

The background of the entire page is a detailed, high-magnification scanning electron micrograph (SEM) of biological tissue. It features a complex, textured surface with numerous small, rounded protrusions and larger, more elongated structures. The color palette is a gradient of teal and green on the left, transitioning through blue to deep purple and magenta on the right. Several prominent, spiky, spherical structures are scattered throughout the field of view, resembling viral particles or specialized cells.

GLOBAL
BIOIMAGING
growing collaboration

BUILDING A SUSTAINABLE INTERNATIONAL NETWORK
OF CUTTING-EDGE BIOIMAGING FACILITIES AND COMMUNITIES

IMAGING TECHNOLOGIES

RESOLUTION REVOLUTION

Modern biology and medicine are undergoing a profound transformation. New, cutting-edge imaging technologies are driving this change by enabling researchers to visualize and measure – with a precision never reached before – molecular and cellular functions as well as the metabolic processes in live organisms. This is possible thanks to the resolution revolution, exemplified by two recent Nobel prizes for super-resolution and cryo-electron microscopy.

IMAGES ARE BIG DATA

Emerging from these advancements comes another revolution – digital imaging data. The wealth of digital imaging is exponentially rising, opening up new areas of research and allowing to interlink diverse disciplines. Indeed, breakthrough are expected when the integration of image data with other data types, such as the ones provided by genomic, will be further developed.

Whether it is the imaging technology or data advancements, opportunities are rapidly growing. In this landscape, Global Biolmaging connects international imaging infrastructure communities, empowering them to deliver the best services to researchers worldwide.

MOLECULAR RESOLUTION



10nm



100nm

CELLULAR RESOLUTION



1 μ m



10 μ m



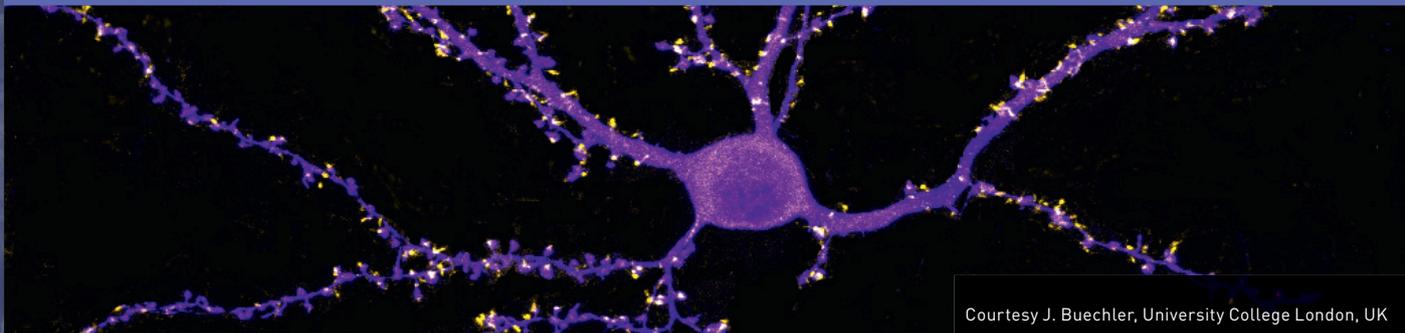
100 μ m



ORGANISMAL RESOLUTION



1cm



Courtesy J. Buechler, University College London, UK

SOCIETAL CHALLENGES

As imaging technologies become increasingly more powerful, they allow researchers to address grand societal challenges.

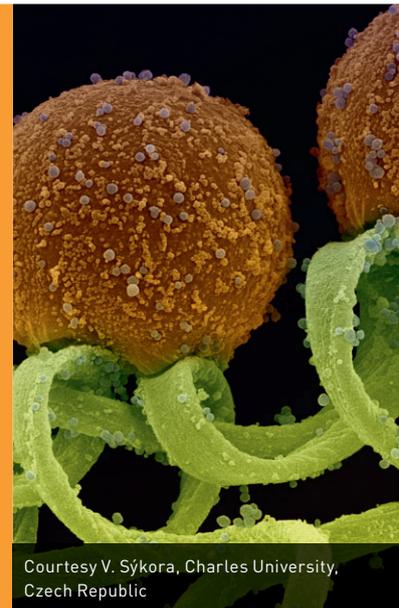
FROM HEALTH

After decades of research, scientists are finally able to molecularly understand healthy and diseased cells and thereby diagnose earlier, improve therapy, monitor therapeutic success better, thereby leading to personalized medicine protocols. Imaging technologies are becoming increasingly key in the fight against cancer, infectious diseases, genetic disorders, ultimately improving our health across longer life-spans.

TO FOOD AND CLIMATE ACTION

Imaging science can also be applied to other fields of research: it provides key insights into plant biology and our planet's marine ecosystem to help us adapt to climate change; it is instrumental in tackling food security as it provides insights on how to increase crop yields and their resistance to extreme conditions such as drought and flooding.

In addition, bioimaging is a cross-disciplinary field where interaction with other sciences – such as computer science for data management, engineering for instrument development, chemistry for the development of probes – provides the means to advance many research fields and enables the generation of new knowledge.



THE GLOBAL BIOIMAGING NETWORK

STARTED FROM EUROPE

Global Biolmaging is an international network of imaging infrastructures and communities, which was founded in 2015, supported by a European Commission funded international collaboration award to EMBL (European Molecular Biology Laboratory), the coordinator of the European Imaging Infrastructure Euro-Biolmaging.

