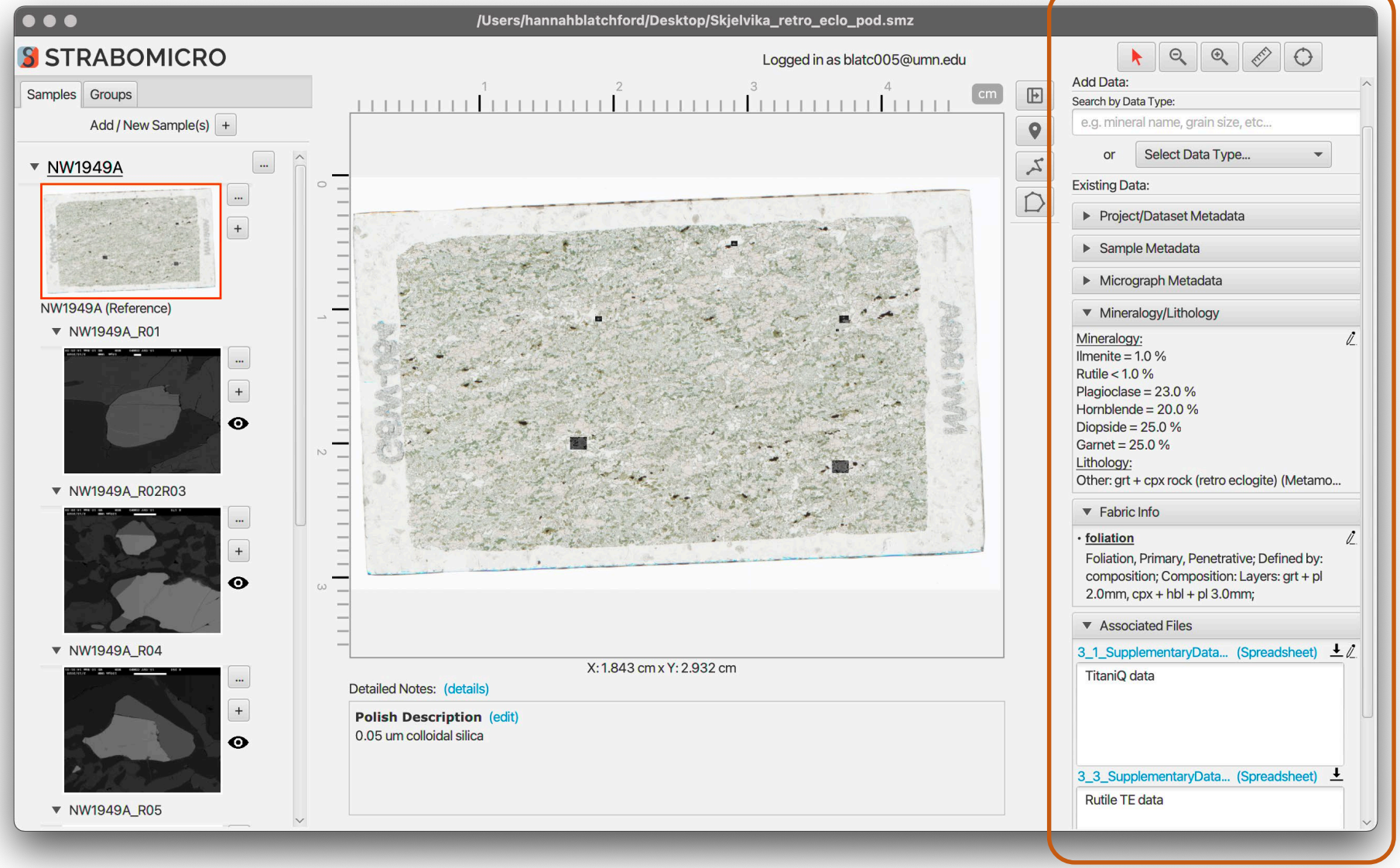
Associated micrograph

StraboMicro

A four-sample example

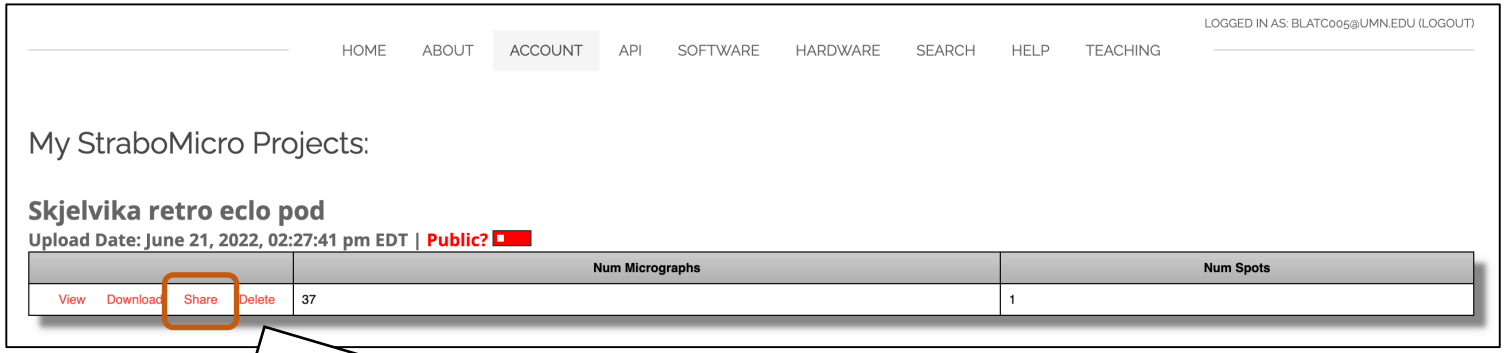
Modals

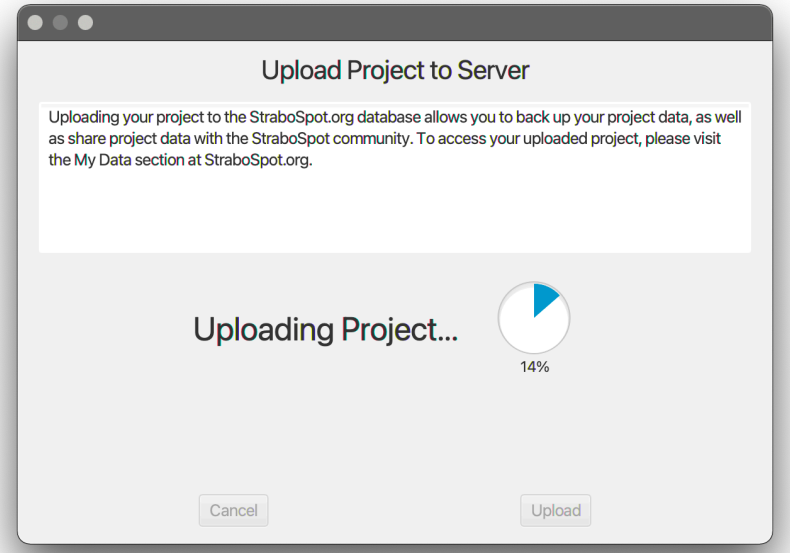




