Euro-BioImaging

European Research Infrastructure for Imaging Technologies in Biological and Medical Sciences

WP3
Process Plan

Task 3.1
Vision of Euro-BioImaging

Deliverable 3.2
Update of Vision of Euro-BioImaging

Task leader
MPG
Helmholtz
CAHTA

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VISION PAPER

The mission of Euro-BioImaging is to provide a clear path of access to a complete range of essential imaging technologies for every biologist and medical scientist in Europe. This vision paper presents the opportunity, importance, benefit, substance and implementation of Euro-BioImaging for key stakeholders such as Member States, funding agencies and decision makers.

Euro-BioImaging: Added value for Europe

ACCESS TO IMAGING TECHNOLOGIES: Euro-BioImaging will allow scientists from your country to access a broad range of cutting edge imaging technologies they require for their valuable biological or medical research. Euro-BioImaging will guarantee that your investment in imaging infrastructure is used in the most cost-effective and efficient way by applying Euro-BioImaging quality standards in management, access and service of imaging facilities.

TRAINING: Standardized and high quality education of tomorrow's scientists in applying advanced imaging technologies to study the single cell to the entire human being will be one of the major challenges in biology and medicine. Specific training programmes at Euro-BioImaging facilities will complement national efforts in education and Member States will benefit from an increase in expertise.

IMAGING DATA: Biological and medical imaging will become one of the major data producers in the future and researchers are facing unprecedented challenges concerning image data management and analysis. The Euro-BioImaging infrastructure will offer platforms for storing, sharing and processing biological and medical imaging data on a large scale.

ECONOMIC VALUE: Implementing the Euro-BioImaging infrastructure with its nodes in different regions of Europe will bring new job opportunities and perspectives for researchers, engineers, administrative and related staff. These positive effects will also radiate into the surrounding areas of technology development and services.

EUROPEAN RESEARCH AREA: Euro-BioImaging closely cooperates with all Biological and Medical Sciences Research Infrastructures to overcome the fragmentation of the European research landscape.

What is Biological and Medical Imaging?

For medical research, imaging includes Magnetic Resonance Imaging (MRI), X-ray Computed Tomography (CT), but also many other imaging technologies. For example, better detection of occluded blood vessels to improve the prediction of heart attack, earlier detection of growing tumours to improve the success rate in the fight against cancer, or monitoring the normal development of a foetus during pregnancy are all dependent on medical imaging. Medical imaging can provide insight into the function and metabolism of organs allowing the visualization of the effectiveness of new targeted therapies, e.g. in cancer patients. In biology, visualizing cells and tissues by light and electron microscopy has led to more discoveries than any other technology. We wish to see how things look. By seeing how they look, function can be extracted and comparison of how healthy cells and tissues look in comparison to their pathological state provides extraordinary insight into the molecular nature of disease. Imaging technologies are thus the central technology platform that drives fundamental research in most disciplines within the biological and medical sciences.

What is Euro-BioImaging?

Euro-BioImaging (www.eurobioimaging.eu) is a large-scale pan-European research infrastructure project on the ESFRI Roadmap1. Euro-BioImaging will deploy a distributed biological and medical imaging infrastructure in Europe in a coordinated and harmonized manner. By providing access to and training in imaging technologies, and by sharing of best practice and image data, Euro-BioImaging will become an engine that will drive European innovation in imaging research and technologies.

Who is behind Euro-BioImaging?

Broad European support. Euro-BioImaging has a strong and growing supporter base. The consortium comprises 39 beneficiaries from 16 European Member States and associated countries, 250 associated partners from 26 European Member States and associated countries. Euro-BioImaging is formally endorsed by over 205 universities, research councils, funding bodies, ministries, and industry partners. In total, there are over 1,400 stakeholders coming from more than 30 European Countries, India, Russia, the USA and Australia. A smooth transition from the preparation to implementation is ensured through the Euro-BioImaging Intergovernmental Working Group (IWG), which was launched in January 2013 at its first meeting in Vienna. This group currently comprises national representatives from 21 countries, who are mandated by their ministries and/or national funding bodies, and EMBL.

Shaping national into European communities. The Euro-BioImaging infrastructure project is the driving force to organize the European BioImaging infrastructure communities. The first step in this process is the self-organization of national imaging infrastructure providers to define their needs and capabilities. The second step is to form a pan-European community of imaging infrastructure providers from the national communities that supports the Euro-BioImaging principles of coordination and harmonized infrastructure deployment, open access and highest training standards. To date, 22 national initiatives have been formed to prepare and support their national imaging facilities for participation in Euro-BioImaging, each community represented by a national coordinating person. It is expected that more national communities will organize themselves in the future and will participate in the Euro-BioImaging activities.

