

# Building global bioimaging research infrastructure

OME community meeting 2026

**Matthew Hartley**

Team Leader, BioImage Archive / EMPIAR



founding**GIDE**

EMBL-EBI



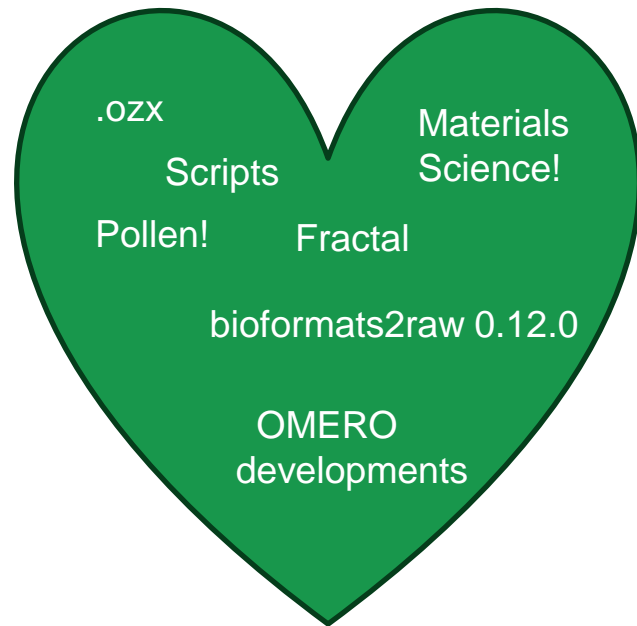
# Things I learned on day 1...



Stairs are scary



Doors are scary



Lots of awesome things are happening in OME-land

# The European Molecular Biology Laboratory



EMBL-EBI

Bioinformatics



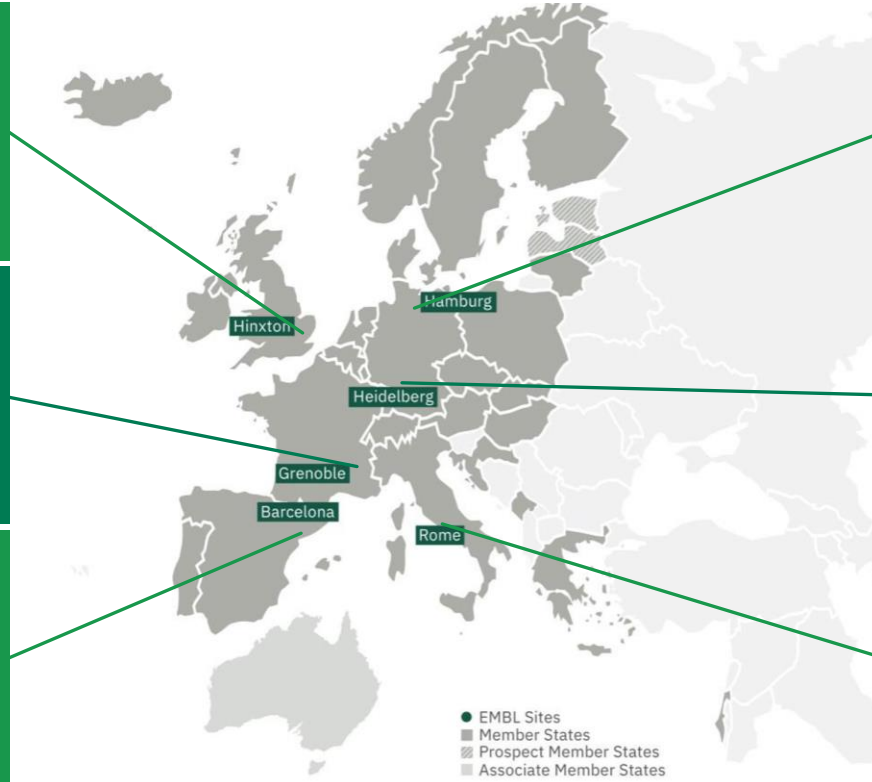
Grenoble

Structural biology



Barcelona

Tissue biology  
and disease  
modelling



Hamburg

Structural biology



Heidelberg

Life sciences

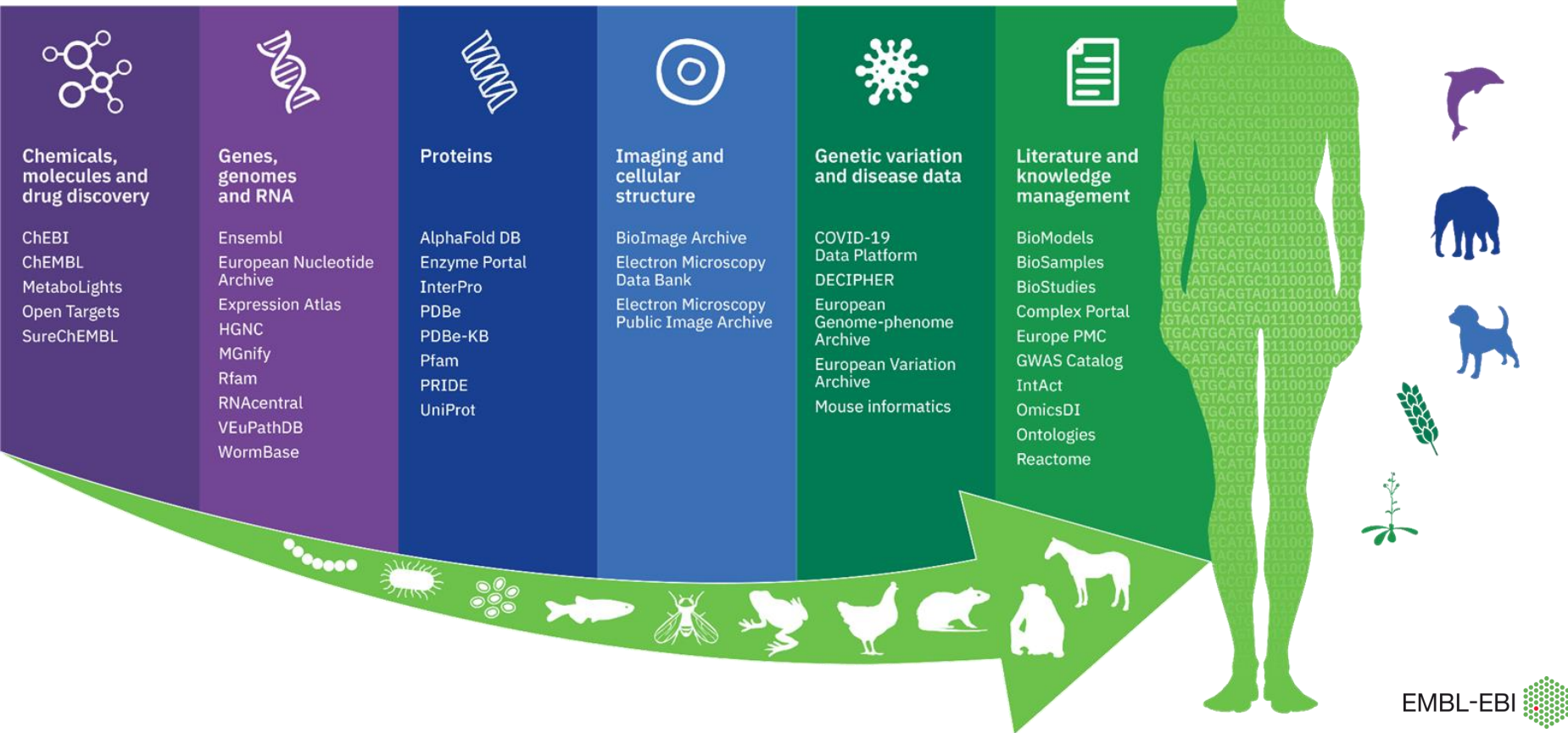


Rome

Epigenetics  
and neurobiology



# Data resources at EMBL-EBI



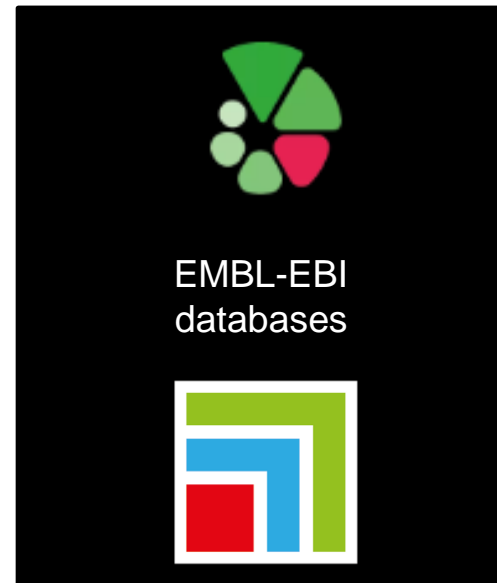
# The BioImage Archive (& EMPIAR)

