I3D:bio OMERO user training slides

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Disclaimer

I3D:bio
Information Infrastructure
for BioImage Data

https://www.i3dbio.de
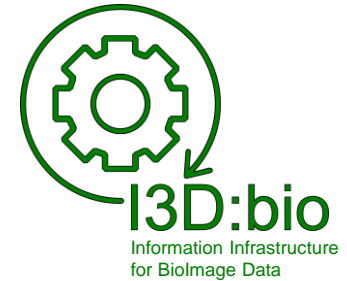
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I3D:bio
Information Infrastructure
for BioImage Data

Research Data Management for Bioimage Data at the ADD INSTITUTE HERE

Data Organization in OMERO

I3D:bio
Information Infrastructure
for BioImage Data
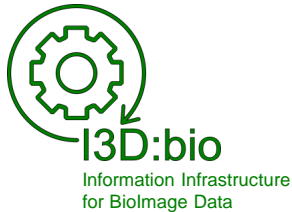
ADD AUTHOR / RESPONSIBLE PERSON FROM YOUR INSTITUE

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Questions/considerations around data organization and management

- Local computer *vs.* shared drives   (Where?)

- Backed-up network drives *vs.* safety copies on hard drives   (Where? Who?)

- Version control software *vs.* manual versioning (file names)   (How?)

- Arbitrary file naming *vs.* (any level) of standardization   (How? Who?)

- Management software *vs.* file folder hierarchies   (How?)

- Documentation in paper notebook *vs.* electronic lab notebook (How? Who?)

- Original data *vs.* derived data   (What? How?)
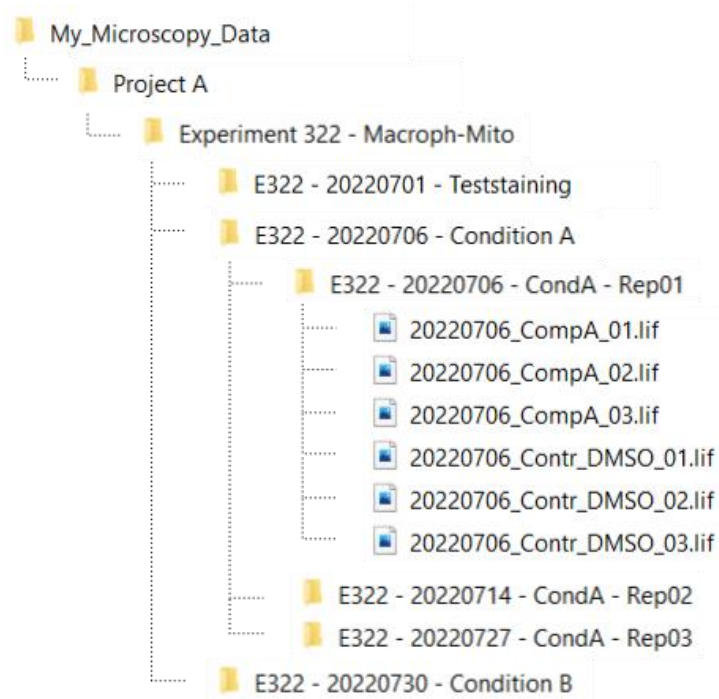
- Automatic recording, sample barcoding, etc.

- …

Managing data in classical file folder hierarchies

Not managed
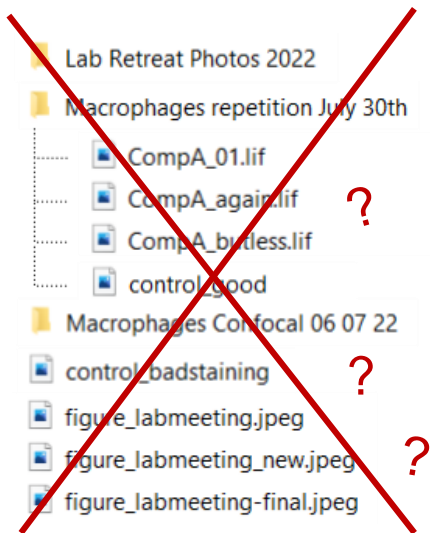
Understanding the data is only possible for the data producer (if at all)

Managed in a file system hierarchy (arbitrary example)

Understanding the data is possible based on the researcher's documentation

Hierarchy structure standardization?
- At the individual's level
- At the group's level
- At the collaboration level
- Discipline-specific standards