Why Euro-BioImaging?

- ✓ *Impact.* Euro-BioImaging will have a profound impact on the European Research Area, European health and quality of life as well as European competitiveness in key industry sectors (imaging technologies, biotechnology, medical technologies, pharmaceutical industry). Continuous assessment of the project's impact by evaluation by independent

[1] ESFRI, the European Strategy Forum on Research Infrastructures, is a strategic instrument to develop the scientific integration of Europe and to strengthen its international outreach. The competitive and open access to high quality Research Infrastructures supports and benchmarks the quality of the activities of European scientists, and attracts the best researchers from around the world. *(Source: ESFRI website of the European Commission http://ec.europa.eu/research/infrastructures/)*

scientific experts and by each stakeholder group (e.g. through surveys and feedback at stakeholder meetings) will help to keep pace with the latest developments and to define new strategies to maximize the project's ultimate impact.

- ✓ *Better return on investment for biological and medical imaging platforms.* A typical medical MRI instrument may be of the order of €2 million. A large cutting edge research ultra-high field MRI may cost upwards of €30 million. The latest super resolution light microscopes and state-of-the-art electron microscopes cost of the order of €2-5 million each. While a single university department may afford one or two of these instruments, not even the best-funded institutions can any longer afford the complete range of imaging technologies they need in order to remain at the forefront of their respective research field. It is therefore critical that a plan is developed for sharing the costs of deployment and providing open access to such expensive but critically important technologies in order to obtain a better return on investment. This is all the more important in times of financial austerity. By realizing the benefits of a coordinated deployment, Euro-BioImaging will decrease expenditures and optimize cost-effectiveness. Rather than having to fund only individual request for a new imaging instruments, funding agencies will have the opportunity to supply the much lower partial costs of accessing shared Euro-BioImaging to ensure access to imaging technologies.

- ✓ *Brain gain instead of brain drain.* Many Member States have recently had to reduce their research funding programs, with some member states making cuts as high as 20%. The consequence of such cuts will be devastating to research and threatens to cause a new generation of brain drain, because the best young scientists will quickly move to the best international environment for their research. Euro-BioImaging will make sure that Europe continues to offer cutting-edge infrastructure in biological and medical imaging to the next generation of scientific leaders and allow Europe to attract the best talent from other countries rather than losing its own. For example, Euro-BioImaging has received more than 2,200 research project proposals that are well-defined and committed to be performed, and which have been submitted by applicants in the First Open Call for Euro-BioImaging Nodes (January to April 2013).

- ✓ *Instant Access.* The time required to establish advanced and powerful imaging platforms is substantial. For example, building an ultra-high-field MRI suite can take years for the largest research magnets. Configuring, ordering, installing and putting into routine data production takes on the order of 6-12 months for the latest research level laser scanning microscope and setting up a high throughput microscopy pipeline can take years. Euro-BioImaging will allow researchers instant access to imaging instrumentation not available at their home institution.

- ✓ *Service and training by the leading experts in the field.* Top-level expertise for many imaging techniques is hard to find and takes years of training to acquire. Euro-BioImaging will have coordinated training programs for its infrastructure providers to ensure that the imaging technologies are supported and reinforced by world-leading expertise. Sharing expertise extends to shared best practices across Euro-BioImaging facilities, as well as repositories of methods, tools, protocols, software applications and image data that will make expertise widely available to the research community.

- ✓ *Better image data storage, sharing and analysis.* Image data is recorded across different biological scales, from sub-cellular structures to organs and in different biological models, from single cultured mammalian cells, via mouse to human tissues. The maturity of the ways image data is stored and used varies greatly amongst the research communities. The Euro-BioImaging infrastructure will offer platforms for storing, remotely accessing, sharing and post-processing biological and medical imaging data on a large scale. The definition of standards on data storage, protection and analysis of images by Euro-BioImaging will enable scientists to share image data between different scientific communities from different countries and to reuse existing data in light of new scientific questions.

- ✓ *Defragmentation, integration, and collaboration.* Different geographical areas of Europe have vastly different qualities of research infrastructure. Europe will under exploit much of its potential if a large percentage of its research community do not have access to state-of-the-art technologies and are therefore not competitive. Euro-BioImaging will address this challenge and enable scientists coming from regions of less developed research infrastructure, to access cutting edge imaging technologies, expertise and training either by going to neighbouring regions or by setting up new infrastructure according to Euro-BioImaging standards regionally. Our strong cooperation with the other 12 Biological and Medical Sciences ESFRI Research Infrastructures will complement these activities and together shape and strongly support the European Research Area.