CONNECTING THE WORLD

Recognizing that scientific, technical and data challenges are universal and not restricted by geographical boundaries, Global Biolmaging brings together imaging facility managers and technical staff, scientists and science policy officers from around the globe, to join forces and build capacity internationally. It provides a unique opportunity for international discussion and cooperation to tackle the practical challenges as well as the strategic questions linked to operating open access infrastructures for cutting edge imaging technologies in the life sciences.



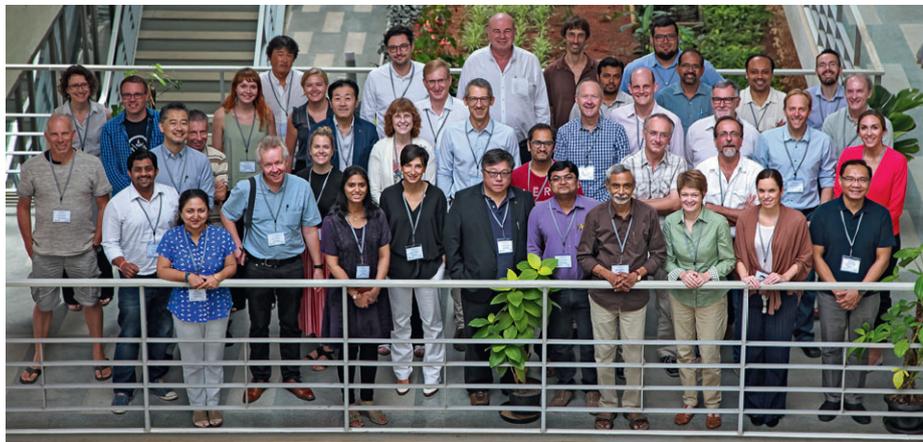
IN PRACTICAL TERMS GLOBAL BIOIMAGING ORGANIZES

- » Annual international workshops to learn from leaders around the globe in infrastructure operation and management, research policies and technology trends.
- » Focused meetings and working groups to discuss specific subjects and build international collaborations.
- » Trainings to support the professional development of managerial and technical imaging facility staff.
- » Staff Shadowing programs to allow imaging facility staff to learn from leading international peers.

SUCCESS STORIES

A SOURCE OF INSPIRATION

Global Biolmaging (GBI) has collected the needs of the imaging community globally, identifying common challenges and potential obstacles as well as possible solutions to overcome them. Challenges faced by the imaging communities – such as access to cutting-edge instrumentation, data challenges, funding bottlenecks – exist everywhere, and some global regions have addressed them earlier than others. Sharing the solutions that have worked – e.g. building strong national networks, share infrastructure services, address the funders with one voice or international partnership – inspires new solutions and new national and continental organizations.



*2nd GBI Exchange of
Experience workshop (EoE II)*

*15th – 16th September 2017
at the National Centre for Biological
Sciences (NCBS) in Bangalore, India*

SUPPORT TO INTERNATIONAL COMMUNITIES

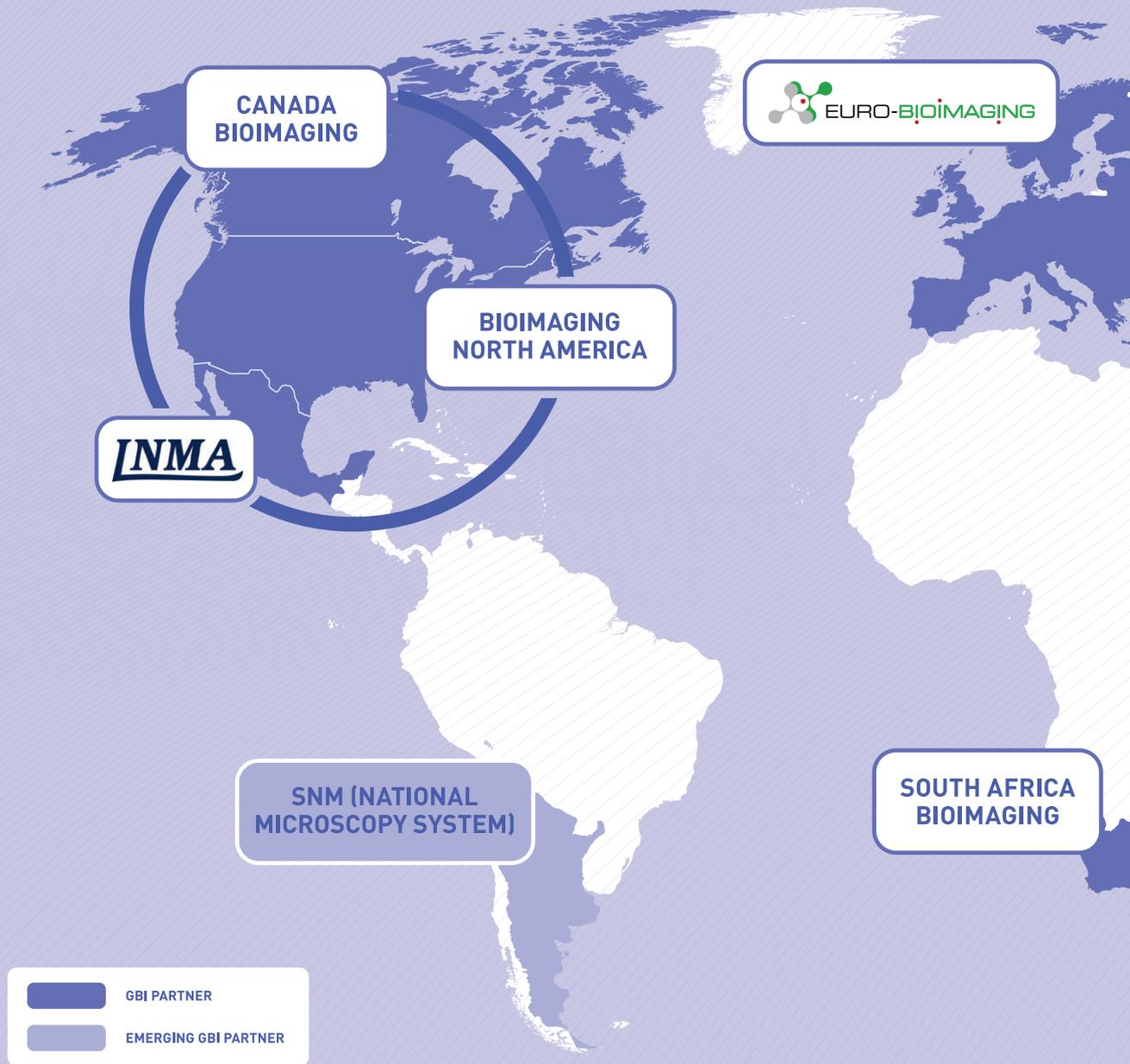
By organizing focused meetings and international workshops, Global Biolmaging has supported the international imaging community to address its challenges, not only by allowing the sharing of experiences between the more advanced infrastructures and the emerging national communities, but also by providing an open forum for discussion and generation of new ideas. Global Biolmaging supports national initiatives to have international impact, building a strong case for their infrastructure funding requests.