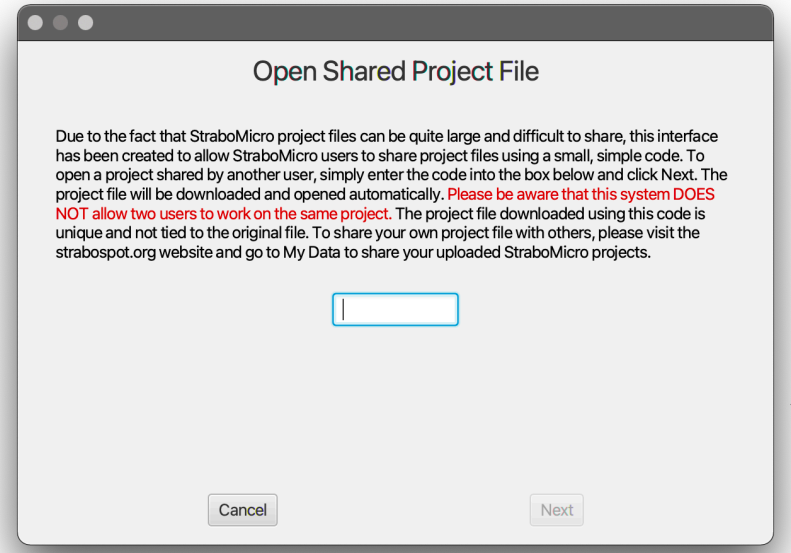
StraboMicro

Collaborative data management



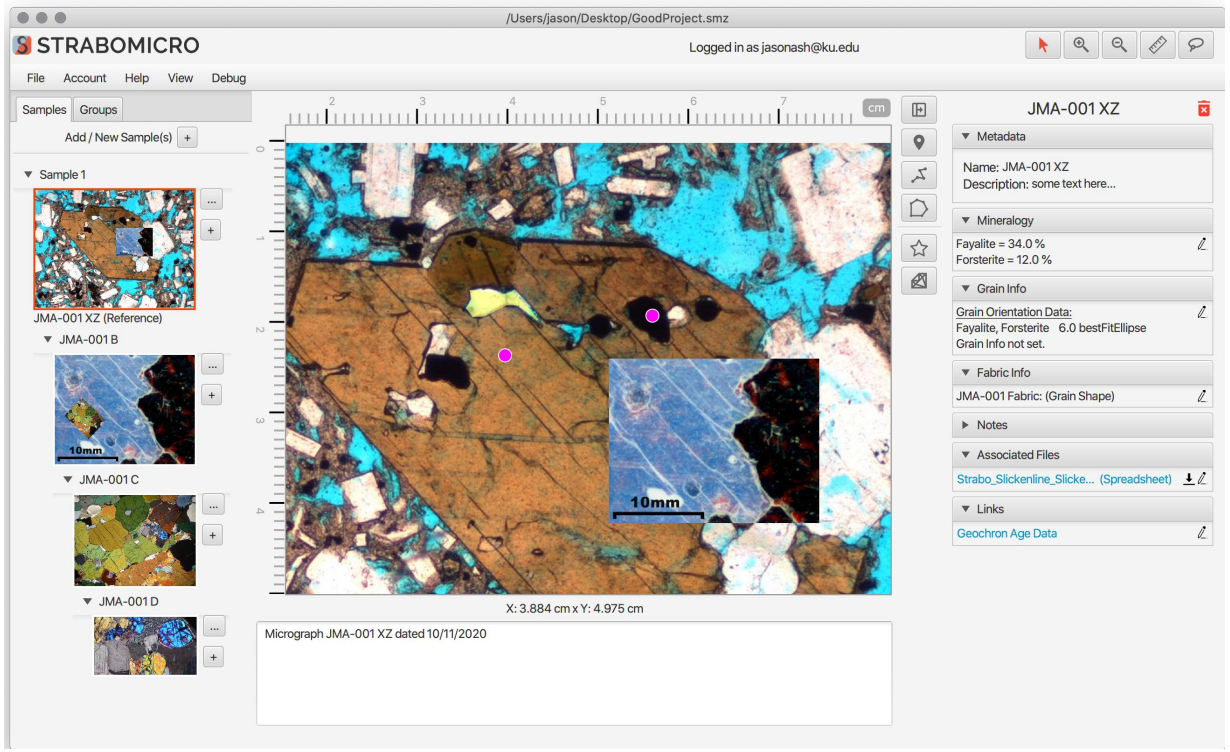


File > upload project



File > open shared project file

Strabo Micro



AVAILABLE for testing NOW!

