

# Online workshop: Opportunities in Life Sciences and Cultural Heritage opened up by Compact Light Sources

**Mon 2 Oct 9:30 – 12:30**

VISION: to establish a scalable nationwide grid of Compact Light Sources (CLS-Grid) providing access to a range of regionally delivered expert centres each hosting a high-quality X-ray beamline for imaging, diffraction and spectroscopy, integrated into a national network of spokes with Diamond Synchrotron as the Hub.

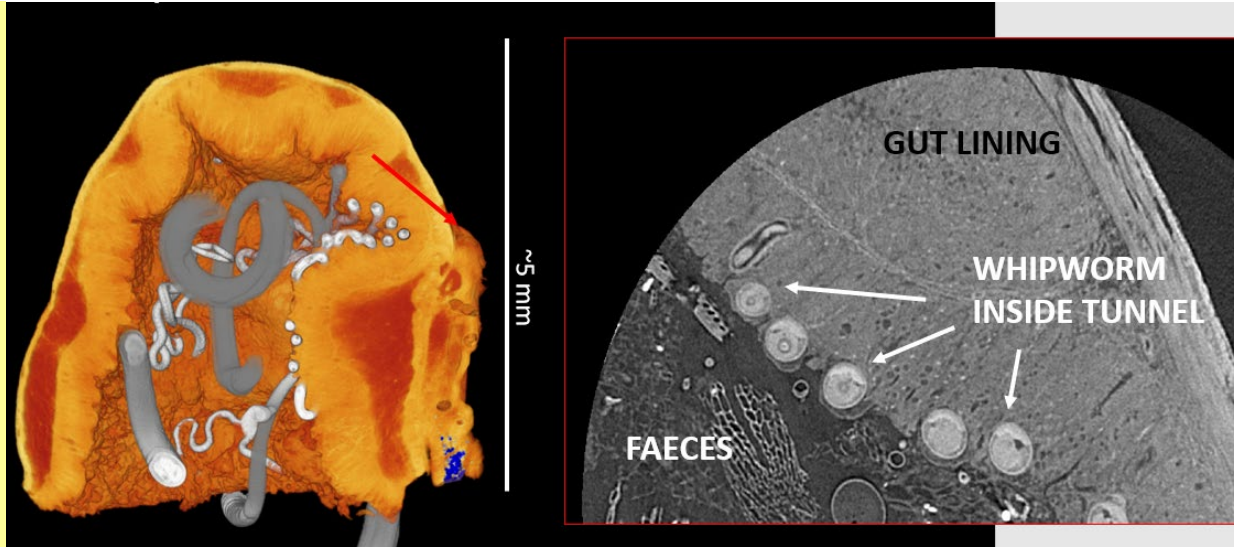
Each node will host an X-ray beamline **tailored to specific science** and engineering themes based around local and national priorities, e.g. life science imaging, materials science, batteries, cultural heritage and chemical engineering.

**Workshop aim:** Discover what **new life science research** could be enabled by CLS-Grid

**No X-ray experience necessary!**

Help us explore potential applications at a Life Science node:

- Structural imaging of soft tissue like organoids, organs, tumours, embryos, without complex sample preparation
- Experimental steering for efficient bridging of correlative or multimodal workflows containing LM and/or EM
- Imaging hard tissue e.g. bone or teeth
- Non-destructive imaging of plants



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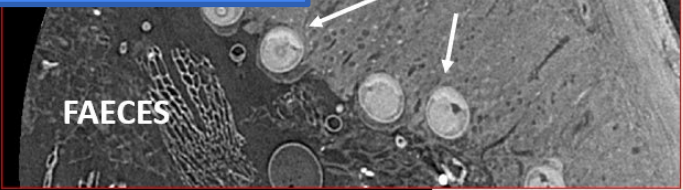
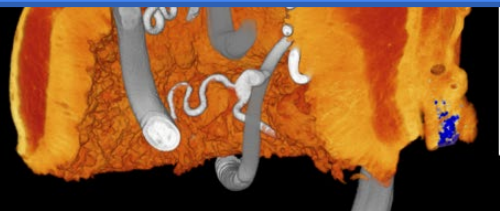
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**More info and details of how to register will be sent over the usual BiolmagingUK channels!**

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No X-ray experience necessary!



