

European Molecular Biology Laboratory's Vision for FP9

I. Introduction

The European Molecular Biology Laboratory (EMBL) is Europe's flagship intergovernmental research organisation for the life sciences and one of the highest ranked scientific research organisations in the world. EMBL has more than 40 years of experience in developing the framework conditions for collaborative life sciences in Europe in areas such as training, scientific services and state-of-the-art research facilities.

The ninth EU Framework Programme for Research and Innovation (FP9) will need to meet the continuous ambition of European global leadership in research and innovation. This can be accomplished by increased efforts in areas where EU added value is greatest and where no equivalents at the national or regional level exist. Notable examples of this are Marie Skłodowska Curie Actions, European Research Council grants and support for Research Infrastructures, three programmes which are pivotal in strengthening a knowledge-based economy in Europe and developing and expanding the boundaries of human knowledge.

As the sole intergovernmental research-performing European infrastructure for the life sciences, and a founding member of the forum of European Intergovernmental Research Organisations (EIROforum), EMBL is committed to providing input in shaping the next EU Framework Programme for Research and Innovation. The proposals in this paper would help boost European research further, drive European leadership in selected research areas and improve the overall functioning of the next programme.

II. Key Principles for FP9

EMBL suggests that the next EU Framework Programme for Research and Innovation is based on the following guiding principles:

Scientific excellence. FP9 should ensure that Europe remains at the scientific forefront by maintaining a focus on scientific excellence across the whole programme. This will require significant additional investments especially for the most successful initiatives such as the European Research Council (ERC) and the Marie Skłodowska-Curie Actions (MSCA).

Make long-term investments in multidisciplinary research. The support provided to collaborative projects in Horizon 2020 (H2020) has so far made major contributions to cutting-edge research and encouraged interdisciplinarity in Europe. Providing steady and sufficient support for cross-disciplinary basic research directed towards complex major objectives should therefore continue to be a European priority.

Increase support for data-driven science. The superabundance of scientific data has opened up novel opportunities for generating new insights relying on data repositories but there are significant challenges in processing, storing and analysing these. EMBL, as a forerunner in providing large-scale bioinformatics services to researchers and industry, encourages FP9 to be designed to reap the benefits of this revolution. Unlocking the opportunities by making data Findable, Accessible, Interoperable, and Re-usable (FAIR) will also require appropriate funding for both the collecting, storing and dissemination of data as well as for data curation and stewardship.

Long-term rather than short-term impact. EMBL agrees that the next Framework Programme takes on board the acknowledgement by the Lamy report¹ that research requires time and that not all research lead to immediate innovation. Curiosity-driven basic research provides the foundation and the necessary concepts for developing innovative applications. Moreover, true breakthroughs with the capacity to alter our understanding of the surrounding world often take time. FP9 should thus include a set of flexible approaches when dealing with impact assessment, ensuring a broad notion of impacts and a diversity of methodologies for measuring them.

Expanding Europe's global reach. The European Research Area has been made stronger by the participation of third countries and the decline of third-country participation in H2020² calls for additional efforts in this field. EMBL views positively the opening up of further sections of the next Framework Programme to researchers from outside Europe and calls for additional measures enhancing scientific cooperation, networking and partnership building between Europe and the rest of the world. One way forward would be to fund all international partners from third countries based on the sole criteria of excellence.

Engage the next generation of citizen scientists. EMBL sees the goal of increasing citizens' involvement in FP9 as commendable. This, however, requires a European public equipped with a high degree of science literacy. Currently, large asymmetries persist³ in the ability of European children and teachers to access and interact with science, creating far-reaching inequalities in their science-related skillsets. To counter this, FP9 should increase the funding for involving the non-adult population in R&I, encouraging the creation of new partnerships and training formats between schools, research organisations and science museums, with the goal of improved science education and training, to foster broader public science literacy.

III. Priorities and structure for FP9 – reflection on the Lamy report

EMBL agrees that the main three-pillar structure of the framework programme, introduced in H2020, should be retained in FP9. Not only did the structure bring significant simplification vis-à-vis FP7, but applicants would also welcome a continuation of some of the programme's elements and instruments.

In line with the goal of addressing even more ambitious challenges in FP9, EMBL agrees that a doubling of the budget to €160 billion is a step in the right direction. This budget should also be grant-based and dedicated to civilian research.

Concerning the proposal of transforming FP9 into a more mission-oriented programme seeking inspiration from the United Nations Sustainable Development Goals (SDG), EMBL wishes to highlight that several topics under the H2020 Societal Challenges have already been considered relevant to the SDG. Introducing a mission orientation in FP9 would thus be a natural extension of the current 'Societal Challenges' pillar:

¹ EC LAB-FAB-APP, Investing in the European future we want' (2017) ISBN 978-92-79-70069-9

² EC SWD(2017) 221 final INTERIM EVALUATION of HORIZON 2020 Annex 1

³ Ballas, D., R. Lupton, D. Kavroudakis, B. Hennig, V. Yiagopoulou, R. Dale and D. Dorling (2012) Mind the Gap: Education inequality across EU regions, Paris: NESSE/INRP. See also European Commission (2015) Science Education for Responsible Citizenship ISBN 978-92-79-43636-9

FP9 pillar structure as proposed by the Lamy expert group

Horizon 2020		Framework Programme 9	
Pillar 1	Excellent Science	→	Science and Skills
Pillar 2	Industrial Leadership	→	Innovation and Competitiveness
Pillar 3	Societal Challenges	→	Global Challenges

Overall, concerning the first pillar, funding for the development and use of world-class Research Infrastructure in Europe should be increased, alongside the funding for the European Research Council and the Marie Skłodowska-Curie Actions. Concerning the proposed second pillar, calls in areas such as biotechnology should encourage collaboration between industry and public research organisations.