at StraboSpot.org → software

Current: Image Management System

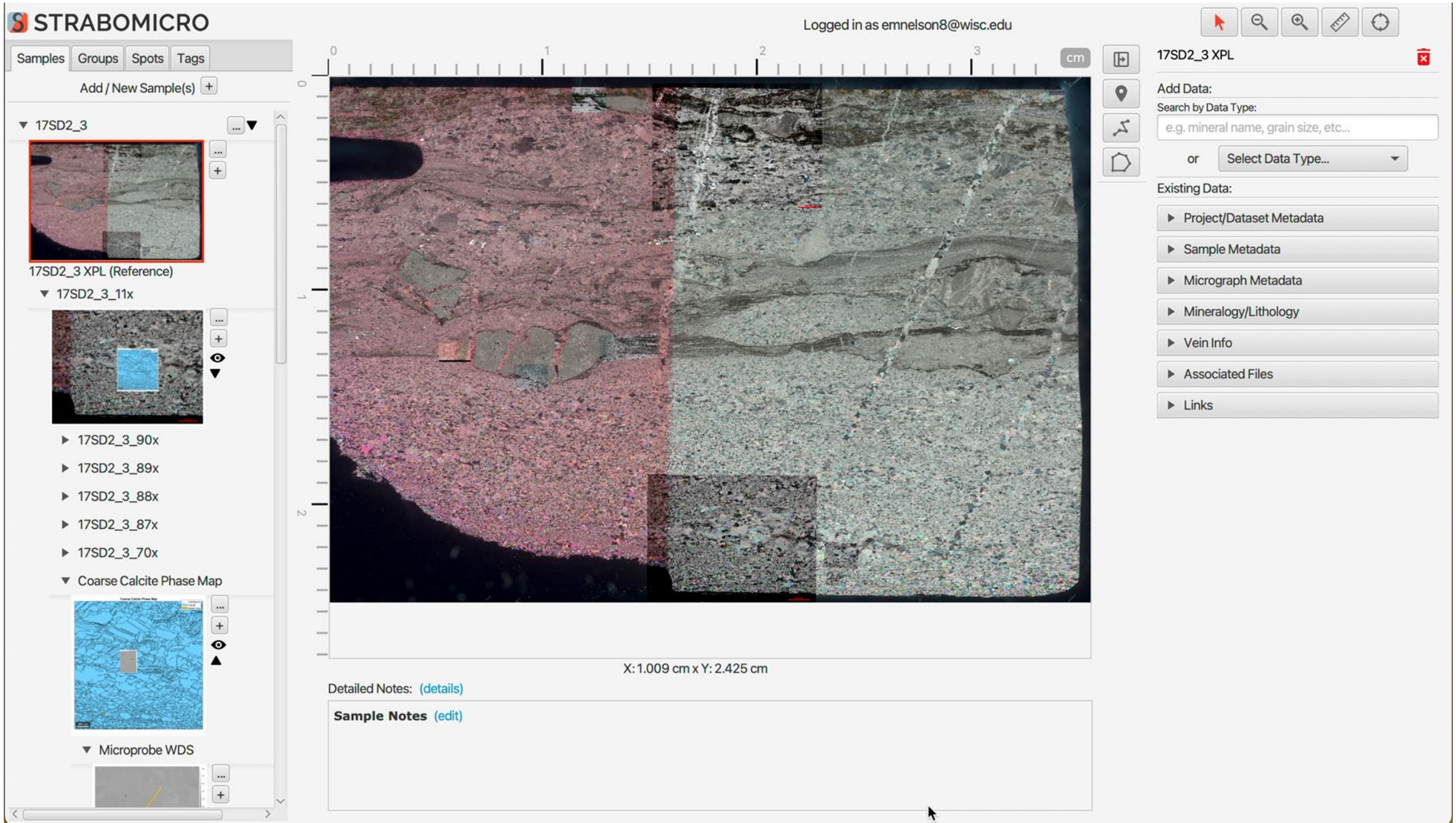
- Metadata
- Field (or experimental) context; orientation
- Scale tracked between images
  - Nested images
- Basic data description
- Any image, or spot within an image, may be linked to associated data (e.g., SEM, probe)

Future: Data reporting

- Deformation Microstructures
- Sedimentary Petrology
- Igneous and Metamorphic Petrology

StraboMicro Demo

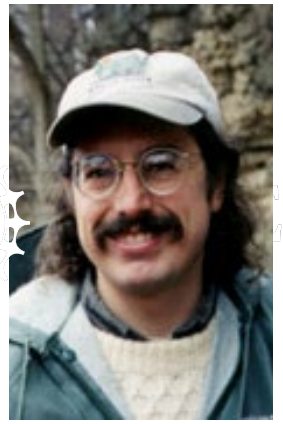
Ellen Nelson



Questions? Comments?