# UK Bioimaging Hardware Infrastructure Online Community Workshop

**SAVE THE DATE!**

Weds 8 November

13:00 – 16:30



- Following our 2020 community white paper, establishment of the UK Euro-BioImaging Node, and community initiatives such as volumeEM, the time is right to propose a national plan
- We want to develop a “**VISION**” document / white paper for national bioimaging infrastructure
- We suggest two streams with funding available in both:
  - 1) User Access
  - 2) Technology Development

**We really value your input - join us to help shape the future UK strategy!**

Further details over the BioUK mailing list, twitter, etc.

*Proposal for a UK Bioimaging Data  
Infrastructure:*

BioImagingUK Data Node



# Background to BioDN

## *Timeline:*

Began as a BOG discussion on the UK Imaging Nodes Consultation

Published a white paper with recommendations for image data services

Data Node discussions continued as a BOG on the BioImagingUK in-person meeting

Data Working Group formed and provisional discussions held online

Jason Swedlow, Maddy Parsons and Georgina Fletcher drafted BioDN proposal

Spring 2020

Summer 2020

Summer 2022

Autumn 2022

Spring 2023



[www.ukri.org/what-we-offer/creating-world-class-research-and-innovation-infrastructure/digital-research-infrastructure/](https://www.ukri.org/what-we-offer/creating-world-class-research-and-innovation-infrastructure/digital-research-infrastructure/)

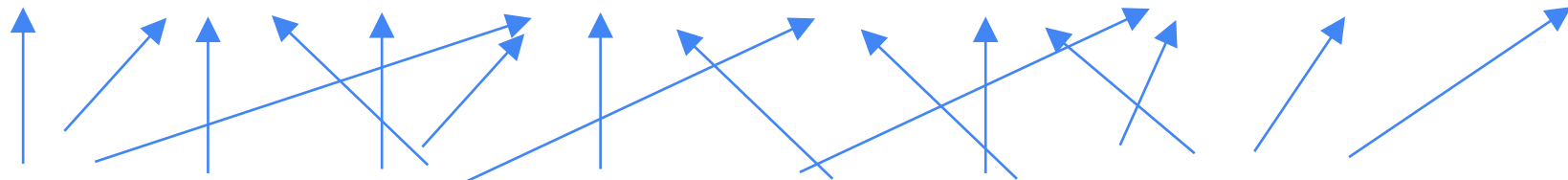
# UK Bioimaging Data Infrastructure: *why?*

- The UK has several bioimaging resources (e.g. OME, BIA, EMPIAR), which are part of a larger network but they **require substantial technical knowledge** to access and implement, **and lack visibility** to researchers outside the core imaging community
- Trend for datasets to be larger and more complex; AI/ML tools are already transforming the research environment but are difficult for non-experts to integrate and adapt into workflows

→ **Most researchers don't know how and when to use the best tools and resources**

**A national digital bioimaging infrastructure would:**

- *democratise access to knowledge/tools*
- *drive significantly enhanced impact from the wealth of UK bioimaging data*
- *connect bioimaging data scientists and instrument developers with the broader user base*
- *co-ordinate cross-domain, cross-scale collaboration to drive solutions to emerging global image analysis challenges*



MicroscopyDB

FocalPlane

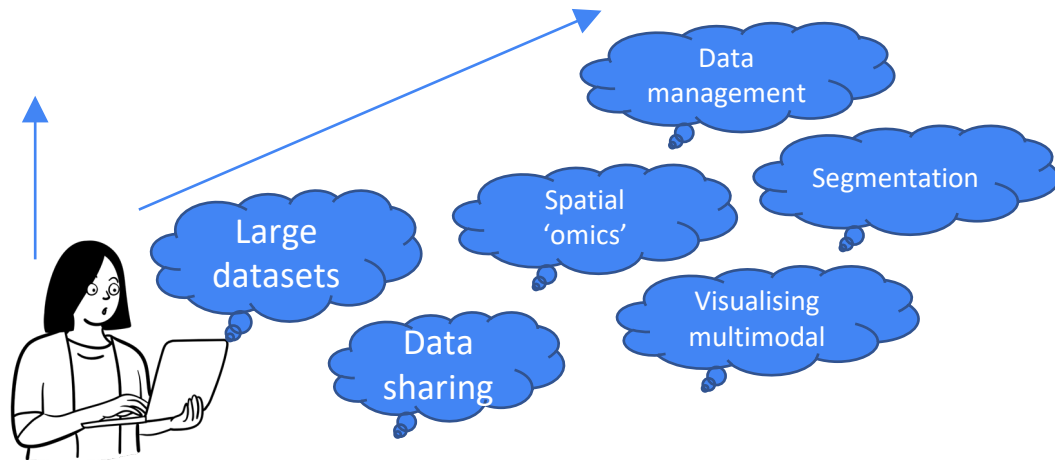
Ask Colleagues

Google/YouTube

Avoid!

