

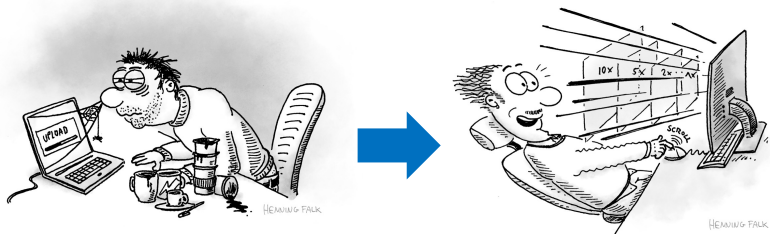
An update: OMERO in an evolving RDM landscape...

Stefanie Weidtkamp-Peters

Heinrich Heine University Duesseldorf & German BioImaging & NFDI4BIOIMAGE

...“we” contribute to this evolution

Next Generation File Format & Josh



Images: “Adam uploads” & “Navid zooms” by Henning Falk, ©2022 NumFOCUS, is used under a CC BY 4.0 license

Projects hosted by German BioImaging e.V.:



CZI
GloBIAS
PI Robert Haase



Wellcome Leap
Delta Tissue
PI Josh Moore



CZI
Single Cell
PI Josh Moore

leap^w

PI Josh Moore

CZI EOSS5
PI Josh Moore

EU Horizon foundingGIDE
PI Josh Moore



OME OMERO

A global community w/ and w/o funding, headquarter at University Dundee, team of Jason Swedlow

IDR

The IDR team at EMBL-EBI

RDM4mic
OMERO

„Research Data Management for Microscopy“

Susanne, Astrid, Peter, Steffi, Josh, Karen ...



BiImage Archive at EMBL-EBI



„Information Infrastructures for Bioimage Data“

...and Roland, Tobias, Julia, Tom, Elisa, Christian, Michele ...



NFDI 4
BIOIMAGE

...and the TA team, the data steward team, the research software engineers team

I3D:bio – the OMERO project

I3D:bio at the TiM 2023

The Data Stewardship Team

Team Heinrich-Heine-University Düsseldorf

Steffi
Center for Advanced Imaging (Head)
Chair of GerBI-GMB
Spokesperson of NFDI4BIOIMAGE
Role / Topics:
Metadata, FRET, FLIM, imaging modalities, community-building

Tom
Center for Advanced Imaging
Role / Topics:
OMERO admin, metadata, file transfer, image analysis, data collection, training material

Team University of Osnabrück

Susanne
iBIOs Facility at CellNanOs
Co-Spokesperson of NFDI4BIOIMAGE
Role / Topics:
Metadata, developer, file formats, storage concepts, OMERO

Julia
iBIOs Facility at CellNanOs
Role / Topics:
Data collection, metadata, ELNs

Team German Cancer Research Center

Elisa
Chief Enabling Technology Officer
Vice Chair of GerBI-GMB
Co-Spokesperson of NFDI4BIOIMAGE
Role / Topics:
Use case documentation, coordination, community-building

Christian
Enabling Technology Department
Project Coordinator I3D:bio & NFDI4BIOIMAGE
Role / Topics:
Data collection, metadata, use case documentation, training material

Team University of Freiburg

Roland
Life Imaging Center (Head)
QUAREP-LiMi
Role / Topics:
Metrology (meta)data, quality control, community-building

Tobias
Life Imaging Center
Role / Topics:
Data collection, metadata, metrology (meta)data, instrument surveillance

Project Partners and Supporters

Josh
Senior Research Data Management Officer
OME-Team
Co-Spokesperson of NFDI4BIOIMAGE
Role / Topics:
File formats, metadata, OMERO, developer, community-building

Thomas
Münster Imaging Network
Co-Spokesperson of NFDI4BIOIMAGE
Role / Topics:
OMERO, metadata, image analysis

- The project is focusing on OMERO: 4 fully funded positions (2022-2024), aiming for a second funding period
- Aim is to improve FAIR image data management: tools, metadata standards, training in the framework of OMERO....
*<https://gerbi-gmb.de/i3dbio/>; publication in JoM:
<https://doi.org/10.1111/jmi.13317>*
- Support to setup and run OMERO instances in Germany (and beyond): all practical aspects
Tom: „OMERO @ TiM“; WS „How to organise data...“

➔ This project generates a lot of feedback!