StraboSpot & StraboMicro

StraboExperimental / LAPS



Matej Pec
Ulrich Mok

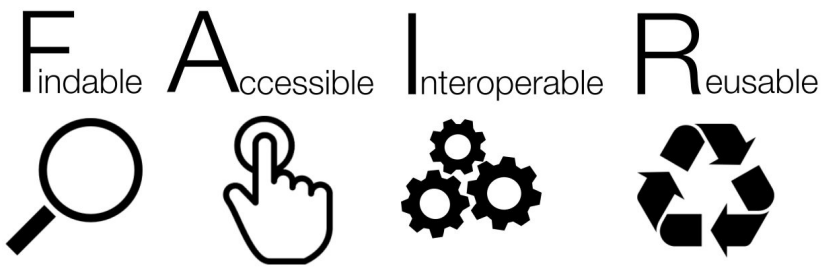
Andreas Kronenberg
Noah Phillips
Julie Newman
Hannah Cunningham

Basil Tikoff
Jason Ash

StraboExperimental

Practical GeoScience Data Challenges

*To publish my work, I need to make **data** and **procedures** publicly available.*



- *Which **repository** is suited for me?*
- ***Ease of Use**?*
- ***Longevity** of Storage?*
- ***Private** access (if I am not ready to share the data yet)*
- ***Upload / Download** Capability*
- *Can I **search** effectively for similar datasets*
- *External access – API for **data mining**?*

StraboExperimental / LAPS*

*Laboratory Acquisition & Protocol Standards

What is StraboExperimental?

*An **digital** repository for experimental information and data. As part of the Strabo Ecosystem, it utilizes features from Strabo Micro **in addition** to capabilities specifically designed for experimental data.*

What is LAPS?

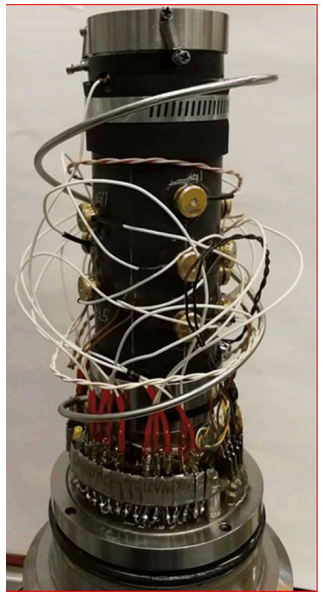
*LAPS is a framework for preparing and storing experimental data **locally**. It comprises a set of instructions and workflow tools for gathering and organizing experimental results. Functionality includes **upload** capability to **StraboExperimental** via API.*

StraboExperimental

StraboExperimental

Experimental Records - Metadata

Apparatus



Sample and Procedures

	A	B	C	D	E	F	G
63							
64	Time	Sd - Deviat	Confining	Pore Press	ea - Axial S	er - Radial	ev - Volum
65	sec	MPa	MPa	MPa	%	%	%
66	0.0001	1.0235	120	43	-0.0005	-0.0028	-0.0062
67	0.1	1.0205	120	43	-0.0015	-0.0008	-0.0032
68	0.2	1.0212	120	43	-0.0028	0.0047	0.0067
69	0.3	1.0222	120	43	-0.0019	0.0004	-0.0012
70	0.4	1.0219	120	43	0.0015	-0.0067	-0.012
71	0.5	1.0248	120	43	0.0018	-0.006	-0.0101
72	0.6	1.0223	120	43	-0.0039	0.007	0.0101
73	0.7	1.0237	120	43	0.001	-0.0053	-0.0096
74	0.8	1.0247	120	43	-0.0038	0.0058	0.0077
75	0.9	1.0207	120	43	0	0.0001	0.0001
76	1	1.0215	120	43	0.0002	-0.0052	-0.0103
77	1.1	1.0245	120	43	-0.0041	0.0069	0.0096
78	1.2	1.0228	120	43	0.0012	-0.0056	-0.0099
79	1.3	1.0197	120	43	-0.0029	0.0036	0.0044
80	1.4	1.0235	120	43	0.0015	-0.006	-0.0104

Data Structure

Community Development of Vocabulary and Metadata Structure

StraboExperimental

Online Interface - Features

	A	B	C	D	E	F	G
63							
64	Time	Sd - Deviat	Confining	Pore Press	ea - Axial S	er - Radial	ev - Volum
65	sec	MPa	MPa	MPa	%	%	%
66	0.0001	1.0235	120	43	-0.0005	-0.0028	-0.0062
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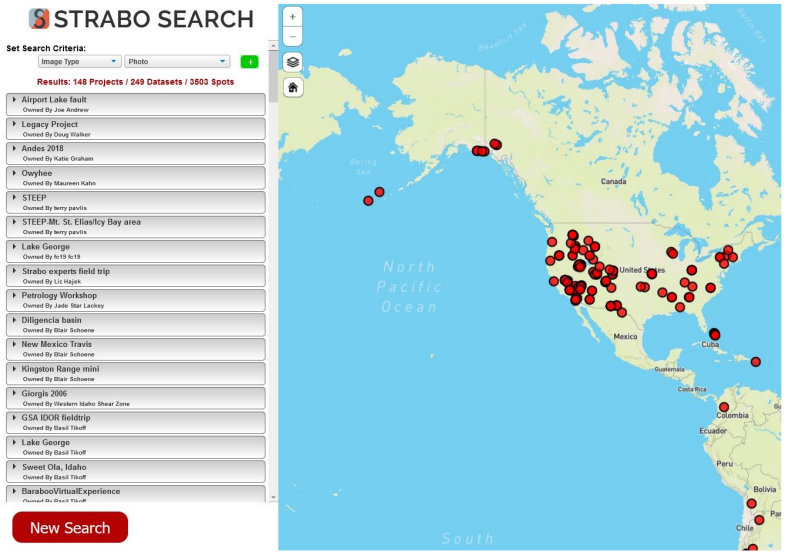
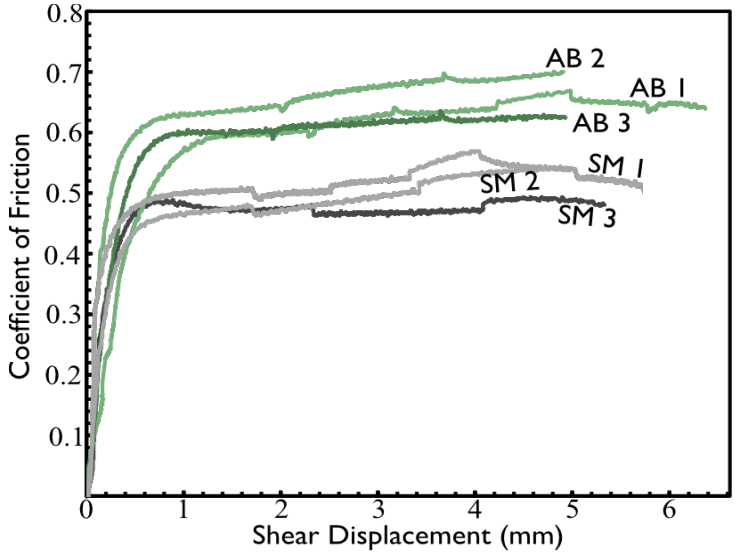
69	0.3	1.0222	120	43	-0.0019	0.0004	-0.0012
70	0.4	1.0219	120	43	0.0015	-0.0067	-0.012
71	0.5	1.0248	120	43	0.0018	-0.006	-0.0101
72	0.6	1.0223	120	43	-0.0039	0.007	0.0101
73	0.7	1.0237	120	43	0.001	-0.0053	-0.0096
74	0.8	1.0247	120	43	-0.0038	0.0058	0.0077
75	0.9	1.0207	120	43	0	0.0001	0.0001
76	1	1.0215	120	43	0.0002	-0.0052	-0.0103
77	1.1	1.0245	120	43	-0.0041	0.0069	0.0096
78	1.2	1.0228	120	43	0.0012	-0.0056	-0.0099
79	1.3	1.0197	120	43	-0.0029	0.0036	0.0044
80	1.4	1.0235	120	43	0.0015	-0.006	-0.0104