### Current situation:

- **Overwhelmed/confused**
- **Slow**
- **Siloed**



# Evidence I

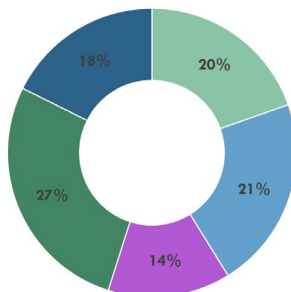
## 2022 Wellcome Trust BioImaging Landscape Survey

(n=385, 36% UK)

*(Unpublished, thank you WT for sharing)*

### Top 3 **scientific & technological** barriers:

1. Quality and reproducibility challenges (n=54, 21%)
2. Lack of appropriate image analysis methods (n=43, 17%)
3. Quantitation challenges (n=28, 11%)



### Solutions:

- Training
- Collaboration (e.g. data sharing)
- Standards/Metadata
- Infrastructure (including people and resources)
- AI implementation

### Top suggestions:

Training & best practice guidelines

Collaboration across stakeholders (scientists, developers..)

Dedicated resources for data management and image analysis projects

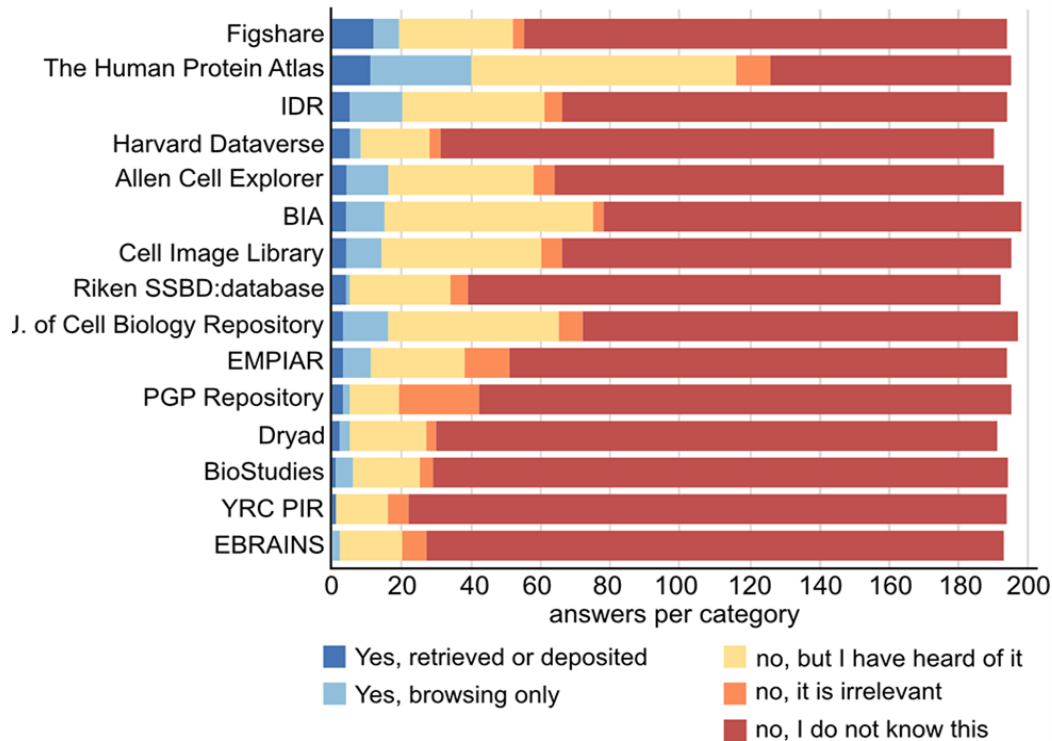
Further implementation of AI and deep learning in image analysis/acquisition

Relevant findings in infrastructure barriers and other barriers but not shown in the interest of time

# Evidence II – 2022 German Biolmaging Survey n=205, ~ 7% UK

[doi.org/10.12688/f1000research.121714.1](https://doi.org/10.12688/f1000research.121714.1)