NFDI4BIOIMAGE within the landscape of NFDI



“The aim (...) is to systematically manage scientific and research data, provide long-term data storage, backup and accessibility, and network the data both nationally and internationally.”

<https://www.nfdi.de/>



**Network of
26 collaborating
CONSORTIA**
(scientific discipline or method)

+ Consortia Assembly
+ NFDI Directorate
+ Scientific Senate

Adapted from: <https://www.dfg.de/foerderung/programme/nfdi/informationsmaterialien/index.html>, copyright: Deutsche Forschungsgemeinschaft

- **Science-driven (bottom-up)**
- **“Invest into people, not into metal”**
- 3 calls for application (2019 – 2021)
→ 26 consortia + 1 cross-consortia project
- NFDI4BIOIMAGE started in 03/2023 with 5 + 5 years perspective

Working together towards the goal: collaboration in sections

Although the individual NFDI [consortia](#) are dedicated to research data management in a wide variety of disciplines, such as the natural, cultural and social sciences, they have many topics in common. Sections are legally dependent departments of the [NFDI Association](#) in which these cross-sectional topics are worked on across the boundaries of the consortia.

Cross-cutting issues are identified and prioritised with representatives of the consortia. The strategy-led process, initiated by the NFDI Directorate and the NFDI Consortium Assembly, can lead to the establishment of sections. In the sections, the association members work together to develop [cross-consortium standards, metadata standards and formats](#).

Four sections were established by the Scientific Senate of the NFDI Association on 01.10.2021. The following sections have been launched:

- [Common Infrastructures](#) (*section-infra*)
- [Ethical, Legal and Social Aspects](#) (*section-ELSA*)
- [\(Meta\)data, Terminologies, Provenance](#) (*section-metadata*)
- [Training & Education](#) (*section-edutrain*)

On 22.03.2023, a further section was established by the Scientific Senate of the NFDI Association:

- [Industry Engagement](#) (*section-industry*)

