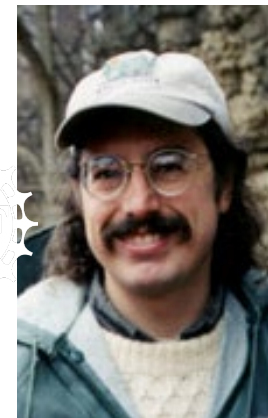




StraboExperimental / LAPS Development



EarthCube



Matej Pec
Ulrich Mok

Andreas Kronenberg
Noah Phillips
Julie Newman
Hannah Cunningham

Basil Tikoff
Jason Ash



Digital Repository for Experimental Data - Goal



	A	B	C	D	E	F	G
63							
64	Time	Sd - Deviat	Confining	Pore Press	ea - Axial Ser	- 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

Input of Experimental Data

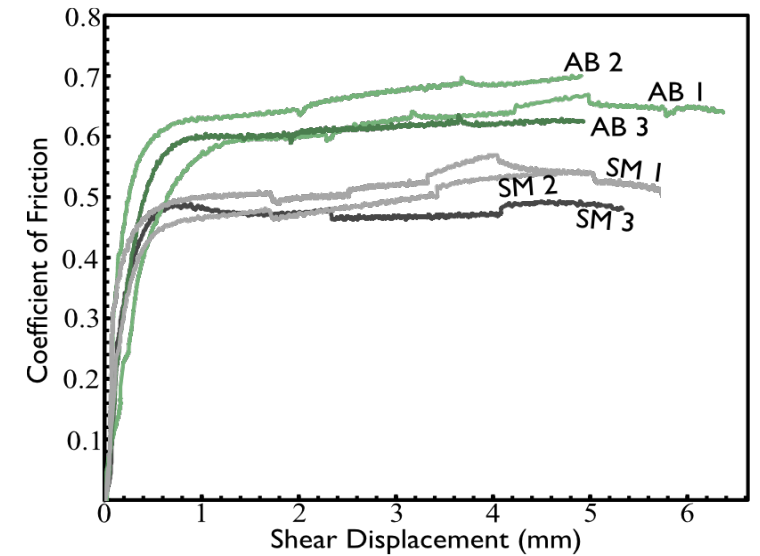
STRABO SEARCH

Set Search Criteria: [Image Type] [Photo]

Results: 148 Projects / 249 Datasets / 3603 Spots

- Airport Lake Basin
- Legacy Project
- Andes 2018
- Owyhee
- STEEP
- STEEP-M: St. Elias/Icy Bay area
- Lake George
- Strabo experts field trip
- Petrology Workshop
- Diligencia basin
- New Mexico Travis
- Kingston Range mine
- Georgia 2006
- GSA 180N fieldtrip
- Lake George
- Sweet Ole, Idaho
- Baraboo/Virtual Experience

