



Euro-BiImaging
European Research Infrastructure for Imaging Technologies in Biological
and Biomedical Sciences

WP6
Advanced Light Microscopy – General Access

Task 6.1
Coordination

Deliverable 6.1
Survey of needs of user community

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Report Summary

The 2011 Euro-Biolmaging Community Survey is the first comprehensive assessment of scientific biological and medical imaging infrastructure repertoire and needs across Europe. Regarding the survey questions for general access to Advanced Light Microscopy (ALM), the survey results reveal an overall reasonable match between the technologies that are demanded by scientists and those that are provided by existing imaging facilities across the life sciences in the Europe. *The most important conclusion from the survey is that the **existing world-class imaging facilities in many EU member countries build a strong foundation for the Advanced Light Microscopy and Biological Imaging infrastructure for the future.** However, the **capacity** of this resource —literally the number of hours available on advanced microscopy systems— **is insufficient** to satisfy the current demand, and the **open access** offered to external and transnational users **is much too limited**. Therefore general access **ALM facilities will have to undergo major upgrades** and in some countries new construction to provide a pan-European open access infrastructure of sufficient capacity to meet the user demand. In addition, better coordination and more resources for the training of both users and facility staff are required to ensure efficient and effective use and the correct match between different imaging modalities and different scientific applications.*

WP6 Objectives:

- Create distributed and coordinated infrastructure for advanced light microscopy (ALM, broad range of imaging methods to visiting scientists)
- Define a network of national coordinators
- Carry out 6-month proof-of-concept-studies for user access to demonstrate potential for access, pitfalls, and needs of the community
- Identify eligibility criteria as a pre-condition for inclusion in the distributed infrastructure
- Provide protocols for harmonized access and plans for unified training platforms in cooperation with WP12 (User Access) and WP13 (Training)

The 2011 Euro-Biolmaging Survey provides the foundation to define the criteria for nodes in the national and trans-national infrastructure, and contributes to the definition of access and use policies for a distributed imaging infrastructure. It will be complemented by the results from the test run of the infrastructure currently ongoing in the proof-of-concept-studies.

Major Survey Findings

Wide Range of Demand. Substantial investment across Europe has delivered a diverse biological imaging infrastructure. This is seen by the overall output of European life scientists, as well as the reporting of the resources available within European advanced microscopy facilities. Demand for these resources is significant and encompasses essentially all of the modern imaging technologies that are available.

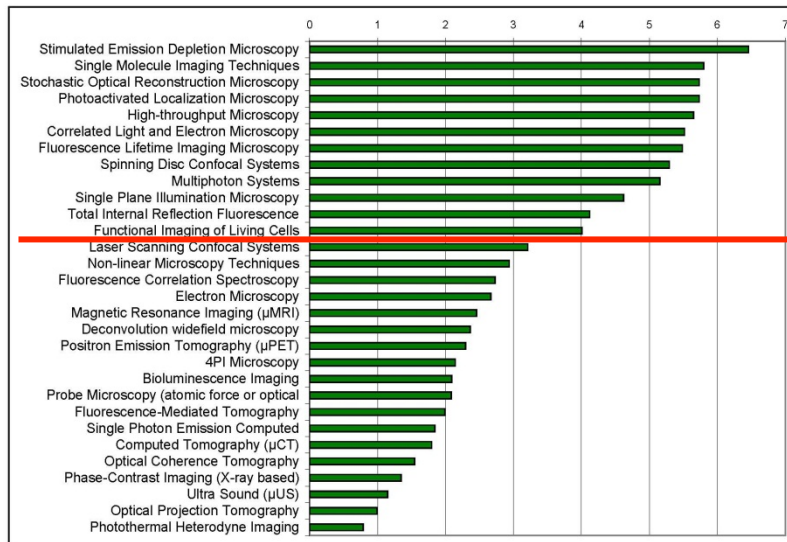


Figure 1. Requests for access for biological imaging technologies by method

However, there is a consistent, growing demand for imaging technologies, and especially significant demand for technologies that have been developed and reached “production” phase only in the last 3-5 years (Fig. 1). These include super-resolution, high-throughput microscopy, correlative light/electron microscopy, fluorescence lifetime imaging microscopy, functional imaging of living cells, etc. In addition, to the demand for “innovative” systems (i.e., those that are not routinely commercially available as turnkey systems) there is a nearly matching demand for the more “advanced” technologies—laser scanning confocal microscopy, deconvolution widefield microscopy, spinning disc confocal systems, etc. which can be operated with cutting edge commercial instrumentation. Therefore, in the future the proper provisioning of a European imaging infrastructure must deliver both advanced and innovative capabilities to meet the existing and future demand of the European life scientists.