## Mission

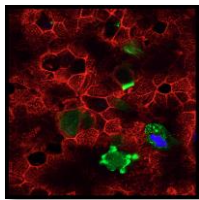
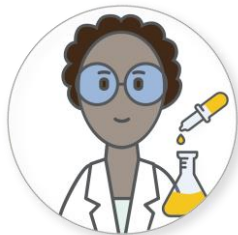
- Long term preservation of imaging data important to the scientific record
- Provision of data for tool development (particularly AI), training, new science

## Services we offer

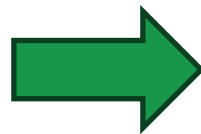
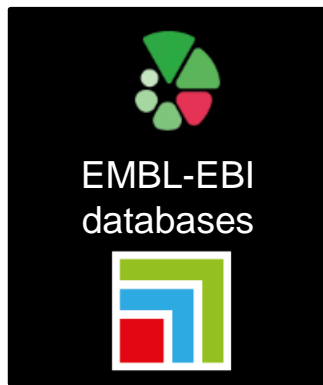
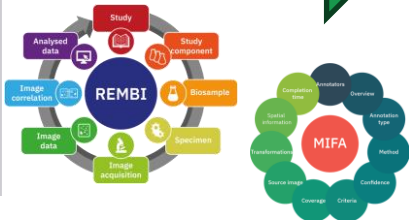
- Deposition (**data in**)
- Data presentation (**data out**)
- Data curation, standards, tools, global coordination



# A deposition database



On publication



More specialised data resources, e.g:

- Knowledgebases
- Data portals
- Data reprocessors



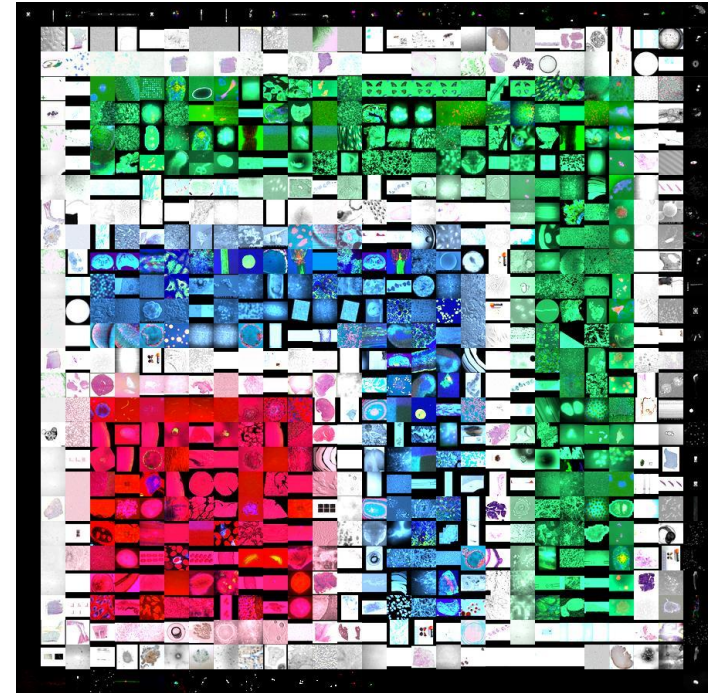
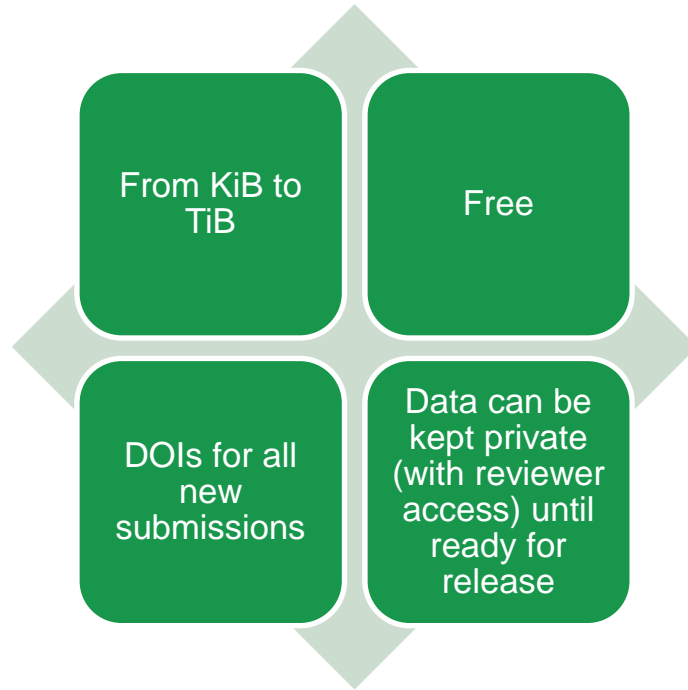
Methods development