Searching and Downloading Experimental Data



Plotting Experimental Data from Multiple Sources





Digital Data Repositories - Challenges

A. Technical Challenges

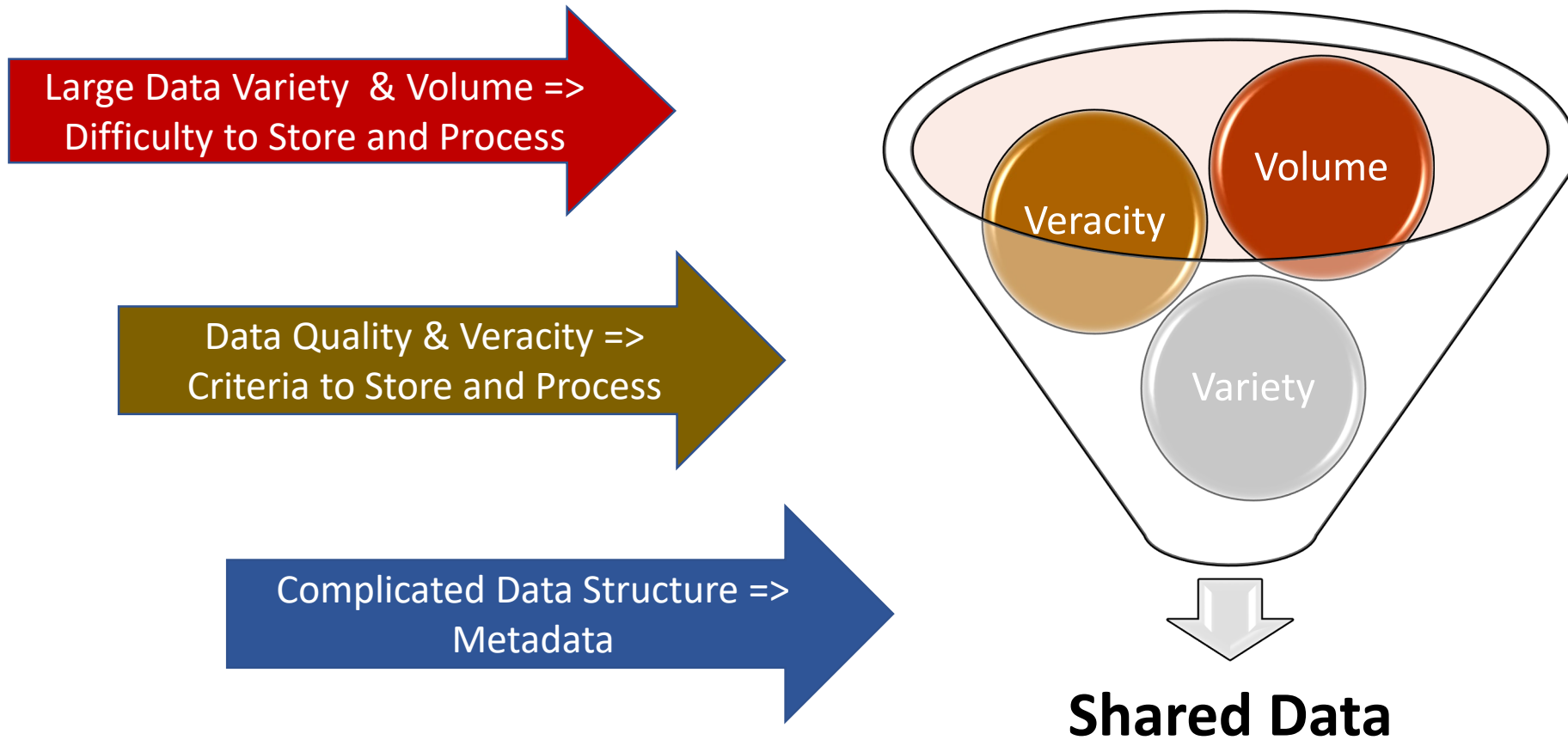
- Permanent Physical Storage
- Database Maintenance and Longevity
- Data Access (Software, API)
- Processing Tools
- Multiple solutions in development (Strabospot, Epos)...

B. Societal Challenges - Community Standards

- Metadata and Vocabulary
- Which data to include (processed-unprocessed)?
- Avoid data Inconsistencies
- Data Quality Criteria
- Copyright, Privacy Issues



Geoscience Data - Problems



Geoscience Data - Dilemma



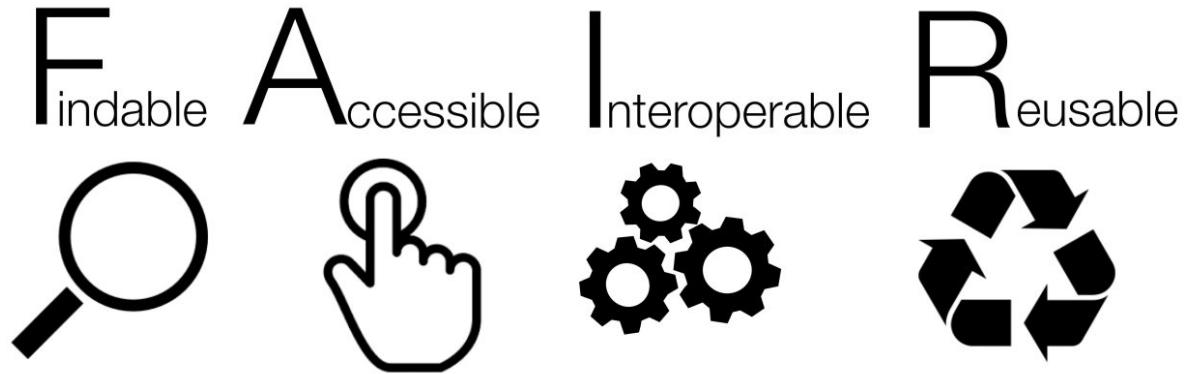
AGU requires that the underlying data and software needed to understand, evaluate, and build upon the reported research be available at the time of peer review and publication.