Form Input of Experimental & Analytical Data



Search, Filter and Download Data



Plotting Experimental Data from Multiple Sources

StraboExperimental

Next Steps

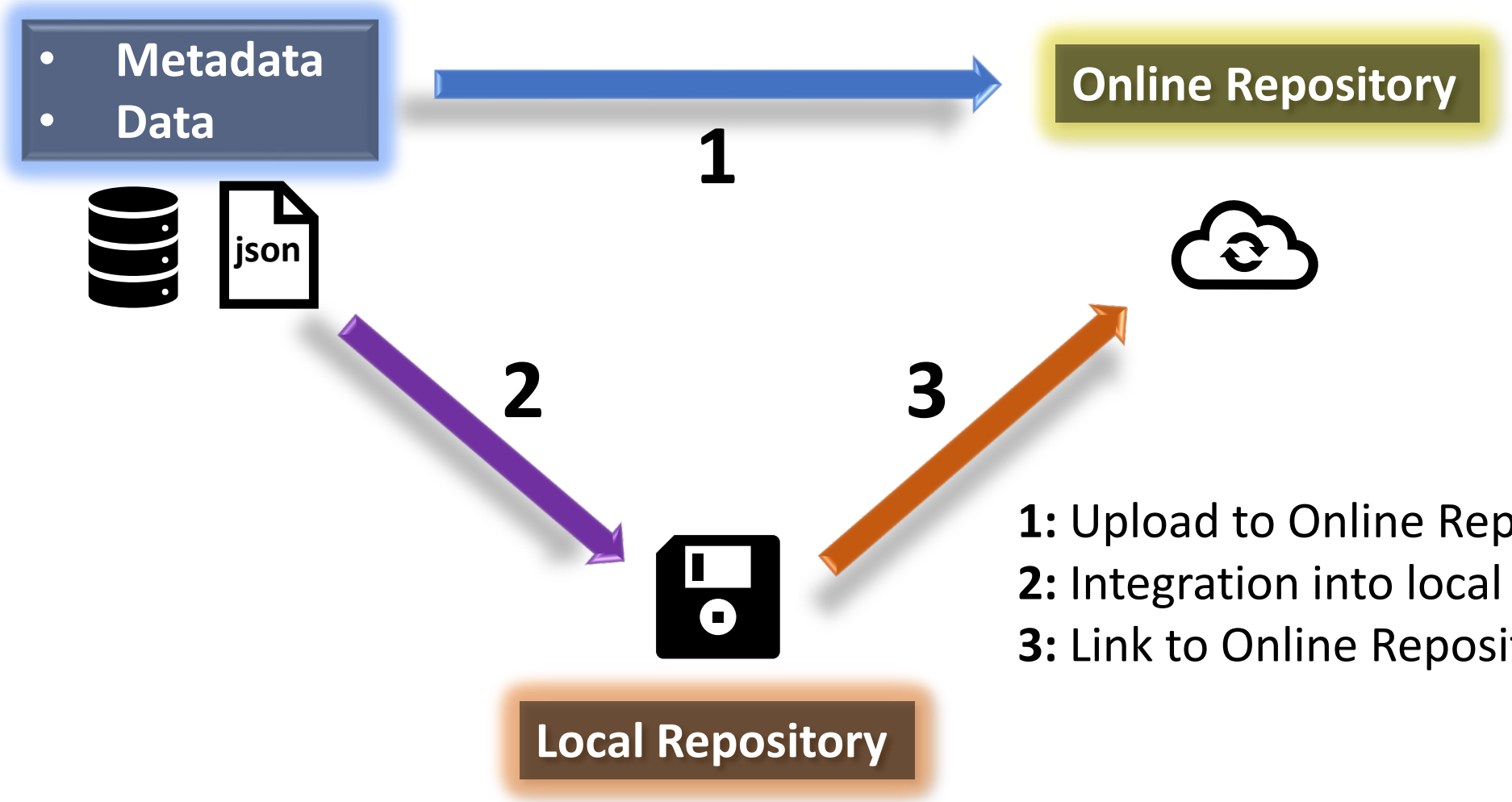
Add to Apparatus Repository

