

## EMBL Hamburg Unit Review Summary and Response

The review of the EMBL Hamburg Unit took place on 20 - 22 February 2023. The review panel consisted of 11 international experts, including two members of EMBL's Scientific Advisory Committee (SAC). The chair was Poul Nissen, from Aarhus University, Denmark. Several observers were present including the German Delegate to EMBL Council, Barbara Ohnesorge, and Belgian Advisor to EMBL Council, Savvas Savvides. Due to travel restrictions under the current financial climate, the review was convened in a hybrid format.

### Evaluation Summary

The research programmes and service facilities are all brilliant and outstanding, with EMBL Hamburg having handled important developments and challenges over the past review period. The unit has performed vital research that integrates structural biology and the Head of Unit Matthias Wilmanns has added a stronger biological profile to the Hamburg Unit in the field of infection biology. The EMBL beamlines have provided highly sought-after user services at the highest level and at the full potential of PETRA III. The level of service is outstanding, with users repeatedly returning over years and decades - a clear token of the high quality provided. The Sample Preparation and Characterisation (SPC) Facility also offers support for many applications and contributes to powerful data analysis programmes that inspire similar facilities at other institutions.

The past period was strongly influenced by the COVID-19 pandemic. The unit performed critical research to help the global community face the pandemic (Custódio T.F., et al. 2020), and supported BioNTech with their product developments. The pandemic also accelerated an efficient implementation of remote and mail-in service at the beamline which helped to maintain and rebuild user numbers.

The collaborations and partnerships with the University of Hamburg (HARBOR) and the Centre for Structural Systems Biology (CSSB) have had a clear benefit on the beamline services and SPC Facility respectively. Furthermore, the cryo-electron microscopy community and facilities at the CSSB, alongside strong programmes in infection biology synergise exceptionally well with the Hamburg Unit.

Based on the unique properties of the upcoming PETRA IV X-ray source, Matthias Wilmanns and Thomas Schneider presented strong scientific plans for the future developments and facility services. The EMBL-DESY partnership is vital in this project, to deliver leading life sciences research and services. This was also clearly stated by Helmut Dosch, Chairman of the DESY Board of Directors during the review. The review panel feels that the plans for the PETRA IV

upgrade are timely, feasible, and important for the vision of EMBL. These vital scientific plans will strengthen the local community and EMBL member states as a whole.

One example of ongoing technology development that will be further developed and implemented as part of PETRA IV is X-ray imaging. Since the last review, EMBL Hamburg has hired new team leader Liz Duke who has demonstrated the truly remarkable potential of X-ray imaging using EMBL's P14 beamline. Although as yet unpublished, the panel recognised this work as a scientific highlight that showed surprisingly rapid and efficient data acquisition and processing. However, the panel notes that when the P14 X-ray imaging capacity reaches its full user community, it will put increasing pressure on beamtime allocations along with other services and research activities at P14. Other modes of operation and subsequent staffing of the beamlines will need to be considered.

The future developments proposed for the unit fit EMBL's 'Molecules to Ecosystems' Programme well, with the strong focus on X-ray imaging capabilities as well as cutting-edge research in structural enzymology and 4D structural biology - with clear applications to microbiome networks and dynamics, and theory developments. There is also an opportunity for EMBL Hamburg to profile itself as an integrative-modelling computational service provider. For example, by providing services to newly developed AI-based tools the Kosinski Group would greatly benefit the worldwide research community (Rantos V., et al. 2022). This, together with other services at EMBL Hamburg, will develop a clear identity in data science at the site, distinguishing it from other EMBL units. However, it would make sense to migrate the Small Angle Scattering Biological Data Bank (SASBDB) to the EMBL-EBI Unit for its operation, while keeping EMBL Hamburg's involvement for expert support and curation.

The panel feels that the SPC Facility could be developed into world class service and expertise but will require a more robust operational model for on-site operations, workshops, and outreach. Regarding the beamlines, mail-in and remote data collection have become the dominant mode for user access. This is a demanding task and it seems important and fair that conditions and/or fees are introduced for such all-inclusive services. Additionally, the panel feels that a more streamlined process within EMBL for ethics approvals of studies with human samples should be considered as the current systems are currently considered a severe bottleneck.

In the context of the financially challenging situation that EMBL currently faces due to the unprecedented rises in inflation and energy costs, group leader recruitments are currently postponed. The panel is concerned about the ability of the unit to maintain a critical core of Group and Team Leaders doing internationally leading research. The panel recognises that surrounding communities at HARBOR and CSSB provide a critical mass that mitigate the problem. However, it should be a future focus for EMBL leadership to ensure a strong research profile for the unit that feeds into the local community and EMBL as a whole. The panel also

advises that the call for related group and team leaders await the PETRA IV funding decision as this could affect the candidate profile.

Regarding the training of fellows, PhD and postdoc fellows feel well supported, supervised, and mentored at EMBL Hamburg and recognise the strengths of the scientific environment. However, both expressed concern about the recently announced reduction in travel budget, particularly as many of the training courses, conferences, and collaborations happen in Heidelberg.

