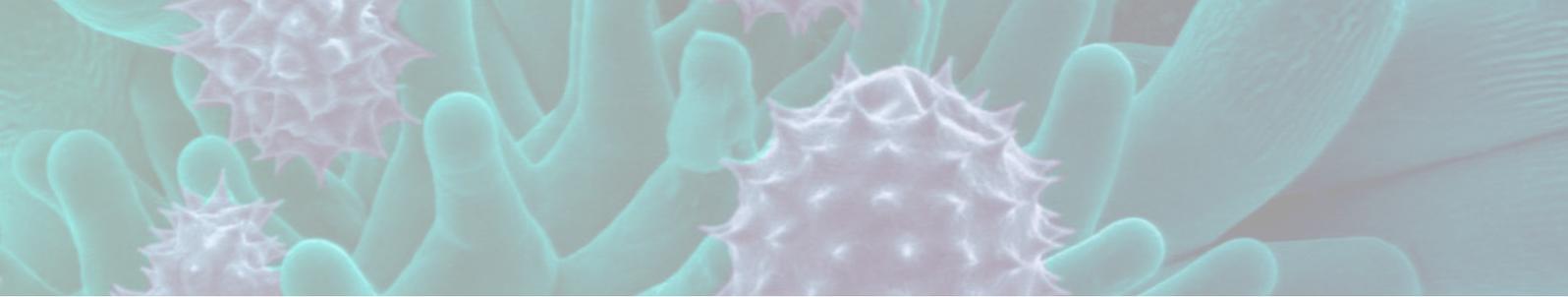


**INTERNATIONAL RECOMMENDATION FOR
ORGANIZING TRAINING COURSES FOR CORE
FACILITY STAFF**



GLOBAL BIOIMAGING PUBLICATIONS PART 3: TRAINING COURSES

INTERNATIONAL RECOMMENDATION FOR ORGANIZING TRAINING COURSES FOR CORE FACILITY STAFF

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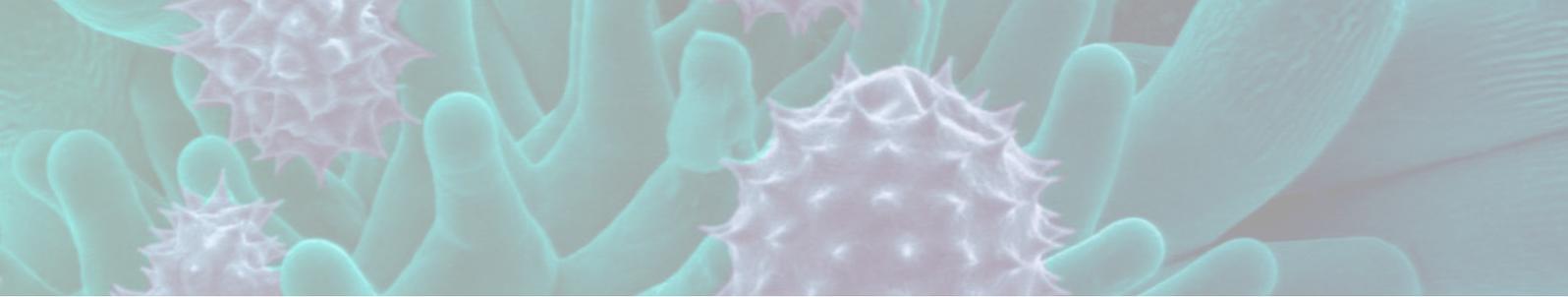
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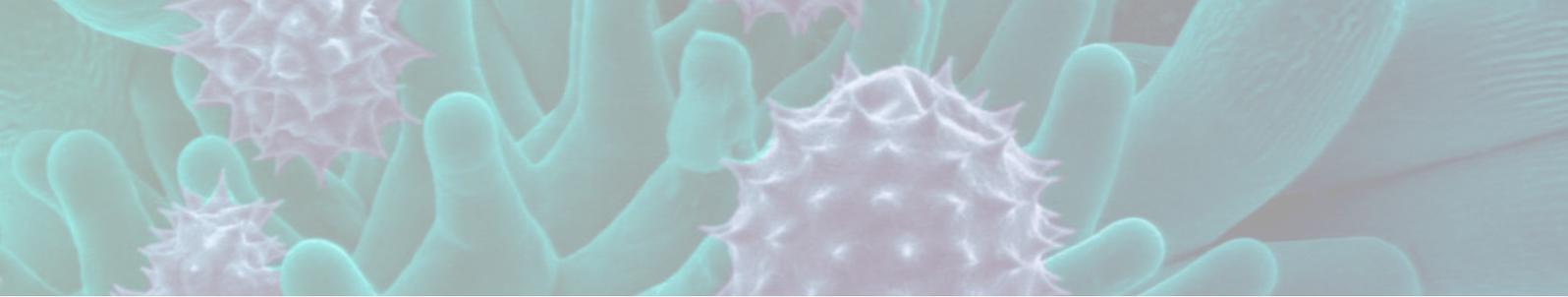
ABSTRACT

