

## Letter of Intent for the NFDI

### 1 Binding letter of intent as advance notification or non-binding letter of intent

<input type="checkbox"/>	Non-binding letter of intent (required as advance notification for proposals in 2020)
<input checked="" type="checkbox"/>	Non-binding letter of intent (anticipated submission in 2021)

### 2 Formal details

- Planned name of the consortium:  
**NFDI4 Biological Imaging and Medical Photonics**
- Acronym of the planned consortium:  
**NFDI4BIOIMAGE**
- Applicant institution  
Universität Konstanz, Universitätstrasse 10, 78464 Konstanz  
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- Spokesperson  
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- Co-applicant institution  
Leibniz-Institut für Photonische Technologien  
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- Participants

(as of 15.08.2020)

- Dr. Hella Hartmann; Center for Regenerative Therapies, Technical University of Dresden
- Dr. Roland Nitschke, Life Imaging Center, Center for Biological Systems Analysis, University of Freiburg
- Dr. Jan Peychl, Light Microscopy Facility, Max Planck Institute of Molecular Cell Biology and Genetics.
- Dr. Pavol Bauer, Leibniz Institute for Neurobiology, Magdeburg
- Dr. Aurelie Jost, Imaging Center of the Excellence Cluster „Balance in the Microverse“, Friedrich-Schiller-Universität, Jena
- Dr. Karol Szafranski, Leibniz-Institute for Aging - Fritz-Lipmann- Institut e.V., Jena
- Dr. Markus Becker Leibniz-Institute for Plasma Research and Technology e.V., Greifswald
- Dr. Claire Chalopin, Innovation Center for Computer Assisted Surgery, Universität Leipzig
- Dr. Timo Dickscheid, Group Leader “Big Data Analytics”, Forschungszentrum Jülich
- Prof. Thilo Figge, Leibniz-Institut für Naturstoff-Forschung und Infektionsbiologie e. V. – Hans-Knöll-Institut (HKI)

### 3 Objectives, work programme and research environment

- Research area of the proposed consortium (according to the DFG classification system)

Biology: 201, 202, 203, 204, 206; Medicine. 204, 206; Chemistry: 304; Physics: 308

- *Concise summary of the planned consortium’s main objectives and task areas*

The main objective of NFDI4BIOIMAGE is to become the national reference entity for FAIR management of bioimage data across research disciplines within the NFDI. NFDI4BIOIMAGE is a joint initiative of German BioImaging Gesellschaft für Mikroskopie und Bildanalyse e.V. (GerBI-GMB) and the Medical Photonics consortium of the Leibniz Research Alliance “Health Technologies”. GerBI-GMB unites the majority of biological and biomedical imaging core facilities at German research institutions in a well-organised and very active network. GerBI-GMB core

facilities have very close interactions with a large number of microscopy research groups and provide access to and expertise in imaging technologies to several thousands of life science researchers every day. The Medical Photonics consortium of the Leibniz Research Alliance “Health technologies” represents photonic research groups, photonic data science groups, and research groups which apply photonic methods in combination with data science to biomedical research questions. Thus, the NFDI4BIOIMAGE has a comprehensive overview of the data management scenarios and requirements of the bioimaging and photonics communities. It is in an excellent position to develop strategies and workflows, as well as implement, test and provide tools and processes for the proper management of research image data according to the FAIR principles to a large community of researchers. It will cover, in the first instance, data from biology, the life sciences and photonics-based medical diagnostics, but will also strive to create image-data related resources and services that are valuable for the whole NFDI. Building upon already existing close links to international activities in this area, NFDI4BIOIMAGE aims also at becoming a gateway for German researches to access and use open repositories for image data which are being created at the European level, in the first place the BioImage Archive hosted at EMBL-EBI and launched on 02.07.2019<sup>1</sup>, as well as further pertinent international repositories. NFDI4BIOIMAGE will also ensure interoperability of these archives with eventual national or local solutions for long-term image data storage.

To achieve these objectives, the consortium will address the following main task areas:

- Define, implement and distribute standards and calibration tools for image data acquisition for improved data quality, comparability and reproducibility in different scientific areas.
- Identify suitable schemes for the accurate and exhaustive description of image data and the respective metadata, and promote their usage by the scientific community.
- Extend and promote the usage of database systems based on image data models in combination with data structuring ontologies.
- Identify and address the need for interfaces between different image data management systems, between different data models and file formats used in the imaging community to enable interoperability and collaboration.

