

EMBL Heidelberg Core Facilities Unit Review

The review of the EMBL Heidelberg Core Facilities took place on 22 - 24 February 2022. The review panel consisted of 19 international experts, including four members of EMBL's Scientific Advisory Committee (SAC). The chair was Olli Kallioniemi, from the Karolinska Institutet, Sweden. Several observers were present, including the Chair of Council Eiríkur Steingrímsson. Due to the SARS-CoV-2 pandemic and the resulting travel restrictions, the review was convened exceptionally via video conference.

Evaluation Summary

The panel was happy with the quality of the eight Core Facilities under review, spanning the fields of light and electron microscopy, chemical biology, metabolomics, proteomics, genomics, flow cytometry, and protein expression and purification. Four of these facilities are headed by Team Leaders also leading their own research. This includes Rainer Pepperkok who has been Head of Core Facilities since 2014 and took on the position of Director of Scientific Core Facilities and Services in 2019. Pepperkok is a key figure whose energetic leadership has played an important role in establishing the flexible and responsive Core Facilities and enabling their continuing evolution. The facilities that he oversees are a major asset for EMBL, ensuring its status as an internationally-recognised centre of research excellence. This praise is reflected in the feedback from users who perceive all aspects of the Core Facilities to be positive. The users and the Core Facilities have a close relationship enabling both to progress.

This evaluation took place at a pivotal time as there are several parallel developments in the scientific community and at EMBL. First, the role of Core Facilities is in a major transition phase, with Core Facility staff now acting as enablers, drivers, and innovators of research. Second, data-centric and data-driven research is increasing and there is a need to integrate data from multiple platforms. Third, EMBL is starting its new Programme "Molecules to Ecosystems 2022-2026", within which, systematic, comprehensive, and integrated views of life are key, as are multi-modal data and analyses. The EMBL Imaging Centre, Data Sciences Centre, Mobile Laboratory Service, and Transversal Themes are all part of the new Programme and their interaction with the Core Facilities is critical to their future.

The panel would like to highlight the overall quality of the Core Facilities' activities, noting in particular the highly specialised expertise of the staff, speed of service, excellent user interaction, sample and data pipelines, personalised service and attention, as well as the facilities' proximity to one another and hence opportunity for synergy.

Choosing just two highlights is difficult and does not do justice to the broad scale of technological advances that were presented to the panel. However, the panel would like to mention the many applications of multi-omics profiling to solve complex biological questions developed by the Core Facilities and the development of image-enabled flow cytometry and cell sorter - an example of a successful industry collaboration.

Multi-scale imaging is one example where EMBL is already leading globally. The dramatic and unexpected power of multi-omics at EMBL was also well showcased, as well as the combination

of omics and imaging as a cross-facility service. However, other areas such as automation, robotics, high-throughput, and miniaturisation development may need attention to develop pipelines and capabilities. The panel recommends setting up multi-omics or multi-facility pilot services for users that wish to achieve a true systems biology view of their problem.

The convergence of data-driven research and data sciences needs to be considered. Therefore, the panel welcomes the concept of the Data Sciences initiative and is interested in its interface with the Core Facilities. Strong links with the Data Sciences Centre as well as realistic expectations of what the Centre can do in the short term are needed. The panel recommends that each facility has one nominated person responsible for the data pipelines and relations with the Data Sciences Centre.

The panel noted that many Core Facilities are proactively planning their contributions to the new Programme, in particular the upcoming Mobile Laboratory Service. However, it is recommended that future infrastructure trends and developments within specific facilities should not be overshadowed.

It will be important to consider the minimal viable size of a Core Facility to carry out services, sustain the critical mass and expertise, keep up with the latest developments, and to develop new technologies. Knowledge transfer from present to future facility personnel must also be ensured. Similarly, when EMBL grows or research areas develop, Core Facilities must match this. The critical mass and sustainability of Core Facilities could also be achieved by reconsidering the reorganisation of some of the facilities, with some forming joint services for specific tasks.

