

## EMBL-EBI Research Review

The review of the European Molecular Biology Laboratory's European Bioinformatics Institute (EMBL-EBI) research activities took place on 16-18 March 2021. The review panel consisted of 20 international experts, including three members of EMBL's Scientific Advisory Committee (SAC). The review was chaired by Bas van Steensel, Netherlands Cancer Institute, Amsterdam (NL). Several observers were present at the review; the Chair of SAC Paul Nurse, the Chair of Council Eiríkur Steingrímsson, the EMBL Council Delegate of Finland Sirpa Nuotio, the EMBL Director General Edith Heard, Head of EMBL Council Secretariat Michael Thompson, Senior Administrative Officer of the Council Secretariat Judit Gulyas, and Strategy Officer Emma Steer attended the review as observers. Due to the SARS-CoV-2 pandemic and the resulting travel and physical distancing restrictions, the review was convened exceptionally via video conference.

### Evaluation Summary

Ewan Birney and Nick Goldman served together as interim Heads of Research during most of the review period, with Goldman continuing as sole Head of Research when Birney was made the Deputy Director General of EMBL in January 2020. Birney and Goldman have done an outstanding job leading research at EMBL-EBI. After an international call, John Marioni was appointed as the new Head of Research in 2020 and will take up this position immediately after the review in March 2021. The appointment of Marioni as Head of Research is a huge gain for EMBL-EBI. He brings a world-class research programme, excellent leadership, and a keen sense of the important research directions for EMBL-EBI.

There were 18 Group Leaders under review, of which eight have additional responsibilities as Team Leaders, within EMBL-EBI's service activities. These research team leaders dedicate 20% of their time to research, as their service responsibilities take priority. During or immediately after the review period, five group leaders will have left EMBL-EBI to take on senior leadership positions at institutes throughout Europe. The EMBL-EBI leadership should be congratulated on providing early-career faculty with a springboard for their careers.

Undoubtedly, EMBL-EBI continues to be a world-class bioinformatics research institute. Clear synergy with EMBL-EBI services further boosts the global impact. Many of EMBL-EBI's 500 papers appeared in highly visible journals and the majority were made available as preprints prior to publication, thus promoting Open Science. EMBL-EBI scientists engaged in nearly 200 productive collaborations across the UK, Europe and the world and EMBL-EBI hosted around 250 scientific visitors. Particularly noteworthy are the leading roles that many EMBL-EBI research groups have shown in tackling urgent scientific problems related to SARS-CoV-2. This illustrates the relevance of the fundamental research done at EMBL-EBI and admirable flexibility to redirect research when needed.

One such example of this from the Goldman Group was also identified as a research highlight. The group performed a large-scale analysis of SARS-CoV-2 genomes, revealing a need for cautious interpretation of sequencing data to identify mutations within the virus' genome. Other research highlights include a paper by Marioni which presents an important tool for comparing and

combining scRNA-seq data, providing greater power for detection of rare cell types and better identification of cell type-specific marker genes. The Finn Group presented a formidable reconstruction of >90,000 metagenome-assembled genomes from >10,000 human microbiomes, identifying nearly 2,000 uncultured candidate bacterial species. In collaboration with the Noh Group in the Genome Biology Unit of EMBL Heidelberg, the Beltrao Group undertook an impressive systematic survey that identifies regulatory phosphosites across different molecular mechanisms, with links to a wide range of diseases and genetic susceptibilities. Finally, the Iqbal Group published methods to facilitate comprehensive cohort analysis of bacterial pan-genomic variation, with potential broad impact on genotype/phenotype and epidemiological studies.

EMBL-EBI research has important synergies with most other EMBL sites. The transversal themes planned for the new EMBL Programme are likely to further strengthen inter-unit interaction as EMBL-EBI is expected to play a leading role in data integration. It is clear that EMBL-EBI is perfectly positioned to help to build bridges between areas of ongoing and future research at EMBL.

In this context, the Review Panel was pleased with the future vision presented by Marioni. The Review Panel supports maintaining or increasing the diversity of topics covered by EMBL-EBI Research, provided that Group Leaders and Team Leaders are well connected within EMBL-EBI and EMBL as a whole. The Review Panel also agreed with Marioni's vision to recruit in areas such as: (i) artificial intelligence and machine learning with emphasis on image analysis; (ii) protein biology; (iii) host-microbiome interactions, and (iv) theory. In addition, the Review Panel suggests plant biology and infectious diseases with their broad impact on humanity to be also considered as important topics.

The satisfaction level of the PhD and postdoc fellows was high. The fellows felt that they were very well supported by EMBL during the pandemic. Postdoc fellows appreciated the new female mentorship programme that has been implemented under Edith Heard's direction. However, fellows wished to highlight discrepancies in salaries and benefits of EMBL-EBI students compared with EMBL Heidelberg students, despite higher living costs.

There is no doubt that the leadership of EMBL-EBI and EMBL is committed to improving the gender balance and diversity among faculty. The Review Panel hopes to see these targeted efforts reflected in the recruitments during the next review period. Although support and guidance of junior faculty is clearly attended to by the leadership, the Review Panel recommends that new group leaders get external guidance and mentorship at a checkpoint progress review two years after their start. Most of the Review Panel members supported the view of the leadership that EMBL-EBI should not facilitate wet-lab experiments in-house. Nevertheless, hybrid computational-experimental research is increasingly prevalent and important. For researchers who wish to conduct wet-lab experiments, they should seek practical solutions through collaborations, joint appointments, and use of the EMBL Core Facilities.