Capacity for External Users. In the last decade many EU member states have invested substantially in biological imaging instrumentation, and for most parts there is a reasonable match between the types of technology being developed and/or installed and the current user demand. Figure 2 shows responses to the question, “Which innovative technologies are PROVIDED at your institution” and asks respondents to distinguish to WHOM access is provided (internal and/or external users).

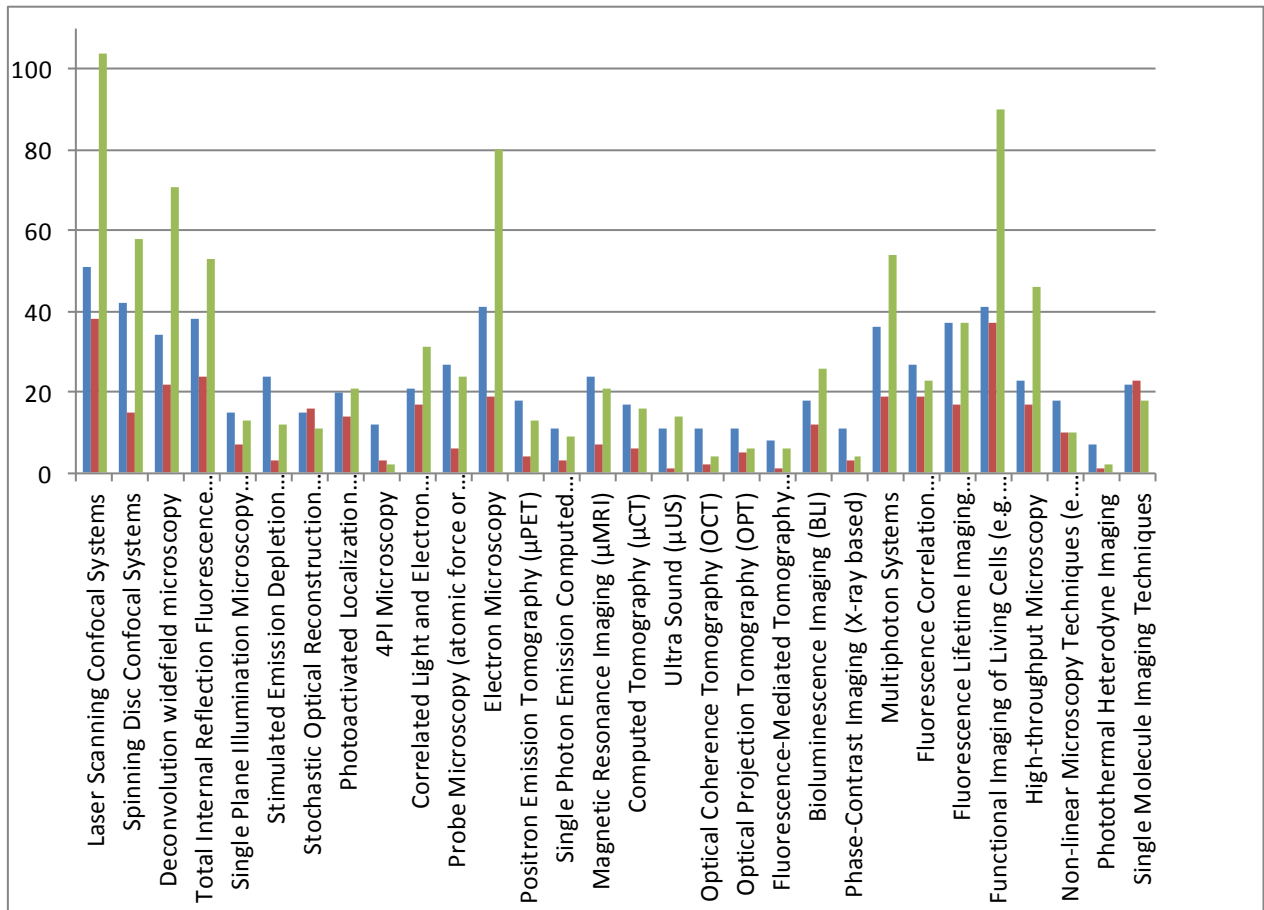


Figure 2. Number of Respondents Reporting Access to Imaging Technologies. Green bars - Access provided by an institutional imaging facility; Blue bars - External access already provided; Red bars - Access provided for lab or institution only.

This data clearly show that most imaging technologies included under WP6 are provided by institutional facilities, and many of these facilities already provide access to external users. However, when asked to quantify the amount of these resources available to external users, respondents reported that even widely available advanced technologies like spinning disc confocal systems and total internal reflection fluorescence microscopy were mostly dedicated to internal use (Figure 3).