Task Areas of NFDI4BIOIMAGE



TA 1



Susanne Kunis



Josh Moore

employed
by GerBI

Image (meta)data formats and **standardization**

TA 2



Björn Grüning



Markus Blank-Burian

Technical infrastructure and **cloud resources**

TA 3



Phillipp Mallm



Werner Zuschratter



Torsten Stöter

Multimodal data linking and integration

TA 4



Anna Kreshuk



Thilo Figge



Christian Tischer

Bioimage informatics and **analysis**

TA 5



Thomas Zobel



Robert Haase

Training and community integration

TA 6



Elisa May



Stefanie
Weidtkamp-Peters



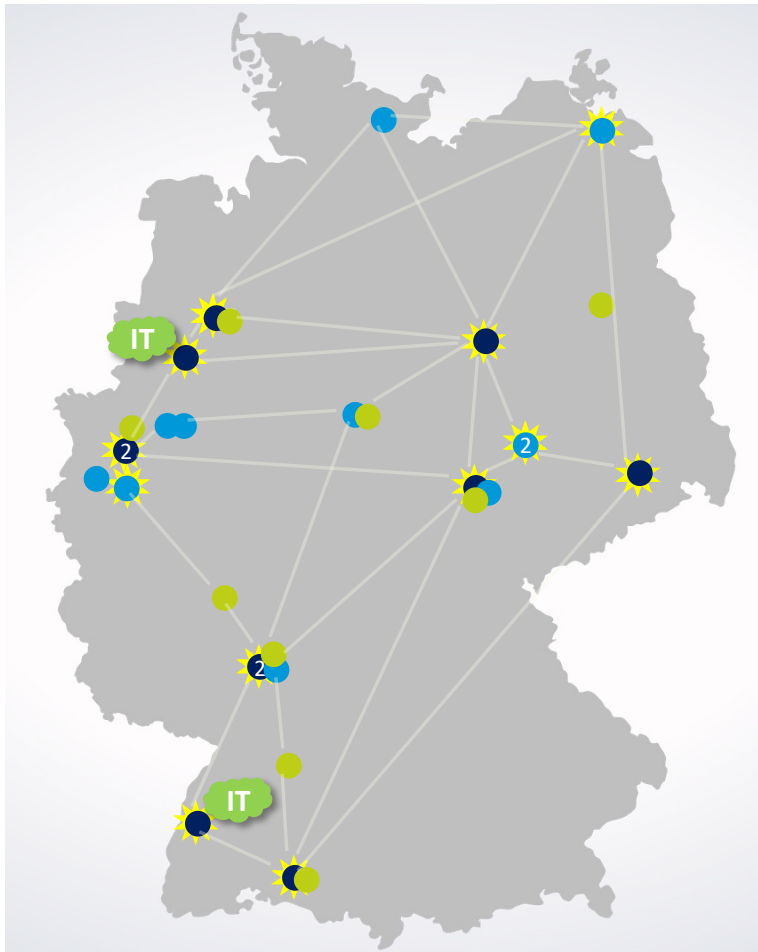
Christian Schmidt



Kathy Schmitz

Coordination, governance and networking & office

NFDI4BIOIMAGE: community integration



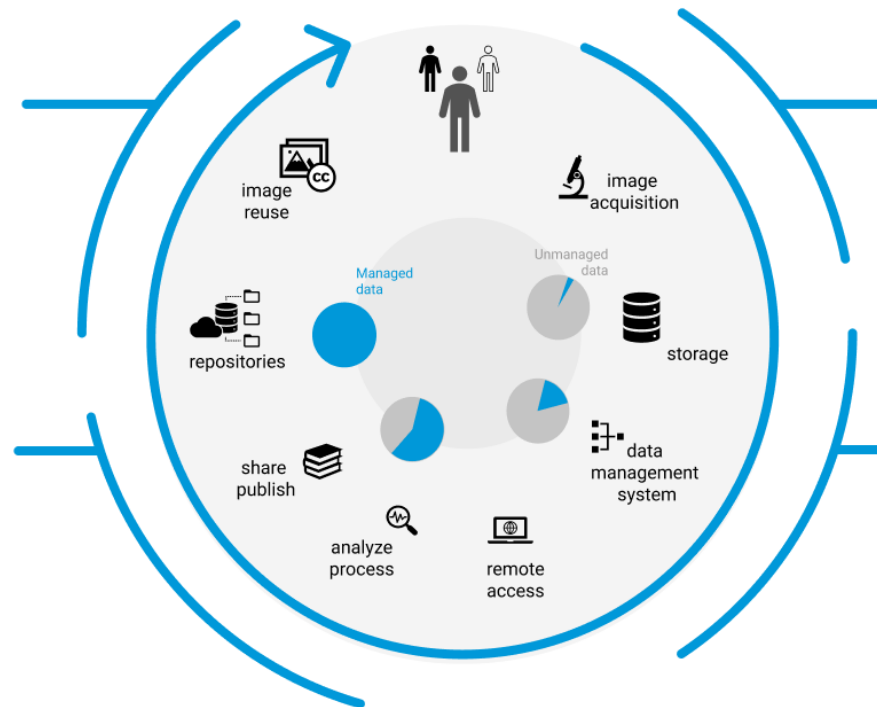
- co-applicant institutions (Task Area Leaders)
 - IT IT infrastructure (*storage & playground: @WWU & @ALU-FR*)
But not: a central data archive for all bioimaging data (→ BIA, IDR)
- participating institutions
- ☀ data stewards (DaSts) & research software engineers
- community use cases
- ~ 20 FTE: work on practical RDM solutions & training
- Help Desk
- Collaborate
 - with other NFDI consortia
 - with industry (via Quarep-LiMi, GerBI & others)
 - **international partners from the bioimaging community**

