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# NFDI4BioImage TA3 Hackathon @ UoC



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# REMBI / Mapping

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# REMBI

**REMBI** = **RE**commended **M**etadata for **B**iological **I**mages

REMBI publication: <https://rdcu.be/dsDc6>.

At this Hackathon, we used a REMBI template which is used at CAi at HHU Duesseldorf.

The CAi REMBI template is adapted from the REMBI table in the supplementary information of the REMBI publication: <https://doi.org/10.1038/s41592-021-01166-8>.

# Questions

## REMBI and ARC:

- Should REMBI go into an ARC?
- Can we map ARC metadata to a REMBI template?
- Can we cherrypick the metadata of the ARC to extract the REMBI aligned metadata?
- Which metadata is required when submitting to an imaging repository that expect users to use REMBI? Add also other imaging-related metadata available in the ARC?

## Organization of data in OMERO - using tags:

- Organization of data in OMERO (project/dataset compared to tags vs. key-value-pairs) for easier mapping to and from ARC.
- omero-arc-exporter related: How to handle "tags" in OMERO -> selection of metadata (subsets) for an ARC

# Progress

Getting more acquainted with the concepts and tools

- Navigated in an ARC, explored Swate, discussed about the use of templates and appropriate ontology.
- Started documentation: current state of the art and the steps done for this topic at the Cologne Hackathon.

Collected possible paths of data for OMERO-ARC users:

- How to import images/stacks in OMERO (e.g. do not upload tiff but lif files)
- Possible combination of workflows and runs triggered from an ARC with OMERO - tools consuming input data from OMERO, retrieving output data and exporting this again into an ARC. Does this make sense?

Guidance for OMERO, learned about REMBI template, used @CAi (Vanessa Fuchs, Tom Boissonnet):

- Started bringing a dataset from the example ARC into OMERO. ([https://git.nfdi4plants.org/natural-variation-and-evolution/microscopy\\_collection/map-by-seq\\_clsm-stacks](https://git.nfdi4plants.org/natural-variation-and-evolution/microscopy_collection/map-by-seq_clsm-stacks))

# REMBI example

We used Andrea's ARC/OMERO-data to fill in a REMBI template:

Annotation on the <b>Project</b> level			COMMENTS FROM OUR DISCUSSION @ THE COLOGNE HACKATHON
	Title	Localization of YFP-ARK1 ...	
	Study description	studying the role of different types of cytoskeleton onto the localization of ARK1 in Arabidopsis leaf epidermal cells	
	Study type	protein localization	
	Study term accession number	"http://purl.obolibrary.org/obo/GO_0008104", "GO"	
	Authors	Andrea Schrader, Martin Hülskamp	
	License	CC-BY 4.0	
	Copyright	Data in this dataset is part of the following publication: Louai Rishmawi; Hequan Sun; Korbinian Schneeberger; Martin Hülskamp; Andrea Schrader (2014) "Rapid identification of a natural knockout allele of ARMADILLO REPEAT-CONTAINING KINESIN1 that causes root hair branching by mapping-by-sequencing", doi:10.1104/pp.114.244046, publication ID: 25248719	

# REMBI example

We used Andrea's ARC/OMERO-data to fill in a REMBI template:

Annotation on the <b>dataset</b> level		COMMENTS FROM OUR DISCUSSION @ THE COLOGNE HACKATHON	
Study component	imaging method name	Confocal microscopy	
	imaging method term accession number	<a href="http://purl.obolibrary.org/obo/NCIT_C17753">http://purl.obolibrary.org/obo/NCIT_C17753</a>	
	imaging method term accession number source REF	NCIT	
	study component description		
Biosample	biological entity	leaf epidermal cell	
	biological entity term accession number	<a href="http://purl.obolibrary.org/obo/PO_0004013">http://purl.obolibrary.org/obo/PO_0004013</a>	
	biological entity term accession number source REF	PO	
	organism	<i>Arabidopsis thaliana</i>	
	organism term accession number	<a href="http://purl.obolibrary.org/obo/NCBITaxon_3702">http://purl.obolibrary.org/obo/NCBITaxon_3702</a>	
	organism term accession number sourceREF	NCBITaxon	
	intrinsic variable	-	e.g. mutations - not applicable here, only Col-0 wildtype leaves
	extrinsic variable	-	e.g. specific growth conditions - not applicable (standard greenhouse conditions)
	experimental variables	DMSO + XYZ	maybe DMSO treatment, unsure, 1st image before treatment, treatment, 2nd image, DMSO is the controle, others are oryzaline latrunculinB but we decided these are different datasets.