## ) use of repositories for bioimaging data

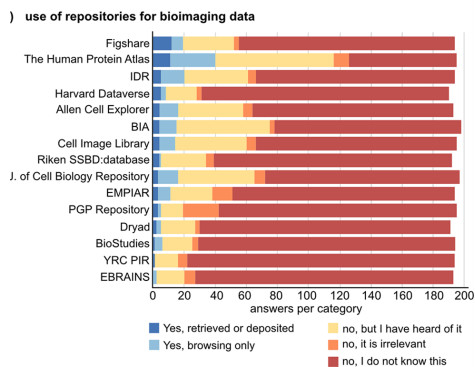


### Data handling example:

The majority of respondents had not heard of the repositories shown in the chart, with the exception of Human Protein Atlas (and <20% had used or visited HPA)

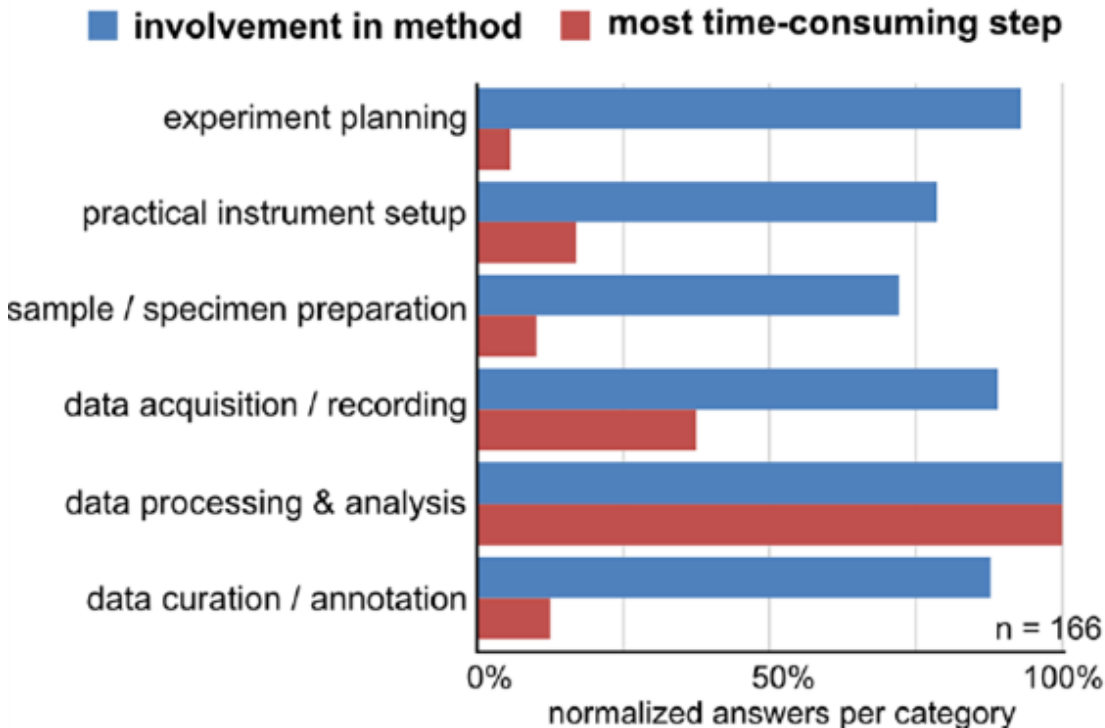
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## Data processing and analysis example:

All respondents do this and all find it the most time-consuming step



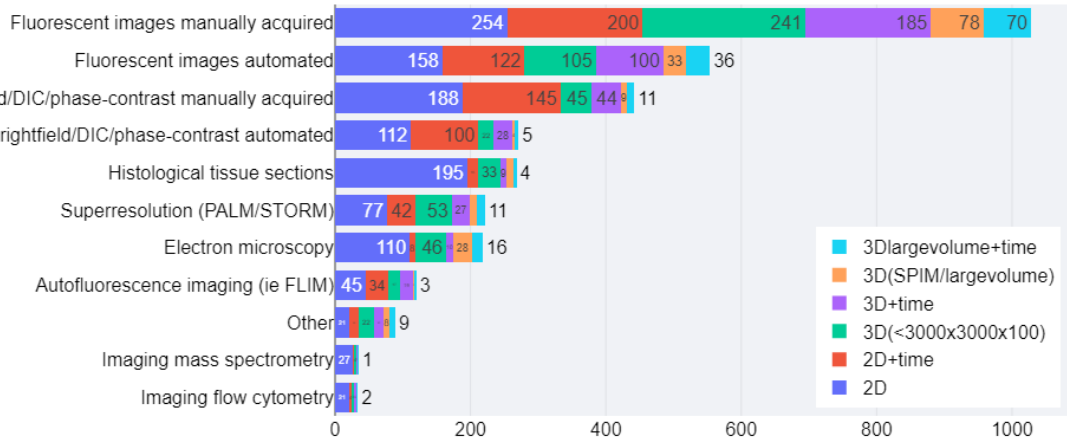
# Evidence III – 2018 & 2022\* COBA/BINA/RMS Surveys \*n=493, 46% Europe