Since 2016, Global Bioimaging (GBI) partners have been organizing international training courses for imaging core facility staff on topics such as facility management and image data handling. Based on their own experience as well as collecting in-depth feedback from trainers and participants in these courses, GBI partners are now publishing an “International recommendation on organizing training courses for facility staff”. The recommendation additionally considers the input from the experts and trainers in the GBI Working Group “Training Core Facility Imaging Scientists”, community feedback, and consultation of existing recommendations such as the Global Bioimaging deliverable D3.3 “Training courses for facility staff” published in 2018.

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INTERNATIONAL RECOMMENDATION FOR ORGANIZING TRAINING COURSES FOR FACILITY STAFF

GENERAL INTRODUCTION

In the times of democratizing access for all scientists to expensive and cutting-edge instrumentation hosted by public research institutions, facility management has developed as a new career opportunity for scientists around the globe, although a clear curriculum or educational program for facility staff is still missing in most places. In view of this, Global BioImaging (GBI)¹, an international, open network of imaging infrastructures and communities, presents here a recommendation for facility staff training based on discussion among the experts, community feedback and existing recommendations (in particular, the Global BioImaging deliverable D3.3 “Training courses for facility staff” published in 2018²), as well as direct responses from participants of the GBI training courses. This recommendation has been developed in collaboration with the international GBI partners and their communities, the GBI Working Group “Training Core Facility Imaging Scientists”, including imaging facility directors and experienced trainers in core facility management and image data handling.

GBI is committed to providing access to high-quality training courses and training material. Training materials for core imaging facility staff and end users is available in Global BioImaging Virtual Training Platform³.

The focus of this recommendation is on organizing training courses for imaging facility staff in management of core facilities and image data handling.

INTERNATIONAL RECOMMENDATION ON ORGANIZING TRAINING COURSES FOR FACILITY STAFF

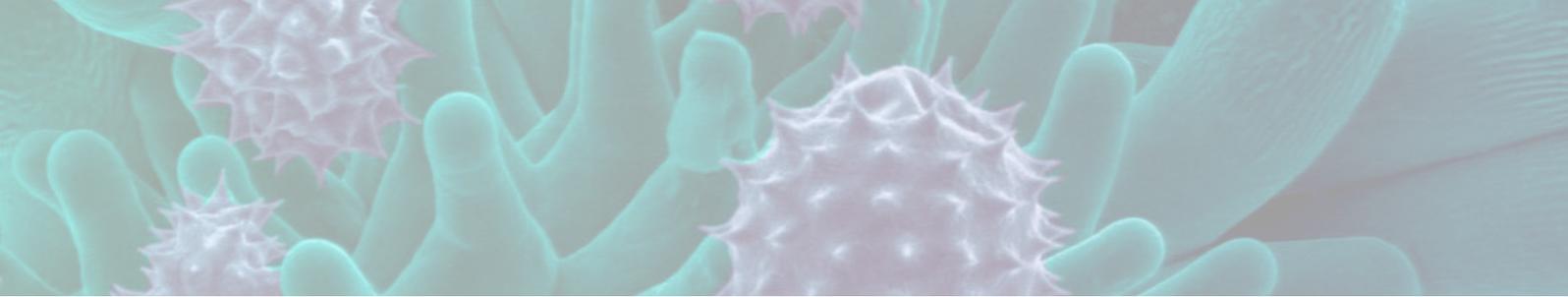
An advanced imaging core facility not only provides technical support, but also provides training tailored to the individual expertise and scientific needs of the end user. Thus, the quality of services in imaging technologies is determined by the highly specialized technical and scientific expert competence. To ensure that the qualified personnel of a core facility are developed to the highest level, coordinated and modular systems of advanced training are required. These training programs will enable imaging facility staff to reach the highest technical expertise in order to provide exceptional support to their users.