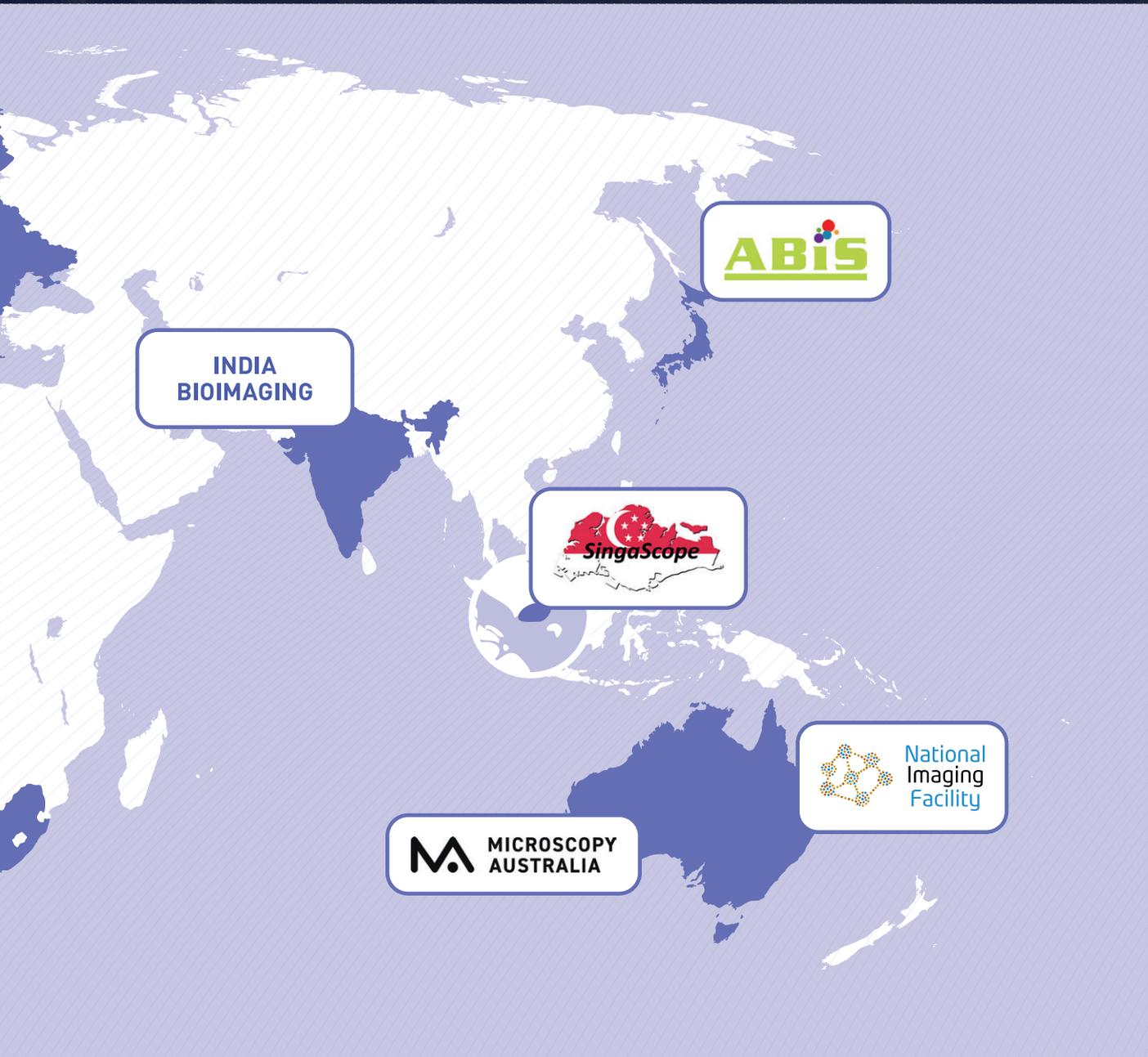
CAPACITY BUILDING

Via its activities, training courses and staff exchange programs, Global Biolmaging allows imaging facility managers and scientists to learn from peers on practical issues related to the day-to-day practice of enabling science with imaging platforms. Dr. Andrew Menhert from Australia participated in the GBI Job Shadowing program and commented