Specifically:

- 1. Depositing the data and software in a community accepted, trusted repository*
- 2. Including an [Availability Statement](#) as a separate paragraph in the Open Research section explaining to the reader where and how to access the data and software*
- 3. Including [citation\(s\)](#) to the deposited data and software in the Reference Section*



Geoscience Data - FAIR



Project Based
5 Gb / Project
DOI* for Project
Rudimentary Search



Texas Data Repository

Dataset Based
10 Gb / Dataset ; 4 Gb / File
DOI* for each File
Rudimentary Search

*DOI=Digital Object



Summary

- To improve experimental data usability - structured or semi-structured data sets are a necessity
- FAIR Principles require standard vocabulary
- Experimental variables: use it (as metadata) or lose it.
- Data storage requirements forces laboratories to re-assess their workflows: use standard framework instead of insular solution
- StraboExperimental:
 - simplify metadata entry by use of templates and repositories
 - implementing workflow logic can further simplify user entry



Laboratory Workflow (LAPS)



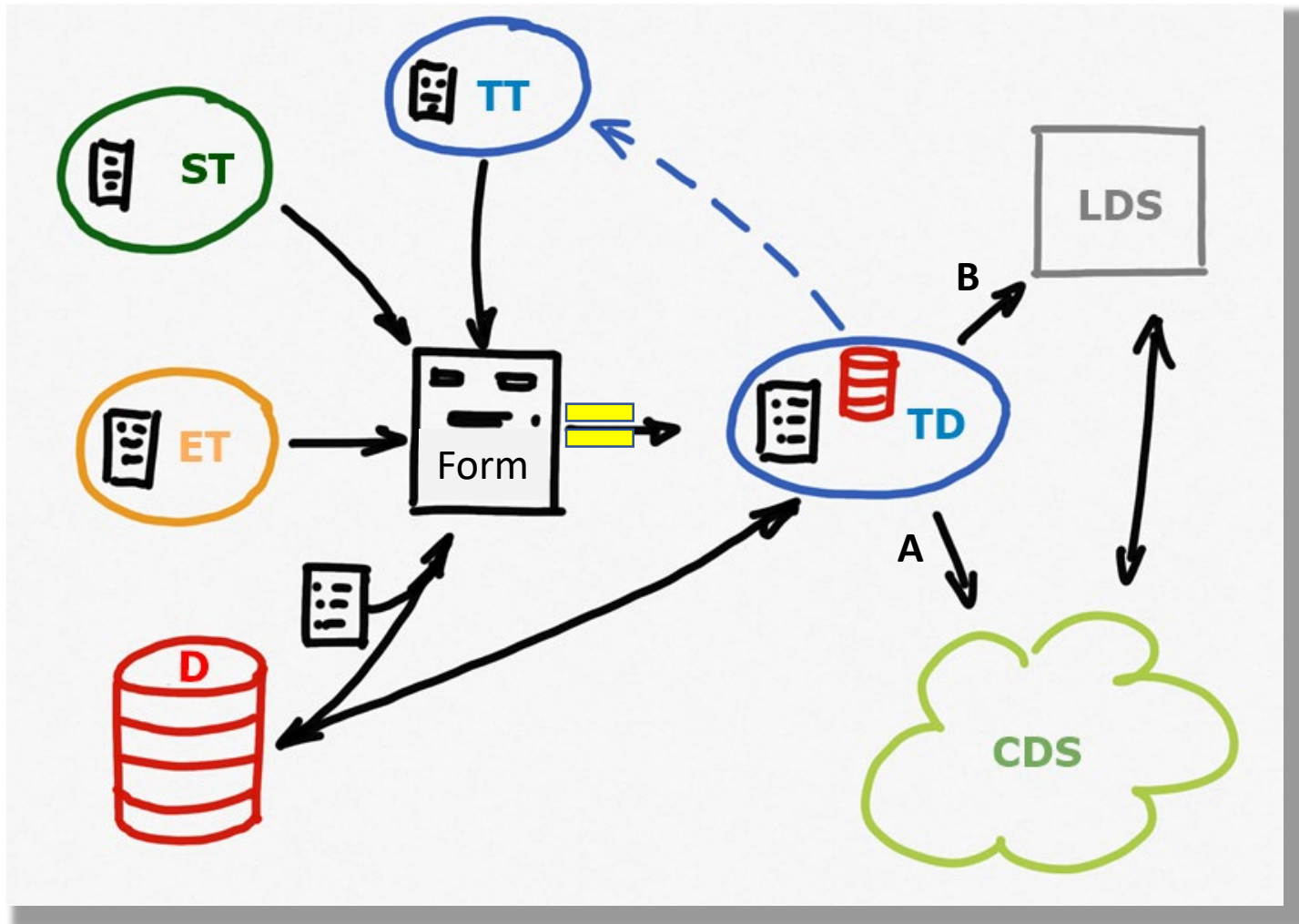
- Local Solution
- Ease of Use
- Adapt to Community Standards as it develops
- Data is Structured
- Can contain Multiple Datasets
- Open Source
- Software + User Readable File Format
- Browser Based Forms (if needed)
- Single Data Container for Data + Metadata
- Reusable Templates