No preview and limited direct access to metadata

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A data management system helps to organize data (here: OMERO)

Example:
Access with OMERO.web

Example: A file with a „multi-scene image"

- Managed data
- Preview available
- Access to metadata
- User-friendly but machine-accessible

Preview thumbnails

Metadata

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Data organization in OMERO – part 1

OMERO.web offers a tree-view data hierarchy in the **Explore** tab

Projects

Datasets

Screens (multi-well plates)

user/group

Projects (blue)

Datasets (green)

Image(s) (grey)

Dataset within project

Non-nested Dataset

Scenes from multi-scene image (e.g., slide scanner)
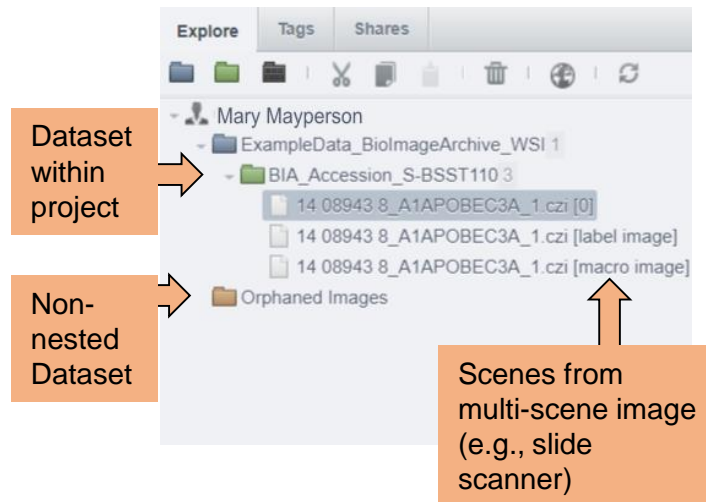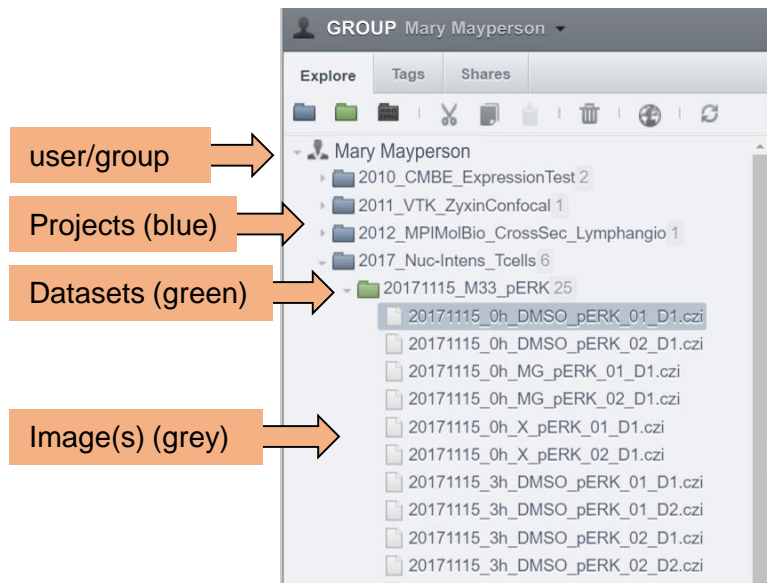
Re-think data organization:
File folder hierarchy vs. object-oriented data structure in OMERO?