Courses for staff and managers of imaging core facilities should focus on one overarching topic, addressing for example facility management and administration or new imaging technologies or training in image data management. For each topic, GBI recommends organizing a course comprising of several different modules.

1 <https://globalbioimaging.org/>

2 Global BioImaging deliverable D3.3 “Training courses for facility staff” (2018)

3 <https://globalbioimaging.org/international-training-courses/repository>



The number of modules will dictate the duration of the course. GBI recommends a course with minimum duration of 3 days and maximum duration of 5 days. The GBI recommendations for organizing and running training courses for imaging facility staff are summarized below:

- Each course should focus on one overarching topic, e.g., facility management or image data handling but not both.
- The duration of a course should be 3-5 days depending on the topic, level of detail and type of modules offered during the course.
- Hands-on versus theoretical training should be well balanced and if possible, split evenly.
- Provision of training material such as videos, protocols, and exercises before the course so that group can focus more on hands-on, interactive exercises, open discussions and common goals and outcomes of the training experience.
- Separate courses should be organized for participants with different levels of experience and seniority.
- There should be a maximum of 25 participants per course.
- The application process should be openly advertised with evaluation of incoming applicants for their suitability and excellence reviewed and selected by an unbiased selection committee.
- Participants should be selected based on their application and motivation statement including the importance of the course for their work by an unbiased selection committee.
- Selection criteria and the selection process should be open and transparent to avoid any real or perceived bias in the process.
- An attempt should be made to balance the participants of the course based on region, gender, career stage and underrepresented groups.
- International courses aimed at participants from around the globe should be taught in English*.
- The value of networking should be emphasized, and course participants should be given the opportunity to introduce themselves, their facility, and work (e.g., via flash talks) and network during breaks.
- Trainers should provide course participants with training material ahead of time to increase training efficiency.
- Senior trainers should stay at least for a full day during the course to be available for questions and for networking purposes and are encouraged to participate in the entire course. The value of their presence, interactions with course participants and mentorship cannot be underestimated.
- For optimization of future courses, anonymous feedback from the participants should be collected through a survey sent to the participants immediately after the course.
- A second survey, impact assessment, can be conducted 6 months after the course to understand and gain feedback on tangible use of what the participants learned from the course to improve their practices in their own imaging facility.

*Figure 1: Recommended general out-set of training courses for imaging core facility staff.
Courses with only national or regional participants can be conducted in the local language

When designing the content for a course, organizers should clearly indicate their target audience, learning objectives and distinguish between facility staff levels. For example, early career staff with 0-3 years of experience working in a facility and focusing on day-to-day operation and technical tasks, or facility managers and directors with at least 3 years of working experience in a facility position with tasks including staff supervision, focusing on future strategic capability needs and directions, and measuring facility metrics, or established facility managers and directors with more than 10 years of experience managing a facility, writing grants, engaging with the institution, corporate partners and funders. This distinction is also relevant for the style and delivery of the course, as established facility managers might appreciate a more interactive workshop, where they have sufficient time to exchange ideas and discuss past experiences among the participants.