“ [GBI] has provided the opportunity to learn how similar issues are dealt with by other nodes and independent feedback about the strengths and weaknesses of our facility. ”

THE GLOBAL BIOIMAGING PARTNERS





**INDIA
BIOIMAGING**



EUROPE

EUROPEAN RESEARCH INFRASTRUCTURE FOR IMAGING TECHNOLOGIES IN BIOLOGICAL AND BIOMEDICAL SCIENCES

Euro-BioImaging ERIC (EuBI) is the European research infrastructure for imaging technologies in biological and biomedical sciences. Euro-BioImaging is the landmark infrastructure of the European Strategy Forum on Research Infrastructures, recognized as “a European Hub of scientific excellence, generating new ideas and pushing the boundaries of science and technology.”

Through Euro-BioImaging, researchers can have access to imaging instruments, expertise, training opportunities and data management services that they do not find at their home institutions or among their collaboration partners. Euro-BioImaging offers open access to its services to all scientists, regardless of their affiliation, area of expertise or field of activity.



» ACCESS TO TECHNOLOGIES

The technologies offered by Euro-BioImaging can be accessed at EuBI's Nodes, advanced imaging facilities distributed across Europe. They cover the whole spectrum of biological, pre-clinical and in vivo imaging, with an ever-growing portfolio of cutting-edge instruments.

» ACCESS TO DATA SERVICES

Euro-BioImaging offers a wide range of image data services which include image- and meta-data archives as well as added value databases, where image datasets can be linked and re-analysed to generate new knowledge.

» ACCESS TO TRAINING SERVICES

Euro-BioImaging offers training courses on many different cutting edge imaging technologies for scientists as well as imaging facility operators.

Using its experience and networks, Euro-BioImaging initiated the Global BioImaging community in 2012 with the signing of collaboration framework agreements with the Australian Microscopy and Microanalysis Research Facility (AMMRF), the Australian National Imaging Facility (NIF) and India BioImaging.

CONTACT

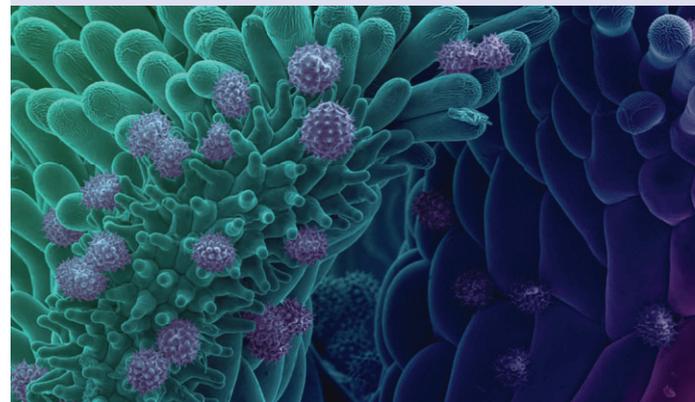
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AUSTRALIA

MICROSCOPY AUSTRALIA (PREVIOUSLY AMMRF)



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Microscopy Australia is an Australia-wide network of university-based microscopy facilities. It provides open access to instruments, expertise and training for all Australian researchers regardless of their location.

The instruments range from scanning and transmission electron microscopes, ion and atom probe instruments and X-ray techniques to light, confocal and super-resolution platforms. The full range of instruments and capabilities can be searched using TechFi™ – our online technique finder tool.

This breadth of capability enables Microscopy Australia to support research in disciplines such as medical science and biology to art conservation, archaeology, agriculture, engineering, and nanoscience.

» WORLD-RENOWNED TRAINING

To support efficient operation of our facility and maximise access for researchers, Microscopy Australia has developed MyScope™, the freely available world-leading online training tool in microscopy and microanalysis, providing simulator-based learning experiences for new users.

» TECHNICAL DEVELOPMENT

Our microscopists are on the forefront of technique development and application, not only supporting users with instrument operation but using their extensive knowledge to push the boundaries of what is possible in order to answer the important research questions posed by researchers.

» COLLABORATION

Through national and international collaborations, particularly with Euro-BioImaging and Global BioImaging, Microscopy Australia share their experience of establishing and operating collaborative research infrastructure as well as learning with our international counterparts in the areas of best practice, new and emerging technologies, and data analysis and management.

AUSTRALIA

NATIONAL IMAGING FACILITY (NIF)

National Imaging Facility (NIF) is an Australia-wide collaborative network of world-class imaging infrastructure, which was established in 2007 under the National Collaborative Research Infrastructure Strategy (NCRIS) program.

Connecting Researchers with Infrastructure, NIF provides open access to cutting-edge imaging technologies and highly specialized expertise to national and international users in three main themes of:

- » **Molecular Imaging and Radiochemistry;**
- » **Human Imaging; and**
- » **Animals, Plants, and Materials Imaging.**

» ACCESS TO TECHNOLOGIES

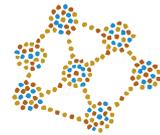
NIF offers a wide range of imaging capabilities from molecular, pre-clinical (small and large animal), human, optical, and in-vivo imaging in addition to cyclotron and radiochemistry facilities. The unique and cutting-edge technologies facilitate competitive research and innovation, as well as, multidisciplinary collaborations that are essential for world-leading research and addressing global challenges.

» ACCESS TO HIGHLY SPECIALIZED EXPERTISE

Through its network of scientific fellows, NIF provides expertise in project design, animal handling and ethics, best tools for image acquisition, and best practice in data analysis and interpretation, data management and curation, and data reuse.