What kinds of images do you commonly want to analyze (life sciences)

[doi.org/10.1101/2023.06.05.543701](https://doi.org/10.1101/2023.06.05.543701)  
[doi.org/10.1017/S2633903X21000039](https://doi.org/10.1017/S2633903X21000039)

2022

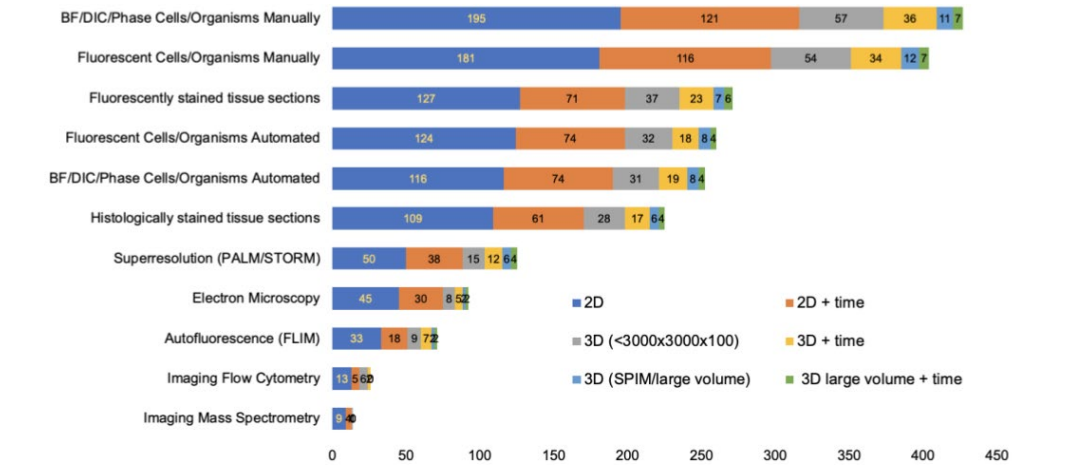
Majority of image analysis workflows are of the “workhorse” variety