Laboratory Workflow (LAPS)



Combine Experimental Information + Data



ST: System Template
ET: Experimental Template
Sample Template
D: Data

TD: Test Dataset
TT: Test Template

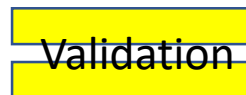
LDS: Local Data System
CDS: Cloud Data System



Meta Data



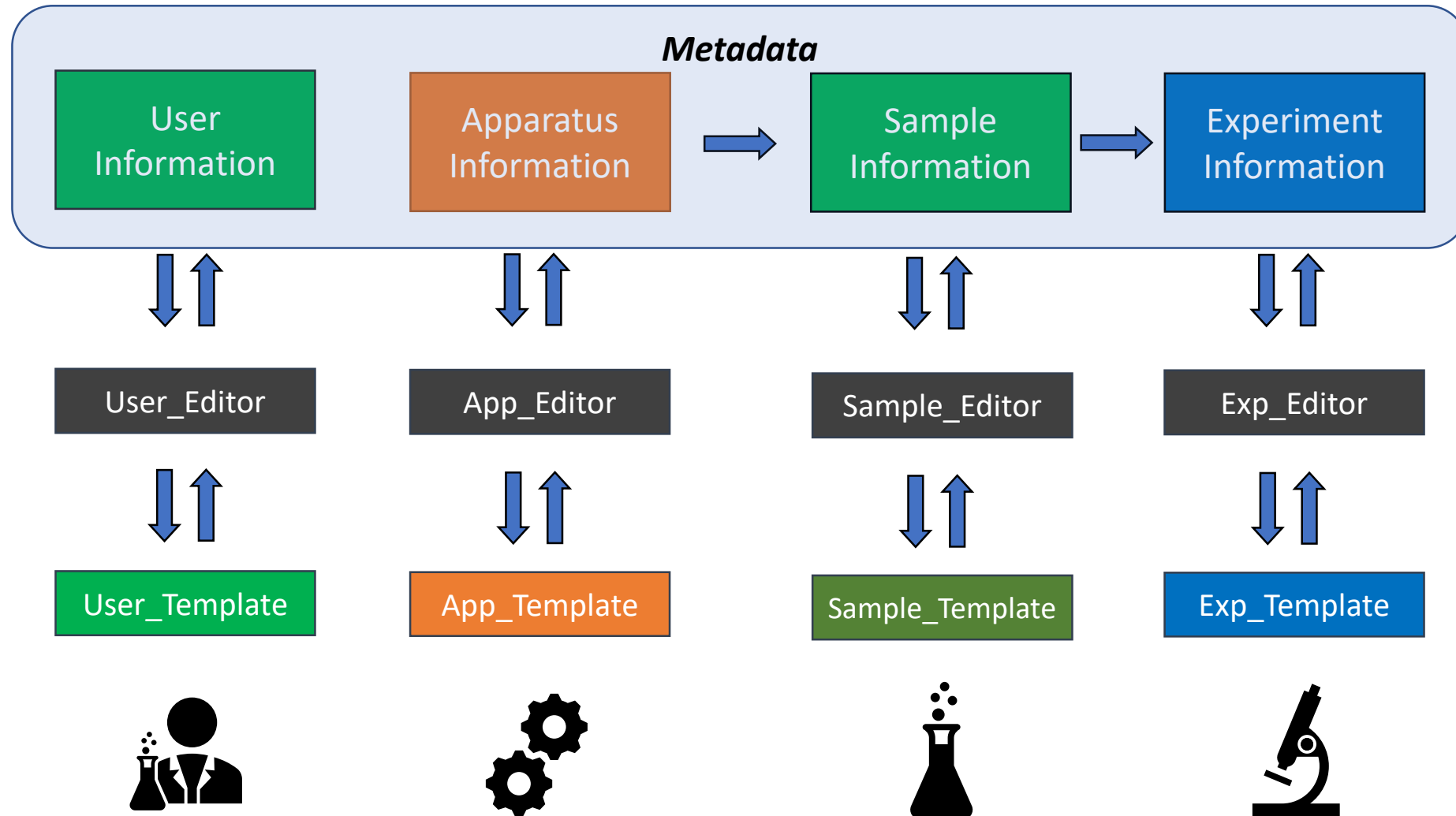
Data Set (e.g., Time Series)