» ACCESS TO DATA SERVICES

NIF offers infrastructure systems for data transfer from instrument to repository, including automated capture and curation of meta-data, with the option for researchers to publish the meta-data and the data. Trusted Data Repositories provide an extension to deliver durable, reliable, high-quality data, whereby data is certified to have been acquired according to an agreed process, integrated with a persistent identifier for the scanner used, and associated with relevant quality control data. NIF is also a partner in the Characterization Virtual Laboratory (CVL), which provides researchers with a desktop in the cloud, preloaded with the most popular image analysis software. NIF is committed to promoting F.A.I.R. data principles.



**National
Imaging
Facility**

NIF Alliance with Euro-Biolmaging and participation in the Global Biolmaging Project, which enables trans-global collaborative projects, not only provide a platform for exchange of experience in technology development, establishment and management of collaborative research infrastructure, but also facilitate share of expertise in best practice data management, curation and analysis.

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INDIA

INDIA-BIOIMAGING CONSORTIUM



Inspired and guided by Euro-Biolamging, the India-Biolmaging Consortium was started in 2012 and it is the Indian research infrastructure for imaging technologies in biological sciences. The consortium partners offer open access to their services to bioscience researchers. Indian researchers can access imaging stations, expertise, training opportunities which they do not find at their own institutions or among their collaborative partners.

» ACCESS TO TECHNOLOGIES

Biological imaging (e.g. LSCM/CLSM (single and multiphoton), STED, SIM, STORM, FCS, SPIM, TIRF, FLIM) can be accessed by scientists coming from all over India at the partner institutions of the India Biolmaging Consortium. The India Biolmaging users get expert technical assistance and support while running their imaging experiments. The imaging technologies available at National Centre for Biological Sciences, Bangalore can be accessed through Centre for Cellular and Molecular Platforms and others can be directly accessed through consortium partners at Indian Institute of Science, Bangalore and Indian Institute for Science Education & Research, Pune.

» ACCESS TO TRAINING SERVICES

The India Biolmaging Consortium offers training courses at different levels and on many different imaging technologies for scientists as well as imaging facility operators. One of the partners of India Biolmaging Consortium, the National Centre for Biological Sciences (TIFR) has been organizing the Bangalore Microscopy Course every year in collaboration with University of California, San Francisco, since 2009.

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JAPAN

ADVANCED BIOIMAGING SUPPORT

»» WHAT IS ABiS?

Advanced Bioimaging Support (ABiS) is the Japanese infrastructure for bioimaging to support scientists in Japan who holds grants from the Ministry of Education, Culture, Sports, Science and Technology (MEXT). ABiS was established in 2016 at the initiative of MEXT as one of Platforms for Advanced Technologies and Research Resources. It aims to facilitate life sciences in Japan by providing scientists with access to resources from model animals to state of the art instruments, research materials, and technical supports, free of charge (as of 2018).

»» HOW IS IT OPERATED?

Situating the National Institute for Basic Biology (NIBB) and National Institute for Physiological Science (NIPS), the inter-university research institutes, as the hub of the network, ABiS is implemented primarily in a bottom-up manner with the cooperation of expert scientists of bioimaging belonging to 20 universities and institutes across the country. ABiS provides accesses to advanced light microscopy, electron microscopy, magnetic resonance imaging (MRI), and image data analysis, respectively.

»» HOW ARE APPLICATIONS MANAGED?

All proposals from scientists are processed by the web-based system for pre-consultation, full application, and reviewing by the ABiS experts and a few external reviewers.

»» WHAT ELSE CAN ABiS PROVIDE?

ABiS provides scientists with the platform for exchanging information and technologies. It also entails educational programs for young scientists including students in bioimaging and organizes workshops, symposia and training courses. In addition, ABiS organizes board meetings as well as general assembly meetings for strategic planning and training courses for ABiS-affiliated scientists and technical staffs to improve their technical skills.



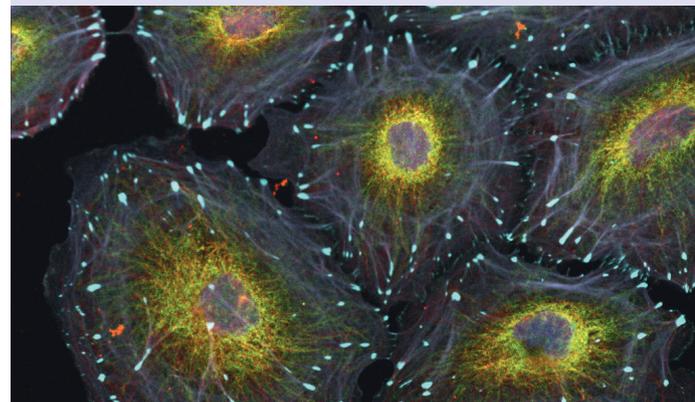
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SINGAPORE

SINGASCOPE – A SINGAPORE-WIDE MICROSCOPY INFRASTRUCTURE NETWORK



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www.singascope.sg

SingaScope – a Singapore-wide microscopy infrastructure network is a new project funded by a National Research Foundation Shared Infrastructure Support (SIS) grant in Singapore. The project is a partnership between the Agency for Science, Technology and Research (A*STAR), the National University of Singapore (NUS), Nanyang Technological University (NTU) and SingHealth.