New discovery

Training

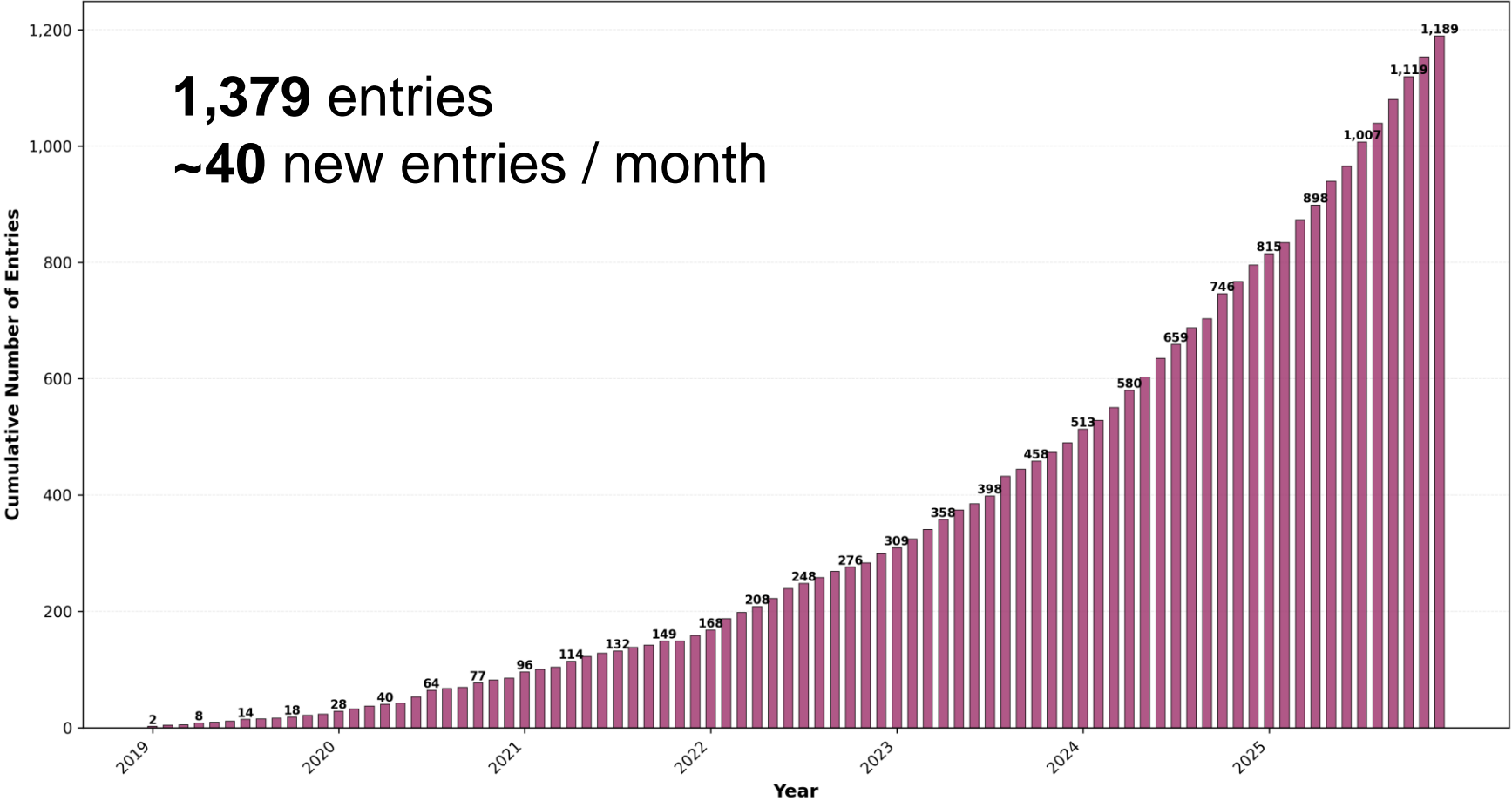


# Data submission

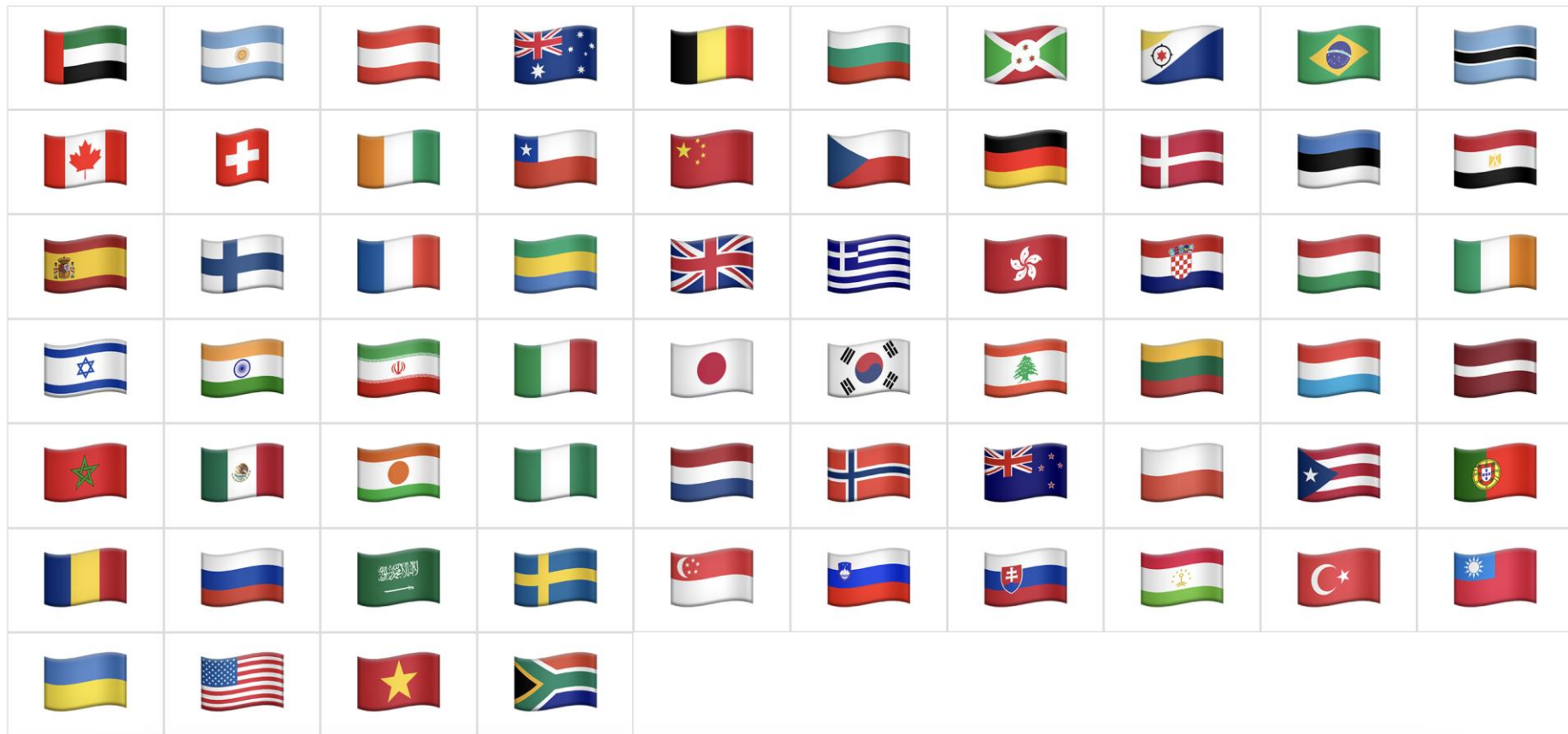


BioImage Archive

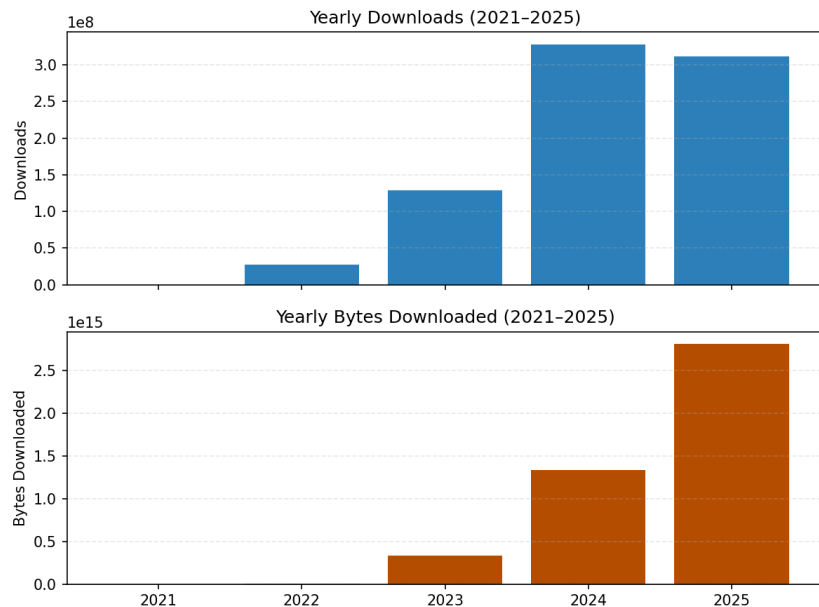
# Cumulative count of archive entries



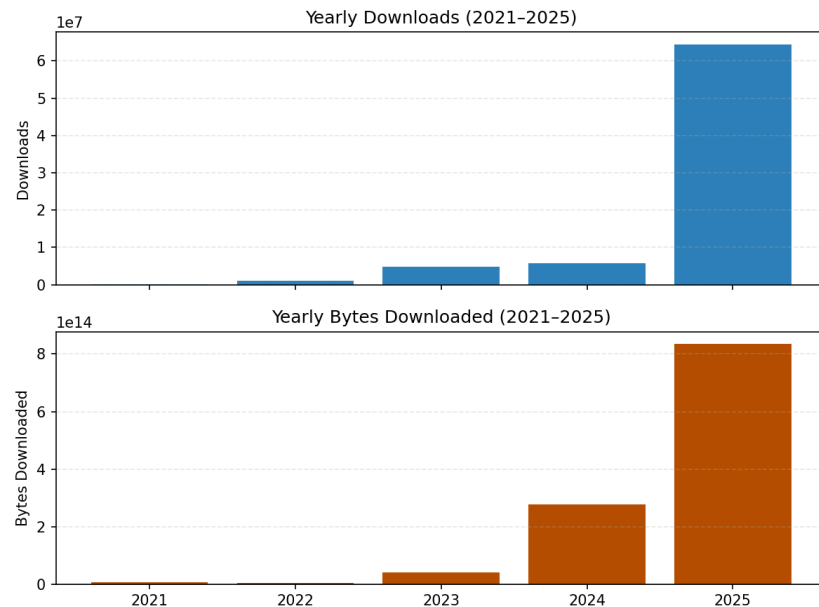
# ~64 different countries provide depositions