For facility management and administration, the course should be designed as a curriculum consisting of modules that address staff with increasing levels of working experience (see Figure 1). Audiences with different levels of experience also demonstrate distinct preferences regarding the modules. Early career facility staff members appreciate training in soft skills, for example, time management, user communication, conflict management, teamwork, and culture, whereas established facility managers emphasize the importance of budget administration, negotiation skills with institutional leadership and training in the demonstration of facility impact. Participants from the previous training courses who apply for the next course level (e.g., from Beginners level to Intermediate level) should be informed well in advance about upcoming training opportunities and their previous participation should be considered in the evaluation of the application. In more advanced courses, the audience could be divided into parallel sessions, which allow the sessions to address questions that are more specific to biological or biomedical imaging facilities (e.g., sample biohazards vs confidentiality of patient data).

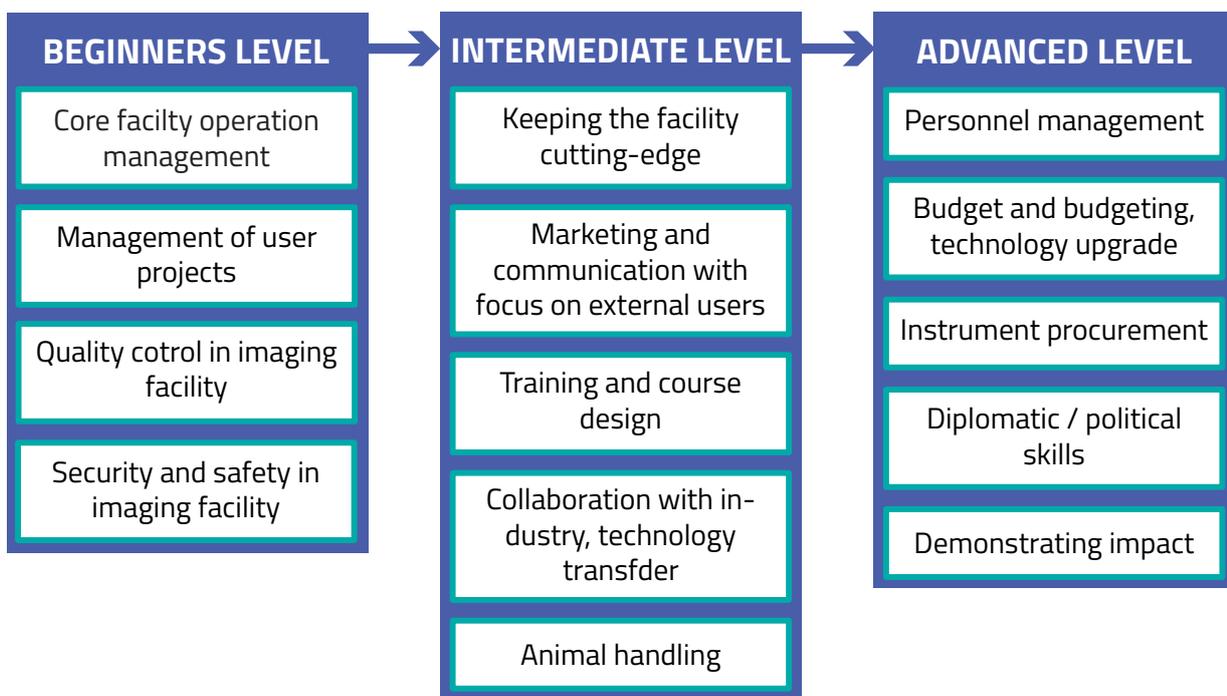
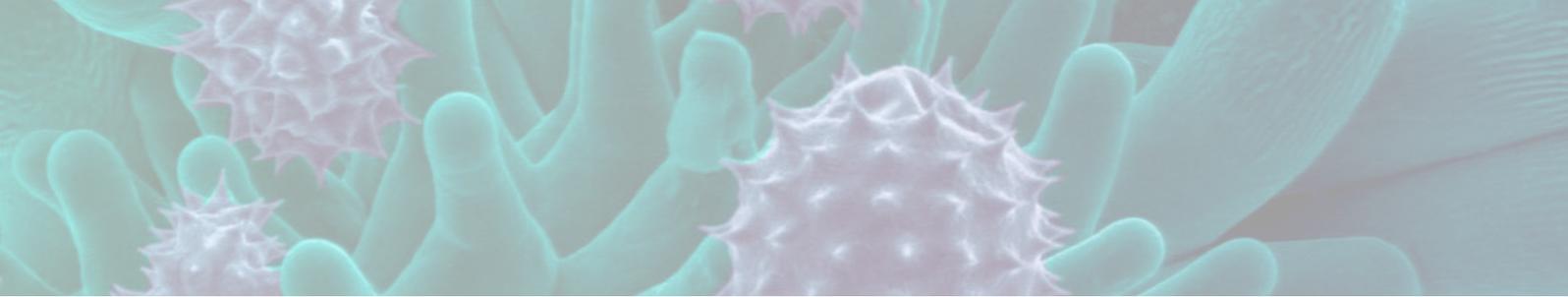