The Core Facilities have many key strengths which do not present a need to outsource these activities. However, when these advantages are not fully evident, outsourcing should be considered. The panel suggests continuing the concept of a dual research group leader and Core Facility head (i.e. “team leader”). This model usually seems to work successfully although it is advisable to assign a strong and competent co-leader or manager to support the team leader when needed. The panel also notes that most facilities are very booked with internal users. Although it is not a primary role to serve as an infrastructure provider to external users, the role that it plays can be highly significant. EMBL can attract new users by improving communications, describing upcoming services, and showing inspiring examples.

Overall, the panel would like to congratulate the EMBL Heidelberg Core Facilities on their outstanding plans. The overview of all the teams shows tremendous opportunity for the future.

Response to the Panel’s Recommendations

I would like to extend my thanks to the chair, Olli Kallionemi and the whole panel for their time and effort in reviewing the EMBL Heidelberg Core Facilities. It is unfortunate that the panel were unable to visit in person to fully appreciate the practical nature of the unit and innovative technologies on site. Despite this, the review included an incredibly lively discussion with positive and constructive considerations. This valuable input was very welcome, in order for the EMBL Heidelberg Core Facilities to move forward. EMBL has a core mission to provide scientific

services internally and to its member states and the EMBL Heidelberg Core Facilities are a key component of this.

The review coincided with the start of the new EMBL Programme in 2022, which the Core Facilities is playing a key role in implementing. This includes development of a Mobile Laboratory Service which will scientifically support the systematic sampling of marine ecosystems at numerous European coastal sites. This service is highly valued by member states as it gives their scientists direct access to EMBL Core Facility expertise and collaborative research projects. The initiative will also help to diversify and expand EMBL's external user base across member states and will be a highly effective advertisement of EMBL's services to potentially underrepresented users.

The Data Sciences Centre is another leading initiative within the EMBL Programme. The Centre will tackle the challenge of exponentially increasing volumes of data produced by progressively complex technologies and experiments. Data analysis experts within the Core Facilities will integrate with the Data Sciences Centre to work synergistically: they will continue to provide services while also connecting with like-minded data sciences experts. Rainer Pepperkok is working closely with the Head of Data Sciences to ensure this integration results in an amplification of this essential data analysis support within the Core Facilities.

Currently the Core Facilities collaborate and develop cross-facility technology and methods in response to researchers' needs, for example in the fields of spatial omics, single-cell multi-omics, and correlative light and electron microscopy. This natural synergy and cross fertilisation across facilities is thanks to Rainer Pepperkok's collaborative and flexible leadership style. As recommended, we will discuss and consider ways to more formally set up cross-facility services to best support the users. This could involve current EMBL Core Facilities and services located on other sites.

I agree with the panel's comments about the critical mass of some of the facilities. Regardless of their size, all of the facilities provide important services to the research community. Together with Rainer Pepperkok, we will examine how much flexibility there is to reinforce some critical facilities within the current available funding and also ensure sufficient knowledge transfer between outgoing and incoming facility staff.

Given the numerous and important benefits that in-house services provide, I agree with the panel that outsourcing the facilities is not an attractive option. The working relationship between facility staff and users is very close, with facility staff taking a hands-on approach to help difficult experiments be executed efficiently and to an exceptionally high quality. This close engagement enables EMBL to take advantage of the virtuous cycle of research, service, and technology development.

The concept of having dedicated Core Facility heads and team leaders, who also run their own research group is very important to EMBL. This set-up ensures closer links between the Core Facilities and research units. I recognise that this role is not fitting for all Core Facility heads, which is why both roles will continue to exist.

The Core Facilities are essential to support EMBL group leaders who are often in the early stages of their career. However, when capacity allows, a substantial number of users are also from institutes within EMBL member states. This engagement is important to EMBL and is highly valued by our member states. EMBL facility staff also readily support member states by advising and helping institutes set up, or troubleshoot, their own core facilities. To further engage with and diversify EMBL's external user base, the upcoming Mobile Laboratory services will play a vital role.

I would like to conclude by thanking the chair and the panel for their advice and suggestions and to warmly congratulate all members of the EMBL Heidelberg Core Facilities and Rainer Pepperkok for an extremely successful review. The unit's collaborative way of working and its highly skilled and engaged staff have enabled the Core Facilities to excel and provide support for a vast number of diverse research projects across Europe.



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