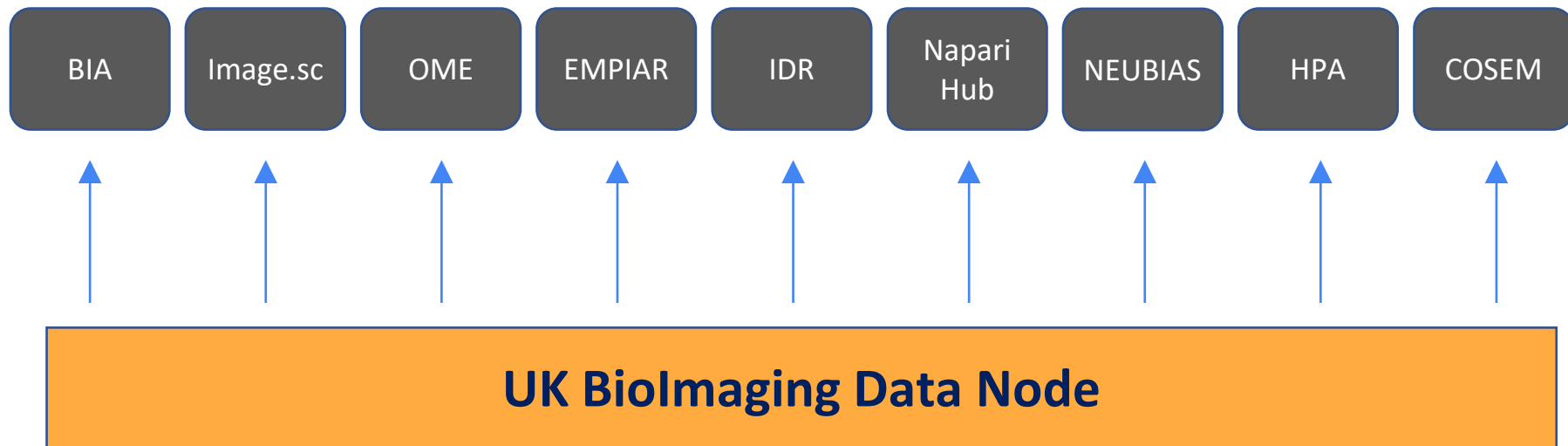


“Respondents’ needs are documentation, detailed tutorials on the usage of image analysis tools, user-friendly intuitive software, and better solutions for segmentation, ideally in a format tailored to their specific use cases.”

2018

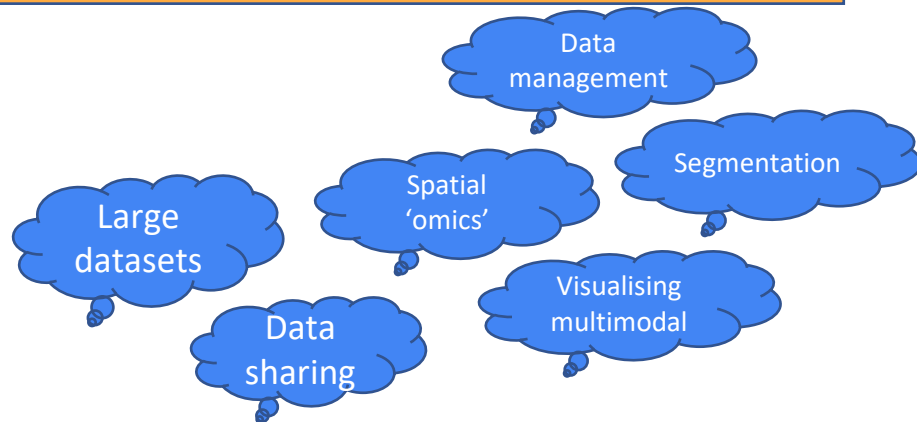
In addition, the community suggests the need for a common repository for the available image analysis tools and their applications.”