The panel would like to congratulate EMBL-EBI Research on its outstanding quality and quantity of research outputs as well as its success in training early-career scientists to become the next generation of scientific leaders.

## Response to the Panel's Recommendations

Thank you to the Panel for their time and effort in reviewing EMBL-EBI Research, especially in the current circumstances afforded by the ongoing pandemic. I would like to join them in congratulating everybody within EMBL-EBI Research and in particular the leadership team for an outstanding review. It is wonderful to hear such an exceptionally positive report. I am proud of what Nick Goldman and Ewan Birney have achieved in creating such a vibrant and nurturing research environment that has enabled so much outstanding research and so many early-career scientists to flourish. I am also confident that under John Marioni's new leadership and his vision, EMBL-EBI Research will thrive.

I am pleased that the EMBL-EBI research community was recognised for being highly collaborative. As the panel pointed out, this collaborative spirit has been key to enabling the global impact that EMBL-EBI has on international research. Important synergies exist within EMBL-EBI Research, with EMBL-EBI Services, and with other EMBL sites. This is achieved through careful recruitment coupled with encouragement for scientists to interact and join forces across the organisation and beyond. Specifically at EMBL-EBI, there is a critical mass of computational perspectives which bring complementary skill sets together and is relevant to many areas of biology.

I join the panel in congratulating EMBL-EBI researchers for the key roles they have played during the pandemic in tackling urgent scientific problems related to SARS-CoV-2. This was achieved despite the tremendous challenges of working during lockdown. I also agree with the panel that this pandemic illustrated the importance of fundamental research at EMBL-EBI, as practical applications immediately emerged. The pandemic also revealed the remarkable flexibility of EMBL researchers to redirect their research when needed.

In the context of future plans, it was highlighted that despite there being no obligation to do so, many researchers at EMBL-EBI were pivotal in the joint development of the EMBL Programme and will continue to be key players during the Programme's implementation from 2022 onwards. Examples of active involvement of EMBL-EBI research groups and teams in pan-EMBL actions in the future programme, include the Theory, Microbial Ecosystems and Human Ecosystems Transversal Themes as well as Data Sciences. The new Imaging Centre at EMBL Heidelberg and the need for novel image analysis methods across EMBL are further examples of collaborative touchpoints that I envisage between EMBL-EBI research and other parts of EMBL. EMBL's high turnover and open recruitment criteria focusing on excellence should also enable new areas, such as plant biology to emerge, as the panel suggests. I particularly welcome this suggestion given its relevance to the Planetary Biology Transversal Theme.

I am pleased to hear that PhD and postdoc fellows feel supported and that issues and concerns raised are listened to. I know that John Marioni is aware of the responsibility that EMBL-EBI Research leadership has to listen to fellows and also to ensure that diverse opportunities, such as training for academic or industry careers, can be offered. Regarding the perceived discrepancies in cross-site stipend rate comparisons, this will be looked into. However it should be noted that the stipend rates for pre- and postdoctoral fellows based at EMBL-EBI are derived from the base salary scales for UK staff members. In each EMBL host country the stipend rates are derived from the EMBL basic salary scales for that country, which are adjusted annually according to the procedure of the Coordinated Organisations, as outlined in EMBL's Staff Rules and Regulations. The

Coordinated Organisation procedure takes account of changes in cost of living in that country, government employee salary adjustments in that country and an index designed to maintain purchasing power parity between countries.

Thanks to the panel for bringing up the issue of gender balance and diversity, which we continue to proactively tackle as an organisation. I would like all of EMBL, including EMBL-EBI Research, to consider equality, diversity, and inclusion at all levels of the organisation's standard operations, including recruitment. To enable this, a new Equality, Diversity, and Inclusion Office has recently been created at EMBL and is currently developing EMBL's first equality, diversity, and inclusion strategy.

I also thank the panel for the discussion about the possibility of incorporating experimental laboratories into EMBL-EBI. For now, such wet lab space is not envisaged at EMBL-EBI as the group and team leaders collaborate very effectively with experimental researchers both with other EMBL sites, as well as with local and international partner institutes. This enables EMBL-EBI scientists to carry out a wide range of collaborative projects and experimental methods. Like the panel, I encourage group and team leaders to continue and expand upon these collaborations, even more so in the context of the new Programme.

EMBL-EBI's remarkable, long track-record in identifying promising young researchers, and nurturing them to succeed was rightly emphasised by the panel. I do agree with the panel on the importance of formal mentorship structures. These were put in place during the current review period and after initially being optional, are now mandatory for early-career group leaders.

In conclusion, I am very proud of EMBL-EBI Research for all their scientific contributions to the community, and for creating an atmosphere that nurtures and emboldens early-career group leaders to take on scientific leadership roles. They follow in the footsteps of many alumni that EMBL has seeded throughout Europe and beyond during its almost 50-year history. My congratulations once again to Nick Goldman and Ewan Birney for so successfully leading a highly productive and supportive unit and to John Marioni for taking on its leadership and ensuring what promises to be an exciting and successful future.



Professor Edith Heard, FRS  
Director General  
23 June 2021