If OMERO offers only a two-folder deep hierarchy…
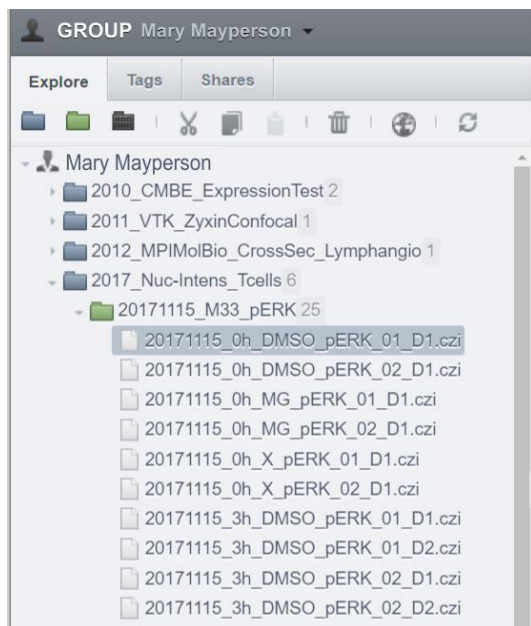
… how does my data fit?
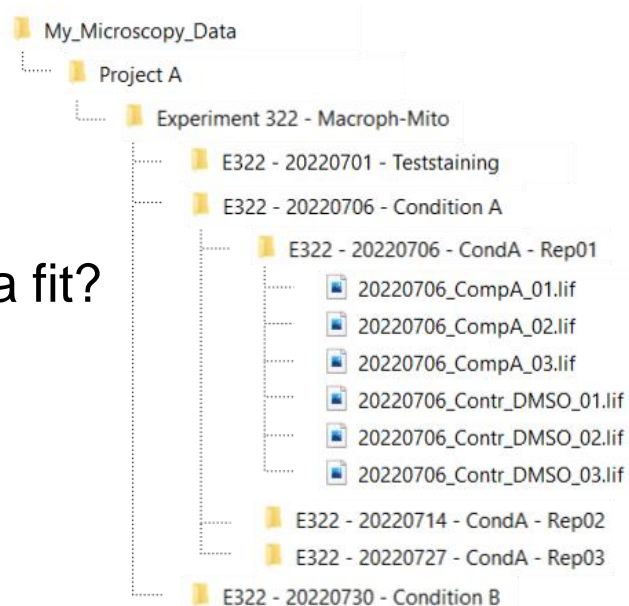
File folder hierarchy in explorer *vs* object-based data structure

A file folder hierarchy is itself a form of metadata
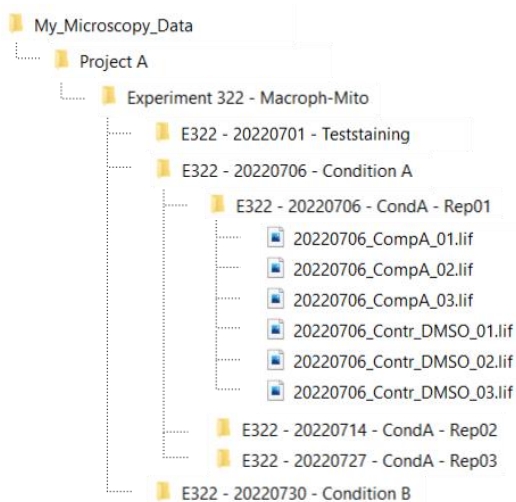
OMERO uses *structured metadata*, e.g., with **Tags** and **Key-Value Pairs**
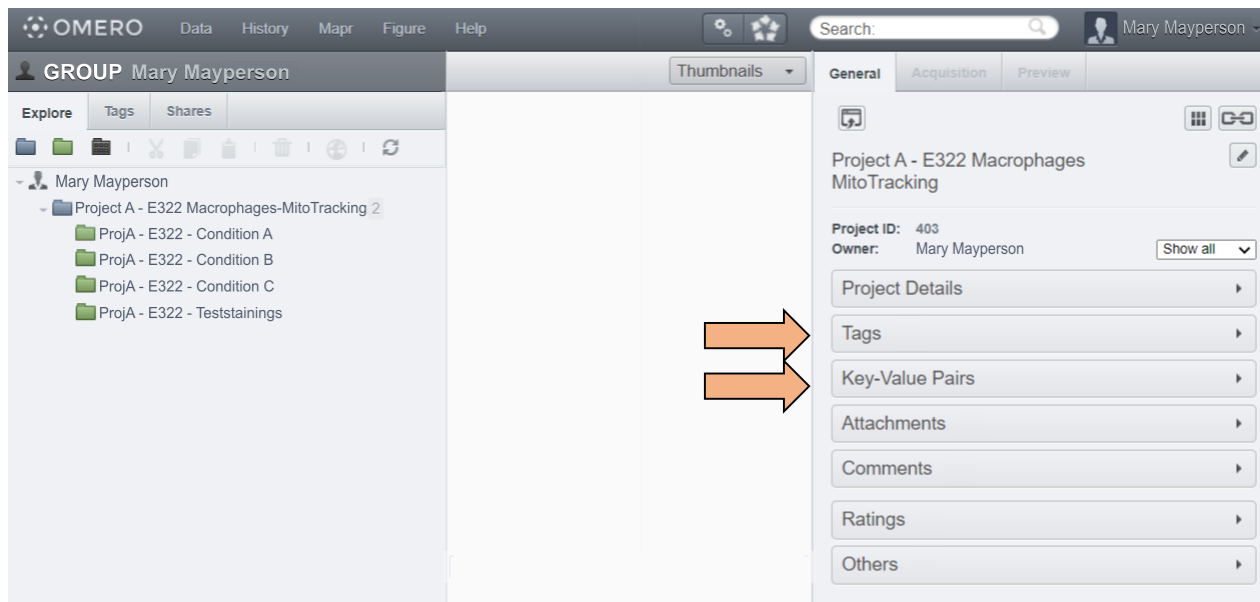
→ Annotate data with Tags and Key-Value Pairs