» ACCESS TO INSTRUMENTATION AND EXPERTISE

The project will network the wealth of biological and biomedical microscopy infrastructure across Singapore to enable scientists to identify and access instrumentation and expertise, with a key principle being that all researchers, whether from academia or industry, will have access to these valuable resources. SingaScope is developing an online searchable database and App to enable researchers to identify the resources available.

» STRATEGICALLY EXPANDING CAPABILITIES

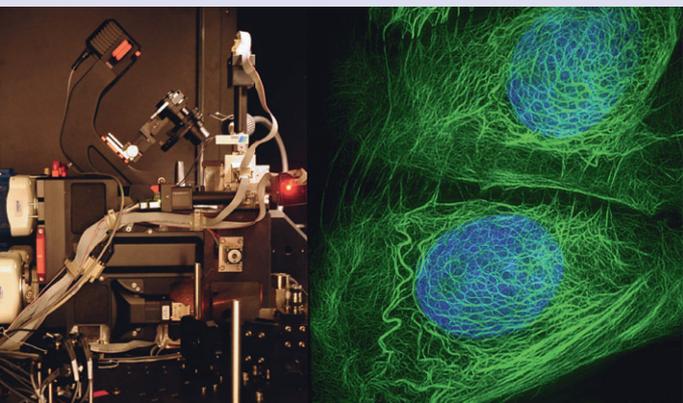
Leveraging on existing well-equipped microscopy platforms, SingaScope will continue to develop the infrastructure available through strategic acquisitions of emerging technologies – keeping Singapore at the cutting-edge whilst avoiding unnecessary duplication. Routine equipment is already widely available across Singapore but the project will ensure it is well-maintained and kept up-to-date. Advanced instrumentation, and the relevant expertise, has more limited availability, so sharing these resources widely will make a significant difference to a multitude of research projects.

» DEVELOPING HUMAN CAPITAL

We will continue to develop Singapore's human capital, raise service standards and cement Singapore as the regional centre of excellence for microscopy training. SingaScope will achieve this by educating scientists, at all levels, in microscopy and training facility staff in both technical and managerial/operational skills.

» EXCHANGE OF EXPERIENCE AND INTERNATIONAL ENGAGEMENT

SingaScope will provide a forum for the exchange of experience and information between scientists both within Singapore and with the international community by engaging with similar initiatives overseas and the Global Bioimaging project.



CANADA

CANADA BIOIMAGING

The Canadian Network of Scientific Platforms (CNSP) is a Canada wide network that was founded in 2017 for infrastructure platforms from all disciplines from engineer to physical sciences, life sciences and health sciences. Canada Biolmaging (CBI) is the first technology node under the CNSP umbrella and has support from the Canadian Cytometry and Microscopy Association (CCMA) and the Microscopical Society of Canada (MSC). Canada Biolmaging currently represents ~100 imaging facilities with nearly 200 members from 40 different universities and institutions.

In line with the Global Biolmaging (GBI) thematic areas Canada Biolmaging plans the following activities:

» QUALITY MANAGEMENT

Contribute to global initiatives to establish affordable samples and detailed reliable protocols for quality management for light and electron microscopy.

» DATA MANAGEMENT

Develop a national strategy for microscopy data storage and management that follows international guidelines.

» TRAINING & EDUCATION

The Canada Biolmaging community is already running cutting edge training programs. The network will coordinate and streamline training initiatives to avoid duplication of efforts, continue to offer existing training courses and develop new world class training in rapidly developing technology areas.

» NEW TECHNOLOGIES

The community will identify key emerging technologies and keep the community informed. As technologies become more established and mainstream training regimes will be developed.



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MEXICO

NATIONAL LABORATORY FOR ADVANCED MICROSCOPY



The National Laboratory for Advanced Microscopy (Laboratorio Nacional de Microscopía Avanzada, LNMA) represents the Mexican Bioimaging community within the GBI network and was formed in 2013 in the Biotechnology Institute of the Mexican National Autonomous University (UNAM) as part of the CONACyT (Mexican Research Council)-funded National Laboratory programme. In 2015 it expanded to include a site at one of the principal National Medical Centers (Centro Medico Nacional Siglo XXI) in Mexico City, and in 2018 opened its third site at the Center for Scientific Research in Ensenada (CICESE), Baja California.

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The Mexican bioimaging community is large and active, with a considerable expansion in high-end microscope and imaging equipment occurring over the last ten years, albeit somewhat fragmented at present. Initiatives to increase the integration and coordination of the bioimaging community are planned, with the LNMA currently taking the first steps to reach out to the wider community.

»» ACCESS TO TECHNOLOGIES AT THE LNMA

Biological imaging (e.g. LSCM, PALM/STORM, TIRF, FRET, Imaging Flow Cytometry, Bioluminescence (luciferase) imaging, FCS/ICS/Single Molecule, Whole-animal optical imaging, SPIM, FD-FLIM, MP-LSM, SHIM & TEM) can be accessed by scientists directly at LNMA at one or more of its three sites, with further imaging modalities available at other National Laboratories. Assistance for plant and animal histological sample preparation is available and users are encouraged to consult with us at the experimental planning stage.

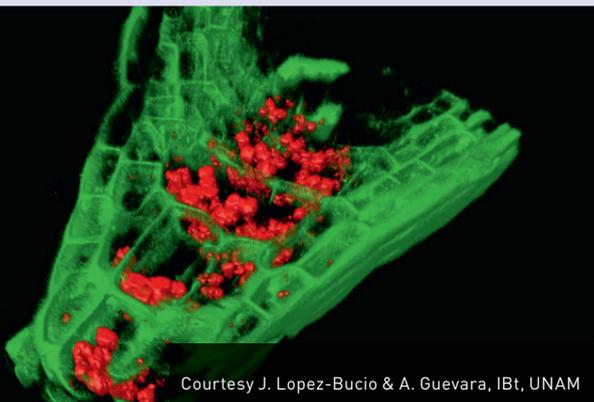
»» ACCESS TO DATA SERVICES

LNMA offer support for image analysis protocol design and execution through high-end CPU/GPU servers.