Figure 1. Examples of teaching modules addressing the topic of imaging facility management and administration. Specific teaching modules are assigned to the corresponding level of training for Beginners, Intermediate or Advanced participants. For each level, GBI suggests different modules and content in the course to best develop the skills required for imaging facility staff and managers.



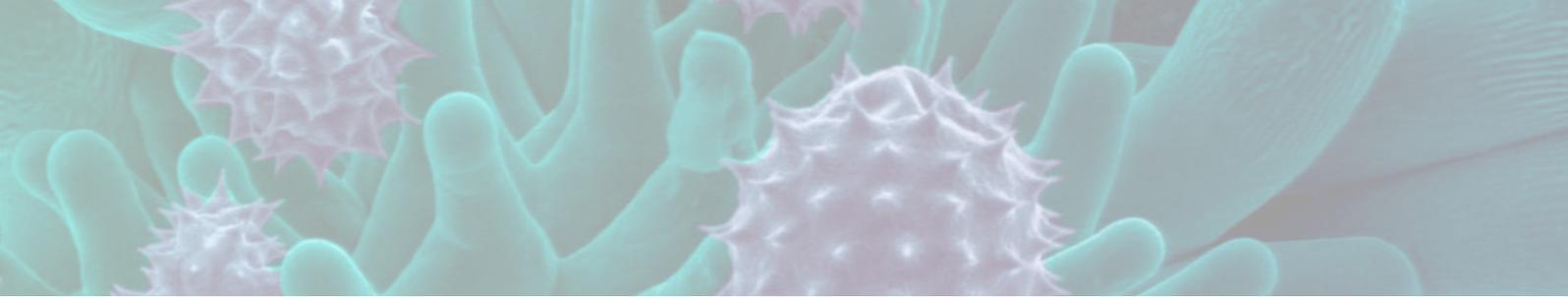
Facility management and administration

In addition to providing training on how to optimally support users, the added value of facility management course is to attract young and talented facility staff from all around the world and promote international knowledge exchange. This ultimately should accelerate science and result in more discoveries in interdisciplinary scientific areas, more high-impact publications, a greater number of innovations and technology developments, and extensive collaborations between researchers with their international counterparts.

On the right you will find examples of topics that can be part of the facility management and administration course:

- Facility administration and management, e.g., e-management, quality management and metrology
- Establishing an imaging facility
- Quality control in imaging facilities
- Outreach and communication with users
- Personnel management
- Budgeting and accounting
- Training and course design
- E-learning and virtual platforms for theoretical and hands-on user training
- Collaboration with industry and technology transfer
- Visits of academic and/or industry imaging centers and manufacturers of imaging equipment
- Soft skills relevant to facility staff with a focus on, e.g., conflict resolution, negotiation, and user communication
- Technology foresight to keep the facility cutting edge and identify technology upgrade requirements
- Management of user projects
- Measuring imaging facility impact





Data management and image analysis

A course focused on image data topics such as data management and/or image analysis would allow to demonstrate capabilities and technologies currently available in the field of image data management and/or analysis, to raise awareness on the current challenges in the field and to provide course participants with a new set of tools (and references) that can be used to tackle such challenges and improve their own facility's working life.