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<sup>1</sup> <https://www.ebi.ac.uk/about/news/press-releases/bioimage-archive-launch>

- Support the development of linkages between open source software for image data analysis and image data management platforms. Promote the proper documentation and publication of data analysis workflows.
- Uphold openness for other (non-image) data types by developing e.g., interfaces to data bases for other data types, in order to foster the combination and integration of knowledge from different disciplines and methodological approaches.
- Consolidate and expand the links to international and in particular European endeavours aimed at the FAIR management of image data to foster synergies and avoid the duplication of efforts. Ensure communication and compatibility between national and international image data management solutions.
- Promote awareness for the necessity of FAIR data management plans and of resources for image data in the scientific community and create extensive education and training opportunities.
- Promote the inclusion of commercial providers of microscopy and photonics equipment in the processes for the development of FAIR image data management.

▪ *Brief description of the proposed use of existing infrastructures, tools and services that are essential in order to fulfil the planned consortium's objectives*

The NFDI4BIOIMAGE consortium builds upon GerBI-GMB, a network of ~50 imaging core facilities across Germany which, over the last 10 years, have practiced an intense and lively exchange of knowledge and expertise on all topics of biological imaging. The network has conceived and realized novel training formats for imaging scientists such as Job Shadowing and Facility Management Courses and has substantial experience in the organisation of scientific events. NFDI4BIOIMAGE will furthermore capitalize on the links and interactions developed during the preparation of two concepts for the German Roadmap for Research Infrastructures 2015 for which a decision by German Ministry for Research and Education is still pending: the German BioImaging Research Infrastructure (GerBI-RI) and the Leibniz Center for Photonics in Infections Research (LPI). The GerBI-RI proposal, in particular, envisioned the creation of a “virtual” node for the coordinated development and distribution of algorithms and tools for the processing and evaluation of large image data. This concept goes hand in hand with the aims of NFDI4BIOIMAGE.

In addition, a number of imaging facilities within GerBI-GMB has started the implementation of image data management plans mainly based on the open source image database tool OMERO, which is provided and supported by the Open Microscopy Environment (OME) community.

GerBI-GMB is also in contact with Euro-Biolmaging, the European Research Infrastructure for imaging technologies in the biological and biomedical sciences. Euro-Biolmaging will provide access to image data repositories and analysis tools in collaboration with EMBL-EBI, which will also be the hosting institution of the planned Bioimage Archive, an integrated public repository for bioimage data. EMBL-EBI also hosts the Image Data Resource (IDR), an added-value image database which links data from several imaging modalities with public genetic or chemical databases and cell and tissue phenotypes expressed using controlled ontologies. These data infrastructures will greatly enhance data sharing and reanalysis by the scientific community.

Ahead of the NFDI4BIOIMAGE proposal for the NFDI, we have prepared a proposal for the DFG funding program "Information Infrastructures for Research Data" to be submitted in August 2020. Main task for this project is to consolidate developments and initiatives for image data management based on OMERO that have recently started at individual research groups, institutes and core facilities but are not yet well coordinated and visible. We will begin working towards the goals of the NFDI4BIOIMAGE on a smaller scale engaging a subgroup of imaging core facilities and research groups who are farther in the implementation of data management processes and thus provide proof-of-principles for a larger consortium. By these means, we will create a structure which can act as a seed for the future NFDI4BIOIMAGE and will grow by including new members as they proceed with their FAIR data management plans.

Importantly, NFDI4BIOIMAGE will be a data-type centered, methodological consortium within the NFDI spanning across a wide range of disciplines. By setting up an infrastructure for image data management while the first disciplinary NFDI consortia are building up, we hope to trigger connections between them and the future NFDI4BIOIMAGE from day one of the NFDI, with the long-term goal to become integrated in all consortia dealing with image or image-related data. The University of Konstanz has committed a position for a full-time coordinator for the preparation of the NFDI4BIOIMAGE consortium and we are in the process of filling this position.

- *Interfaces to other proposed NFDI consortia: brief description of existing agreements for collaboration and/or plans for future collaboration*

The envisaged NFDI4BIOIMAGE is a merger of the initially proposed German-Biolmaging Microscopy Data Consortium and the NFDI4Medical Photonics consortium (see corresponding extended abstracts submitted to the 1<sup>st</sup> NFDI Conference) making the expertise of imaging core facilities in data management utilizable for imaging research groups and providing a larger user community.

*Other proposed NFDI consortia with synergetic possibilities are the following:*

DataPlant aims to provide the research data management practices, tools, and infrastructure to enable collaborative research in fundamental plant research. In collaboration with this consortium we plan to develop protocols to ensure integration of imaging data into data-centric workflows, which will be provided by the DataPLANT consortium (Contact: Dirk von Suchodoletz, University of Freiburg).

DeBioData is a consortium for pre-clinical research data with a focus on drug discovery. The aim is a resource for the integrated access to pre-clinical data generated through a wide spectrum of methodologies, including imaging at the cellular, tissue and small animal level. For imaging data, we will collaborate on interfaces enabling data exchange and data integration in the domain-specific databases. (Contact: Philip Gribbon, Fraunhofer Institute for Molecular Biology and Applied Ecology, Hamburg)

NFDI4AIRR: A consortium for data describing the Adaptive Immune Receptor Repertoire will rely among others also on imaging data, for which NFDI4BIOIMAGE can provide resources and tools (Contact: Christian Busse, DKFZ Heidelberg).