Sample & Procedures

Data Structure

Data Input

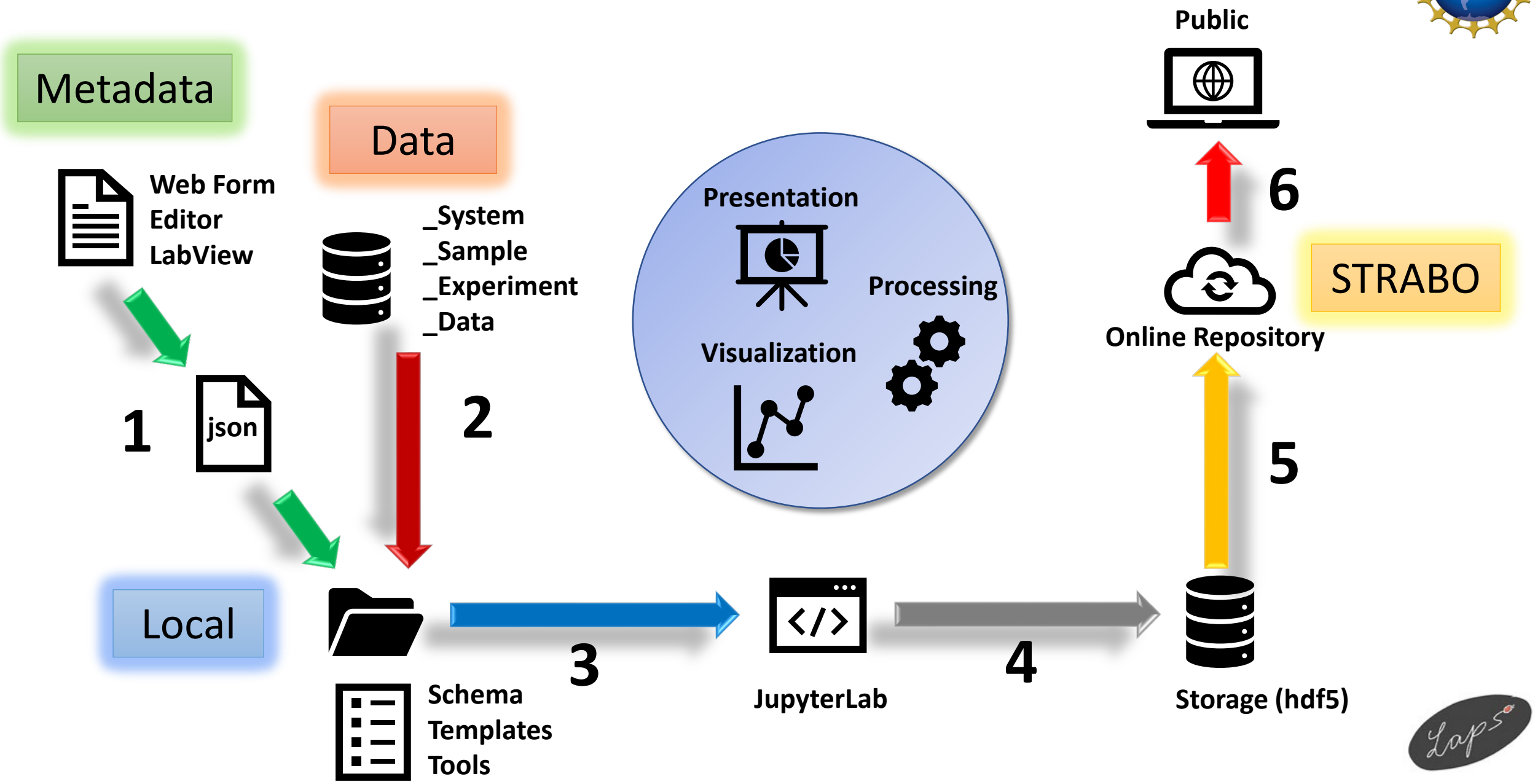
LAPS



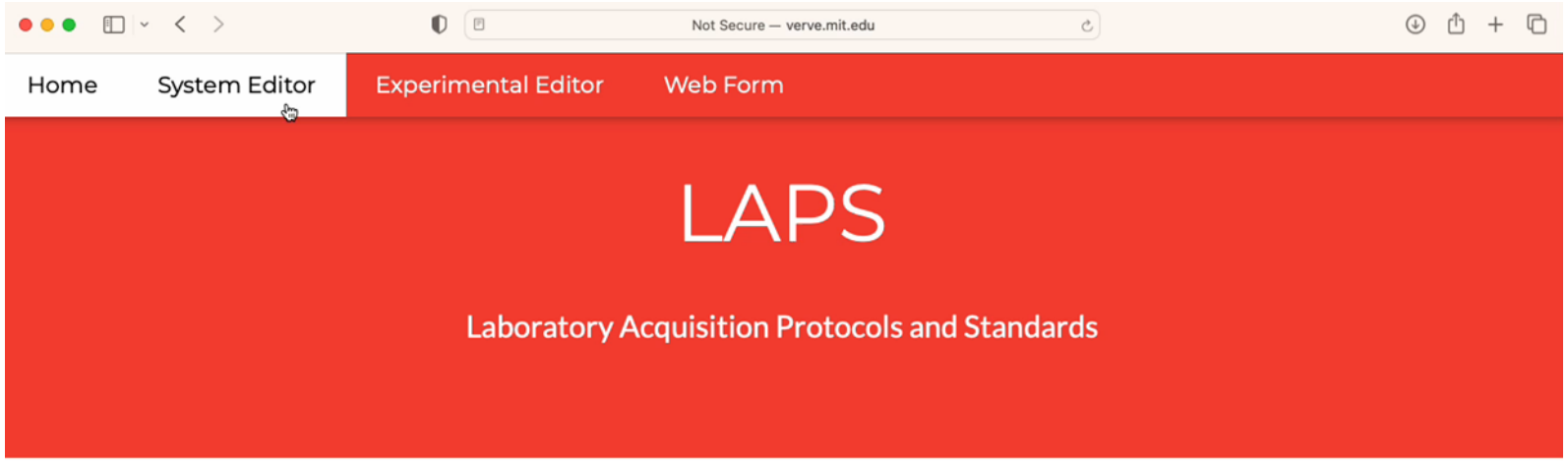
1: Upload to Online Repository
2: Integration into local Workflow
3: Link to Online Repository (API)