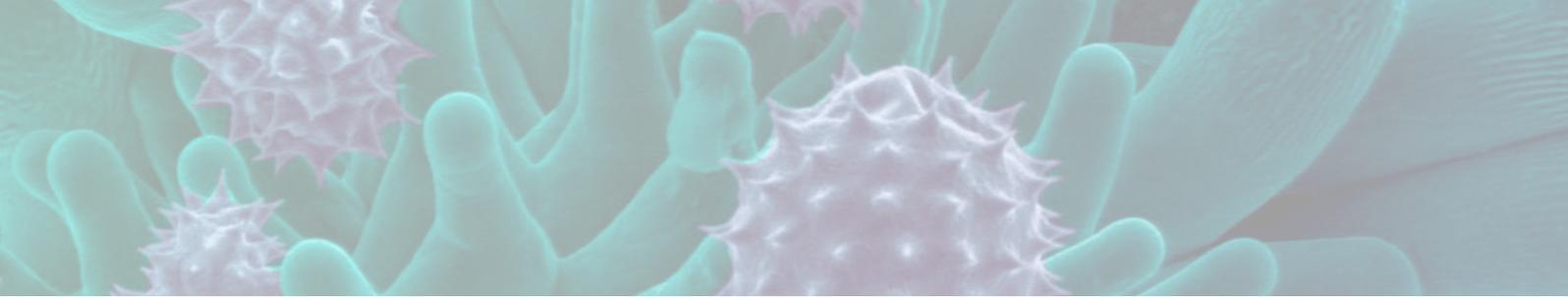
The following list contains examples of topics that can be taught as part of the data management and/or image analysis course:

- Data management, anonymization, provenance, and curation
- Compression and file storage
- Pre-processing, segmentation, and image filtering
- Registration, 3D rendering and visualization
- Quality control
- Signal quantification, object tracking, feature extraction, and statistics
- Cloud-based analysis
- Ethics and data publication
-

GBI recommends that course participants are not required to download software and test datasets in advance because participants may not have full administrative privileges on their machines needed to install the required software. Additionally, troubleshooting with participants that haven't been able to complete this requirement can result in additional time spent on software installation at the beginning of the course and delay the start of the course. To minimize the burden of software installation for course participants, is recommended to use cloud-based resources, virtual training labs or remote desktops that are accessible by a participant-specific login with access to all course software and datasets. Providing such capabilities eliminates the need for participants to install a software and allows them to access the learning environment after the course, also to reproduce what had been done in the classroom in their own imaging facility.

However, the provision and set-up of cloud-based resources, virtual training labs or remote desktops containing software and test datasets as well as creation of user accounts for participants and course instructors requires substantial work before a course by system administration staff. Circulating some pre-course materials in advance would allow participants to familiarize themselves with potential programming languages to be used during the course.





CONCLUSIONS

The Global BioImaging community recommends that training courses for facility staff and managers become part of their continuous professional development. Complementing training courses with existing staff exchange (exchange of expertise, job shadowing) programs for imaging facility managers and staff can be very beneficial for both, visiting staff and hosting institution.