Main objectives of NFDI4BIOIMAGE



Objective 4
Capacitate researchers
for FAIR image data
management

Objective 3
Maximize the reach
of **reproducible** image
analysis workflows
in the community



Objective 1
Champion the
standardization
of the „bioimage
data“ type

Objective 2
Provide scalable
infrastructure
for FAIR image data

The NFDI4BIOIMAGE data steward team



THE DATA STEWARDS TEAM OF NFDI4BIOIMAGE

Mohsen Ahmadi

Background: Biochemistry &
Microscopy
Affiliation: INP Greifswald



Vanessa Fuchs

Background: Plant Sciences
Affiliation: Heinrich-Heine University
Düsseldorf



Riccardo Massei

Background: Environmental Sciences
and Toxicology
Affiliation: Helmholtz Center f. Env.
Res. (UFZ), Leipzig



Maximilian Müller

Background: Ecotoxicology
Affiliation: University of Konstanz



Jens Wendt

Background: Electrical Eng./
Information Tech. & Biomedical Eng.
Affiliation: University of Münster



Cornelia Wetzker

Background: Molecular Biology,
Immunology, Zoology
Affiliation: Dresden Technical
University



<https://nfdi4bioimage.de/about-us/data-stewardship-team/>

Data Steward Support...



Name: Dr. Riccardo Massei

Institution: Helmholtz Centre for Environmental Research - UFZ

Academic background: Environmental Sciences and Toxicology



Professional experience: I am dealing with high-content screening (HCS) images collected from fish embryos, zoo-plankton and cell lines. I joined NFDI4Bioimage to apply/advise on FAIR-IO concepts for HCS data and provide semi(automated) integrative workflows for transferring analytical HCS into cloud based systems (i.e. OMERO).

General tools: OMERO, Python, KNIME, eLabFTW, FishInspector, JupyterNotebooks

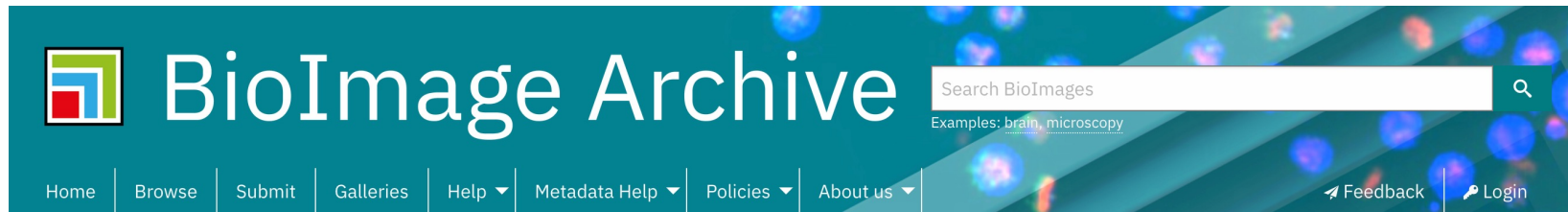
Related publications:

- Analysis of vascular disruption in zebrafish embryos as an endpoint to predict developmental toxicity - High Content Screening Raw Data (OBI/WIK strain) (<https://www.ebi.ac.uk/biostudies/bioimages/studies/S-BIAD954> ↗)

...for publication of
image data

here:
HCS data of
zebrafish embryos

Submission of image data to BIA



BIOSTUDIES / BIOIMAGES / S-BIAD954

Release Date: 30 November 2023 • Modified: 1 February 2024

[Cite] [JSON] [PageTab] [HTTP] [FTP] [Globus]

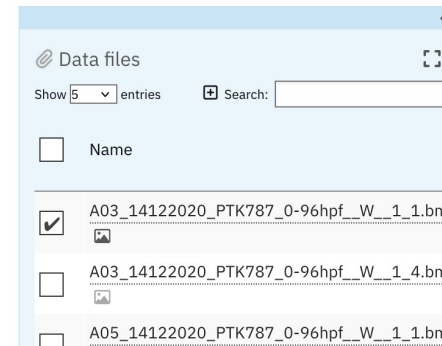
Analysis of vascular disruption in zebrafish embryos as an endpoint to predict developmental toxicity - High Content Screening Raw Data (OBI/WIK strain)