LAPS* - Workflow Details

*Laboratory Acquisition & Protocol Standards



LAPS - Demo I: General Input Form



Introduction

The LAPS project intends to establish a simple, yet effective way to describe equipment and experiments across a variety of testing rigs and devices. Its purpose is to facilitate interlaboratory communication and standards in experimental Geophysics. In addition, the objective of LAPS is to prepare experimental data to be stored in the STRABO digital data repository.

Current Status of Work: Using conventions from the STRABO vocabulary and lab specific requirements we outline which information is necessary in a 'system profile': a snapshot of features, hardware and data format that follows a given structure and a set of attributes. To maintain data integrity, profiles should be validated against a 'schema' and saved as json text files.

At this point the schema is still in an experimental stage. Also, there is currently no 'back-end' database where profile information is stored. It remains as json file only. Furthermore, technology issues on how data is being accessed (either using REST-API or GraphQL or otherwise) is being deferred to a later point. Ultimate goal is to establish a schema that is acceptable for the community and to possibly integrate it into Strabo or compatible system.

NEWS

5/2020: LAPS receives NSF funding - Award# (FAIN): 1948453

7/2020: Experimental Deformation Data Workshop at Digital EGU Meeting

12/2020: LAPS presentation at AGU 2020

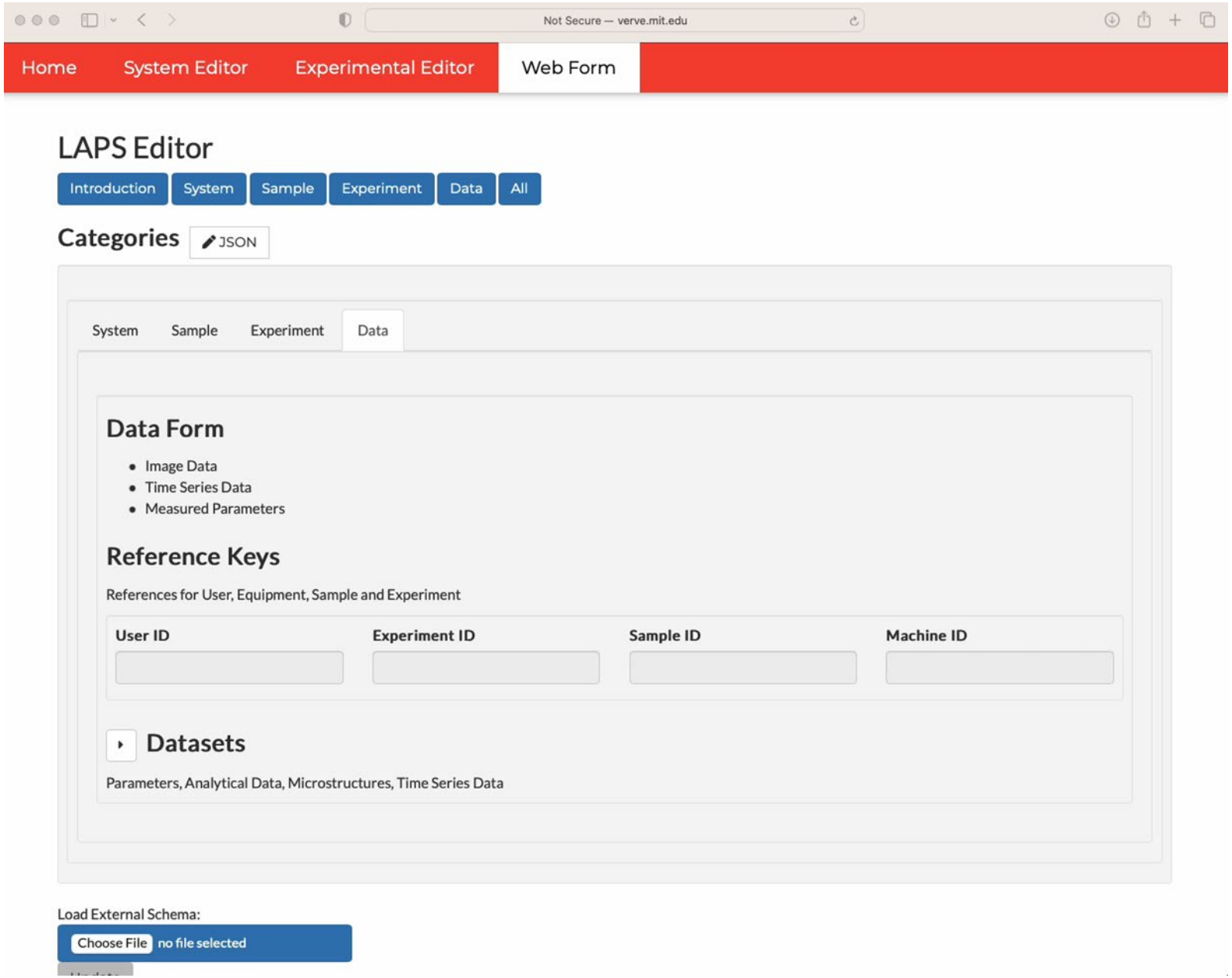
04/2021: EGU Townhall Presentation: Introduction to StraboExperimental