# BIA data reuse: total downloads, download volumes

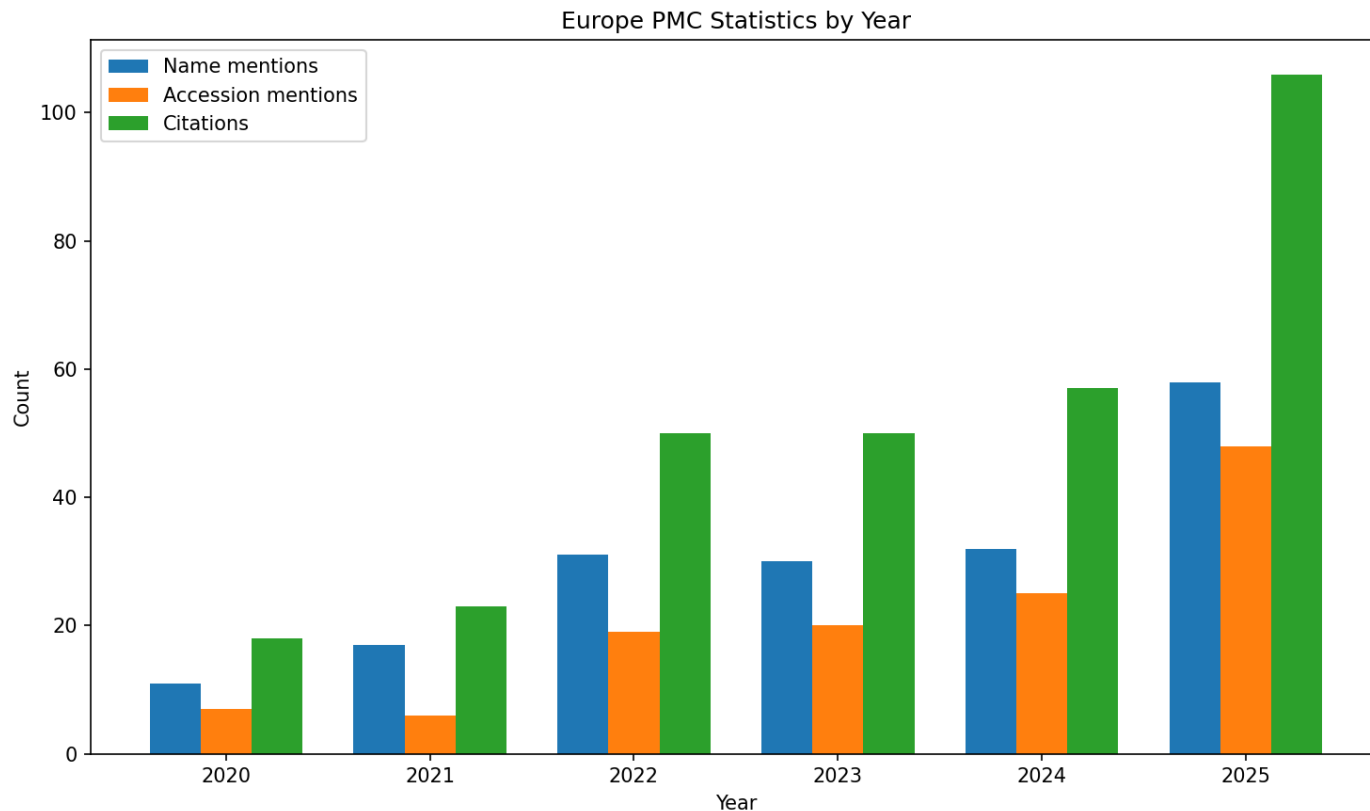


HTTP: **over 2.5PB** downloaded 2025



FTP: **over 800TB** downloaded 2025

# Data reuse: website hits, literature citations



Literature hits

# Recent developments – new website

The image displays the BioImage Archive website. The top navigation bar includes links for EMBL-EBI home, Services, Research, Training, About us, and a search icon. The main header features the BioImage Archive logo and the tagline "A resource for open, FAIR life science imaging data". Below this is a search bar labeled "Search Studies or Images". The main content area is divided into four sections: Home, Browse (highlighted), Submit, and Galleries. The "Browse" section shows a list of studies, including S-BIAD1641, S-BIAD2529, and S-BIAD1597, each with a thumbnail image and a brief description. The "Filter by" section on the right allows users to filter results by Organism, Release Year, and Imaging Method. The "Organism" filter shows a list of organisms with their respective counts. The "Release Year" filter shows a list of years with their respective counts. The "Imaging Method" filter shows a list of imaging methods with their respective counts.

EMBL-EBI home Services Research Training About us

**BioImage Archive**  
A resource for open, FAIR life science imaging data

Search Studies or Images

Home Browse Submit Galleries

bioimage-archive > Browse Studies

<https://beta.bioimagearchive.org/>

Launched beginning December

**Filter by** 25 - 36 of 1237 results

**Organism** TOP 13

- ☐ Arabidopsis thaliana 31
- ☐ Caenorhabditis elegans 18
- ☐ Danio rerio 19
- ☐ Drosophila melanogaster 29
- ☐ Escherichia coli 13
- ☐ Homo sapiens 320
- ☐ Mus musculus 209
- ☐ Nicotiana benthamiana 9
- ☐ Rattus norvegicus 19
- ☐ Saccharomyces cerevisiae 17

**Release Year** TOP 13

- ☐ 2016 1
- ☐ 2017 7
- ☐ 2018 16
- ☐ 2019 24
- ☐ 2020 65
- ☐ 2021 76
- ☐ 2022 143
- ☐ 2023 189
- ☐ 2024 304
- ☐ 2025 394
- ☐ 2026 18

**Imaging Method** TOP 13

- ☐ Bright-field microscopy 95
- ☐ Confocal microscopy 238
- ☐ Electron microscopy 18
- ☐ Fluorescence microscopy 249
- ☐ Light microscopy 41
- ☐ Microscopy 17
- ☐ Phase contrast microscopy 15
- ☐ Spinning disk confocal microscopy 64
- ☐ Time lapse microscopy 22
- ☐ Transmission electron microscopy (tem) 18

**S-BIAD1641** ➔  
Neuronal, vascular, and glial markers in human thalamus imaged with multiplexed fluorescence microscopy  
**Release date:** 2025-12-30  
**Imaging method:** fluorescence microscopy  
**Organism:** Homo sapiens (human)

**S-BIAD2529** ➔  
Single-cell spatial proteomics maps human liver zonation patterns and their vulnerability to disruption in tissue architecture  
**Release date:** 2025-12-27  
**Imaging method:** spinning disk confocal microscopy  
**Organism:** Homo sapiens (human)

**S-BIAD1597** ➔  
Proteomic landscapes of Ewing sarcoma unravel immunological regulation of tumor progression  
**Release date:** 2025-12-25  
**Imaging method:** fluorescence microscopy, light microscopy  
**Organism:** Homo sapiens (human)

# Recent developments – landing pages for images

<https://beta.bioimagearchive.org/bioimage-archive/image/2ed865c0-f303-49e6-9f10-dc1d4331454a>

With interactive visualisation

[bioimage-archive](#) > [studies](#) > [S-BIAD2789](#) > [2ed865c0-f303-49e6-9f10-dc1d4331454a](#)

BETA

## S-BIAD2789

The Mitochondria-Targeted Peptide HDAP2 Reduces Mitochondrial Loss and Retinal Ganglion Cell Degeneration After Optic Nerve Injury

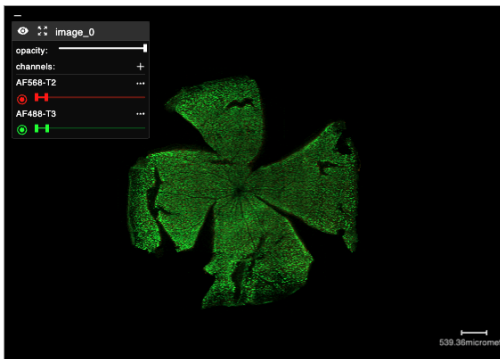
Control wholemounts

[Study Page](#)

### Image metadata

**Physical image size:** 0.0054 x 0.0054 m  
**Physical voxel size:** 4.0e-7 x 4.0e-7 m/pixel  
**Pixel image size:** 13460 x 13460 px  
**Number of channels:** 2  
**Number of timesteps:** 1

Additional user metadata



### Access images

License:  
<https://creativecommons.org/publicdomain/zero/1.0/>

[How to download this image](#)

[Copy OME-Zarr URI](#)

Visualise

[Open in Vizarr viewer](#)

### Biosamples:

#### ▼ **ONC C57BL/6 mice**

##### **Organism(s) taxonomic information:**

- *Mus musculus* (mouse)

**Description of biological entity:** Retinal ganglion cells and optic nerve - Study of the retina and optic nerves in animals that received unilateral optic nerve crush.