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Re-think data organization: Object-based data organization

Organization example 1
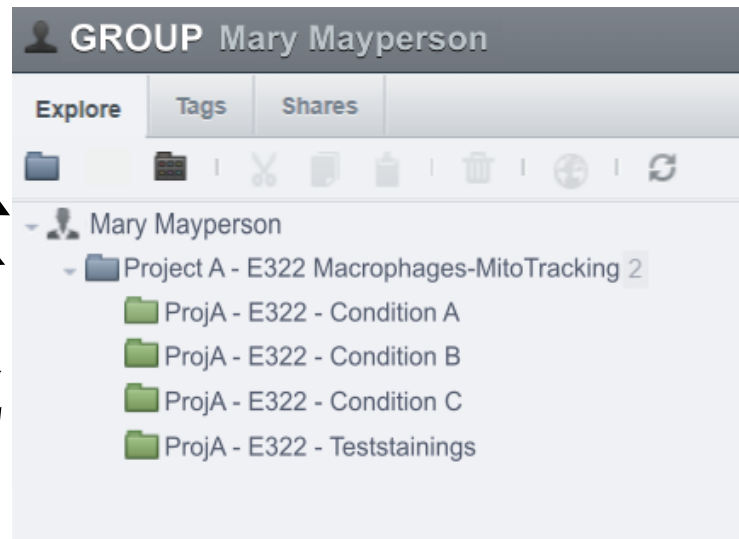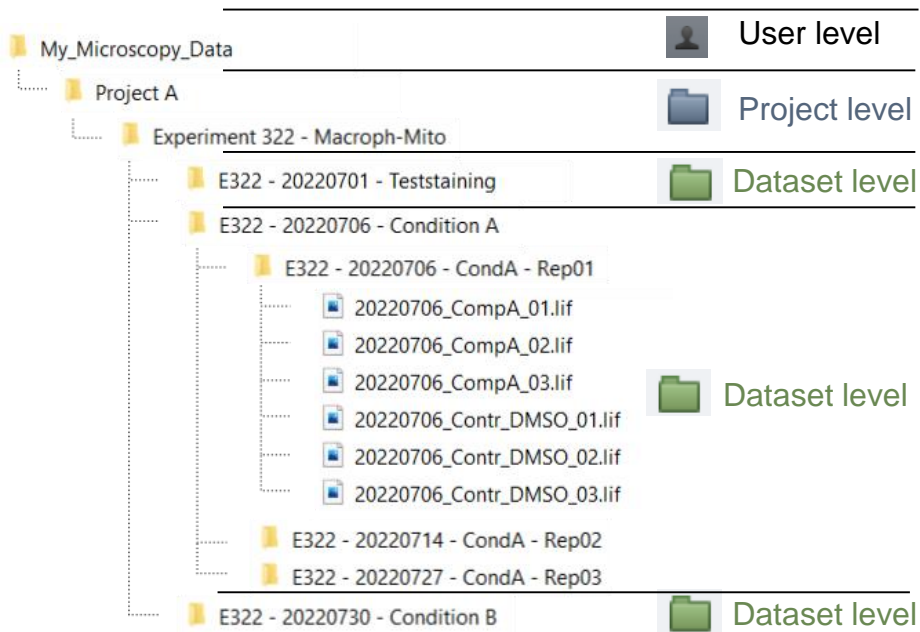
Use Tags for information across datasets and to *substitute for deep folder hierarchies*
(→ How? See the following slides and chapters!)