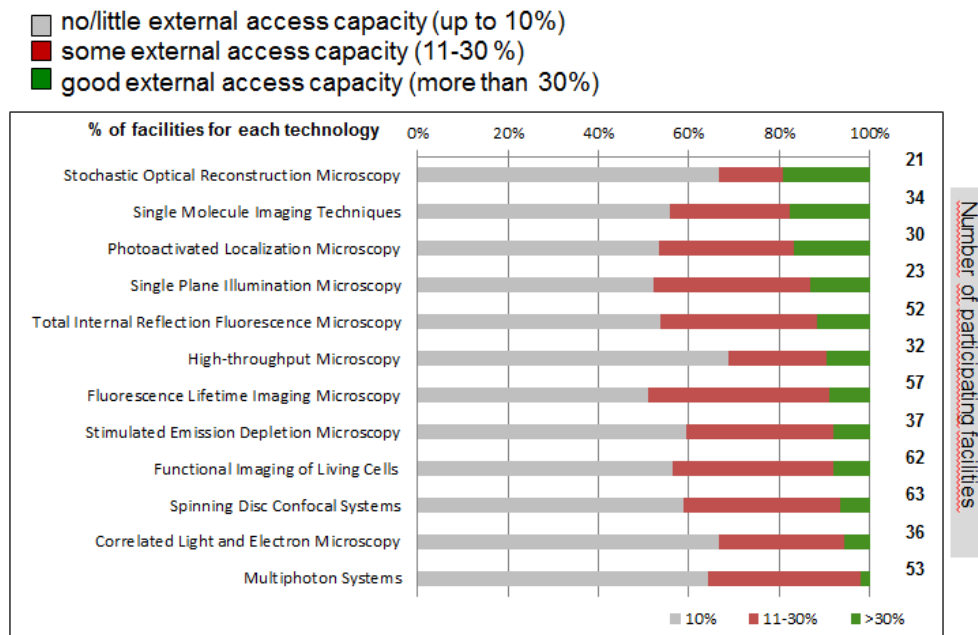


Figure 3. Imaging resources and their available capacity for external users

The data in Figures 2 and 3 show that while most imaging technology is delivered through institutional facilities, there is insufficient capacity to deliver substantial external access. Most facilities report having no more than 10% of their capacity available for external access and use. For those facilities that *currently provide no external access*, 63 out of 89 respondents (~70%) stated that they lacked sufficient instrument or personnel capacity in order to do so. These data sum up to a consistent picture - the upgrading of existing facilities to enable sufficient external access is perhaps the single most important challenge and opportunity for Euro-Biolmaging regarding WP6 technologies in Advanced Biological Imaging to enable open national and transnational access programmes.

Another potential barrier—willingness to travel to remote sites—appears less of a problem. >60% of respondents say they willing to travel for access, and >50% willing to travel >250 km. In the European context, this means that most survey participants are willing to cross their national borders to access advanced imaging technology, demonstrating the demand for and utility of a trans-national European imaging infrastructure.

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When asked “which of the following RESOURCES do you need for providing access to external visitors?” 169 respondents listed a wide variety of resources (Table 1), but the dominant needs were for staff (~35%), support for IT and data (~21%), and actual imaging systems (~18%).

Resources Needed	Number of Responses	Per Cent
Meeting Rooms	31	4.3%
Facility Manager	49	6.7%
Office Space	65	8.9%
Data Management Support	73	10.0%
IT Infrastructure	79	10.9%
Consumables	88	12.1%
Imaging Scientist	103	14.2%
Technician	107	14.7%
Equipment	132	18.2%
Total	727	100.0%

Table 1. Resources need at existing imaging facilities.

These data highlight the range of requests funders will most likely receive from Euro-Biolmaging node applicants for their required capacity upgrade in order to provide open access for users. Future requests will include support for all the activities an imaging facility provides—i.e. service, training, data acquisition and data processing. This consistent unmet need probably exists because, despite significant investment in equipment and facilities (Figs. 1, 2, and 4), current funding mechanisms do not adequately address training, staff or IT resources.

These data highlight the need for national and trans-national coordination and specification of the upgrade requirements to enable access to Europe’s biological imaging facilities. The user access needs these data reveal align well with priorities already established during the Preparatory Phase of Euro-Biolmaging and addressed by the Work Packages for Training (WP13), Access to Advanced and Innovative Biological Imaging (WPs 6 and 7), and Data Management (WP 11).

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National Investment Analysis. In analyzing the Euro-Biolmaging survey, we have compared existing infrastructure resources between member countries, and normalized the number of systems per capita (Fig. 4). This approach highlights the availability of systems in the Netherlands and Finland, where there is a strong commitment to science funding and strong commitment to imaging in the life sciences, but also relatively smaller populations.