### Specimen Preparation Protocols:

#### ▼ **Control whole mounts**

**Protocol description:** Control (contralateral, uninjured) retinas from both saline-treated (n=6) and HDAP2-treated (n=8) animals were analyzed as wholemounts to verify that HDAP2 does not affect RGC survival in the absence of injury, and to establish baseline regional RBPMS/ChAT ratios. Animals were treated with either saline or HDAP2 (3 mg/kg, IP) once a day for 14 days and euthanized with an IP overdose of ketamine (300 mg/kg) and xylazine (60 mg/kg). Each eye was removed from the animal with forceps and hemisected and fixed in 4% paraformaldehyde for 1 hour. Retinas were blocked and permeabilized with 4% normal donkey serum in 0.1 M Tris or phosphate buffer with 0.5% Triton-X for 1 hour, then incubated for 3 days at 4°C with rabbit anti-RBPMS (1:200; PA5-31231, Invitrogen, Carlsbad, CA) to label all retinal ganglion in 2% normal donkey serum in the same buffer. Tissue was rinsed 3 × 10 minutes with buffer and incubated with secondary antibodies overnight at 4°C (wholemounts).

### Image Acquisition Protocols:

#### ▼ **Control wholemounts**

**Protocol description:** Images (~160 with 10% overlap) that were automatically stitched together using Airyscan processing to produce a montage of the entire retina.

**Imaging instrument:** Wholemounts were imaged using a Zeiss LSM 900 confocal microscope with a 10× objective by acquiring ~160 images (10% overlap) that were automatically stitched together using Airyscan processing.

**Imaging method:** confocal microscopy

# Recent developments – study and image search

**Filter by**

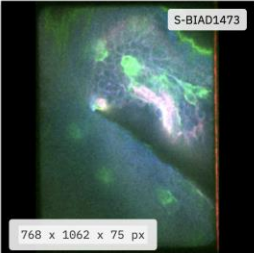
- Organism 1
  - ☐ Drosophila melanogaster 81
- Image Format 9
  - ☐ czi 10
  - ☐ ims 5
  - ☐ jpg 2
  - ☐ lif 8
  - ☐ lsm 5
  - ☐ ome.zarr 81
  - ☐ ome.zarr.zip 4
  - ☐ sdt 3
  - ☐ tiff 44
- Imaging Method TOP 10 20
  - ☐ Bright-field microscopy 5
  - ☐ Confocal microscopy 55
  - ☐ Film 3
  - ☐ Fluorescence microscopy 10
  - ☐ Lattice lightsheet microscopy 3
  - ☐ Light microscopy 3
  - ☐ Multi-photon microscopy 7

**Search results for drosophila**

1 - 12 of 81 results

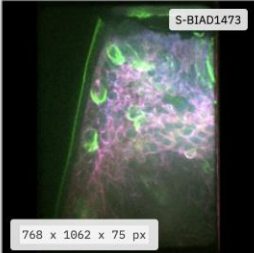
Query: drosophila

Cards Table Grid Page Size: Default




768 x 1062 x 75 px

**Imaging method:** confocal microscopy  
**Organism:** Drosophila melanogaster  
**Image format:** ome.zarr, tiff



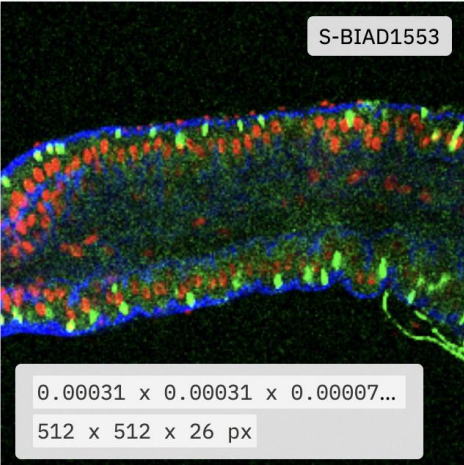
768 x 1062 x 75 px

**Imaging method:** confocal microscopy  
**Organism:** Drosophila melanogaster  
**Image format:** ome.zarr, tiff



768 x 1062 x 75 px

**Imaging method:** confocal microscopy  
**Organism:** Drosophila melanogaster  
**Image format:** ome.zarr, tiff



0.00031 x 0.00031 x 0.00007...

512 x 512 x 26 px

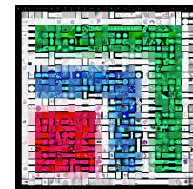
**Imaging method:** confocal microscopy  
**Organism:** Drosophila melanogaster  
**Image format:** lif, ome.zarr  
**Number of channels:** 3  
**Number of timesteps:** 1

# Recent developments – an API to find some OME-Zarrs

```
curl -sS --get 'https://beta.bioimagearchive.org/search/v1/search/fts/image' \
--data-urlencode 'size_x.gte=100000' \
| jq -r '
.hits.hits[]
| ._source as $img
| $img.representation[]? as $rep
| select($rep.image_format == ".ome.zarr")
| $rep.file_uri[]?
| [$img.accession_id, ($rep.size_x|tostring), .]
| @tsv
'
```

```
S-BIAD2957 104919 https://livingobjects.ebi.ac.uk/bioimaging-integrator-data/S-BIAD2957/04c35394-0ed9-4fea-985a-03a77411728d/4e3d4324-e80d-4081-a6f5-a5c4cd345eac.ome.zarr/0
S-BIAD2957 104919 https://livingobjects.ebi.ac.uk/bioimaging-integrator-data/S-BIAD2957/237a165f-856e-47e9-b5fe-d7ed75e33e6d/0efe0443-9705-4761-be26-deb94c71240b.ome.zarr/0
S-BIAD2776 105600 https://uk1s3.embassy.ebi.ac.uk/bia-integrator-data/S-BIAD2776/eade1b2f-77a7-4103-9d8f-76ffb9be4cbd/42b84a8d-cbef-43c9-a73e-e68e5452daa3.ome.zarr/0
S-BIAD2455 200220 https://uk1s3.embassy.ebi.ac.uk/bia-integrator-data/S-BIAD2455/a7b9624f-95b7-45f0-95d4-3a43bcd3a1e4/17c15af2-d372-49b7-a35a-68be5da9aec3.ome.zarr/0
S-BIAD2455 266443 https://uk1s3.embassy.ebi.ac.uk/bia-integrator-data/S-BIAD2455/b846273c-df64-4079-b812-a8fada31e88d/0c4b3443-d589-402a-8dff-12fd0608d6ee.ome.zarr/0
S-BIAD2455 161444 https://uk1s3.embassy.ebi.ac.uk/bia-integrator-data/S-BIAD2455/dd659dc5-1b82-4290-920d-b7a89e3c7217/e8de6f1e-0af5-4649-a253-fcebed6354cb.ome.zarr/0
S-BIAD2454 116883 https://uk1s3.embassy.ebi.ac.uk/bia-integrator-data/S-BIAD2454/312eb5db-19e9-443a-8a56-ac6dc7eac5e6/c736c5d1-f630-48a2-aaf7-bda043e8e1c0.ome.zarr/0
S-BIAD2454 106920 https://uk1s3.embassy.ebi.ac.uk/bia-integrator-data/S-BIAD2454/ea0f9447-da48-4419-aa65-eb49fc995368/10cef570-9dc0-4bf8-87d8-3d65f51fd051.ome.zarr/0
S-BIAD2453 226213 https://uk1s3.embassy.ebi.ac.uk/bia-integrator-data/S-BIAD2453/4859299d-7d5b-49ef-81af-d1f48b77d6b2/9f5ffed9-a438-44f0-bb6a-446c7de96b70.ome.zarr/0
S-BIAD2453 134136 https://uk1s3.embassy.ebi.ac.uk/bia-integrator-data/S-BIAD2453/75b42803-ac70-4db7-b8c2-357f1cb805c4/672815c4-99e6-40aa-bab4-92b60a22fc6f.ome.zarr/0
S-BIAD2452 113967 https://uk1s3.embassy.ebi.ac.uk/bia-integrator-data/S-BIAD2452/5d2242bd-bbde-491f-b99c-c89fd0a8f037/3953f7c3-05ee-4611-8443-d63d72d0144b.ome.zarr/0
S-BIAD2452 119799 https://uk1s3.embassy.ebi.ac.uk/bia-integrator-data/S-BIAD2452/cad13c96-7ee6-44d7-8ab4-7ea644256e4f/1557314f-c018-4d8b-b406-fbc2f7e0ae04.ome.zarr/0
S-BIAD2452 115425 https://uk1s3.embassy.ebi.ac.uk/bia-integrator-data/S-BIAD2452/f9c5157b-a980-4721-8131-85a35de1fb6e/271bf14e-6675-4bde-9d21-59b1076e5ffe.ome.zarr/0
```

# What about...




The “Publish my data” button?