»» ACCESS TO TRAINING SERVICES

LNMA offer bespoke, intensive, module-based training services on request in any of the technologies mentioned previously. Basic and specialized microscopy training courses are organized periodically.

In addition to the above, the LNMA participates in numerous outreach activities (e.g. science fairs, guided tours, school visits) and has active development programmes for low-cost, 3D-printed microscope designs for use in schools and educational projects.



Courtesy J. Lopez-Bucio & A. Guevara, IBT, UNAM

NORTH AMERICA

BIOIMAGING NORTH AMERICA

Biolmaging North America (BINA) is a network that consists of imaging centers throughout the North American continent (including Canada, the United States and Mexico), instrument inventors, imaging probe/sensor developers, software engineers, data scientists and advanced end-users. Currently, the collective expertise of BINA mainly focuses on optical and electron microscopy. However, the network intends to welcome scientists working on other modes of small animal and human imaging, such as MRI, PET, CT, etc.

The network formed as a result of a conference co-hosted by the Advanced Imaging Center at Janelia and Global Biolmaging. The conference ("Frontiers in Microscopy Technologies and Strategies for Biolmaging Centers Network") was represented by more than 50 institutions from 18 countries.

BINA shall support the bioimaging community in North America to organize and to have a collective voice. It aims to be a representative bioimaging partner with which funding agencies can conduct a strategic dialogue and global peer organizations form a closer alliance. BINA works closely with the American Association of Biomolecular Research Facilities (ABRF) to better formulate meaningful partnership that would provide guidance, assistance, training opportunities, data sharing, and technology dissemination to the community, with a strict focus on bioimaging.



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SOUTH AFRICA

SOUTH AFRICA BIOIMAGING



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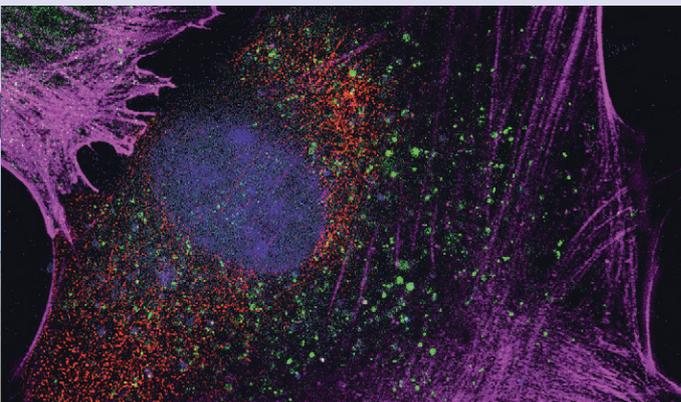
South Africa has a strong and thriving microscopy community as well as microscopy society with a long history in materials science and a tremendously growing community in life sciences. Many institutions with excellent expertise and experience exist. Some are organized as large microscopy facilities with a range of instruments, and many exist as smaller units or labs across the country, at times in very remote areas. In the recent years, the Life Sciences and associated bio-imaging community has grown tremendously. A loose, non-formalized network of microscopists and user groups exist for bio-imaging applications. Inspired by the Global Bio-imaging Project, South Africa is now aiming to formalize a South African Bioimaging network, to enable the sharing of knowledge, expertise and best practices, to better support and reach the growing, and often geographically isolated imaging communities.