# REMBI example

We used Andrea's ARC/OMERO-data to fill in a REMBI template:

			COMMENTS FROM OUR DISCUSSION @ THE COLOGNE HACKATHON
Specimen (sample put under the microscope)	experimental status	control	other treatments like oryzalin would be named "test"
	location within biosample	-	e.g. specific location on leaf - not applicable here, transiently transformed epidermal leaf cells (particle bombardment)
	preparation method	protocol including mounting	
	refractive index of mounting medium	1.33	added row
	Signal/contrast mechanism	fluorescence	
	Channel 0 - content	YFP	
	Channel 0 - biological entity	YFP-ARK1	ontology?
	Channel 1 - content	-	
	Channel 1 - biological entity	-	
Image acquisition	Microscope model	Leica TCS-SPE confocal microscope (DM5500Q)	not needed if data is in OMERO as this is part of this data
	Camera model		not applicable, PMT



# Export ARC (REMBI) metadata

## Discussions at the Cologne Hackathon -> Tasks at the de.NBI Hackathon

Default of exporting ARC metadata for an image to OMERO

- Task: Mapping between assay files and OMERO objects (what mapping do we have)
- Task: Enabling to select subsets (Study, Assay)

Is it possible to assign REMBI to selected metadata in the ARC

- Task: having a REMBI-SWATE-Table/-Template
- Task: Provide terms and add REMBI-specific terms to the DataPLANT container ontology
  - Example: “Characteristic [REMBI - intrinsic variable]”

# Metadata in ARC and OMERO



<https://www.fz-juelich.de/de/ibg/ibg-4/aktuelles/meldungen/arc-overview.jpg>



<https://www.openmicroscopy.org/img/logos/ome-logomark.svg>

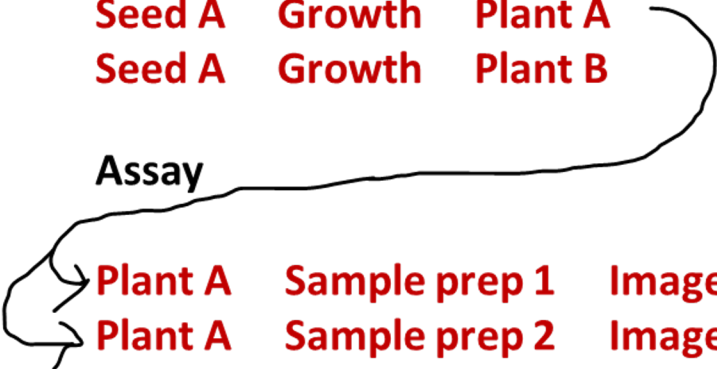
## Investigation

**Rapid identification of natural k.o. allele..**

## Study

Seed A   Growth   Plant A  
Seed A   Growth   Plant B

## Assay



Plant A   Sample prep 1   Image1.tiff  
Plant A   Sample prep 2   Image2.tiff



image123  
image456

Id 123

id456

## Image

Seed A  
Growth  
Plant A  
Sample prep 1

## Image

Seed A  
Growth  
Plant A  
Sample prep 2

# OMERO-REMBI to RDF (Tom)

## Progression: ... 1%

- RDF, need to have (some of) the REMBI terms defined / specified
- (RO Crate) <https://www.researchobject.org/ro-crate/>
- Then with OMEMO.rdf , we can make a REMBI extension to map the REMBI keys to RDF
- REMBI v2?

- **With use cases**

Use the current "Import KV from csv" script in OMERO to import the key-value pairs from an ARC-style isa.investigation.xlsx (script for this purpose: Peter/Tom) (<https://github.com/cecad-imaging/omero-arc-testdata/tree/main>)

- **With use cases**

Go the reverse way, i.e. do all above steps for export out of OMERO into structure:

- Use the OMERO-ARC-exporter

(<https://github.com/cmohl2013/omero-cli-transfer/tree/arc>)

- **Continue with OMERO-RDF**