# In development: RO-Crate in, RO-Crate out

---

## Inbound: BIA Submission Profile

- Defining an RO-Crate profile for BIA submissions
- Foundation for programmatic submission workflows
- Bundles data, metadata & provenance in a FAIR-compliant package



Publish my  
data!

---

## Outbound: Building RO-Crates for Existing Data

- Generating RO-Crates for all existing BIA & EMPIAR entries
- Structured, linked metadata in a standard packaging format



# In development: submission system

---

## Joint EMPIAR & BIA System

- Unified submission pipeline for both EMPIAR and BIA
- Built-in curation and review of incoming data
- Programmatic submission supported via RO-Crate

---

## Timeline

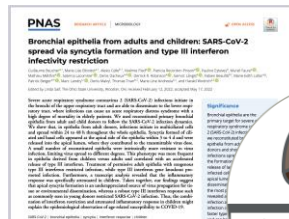
- Initial user testing from mid-2026
- Will gradually take the place of both BIA and EMPIAR submission systems



# In progress: Targetted data curation + wider conversion

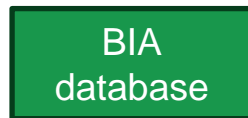
## OME-Zarr Conversion

- All images for selected studies; at least 5 per study for as many as possible
- Stage converted OME-Zarr to S3



## EMPIAR Conversion Roadmap

- Volume EM → **cryoET** → SPA



<https://beta.bioimagearchive.org/bioimagearchive/galleries/volumeem>



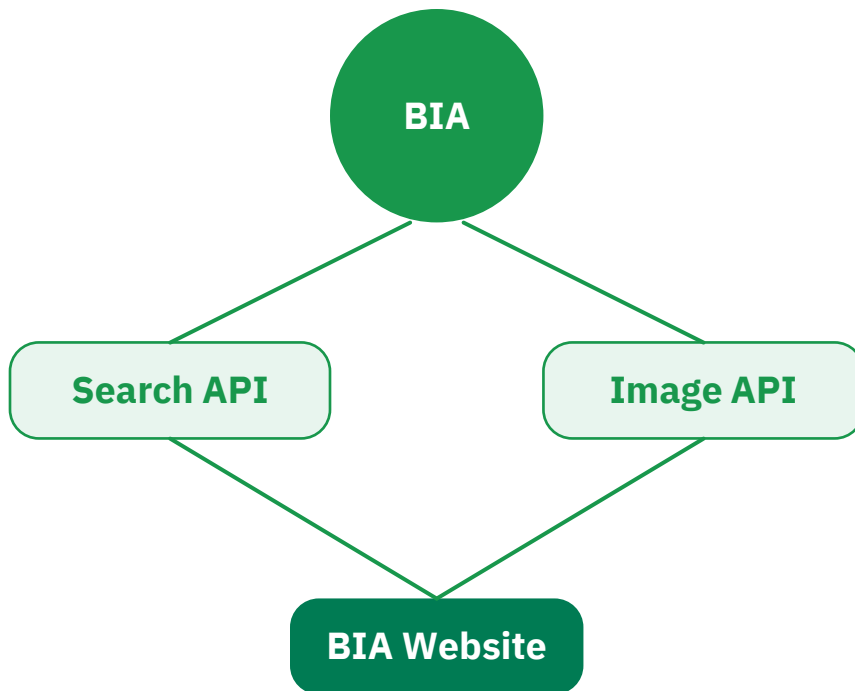
# API access

## Two Core APIs

- **Study API:** whole studies with summary info
- **Image API:** individual images with fine-grained filtering
- Both include search; power the BIA website

## Status & Testing

- World-accessible, expect breaking changes
- Seeking volunteers for early testing!





# founding**GIDE**: Global Image Data Ecosystem



Enabling bioimage data exchange based on global coordination of technical developments among data infrastructures and communities



Funded by  
the European Union



BioImage Archive



SSBD  
:database

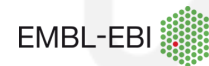


Consiglio Nazionale  
delle Ricerche

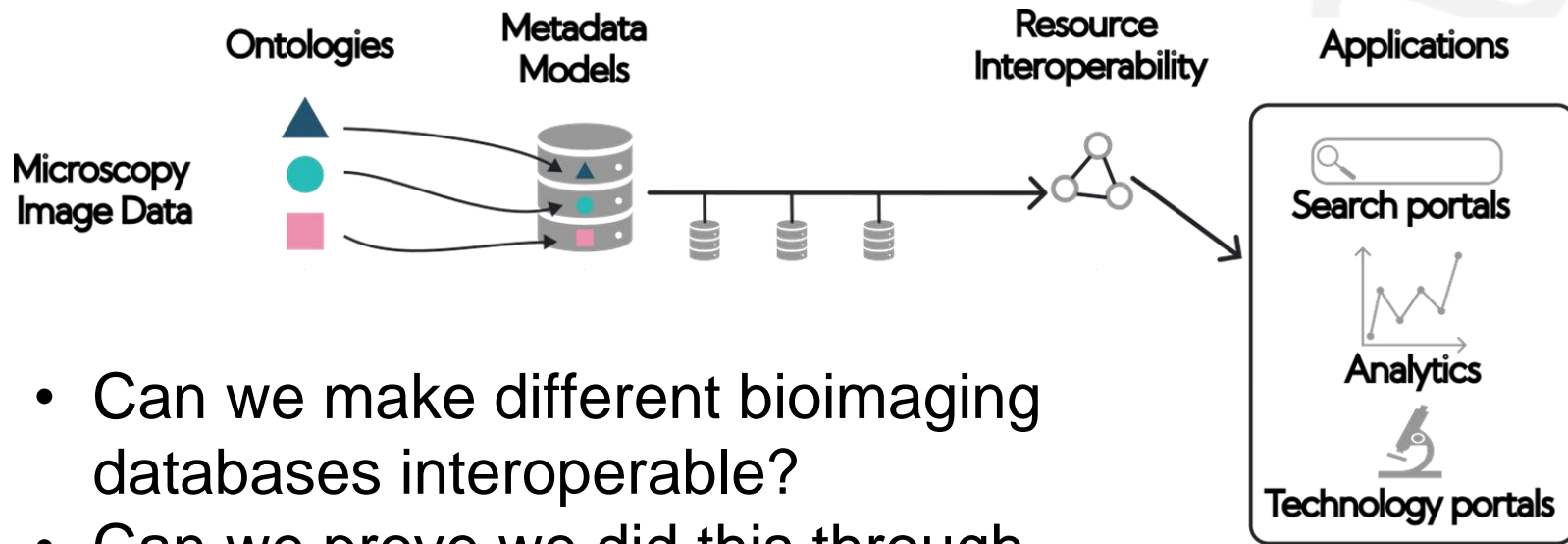


## Our stakeholders

- Research Infrastructures and networks
- Data infrastructures
- Technical and communities initiatives
- Individual researchers



# GIDE:BioImaging - a path to global interoperability



- Can we make different bioimaging databases interoperable?
- Can we prove we did this through shared search?