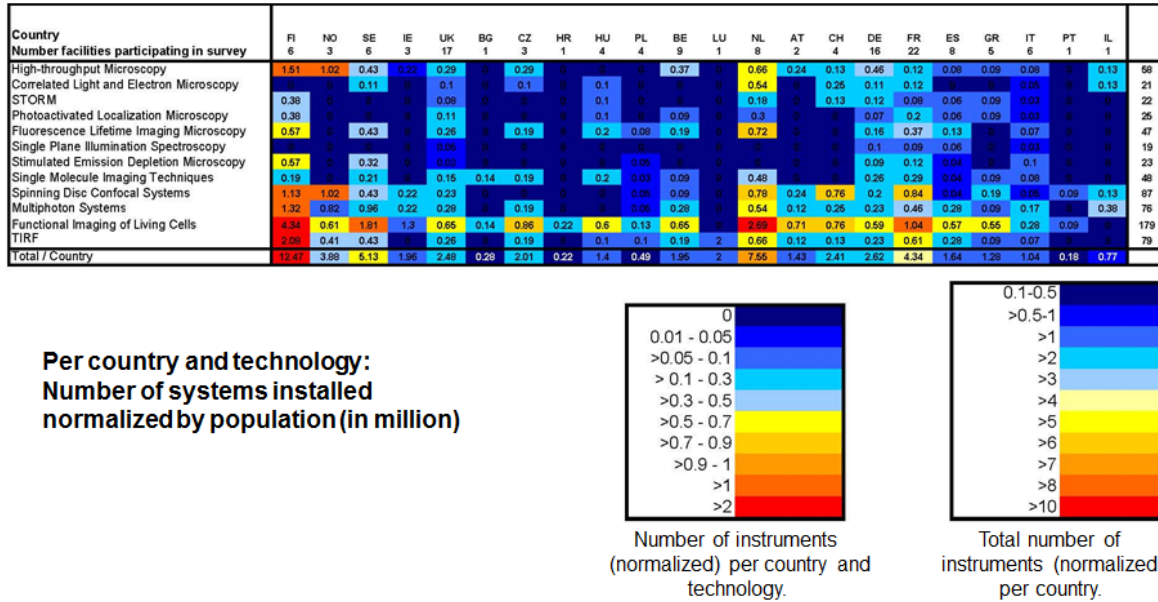


Figure 4. Number of biological imaging instruments normalized by population.

While normalizing per capita is one, using total or per capita research investment would provide a more informative view of the investments made so far, and in the future. Currently these data are not available in a comprehensive fashion for Europe. Regardless, the Euro-Biolmaging survey data shown in Figure 2 and 4 emphasise the breadth and in some countries also depth of the existing imaging infrastructure. As Euro-Biolmaging moves towards its Construction Phase, this operating foundation provides the existing technical and managerial experience and know-how that will underpin future infrastructure investment and expansion and ensure its successful operation.

Training. Training remains a significant limitation for the most effective use for advanced instrumentation. The importance of good training is under-appreciated by users: 95% of providers report providing training to use advanced imaging instrumentation, but only 40% of users say they would request this training. The vast majority of facilities see the necessity to offer training activities, and anecdotally, many facility directors insist that effective and efficient usage of systems requires good training. The majority of facilities therefore see a need to increase the resources devoted to user training as well as to keep their staff at the cutting edge of technology development. Overall there is a strong consensus, that coordinated high quality training programmes and material across Europe would be extremely

important to ensure that the use and development of biological imaging in Europe is as effective and efficient as possible.

Conclusion

The Euro-Biolmaging Survey is certainly the best sampling we have to date on the existing infrastructure and capabilities of the EU's biological imaging efforts. While it cannot be comprehensive, it provides a good foundation for taking forward WP6's Preparatory Phase activities and its transition to Construction Phase.

The Survey demonstrates that significant imaging infrastructure resources already exist in advanced biological imaging methods that can be operated with cutting edge commercial equipment. These are housed in institutional imaging facilities which often serve them in an integrated manner across several modalities, and operate at or close to maximal capacity and mostly provide only very limited external access (<10%). The technologies offered largely match those demanded by users. However, **the available capacity is by far insufficient to meet the high existing and forecast demand for external access to advanced biological imaging methods.** Thus, **the major task for the Construction Phase of Euro-Biolmaging will be to upgrade and** - in countries where past investment has been scarce - **build new facilities.** We anticipate that many existing ALM facilities that already provide integrated access to advanced biological imaging technologies and instrumentation, access, data analysis, and training, will apply in the Euro-Biolmaging open call for nodes and that these facilities will be upgraded as required with funders' support to become Euro-Biolmaging nodes. In addition we anticipate proposals to create new facilities as Euro-Biolmaging nodes, especially in countries where the existing infrastructure is still underdeveloped, for example from some of the new or Southern member states.