- ✓ *A platform for translational research.* The scientific communities of basic biological, molecular and medical imaging work closely together in Euro-BioImaging to integrate imaging technologies employed in basic research with those applied in medical research. Such cooperative facilities will be ideal platforms for translational research and bring innovative new imaging technologies from bench to bedside.

When will Euro-BioImaging be launched and its benefits realized?

- ✓ *Preparatory Phase:* 2010-2013. A construction plan for a pan-European research infrastructure for biological and medical imaging technologies is developed. The legal, governmental and financial framework for implementation of the Euro-BioImaging infrastructure is being established. Costs are €7.9m with €5.2m funded by an EU Framework contract.

- ✓ *Construction Phase:* 2014-2017. The Euro-BioImaging infrastructure will be deployed by either newly constructed or major upgrades of existing facilities funded mainly by Member States. Total anticipated costs are of the order of several €100m, but due to the modular nature of Euro-BioImaging infrastructure nodes, investment can be scaled to national needs and capabilities.

- ✓ *Operational Phase:* 2017 onwards. Euro-BioImaging will provide training programmes in and access to state-of-the-art imaging technologies in a distributed infrastructure of imaging facilities throughout Europe. Operating costs will be approximately 20% of construction cost per year to ensure continuous technology upgrades and the provision of highly trained staff.

Quality of service will be continuously reviewed. Funding mechanisms through a mix of European and Member State measures will be laid out in the Preparatory Phase business plan.

How will the goals of Euro-BioImaging be achieved?

Euro-BioImaging Eligibility Criteria. An important element of the implementation plan for the Euro-BioImaging infrastructure, are eligibility criteria for imaging facilities that wish to become part of Euro-BioImaging. The overarching principles for these criteria will be technical and scientific excellence, open access to imaging technology, and highest quality service staff and user training. Already during the Preparatory Phase, Euro-BioImaging proof-of-concept studies are testing criteria and guidelines for best practice.

Stamp of Excellence. Euro-BioImaging will award research infrastructures that meet the highest quality standards with the Euro-BioImaging stamp of excellence. In order to achieve and maintain this certification, research infrastructures will be evaluated according to defined quality criteria (see above). Obtaining the Euro-BioImaging stamp of excellence is expected to have a strong influence on funding decisions by national authorities and funding agencies.

Operational Models. Euro-BioImaging will develop European operational models that can be adjusted to the legal and administrative environments of the different Member States. Already existing funding mechanisms and measures on various levels (local, regional, national etc.) will be taken into consideration to implement Euro-BioImaging.

How can you support Euro-BioImaging?

Become involved now. The Euro-BioImaging Consortium invites the research ministries, research councils, and all national as well as regional funding agencies from the ESFRI Member States to actively participate in the Preparatory Phase to help shape the legal and financial framework for the infrastructure. The earlier you become involved the easier it will be to make sure Euro-BioImaging serves your needs and its Business Plan matches your expectations and capabilities. At the same time, Euro-BioImaging is actively engaging with policy makers at the European level to advocate sustainable investment into Europe's future imaging infrastructure.

Specifically we invite you to join the Euro-BioImaging Working Groups "Legal, Governance and Ethical Issues" and "Finance Planning". These groups already involve representatives coming from research councils and funding organizations from different ESFRI Member States.

Funding models tailored for you. The modular nature of Euro-BioImaging as a distributed infrastructure with complementary imaging technologies, allows attractive investment models tailored to the national needs and capabilities. The Euro-BioImaging Business Plan will make specific investment models, funding measures as well as example budgets available to the national funding agencies. This provides different options, for how best to support imaging infrastructure and open access facilities. Given the prominence of biological and medical imaging on most national infrastructure roadmaps, we anticipate that a significant part of national budgets of European Member States will be earmarked for biological and medical imaging facilities. The specifics as well as the amounts will be defined in detailed consultation and close partnership with the national funding

agencies. Wherever possible, the investment models will take European funds for infrastructure in convergence regions into consideration.

Submit a Letter of Intent to become an Associated Partner of Euro-BioImaging.

If your institution wants to express its interest in the Euro-BioImaging project we invite you to submit a Letter of Intent at any time. Please find respective templates at www.eurobioimaging.eu.

Contact

Euro-BioImaging Scientific Coordinators:

Dr. Jan Ellenberg (Advanced Light Microscopy) - EMBL
Prof. Oliver Speck (Medical Imaging) – EIBIR

Euro-BioImaging Project Managers:

Dr. Antje Keppler (EMBL)
phone: + 49 6221 387- 8847
keppler@embl.de

Dr. Pamela Zolda (EIBIR)
phone: +43-1-5334064-538
pzolda@eibir.org