# GIDE:BioImaging - search

<https://wwwdev.gide-project.org/portal>

- Single point of entry search
- ~1300 datasets, over 1.5 PiB of open access data
- Four data resources covering data from around the world




IDR



BioImage Archive

SSBD:repository

SSBD:database

 foundingGIDE

AboutSearch

## Search GIDE databases

**Publisher**

- ☐ BioImage-Archive (804)
- ☐ SSBD:repository (175)
- ☐ SSBD:database (158)
- ☐ IDR (138)

**Organism**

- ☐ Homo sapiens (519)
- ☐ Mus musculus (378)
- ☐ Arabidopsis thaliana (46)
- ☐ Drosophila melanogaster (43)
- ☐ Saccharomyces cerevisiae (32)


[Show 10 more](#)

**Imaging Method**

- ☐ fluorescence microscopy (381)
- ☐ confocal microscopy (327)
- ☐ time lapse microscopy (175)
- ☐ bright-field microscopy (121)

Enter search terms... **Search**

Page Size: **Default**



**2D and 3D instance segmentation of nuclei from volume electron microscopy data**

Kedar Narayan

Published: 2026-02-03 Licence: [CC0](#)

2D and 3D instance segmentation of nuclei from array tomography (AT) and FIB-SEM datasets, respectively. In this deposition, 10 AT and 2 FIB-SEM datasets and paired annotations are included. Note: in several datasets, partial annotations of nuclei at image edges have been deleted. These are indicated in the annotation metadata.

Imaging Methods: [scanning electron microscopy \(SEM\)](#), [focussed ion beam scanning electron microscopy \(FIB-SEM\)](#)

Organisms: [Homo sapiens](#), [Mus musculus](#)

**Visual quantification of prostaglandin E2 discharge from a single cell**

Kenta Terai, Tetsuya Watabe, Shinya Yamahira

Published: 2026-01-21 Licence: [CC BY 4.0](#)

Calcium transients drive cells to discharge prostaglandin E2 (PGE2). The authors visualized PGE2-induced

# GIDE:BioImaging: search API

<https://wwwdev.gide-project.org/search/search>

- Full API access to search
- Supports further portal development
- Enables access via AI agents

## Schemas

### BioSample ^ Collapse all object

@id\* string

@type\* > Expand all array<string>

name\* string

description\* string

taxonomicRange > Expand all array<object>

hasCellLine > Expand all (array<(object | string)> | string)

Additional properties allowed

## gide-search <sup>0.1.0</sup> <sup>OAS 3.1</sup>

/search/openapi.json

Unified search API for biological imaging databases

Servers

/search

### default

GET /search Search

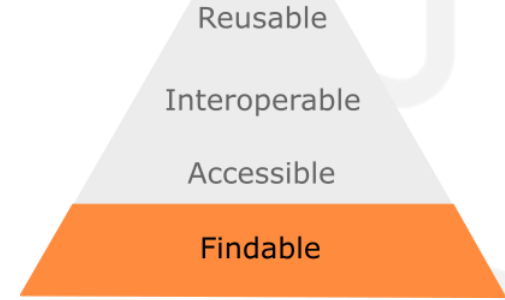
GET /api/entry/{entry\_id} Get Entry

GET /health Health Check

# GIDE:BioImaging - RO-Crate Profile

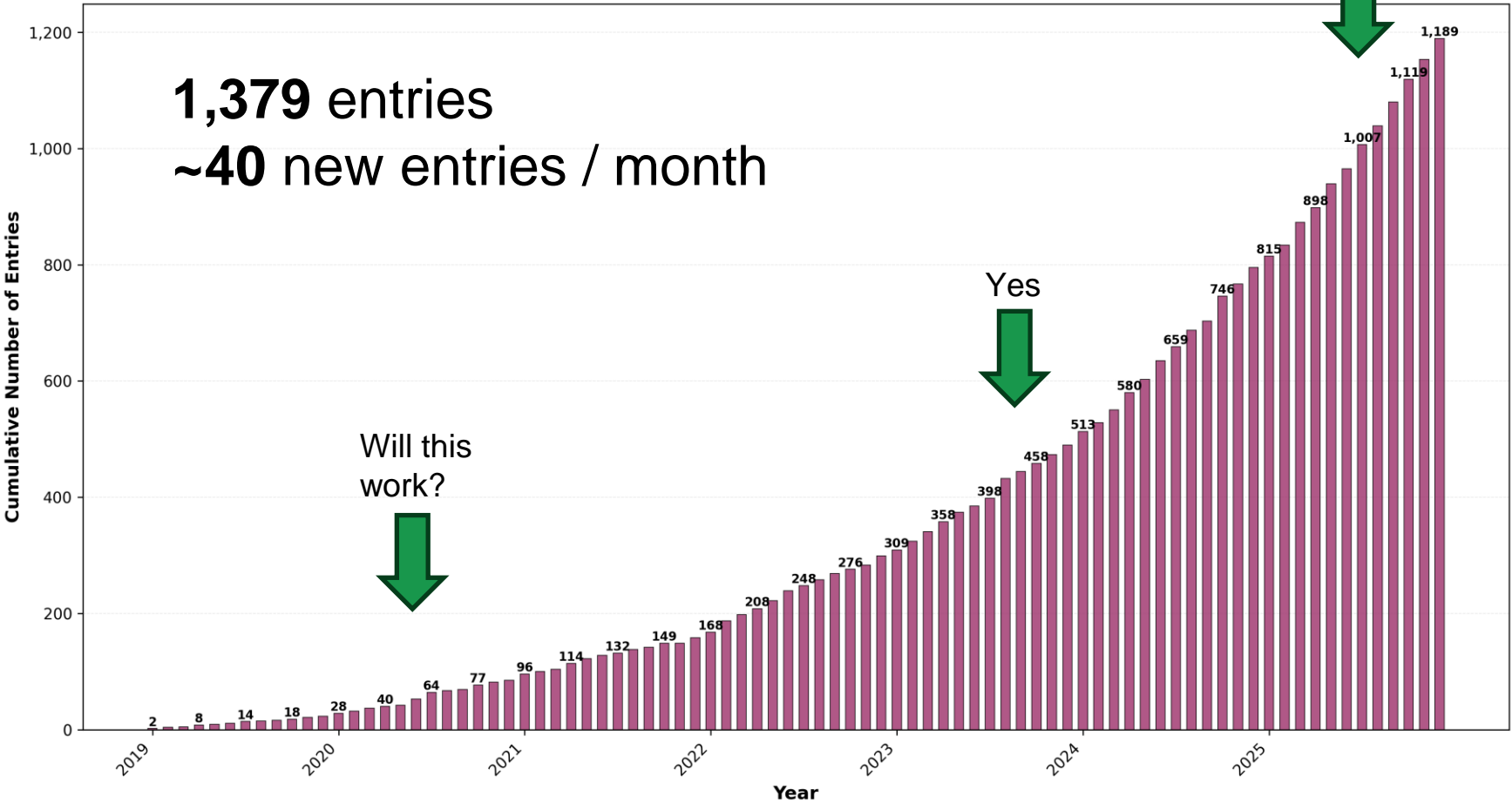
<https://www.gide-project.org/ro-crate/search/1.0/profile>

1. FAIR metadata for Findable data
2. Focus on describing the dataset as a whole:
  - a. Biological subjects
  - b. Imaging methods
3. Use ontology terms & provide enough details for human readability
  - a. Not providing full definitions of terms that exist elsewhere
4. Follow RO-Crate standard requirements, and inspired by BioSchemas
  - a. Use BioSchema profile properties, though not trying to achieve full compliance for defining terms (see 3.a.)