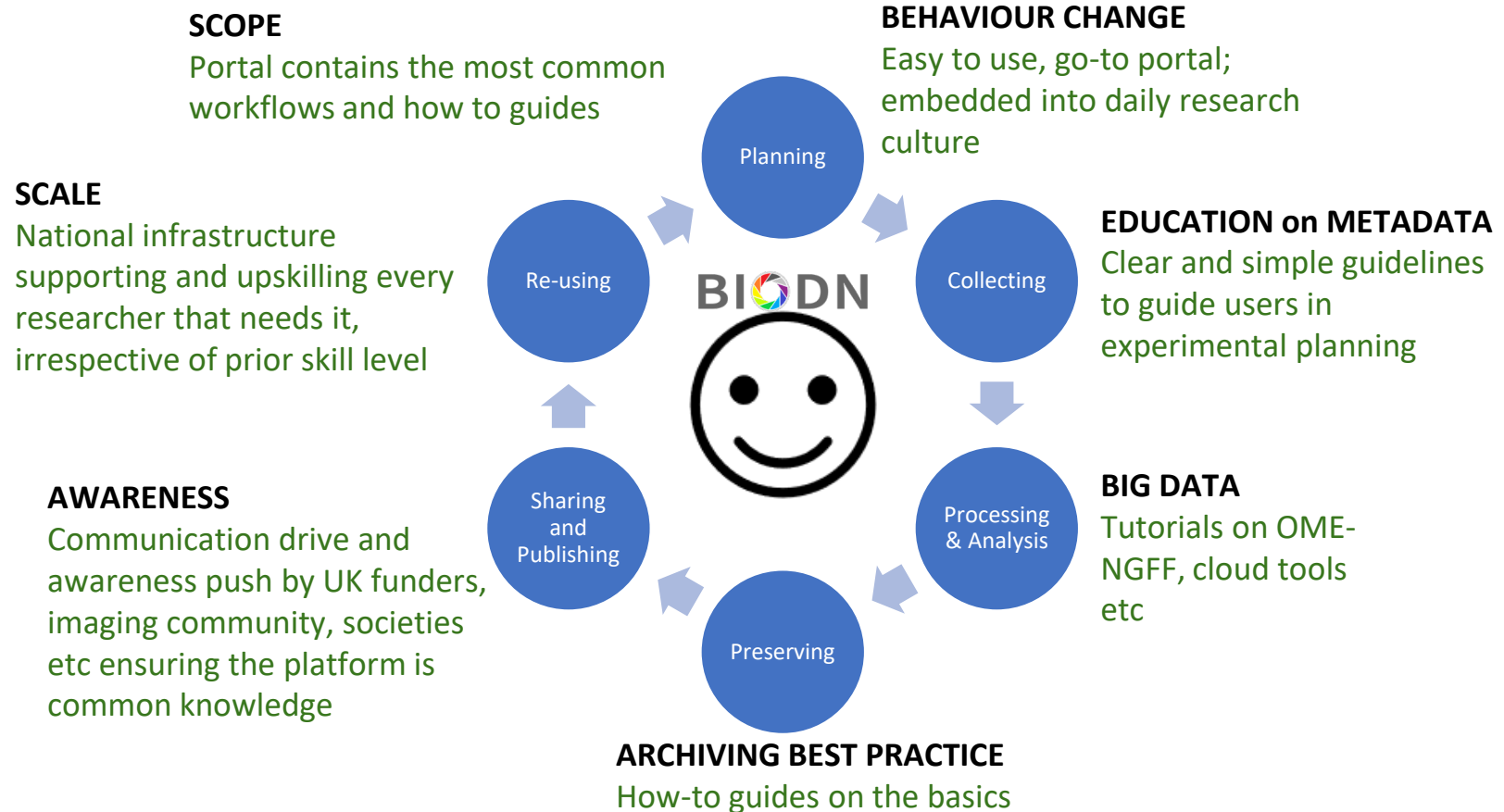


**With a Bioimaging DRI:**

- *Trusted/reliable/current*
- *Faster and easier*
- *Cross-disciplinary*



# BioDN would resolve pain points in the bioimaging data management cycle



## **Common use case examples:**

1. How do I find out what tools I need in order to use OME-NGFF files for vEM?
2. How should I manage histology images associated with my cancer profiling project?
3. How can I properly manage and store my 15TB+ of lightsheet data?
4. Where should I deposit my bioimaging data related to a publication in press?
5. The computer scientist who wrote the analysis code I need isn't answering emails, and the script isn't working anymore, where can I get help?
6. What choices are there for segmenting objects in a timelapse movie?
7. Is it possible to combine, analyse and visualise multimodal imaging datasets?
8. Are there trusted open access AI algorithms I can use to analyse my high content imaging data?

# Proposed Timeline for BioDN

## Proof-of-Concept Phase ≈ 2 yrs (~£750K)

- **Set up a unique comprehensive portal, upload training guides & set up a discussion sites for UK scientists to connect**
- Work with ELIXIR to join up workflows
- Publicise widely across entire research community
- Strengthen links to international initiatives
- Strengthen links to UK industry
- Strengthen links to Medical Imaging community
- Capture metrics, impact and outcomes from user access
- Run workshops to understand community needs in expansion phase

## Expansion Phase ≈ 5 yrs (~£?M, defined in PoC)

- **Expand to include technology development, data formats, data resources**
- Link in with other UK DRIs (OME, EBI etc) to create a National BioImaging Data Node
- Horizon-scanning to develop emerging, strategically important solutions for advanced bioimaging problems
- Develop interactive web-based tools for integration of complex multimodal datasets for delivery of novel biological and biomedical knowledge
- Drive connectivity across diverse spatial biology research domains and linkage of emerging hardware to software

# Slido questions on BioDN

Go to [www.slido.com](https://www.slido.com) and enter the code: **9025957**



- |                                                                        |                   |
|------------------------------------------------------------------------|-------------------|
| 1. Do you broadly agree with the description of the current situation? | Yes, No, Not sure |
| 2. Do you broadly agree with the common use case examples?             | Yes, No, Not sure |
| 3. Regarding use cases, is something critical missing?                 | Yes, No, Not sure |
| 4. If you answered yes to 3, please briefly describe the problem       | open text answer  |
| 5. Do you think BioDN would help to solve the current key issues?      | Yes, No, Not sure |
| 6. Do you think BioDN is important for the UK research community?      | Yes, No, Not sure |
| 7. Do you think the BioDN priorities are correct?                      | Yes, No, Not sure |

Questions and feedback welcome!