Julia Nöth ¹, Stefan Scholz ¹, Wibke Busch ¹, Tamara Tal ¹, Chih Lai ², Akhil Ambekar ^{2,3}, **Riccardo Massey ¹**

¹ Helmholtz Centre for Environmental Research ² St. Thomas University ³ Duke University

Accession S-BIAD954

Description A novel automated imaging-based method to detect inhibition of angiogenesis in early life stage zebrafish. Video subtraction was used to identify the location and number of functional intersegmental vessels according to the detection of moving blood cells. By exposing embryos to multiple tyrosine kinase inhibitors including SU4312, SU5416, Sorafenib, or PTK787, we confirmed that this method can detect concentration-dependent inhibition of angiogenesis. The new test method showed higher sensitivity, i.e. lower effect concentrations, relative to a fluorescent reporter gene strain (Tg(KDR:EGFP)) exposed to the same tyrosine kinase inhibitors. Indicating that functional effects due to altered tubulogenesis or blood transport can be detected before structural changes of the endothelium are visible by fluorescence imaging. Comparison of exposure windows



<https://www.ebi.ac.uk/biostudies/bioimages/studies/S-BIAD954>




This project generates even more feedback and requests!

OMERO in the evolving landscape

Many requests also relate directly to our local OMERO at HHU

- takes all local image data
- ... but it is not yet an official service of HHU
- ... it is not an archive
- ... has no cost model for storage yet
- ... not publicly accessible
- ... is not connected to S3