Validation



Templates simplify user input



Laboratory Workflow - Demo



<http://verve.mit.edu/laps>





Editors

Many ways to modify and edit Experimental Data and Metadata

Load JSON document: No file selected. Save JSON document:

Download MIT Machine Templates here: [Paterson#5](#) - [Permeameter](#)

```
object ▶ system_info ▶ daq ▶ 0 ▶
├── System Profile v3 {3}
│   ├── $schema : system-schema.json
│   ├── facility_info {6}
│   └── system_info {7}
│       └── daq [1]
│           └── 0 {5}
│               ├── analog_input [9]
│               ├── analog_output [2]
│               ├── daq_parameters {4}
│               ├── digital_output [1]
│               └── digital_input [1]
├── data [1]
│   └── 0 {5}
├── system_capabilities [5]
│   ├── system_location : MIT Cambridge Bldg.54 - 715
│   ├── system_name : Paterson Apparatus #5
│   └── system_type : Paterson Apparatus
└── system_parameters {10}
```



```
Paterson.json x experimental-schema.json Solution Explorer - Folder View
Schema: system-schema.json
1  {"$schema": "system-schema.json",
2  "facility_info": {
3  "facility_address": "...",
14 "institute_name": "MIT",
15 "facility_type": "University Lab",
16 "facility_name": "Rock Physics Laboratory",
17 "facility_contact": "...",
25 "facility_id": "45re-tyu"
26 },
27 "system_info": {
28 "daq": [
29 {
30 "analog_input": "...",
177 "analog_output": "...",
207 "daq_parameters": {
208 "daq_name": "NI F",
209 "daq_manufacturer": "...",
210 "daq_resolution": "...",
211 "daq_samplingrate": "...",
212 },
213 "digital_output": "...",
214 "digital_input": "...",
483 },
484 "data": "...",
485 "system_capabilities": {
486 "Acoustic Emission",
487 "Permeability",
488 "Stress Deformation",
489 "Strain Deformation",
490 "Hydrostatic Stress"
491 },
492 "system_location": "MIT",
493 "system_name": "Paterson",
494 "system_type": "Paterson",
495 "system_parameters": {
496 "app_distortion": 75,
497 "f_max": 100,
498 "disp_min": 20,
499 "disp_max": 49,
500 "p_min": 0,
501 "p_max": 500,
502 "pp_min": 0,
503 "pp_max": 100,
504 "t_min": 20,
505 "t_max": 1400
506 }
507 }
}
```

```
{
  "channel_number": 0,
  "configuration": "Differential",
  "unit": "volt",
  "range_low": 0,
  "range_high": 10,
  "rate": "1KHz",
  "calibration": { "cal_date": "2011-06-26" },
  "sensor": {
    "sensor_name": "Capacitive Load Cell",
    "sensor_type": "Active",
    "sensor_detail": "Model"
  },
  "channel_name": "Axial Stress",
  "channel_name_add1": "Internal"
}
```