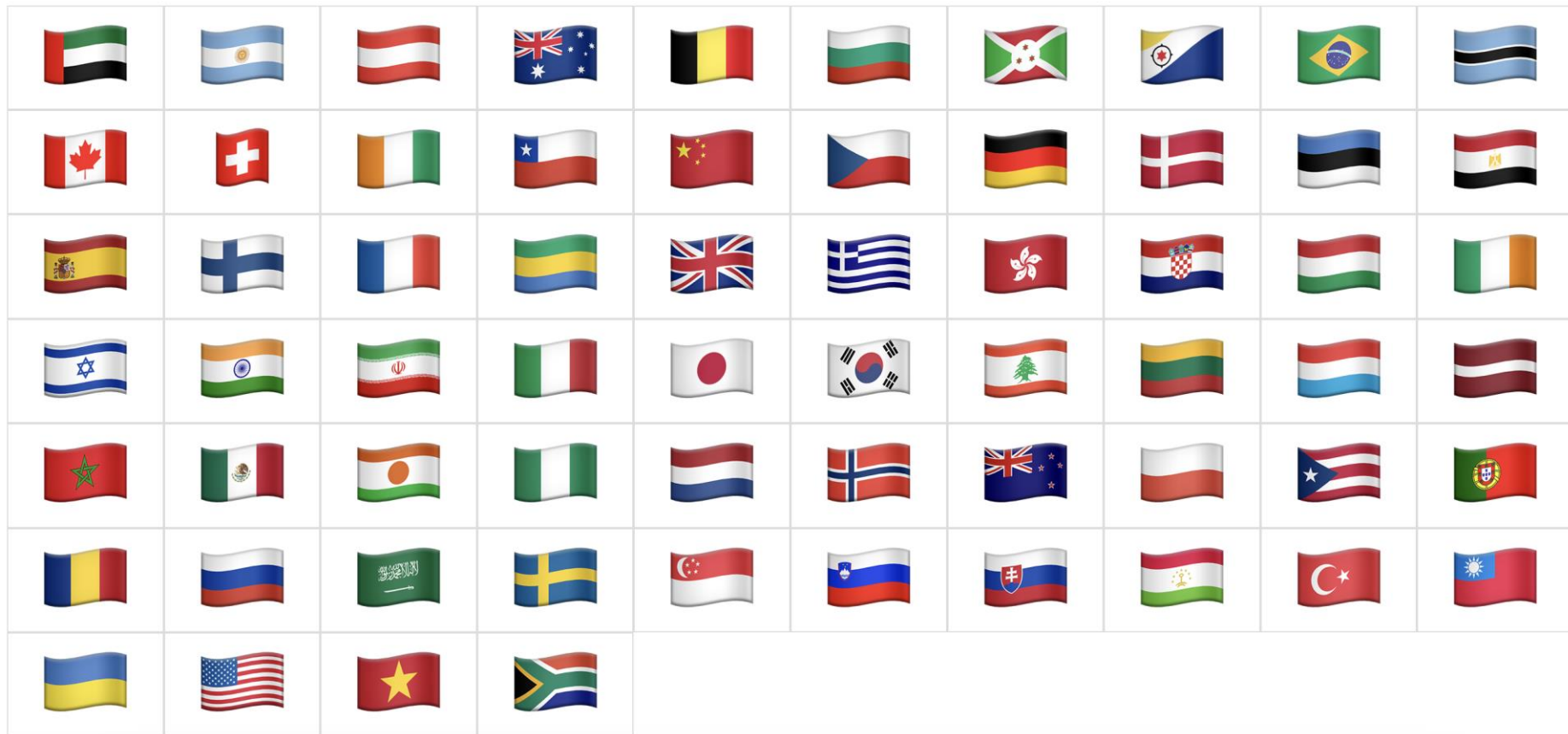


<https://bioschemas.org/BioSample>  
<https://bioschemas.org/Taxon>  
<https://bioschemas.org/LabProtocol>

# Cumulative count of archive entries



# ~64 different countries provide depositions



# Globally shared biodata management



50 years

Protein structures



45 years

Genomes and sequences



40 years

Curated catalogue of proteins



20 years

Research literature



10 years

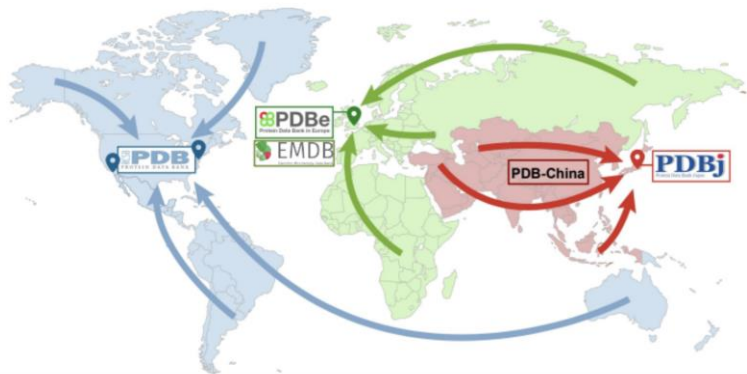
Mass spectrometry



0 years

Imaging





## CHARTER OF THE WORLDWIDE PROTEIN DATA BANK

Agreement between

RESEARCH COLLABORATORY FOR STRUCTURAL BIOINFORMATICS PROTEIN DATA BANK (RCSB PDB Organization), Rutgers, The State University of New Jersey, Piscataway, New Jersey, United States

and

The EUROPEAN MOLECULAR BIOLOGY LABORATORY ("EMBL"), an intergovernmental institution established by treaty, headquartered at Meyerhofstrasse 1, 69117 Heidelberg, Germany acting through its UK Outstation the European Bioinformatics Institute ("EMBL-EBI"), located on the Wellcome Genome Campus in Hinxton, Cambridgeshire, UK, operating both the PROTEIN DATA BANK IN EUROPE (PDBe Organization) and the ELECTRON MICROSCOPY DATA BANK (EMDB Organization)

and

PROTEIN DATA BANK JAPAN (PDBj Organization), Osaka University, Osaka, Japan

and

BIOLOGICAL MAGNETIC RESONANCE DATA BANK (BMRB Organization), University of Connecticut, Farmington, Connecticut, United States

Effective from January 1, 2021

## CHARTER OF THE WORLDWIDE PROTEIN DATA BANK (wwPDB)

### 1. Rationale

The Worldwide Protein Data Bank (**wwPDB**) was created to provide an enduring organizational framework for global management and dissemination of public-domain structural biology data.

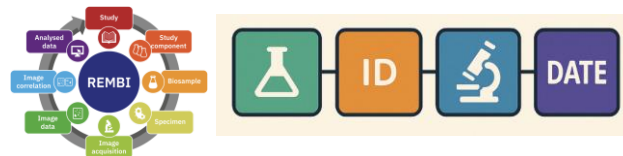
## wwPDB collaboration resource commitments

November 2025 - October 2026

wwPDB Partner	Software Development	Production Maintenance	Project Management	Requirements Setting/ Testing	Core Archive Keeping*	Outreach	Biocuration/ Remediation	Total FTE Commitments

# Next steps: growing **GIDE-bioimaging**

- Lightweight governance process
- Standardising the “GIDE stack”
- Expanding to new resources



**foundingGIDE**  
founding a Global Image Data Ecosystem

*From Interoperability to Global Impact*

foundingGIDE  
**Community Event 2026**  
**Heidelberg, Germany**  
**4–6 of May**  
7–8 of May Workshops and Hackathon

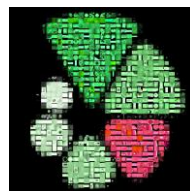
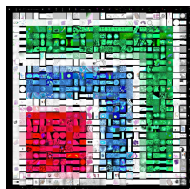
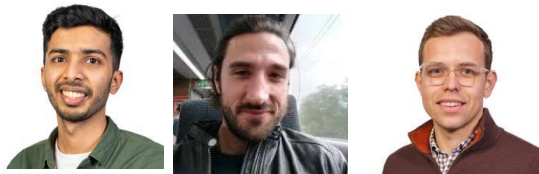
EMBL Heidelberg

Japan Australia Europe  
2024 2025 2026

EUROBIOIMAGING GLOBAL BIOIMAGING growing collaboration EMBL

Funded by the European Union

# Thanks!



Medical  
Research  
Council

GLOBAL  
BIOIMAGING  
growing collaboration



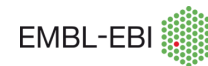
Projects have been funded by the European  
Union's Horizon 2020 research and  
innovation programme

Chan  
Zuckerberg  
Initiative



## founding **GIDE**

- Maria Mirza
- Aastha Mathur
- Sudeep Das
- Tiago Lubiana
- Koji Kyoda
- Yuki Yamataga
- Hiroya Itoga
- Damien Goutte-Gattat
- Josh Moore
- + many others!





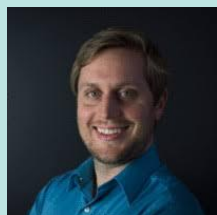
## Euro-BiolMaging and Global BiolMaging Teams



BiolMaging Archive Team



RIKEN Team (Missing: Yuki Yamagata)



National Imaging Facility Team



Microscopy  
Australia Team



GerBI Team



EMBL-EBI 