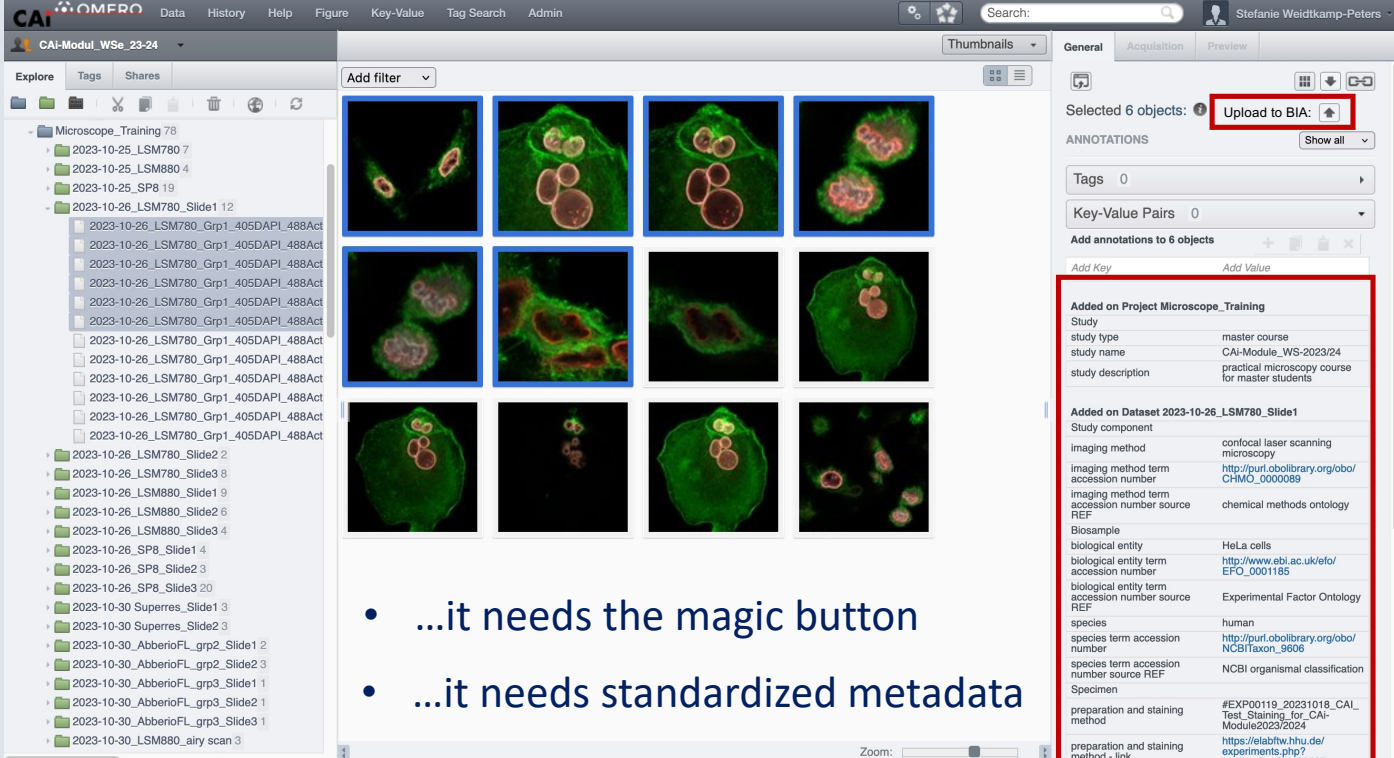


The screenshot displays the OMERO web interface. At the top, there is a banner image of a microscope. Below the banner, the CAI logo is visible, followed by the OMERO logo. A login form is centered on the page, featuring a dropdown menu with 'omero:4064' selected, a 'Username:' input field, a 'Password:' input field, and a 'Login' button. Below the login form, the text 'OMERO.web 5.25.0.' is displayed, along with copyright information: '© 2007-2024 University of Dundee & Open Microscopy Environment'. Further down, it states 'OMERO is distributed under the terms of the GNU GPL. For more information, visit openmicroscopy.org' and provides download links for 'Mac OS X, Windows, Linux'. The OME logo is at the bottom of the page.

OMERO in the evolving landscape

Many requests also relate directly to our local OMERO at HHU

- takes all local image data
- ...and it is not yet an official service of HHU
- ...but it is not an archive
- has no cost model for storage yet
- not publicly accessible



The screenshot shows the OMERO web interface. On the left is a file explorer with a tree view of folders and files. The main area displays a grid of 12 microscopy images. On the right, the 'General' tab is active, showing a table of metadata for the selected objects. A red box highlights the 'Upload to BIA' button and the metadata table.

Added on Project Microscope_Training	
Study	
study type	master course
study name	CAI-Module_WS-2023/24
study description	practical microscopy course for master students

Added on Dataset 2023-10-26_LSM780_Slide1	
Study component	
imaging method	confocal laser scanning microscopy
imaging method term accession number	http://purl.obolibrary.org/obo/CHMO_000089
imaging method term accession number source	chemical methods ontology REF
Biosample	
biological entity	HeLa cells
biological entity term accession number	http://www.ebi.ac.uk/efo/EFO_0001185
biological entity term accession number source	Experimental Factor Ontology REF
species	human
species term accession number	http://purl.obolibrary.org/obo/NCBITaxon_9606
species term accession number source	NCBI organismal classification REF
Specimen	
preparation and staining method	#EXP00119_20231018_CAI_Test_Staining_for_CAI-Module2023/2024
preparation and staining method - link	https://relativh.hhu.de/experiments.php?

- ...it needs the magic button
- ...it needs standardized metadata

Acknowledgments



All-hands Meeting NFDI4BIOIMAGE, Oct. 23, Düsseldorf

Funding:



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NFDI4BIOIMAGE project 501864659



Chan
Zuckerberg
Initiative 



Funded by
the European Union

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the I3D:bio team,
the NFDI4BIOIMAGE members,
the RDM4mic group,
the German BioImaging community,
the OME team,
the BioImage Archive team
and all national & international partners

Presentations available @

**[https://downloads.openmicroscopy.org/
presentations/2024/Dundee](https://downloads.openmicroscopy.org/presentations/2024/Dundee)**