12/2021: AGU Townhall Presentation: Progress in StraboExperimental Development

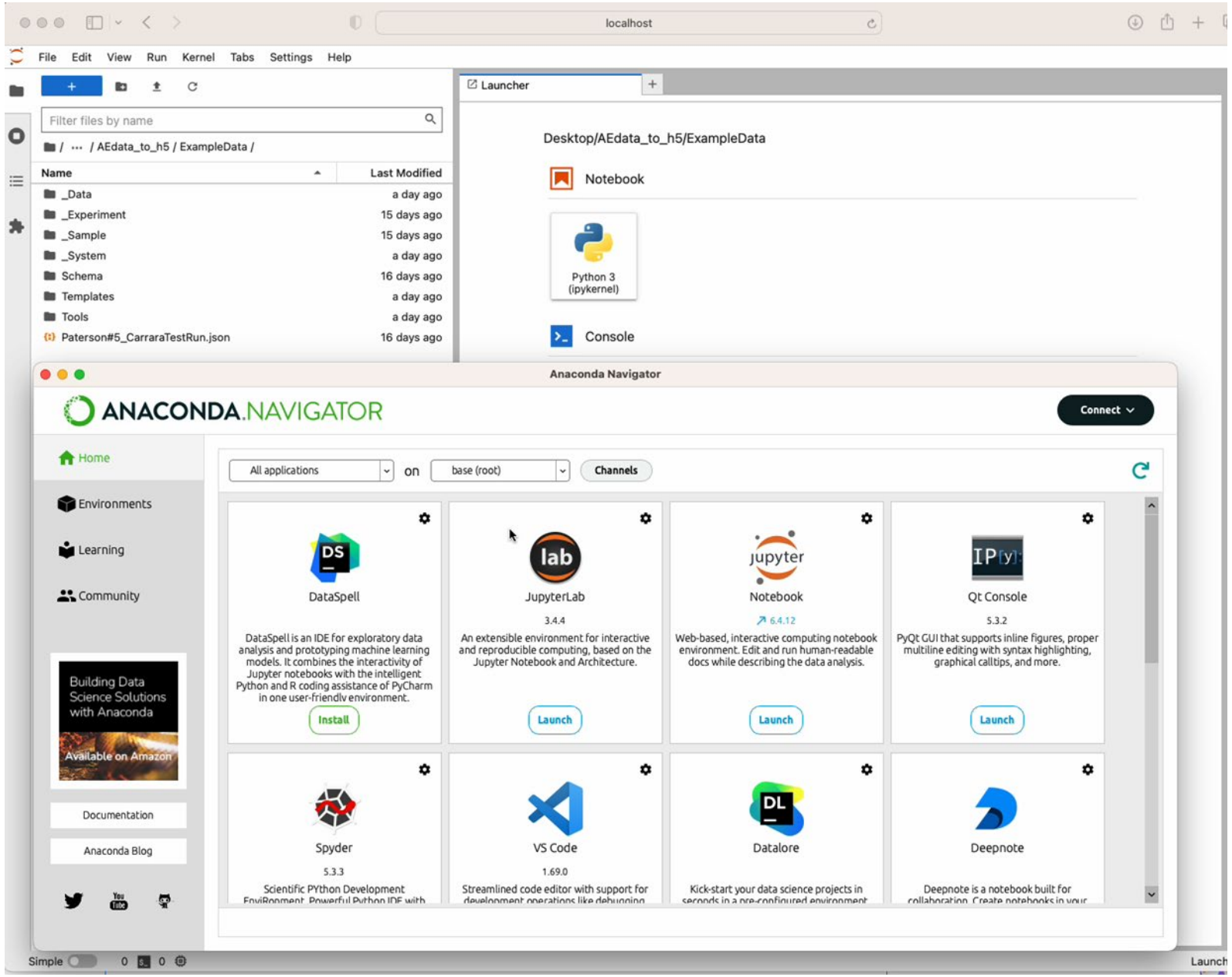
10/2022: MIT EAPS Presentation: Progress in StraboExperimental Development

10/2022: AGU 2022: TH53I - Cyberinfrastructure Tools for Microscopy and Experimental Rock Deformation Data

LAPS - Demo II: Loading Templates



LAPS - Demo III: JupyterLab/Python Tools



LAPS - Summary

Complementary to Strabo Experimental

- Local Solution Only
- Single Test Repository (File/hdf5 based)
- Use Community Metadata Standards
- Browser Based Entry Forms
- Software + User Readable File Format (json)
- Open Source
- Reusable Templates
- Integration into existing Laboratory Workflows
- Multiple Datasets per Test
- Ready for Use 2023

Comparison - Table

	STRABOEXPERIMENTAL	LAPS
Digital Repository	✓	✓ (single Test only)
Access/User Management	✓ (online)	✗ (offline)
Community Standards	✓	✓
Structured Data	✓	✓ (json+hdf5)
Open Source	○	✓
Data Entry Forms	✓	✓
Database	✓	✗
External Data References	✓	✓
Strabo Integration	✓	✗
API	✓	✓
Open Science Ready	✗	✗
Availability	2024	2023

Questions? Comments?

StraboExperimental & LAPS