Re-think data organization: Object-based data organization

Organization example 2

User level

Project level

Dataset level

Dataset level
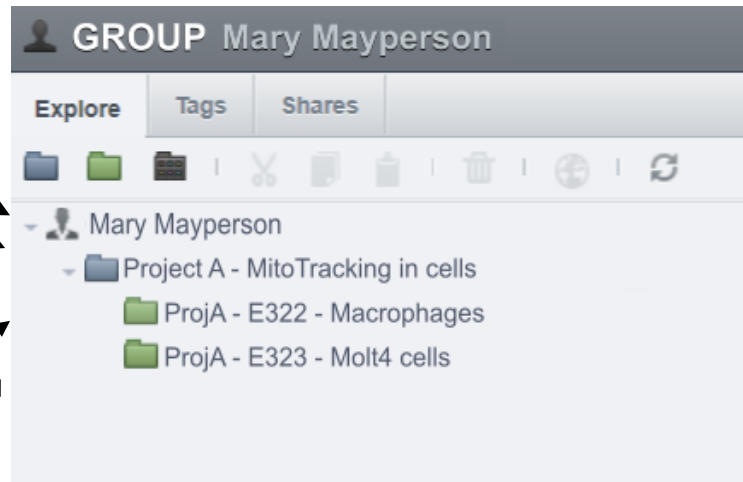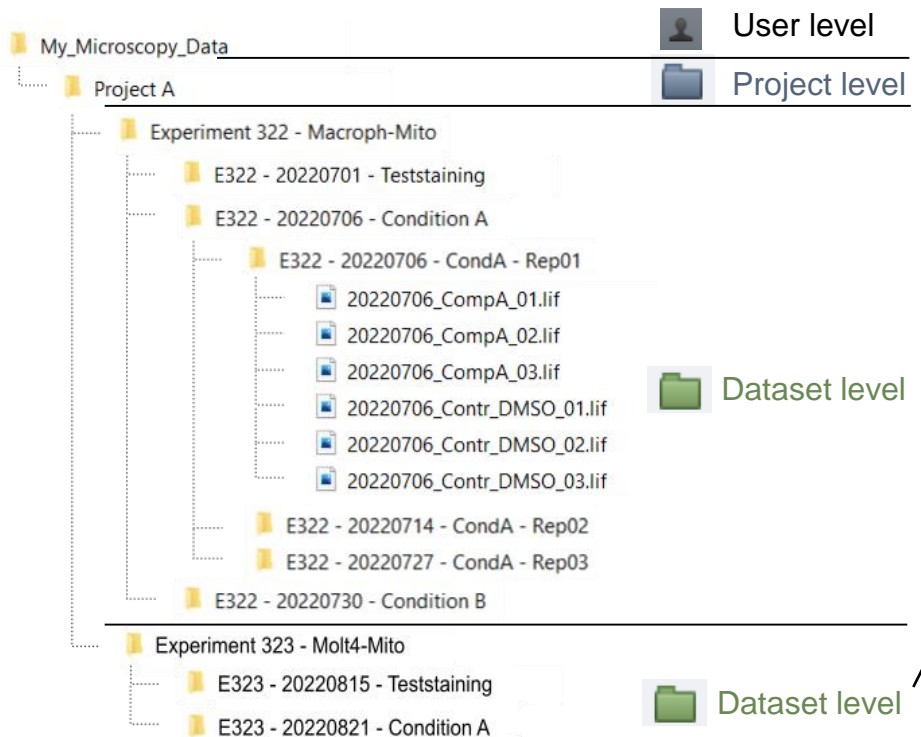
Use **Tags** for information across datasets (e.g., „Compound A", „DMSO control", etc.)
Use **Key-Value Pairs** to enrich with metadata details
(→ How? See the following slides and chapters!)