NFDI-Neuro: Image data are one of the pillars of modern neuroscience. This discipline has been driving the development of optical imaging technologies via its very demanding applications in terms of temporal resolution and spatial scalability. NFDI4BIOIMAGE and NFDI-Neuro will collaborate for developing image data management solutions, including harmonized metadata structures and ontologies that foster comparability and provide a robust data basis for neuroinformatic approaches.

NFDI4Biobanks: Interaction with this consortium will aim at developing a shared framework for biomaterials-related image data enabling sharing of data among members of the biobank consortium and beyond, and contributing to increase the quality of the services offered.

NFDI4Biodiversity gathers very heterogenous types of data, including image data, aimed at the covering the whole diversity of the ecosystem. NFDI4BIOIMAGE may

provide tools and services for the management of biodiversity-related image data favouring the processes of data integration and improving data quality in this particular domain (Contact: Oliver Glöckner, Jacobs University Bremen und Alfred-Wegener-Institut, Helmholtz Zentrum für Polar- und Meeresforschung).

NFDI4Chem is a consortium for all chemistry data including spectral data, like spectroscopic and spectrometric data. Synergies between the NFDI4Chem and the NFDI4BIOIMAGE might exist for spectral and spectrometric imaging data along with 'pure' image data like atomic force microscopic (AFM) imaging data (Contact Christoph Steinbeck, FSU Jena)

#### 4 Cross-cutting topics

*Please identify cross-cutting topics that are relevant for your consortium and that need to be designed and developed by several or all NFDI consortia.* The NFDI4BIOIMAGE fully supports the Berlin Leipzig declaration on NFDI cross-cutting topics and will actively collaborate with the other NFDI consortia on these areas of common interest. To this end, we will capitalize on previous and current work by the network GerBI-GMB<sup>2</sup> and work of the members of the Leibniz Research Alliance "Health Technologies".

Cross-cutting topics of relevance for NFDI4BIOIMAGE will be: Embedding in the research landscape; Standardization; Data quality and metadata; Interoperability and Transfer; Software and Interfaces; Education and Training; Governance; Careers.

- *Please indicate which of these cross-cutting topics your consortium could contribute to and how.*

We foresee to contribute in particular to the following cross-cutting topics:

Embedding in the research landscape: GerBI-GMB as well as the Leibniz Research Alliance "Health Technologies" are community-driven initiatives. Through the imaging core facilities represented in GerBI-GMB we support several thousands of researchers applying imaging technologies in their daily work and can bring data management tools and practices directly at their hands. This will contribute to stimulate the cultural change advocated by the NFDI.

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<sup>2</sup>Ferrando-May et al. Advanced light microscopy core facilities: Balancing service, science and career. Microsc Res Tech. 2016 79:463-79



Education and Training: Within the workgroup “Training” of GerBI-GMB we are continuously developing novel educational and training formats for imaging scientists in particular in the context of infrastructures like core facilities (Job Shadowing, Core Facility Management Course, GerBI-GMB Microscopy Spring School). For establishing training opportunities we will also exploit our connections to NEUBIAS, the very successful Network of European Bioimage Analysts, a COST action in Horizon 2020, in which members of the GerBI-GMB Workgroup Training are actively participating and which has a focus on the development and dissemination of bioimage analysis tools and on training of life scientists in image informatics. Beside these training efforts Raman4Clinics and its planned successor Raman4Pathology are further educational active COST actions in the field of medical photonics.

Governance: On the one hand, we can build upon the governance structure that was conceived for the German Bioimaging Research Infrastructure which accounted for the participation of about 20 different German partner institutions and included also the biological imaging user community at large as represented by GerBI-GMB. Furthermore, with the foundation of GerBI-GMB e.V. we have established and gained experience with a governance structure that values strong participation and representation of all members and also includes representatives from commercial enterprises in the decision making process.

Careers: GerBI-GMB has been very active in the past years in the area of career paths for infrastructure providers, in particular core facility leaders. In 2013/2014, we engaged in a dialogue with the German Council for the Science and Humanities concerning the formulation of the “Recommendation for Career Goals and Paths at Universities”. GerBI-GMB has been involved in discussions with DFG about the critical importance of providing sustainable funding for personnel at University core facilities. There are also ongoing discussions on this topic with international infrastructure associations (Core Technologies in Life Sciences CTLS, Bioimage North America, BINA). NFDI4BIOIMAGE will also take advantage of the high awareness for the career prospects and the professional education of researcher in the Leibniz Association, which has published the “Career Guidelines for the Leibniz Association” and has implemented a strong career development program for young researchers.