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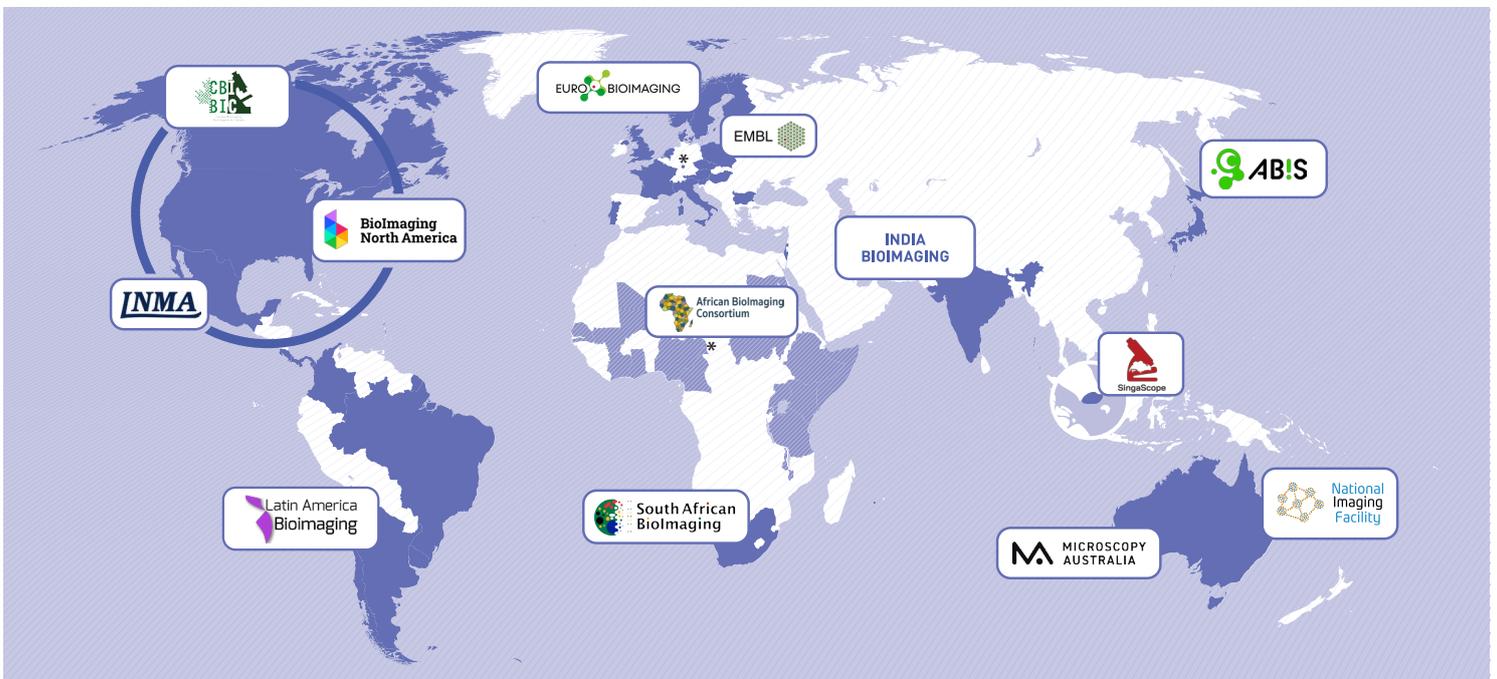
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GLOBAL BIOIMAGING

Global BioImaging (GBI) is an international, open network of imaging infrastructures and communities, which was initiated in 2015 by Euro-BioImaging and partners in India and Australia with the mission to cooperate internationally and propose solutions to the challenges faced by the imaging community globally. Furthermore, the partners support each other to build a strong case towards the funders that imaging technologies and research infrastructures are key in the advancement of life and health sciences; and GBI activities aim to build capacity internationally, leveraging on each other's strengths and capabilities.

Initially supported by a European "Horizon 2020" grant from the European Commission, since January 2020 GBI is funded by the Chan Zuckerberg Initiative and now includes 11 partners and 26 countries around the globe: Advanced BioImaging Support (ABiS) in Japan¹, BioImaging North America (BINA)², Canada BioImaging³, Euro-BioImaging ERIC in Europe⁴, the India BioImaging Consortium, Microscopy Australia⁵, Latin America Bioimaging⁶, the National Imaging Facility (NIF)⁷ in Australia, National Laboratory for Advanced Microscopy (LNMA)⁸ in Mexico, South Africa BioImaging, and SingaScope⁹ in Singapore.



- 1 <https://www.nibb.ac.jp/abis/about-abis/>
- 2 <https://www.bioimagingnorthamerica.org/>
- 3 <https://www.canadabioimaging.org/>
- 4 <https://www.eurobioimaging.eu/>
- 5 <https://micro.org.au/>

- 6 <https://www.latambioimaging.org/>
- 7 <https://anif.org.au/>
- 8 <https://lnma.unam.mx/wp/>
- 9 <https://www.singascope.sg/>