Re-think data organization: Object-based data organization

Organization example 3

Datasets on a flat list act as a "data library"
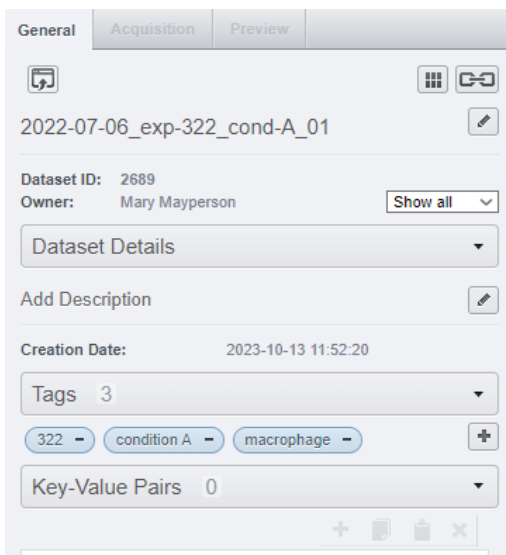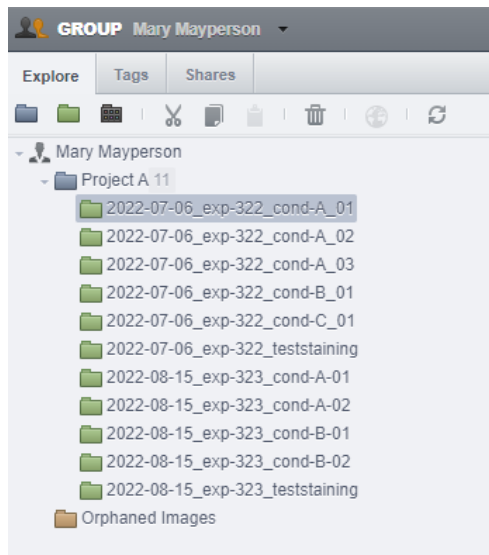
All folders are mapped to tags
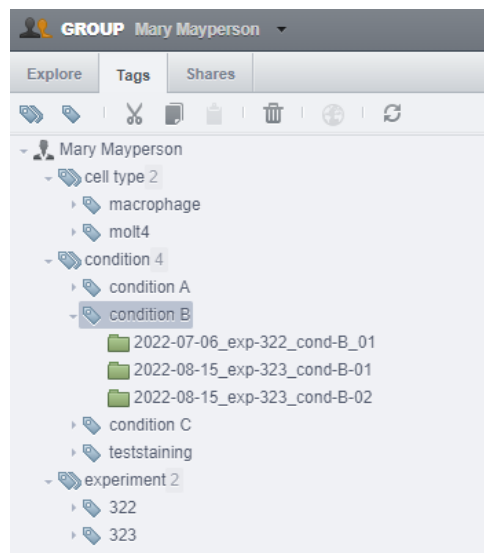
- Images of an experiment are divided to obtain datasets of the same sample + condition + experiment + …
- As the "data library" grows, the tags grant a flexible and efficient filtering
- Because images have the same "origin", they are implicitly annotated all at once (by annotating the dataset)

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Re-think data organization!

This is an important concept:

    OMERO is *not* intended for use as a file hierarchy system

    OMERO is object-oriented

How to leverage the potential of object-oriented data organization using Tags and Key-Value-Pairs will be shown throughout the following chapters

Re-think data organization: Object-based data organization

How to organize data in OMERO?

- Structure data *according to your (group's) needs*

  - Make use of **Tags** (and/or Key-Value Pairs) for data organization (instead of deep folder hierarchies)

  - Explore ways of data organization and discuss them with your research group

<div align="center">

→ **What are Tags and Key-Value Pairs?**

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What are Tags and their advantages?

Tags denote a property of an entity, similar to a price tag in the supermarket

- Tags allow a dynamic re-representation of the data tree (Tag-based search)

- Tags can help organize data across datasets and projects (e.g., similarities, relationships)

*Examples (**Tags**):*

- „show all data treated with ***compound A***"

- „show all data recorded with ***instrument A***"

- etc…
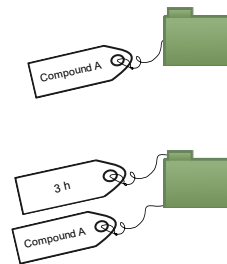
<u>Note</u>: **Tags are associated with users and groups!**

- In a shared group, we recommend discussing which tags to use and potentially assigning a user who curates and manages the tags

- For private data, tags can be used based on user preference alone

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What are Key-Value Pairs and their advantages?

Key-Value Pairs allow (standardized) annotation of detailed metadata

Consists of

- **Key:** Denotes a real-world object or an abstract concept that has a specific value (out of several or many possible values)

- **Value:** Number or text-string that describes the object denoted under „Key"

Examples:

Key: „cell type"   **Value:** „CD4+ T cell"

Key: „disease model"   **Value:** „experimental autoimmune encephalomyelitis"

→ **Allows structured and standardized metadata details curation**

Making use of the data organisation

→ see sub-chapter 6: Search Data in OMERO

Data annotation with Key-Value Pairs and Tags

→ see Chapter 07 on Metadata Curation

→ see official OMERO documentation
   https://omero-guides.readthedocs.io/en/latest/introduction/docs/index.html