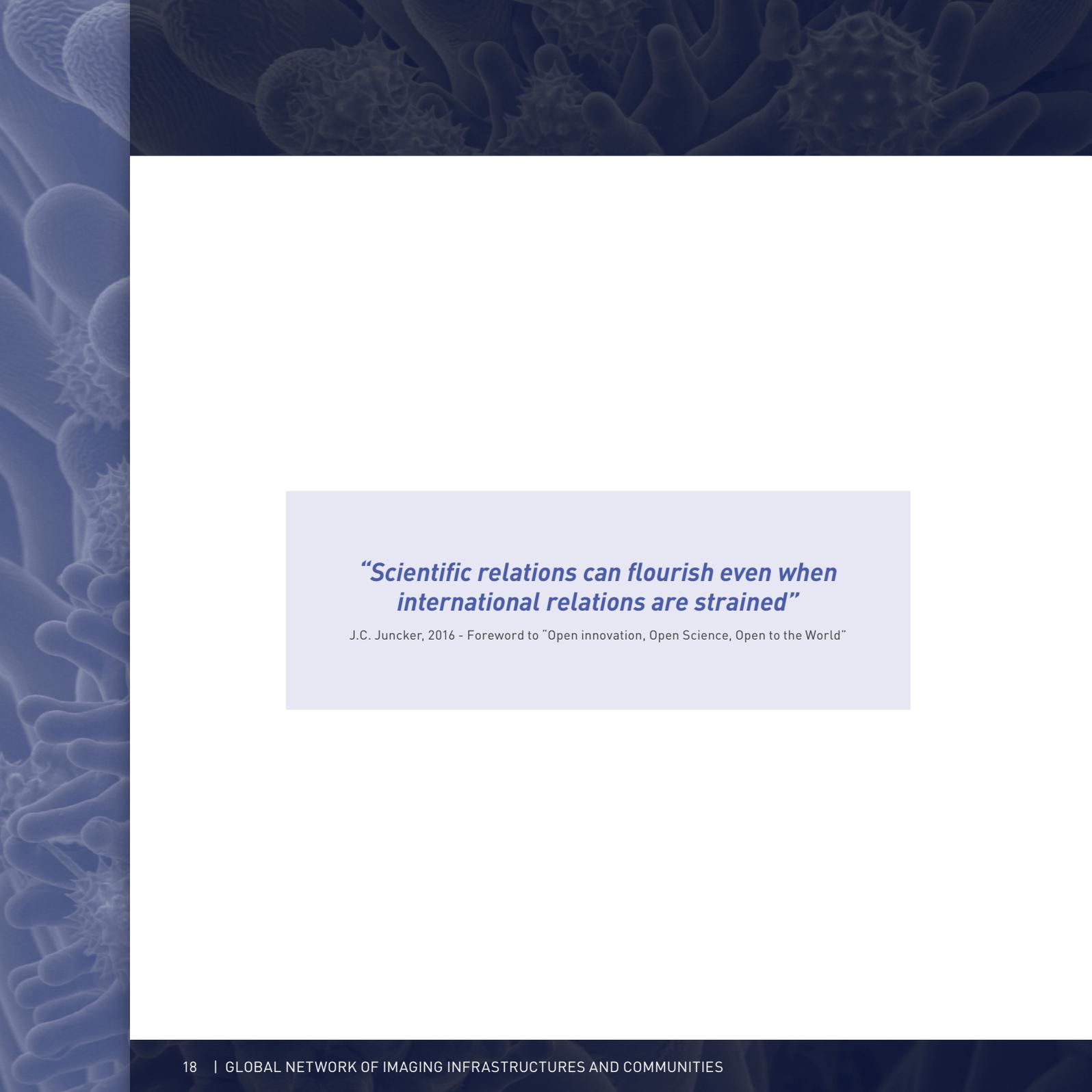
» ACCESS TO TECHNOLOGIES AND SERVICE

The Imaging facilities of the larger institutions provide access to a multitude of tools and techniques, such as widefield, confocal, life cell imaging, TIRF, FRET and FRAP recently also STORM, PALM and CLEM, as well as SEM, TEM and high resolution TEM. Work is ongoing to widen the access opportunities to more South African scientists, residing in more geographically remote regions or who don't have high-end instrumentation available.

» ACCESS TO TRAINING

The microscopy units that operate as platforms, provide individual user training and some of these training activities are accessible at national level. Many smaller institutions, however, often do not have dedicated operating and training support. Hence, the goals of a South African Bioimaging network would be facilitating the sharing of knowhow, especially in topics that are challenging and increasingly growing in complexity (image analysis, image processing, data handling and storage).



The background of the slide features a detailed, blue-tinted microscopic image of biological structures, likely cells or tissues, showing various shapes and textures. The image is most prominent on the left side and top, fading into a white background in the center.

***“Scientific relations can flourish even when
international relations are strained”***

J.C. Juncker, 2016 - Foreword to “Open innovation, Open Science, Open to the World”

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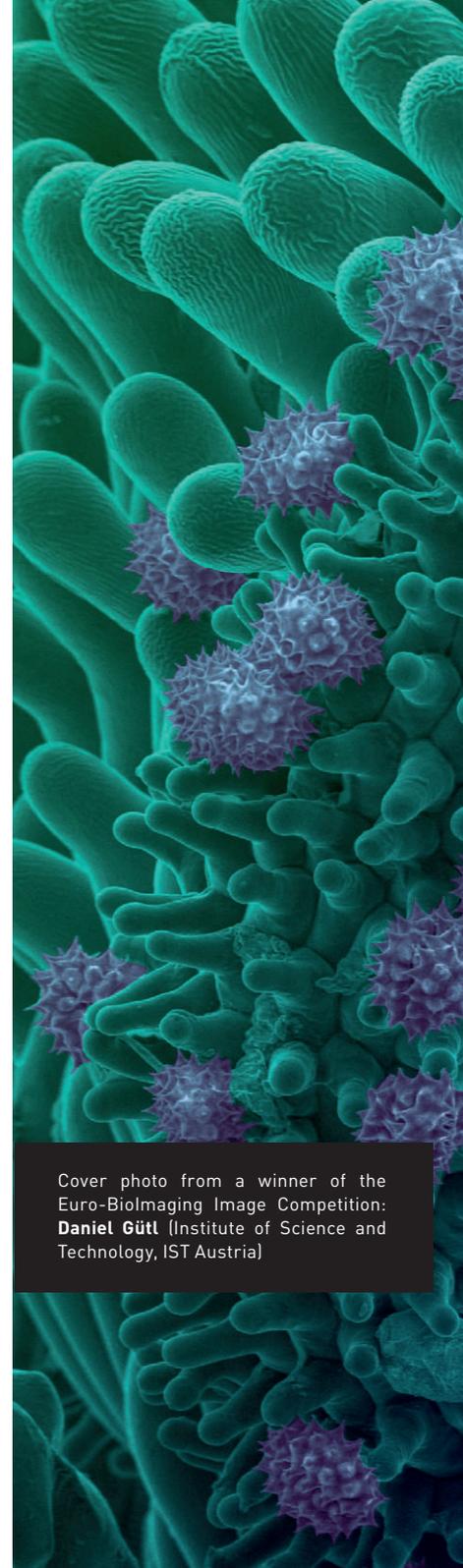
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Cover photo from a winner of the Euro-Biolmaging Image Competition:
Daniel Gütl (Institute of Science and Technology, IST Austria)



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