In conclusion, the current unit leadership under Matthias Wilmanns, Thomas Schneider, and previously also Dmitri Svergun has excelled. As well as strengthening EMBL Hamburg's biological profile, the leadership team have defined key research and service opportunities for X-ray sciences and integrated the unit into the EMBL Programme well. The review panel is confident that the Hamburg Unit possesses the vision, strength, expertise, and structure to undertake demanding new developments for complex systems biology, to continue to develop cutting edge research and services at PETRA III, and to integrate and mediate future PETRA IV facilities for the life science community at the highest level.

### Response to the Panel's Recommendations

I would like to extend my thanks to the chair, Poul Nissen, and the whole panel for their time and effort in reviewing the EMBL Hamburg Unit. It was not ideal to hold the review without everyone being physically present but the discussions were nevertheless remarkably rich and I am very grateful for the panel's valuable input. I would also like to congratulate everybody within the unit, particularly Matthias Wilmanns, Head of EMBL Hamburg, and the leadership team. The unit has performed remarkably in terms of its research and service provision over the review period, despite the challenging circumstances. The EMBL Hamburg services overcame challenges brought by the COVID-19 pandemic by moving swiftly to remote access, in order to support many external users during the pandemic, resolving multiple difficult technical demands, from a very diverse national and international user community.

I agree with the panel's comments regarding the benefits of the local scientific community on the DESY campus. EMBL is keen to work openly and transparently with DESY as the campus host, as well as collaborators such as the CSSB and HARBOR. The continued coherence between EMBL Hamburg and the CSSB over the past four years has benefitted much of the ongoing science. Similarly, the fruitful collaboration with HARBOR to develop the T-REXX end-station has enabled the success of the sought-after 4D structural biology service. EMBL also continues to forge collaborations with the European X-ray Free Electron Laser (EuXFEL).

There has been a lot of proactive engagement from the EMBL Hamburg Unit concerning the development plans for PETRA IV and it is clear that strong leadership is needed for the transition

to PETRA IV. There are still many unknowns, particularly around the project's funding timelines. However, I would like to point out that the unit is already extremely active with PETRA III projects, present and future. PETRA IV is very much a longer-term prospect. EMBL is keen to work closely and cooperatively together with the host campus partners DESY who are managing the PETRA IV project, in an open and transparent process. The scientific advances that users from across EMBL's member states will benefit from as a result of the development of PETRA IV will be paramount. However, I am pleased that this has been recognised by the panel through their positive comments, particularly regarding the ongoing development of X-ray imaging at EMBL Hamburg. EMBL's focus into this field was in direct response to the panel's recommendations from the 2019 unit review. Based on the success of the preliminary work, it is clear that there is a user community for whom the technology would greatly benefit. There is now the opportunity for EMBL to further understand the community's concrete needs and thereby develop the technology into a successful scientific service.

Many members of the EMBL Hamburg Unit have been highly engaged and motivated in the development and implementation of the Molecules to Ecosystems Programme. This is clear from the unit's strong links with the Infection Biology Transversal Theme as well as its dedication to technology development and services in the fields of structural biology and imaging. In response to the panel's suggestion for EMBL Hamburg to profile itself as an integrative-modelling computational service provider, we will evaluate this suggestion with the user community to clearly establish the specific needs, the resources that would be needed, and their long-term sustainability. I would also like to draw attention to the newly-implemented pan-EMBL Data Science Centre. One key aim of the Data Science Centre is to devise a strategy to decide which EMBL-developed databases and software tools should be institutionally maintained. The future of the tools identified by the panel will be considered as part of this strategy, in discussion with their developers.

The SPC Facility is a crucial facility within EMBL that provides outstanding user service and serves as an important connection between EMBL and the CSSB. I am delighted that this has been recognised by the review panel. Any changes to the operational models of either the SPC facility or beamline services will be discussed together with the services' leadership teams.

Regarding the request for a more streamlined bioethics approval process that was raised during the panel discussions with some members of EMBL Hamburg, I would like to point out that EMBL, as an intergovernmental organisation, cannot rely on individual national ethics approvals. Instead, EMBL has the responsibility to evaluate its own approvals, which it does via EMBL's Bioethics Office with dedicated committees of internal and external scientists. Particular cases of delays for approvals from EMBL Hamburg will be further explored with the necessary support and training provided for those involved.

The current financial climate will necessitate some hiring delays as three group leaders, including the Head of Site Matthias Wilmanns, will move on in the next review period.

Nevertheless, as noted by the review panel, EMBL Hamburg is not an isolated site and there are continued opportunities for engagement with scientists in neighbouring institutes. Furthermore, when the calls for group leaders and the Head of Site open, there are ample opportunities to attract excellent national and international candidates. EMBL will continue to hire its group leaders via its usual strategy of hiring the best.

I am delighted to hear that the fellows feel supported at EMBL Hamburg. This is testament to the outstanding scientific and collegiate atmosphere nurtured by the EMBL Hamburg site and its leadership, particularly during the difficult times of the pandemic. The travel reductions mentioned by the fellows are part of the current EMBL-wide financial measures implemented due to current geopolitical factors affecting much of Europe. While group leaders are required to fit a reduced budget, they have the freedom to choose where reductions should be made. Additionally, travel can be supported by external grants and fellows are encouraged to apply for such funding.

I would like to conclude by again thanking the review panel for their hard work and constructive input. I would also like to sincerely congratulate all unit members at EMBL Hamburg and Matthias Wilmanns for a fantastic review. I am proud of the unit's innovative and collaborative research, as well as its indispensable services to support the scientific community across Europe and beyond.



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