Laboratory Data Workflow - Scenario

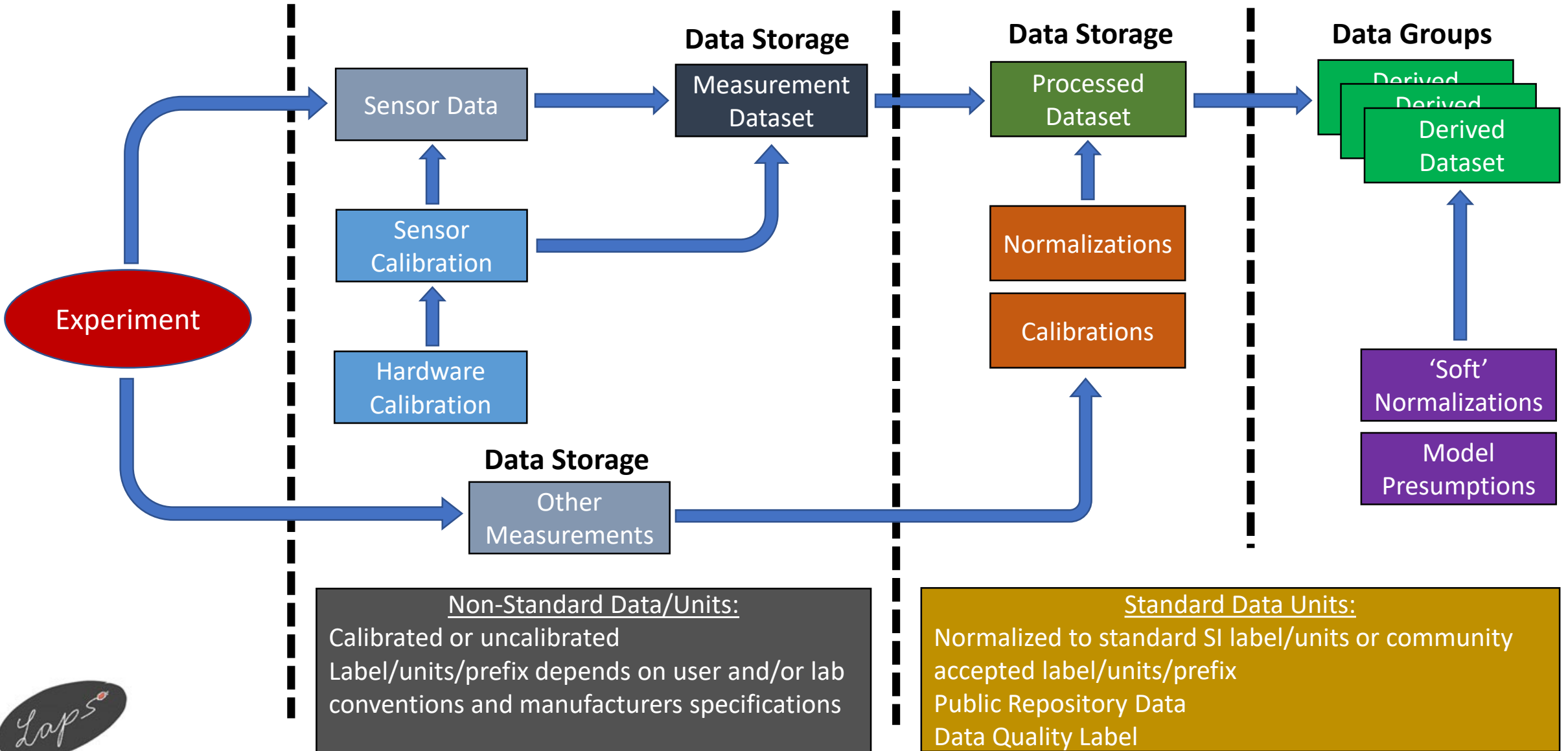




Table Headers - Schema