Moreover, if a top-down mission-orientation is adopted for the proposed third pillar, EMBL wishes to highlight that the missions, for example in the area of Health, should remain compatible with curiosity-driven fundamental research and leave sufficient room for researchers to experiment and take unbeaten paths in contributing to such missions.

IV. Detailed recommendations on mechanisms and instruments

EMBL sees that several current H2020 instruments are also well suited for FP9. The following are our detailed recommendations.

The European Research Council

Equipped with a very well-functioning three-tier structure of grants (starting, consolidator and advanced) and an excellent peer review process, the European Research Council (ERC) has achieved world-wide recognition and should remain a key body in FP9. The success of the ERC in promoting research excellence across Europe should also be reflected in an increase of its annual funding in FP9.

Concerning the grant application process, EMBL strongly endorses the efficient processes currently implemented by the ERC Executive Agency, but recommends streamlining the ethics review process in order to avoid extensive delays in the launch of a project. EMBL also encourages the European Commission to continue to reflect on how to encourage more women and more life scientists to apply for ERC grants.

The latest addition of Proof-of-Concept (PoC) grants is a welcome addition to the core grants, as they allow ERC grantees voluntarily to explore the prospects of commercialization of their ground-breaking science. EMBL also welcomes the idea of Synergy Grants as a step to encourage interdisciplinarity but wishes to highlight that the current review process is extremely complex. To succeed, the scheme needs to adopt a more efficient review process and the ERC could introduce an option to cancel a synergy grant during mid-review in cases where projects are not living up to their goals. A potential future expansion of the Synergy- and PoC-grants should not, however, have a negative impact on the funding of the three core ERC grants schemes.

The Marie Skłodowska-Curie Actions

The Marie Skłodowska-Curie Actions (MSCA) remain a highly attractive programme to both researchers and host organisations due to their focus on interdisciplinarity, international mobility, good working conditions and a bottom-up approach to research topics.

However, with regard to the 'European Fellowships' under the MSCA Individual Fellowships (MSCA IF) scheme, EMBL wishes to underline that life science projects are rarely finalised in the timespan of 2 years. Extending the duration of European Fellowships in FP9 to cover up to 3 years would ameliorate this issue.

For MSCA Co-funding of regional, national and international programmes (COFUND), the current project lifespan for a funded fellowship programme is 5 years, but a post-doctoral project in life sciences generally lasts at least 3 years. In order to ensure that fellows accepted during the third year of the programme are fully covered, the lifespan of COFUND projects should be extended to 6 years. As COFUNDs are based on reciprocal co-funding, such an extension would be cost-neutral and a clear improvement.

European Research Infrastructures

The efforts to open up existing research infrastructures through transnational access funding schemes and integrating activities in the FP7 programme were much welcomed by our scientific community. Unfortunately, provision for access to such infrastructures did not grow in the H2020 programme to the extent necessary to ensure that an ever-increasing pool of European scientists have access to excellent research infrastructures.

Such transnational access schemes are particularly important for the smaller and newer EU member states and have thus a clear European dimension. Future access schemes should operate on the same principle, giving access to scientists based on the quality of their scientific proposal, with targeted efforts for less advanced communities.

In FP9, access schemes should strive to strike a balance between giving support to access existing infrastructures such as synchrotrons, whilst simultaneously giving scientists access to the latest technologies, for example the method of Cryo-electron microscopy that has been sweeping through the field of structural biology and the new advanced imaging methods that are crucial in many fields of the life sciences.

With regard to the development of new innovative technologies at research infrastructures, EMBL sees that pan-EU initiatives such as the ATTRACT, which accelerates the development of detector and imaging technologies for the market through a process of co-innovation and co-creation, would be a good model for other and further developments.

European Research E-Infrastructures

In addition to developing measures enhancing the interoperability of biological and medical data resources and software tools to facilitate the exploitation of research results, FP9 also urgently needs to create solutions with regard to data curation. Data is growing exponentially but large amounts of the data deposited in data repositories in Europe are not well annotated or lack crucial metadata and can thus not be properly exploited.

Without being able to find and optimally exploit all this data, European researchers will be unable to harness the benefits of the data revolution. FP9 should thus introduce a funding scheme supporting curators and the curation and stewardship of data, for example through the development of better processes and increasing the numbers of data stewards and data wranglers.

Developing the European Open Science Cloud

Maintaining a competitive advantage in cloud computing and big data analysis must remain a top priority in FP9, as without the development of the e-infrastructures of the future, Europe will inevitably fall behind. The European Open Science Cloud (EOSC) pilot represents a good first step and EMBL recommends that the governance model is formed around end-

users and procurers. By making EOSC a key theme in FP9, research communities and service providers will continue to build trust and to invest in the initiative.

Further action is also needed to fund outstanding exemplars in the scientific community, for example by stimulating the use of the EOSC through a voucher scheme, and by exploring hybrid models involving private and public cloud resources, that are linked with trusted community repository and service capacities of cloud “fast runners” such as EMBL. For the success of the EOSC, taking measures to integrate innovative ideas from commercial cloud providers will be crucial.

Missions and goals for Health-research in the 2030’s

Basic research forms the foundation for breakthroughs in applied health research, a fact that calls for increased support for basic research endeavours in FP9. Such research should explore solutions for the next decade in the grand areas affecting the health and wellbeing of the European and global population. Promising ways forward would be to develop:

- Support measures for undertakings of global significance such as the Human Cell Atlas, aimed at charting the specific genetic properties of all human cells, laying the foundation for a cell-based description of disease states.
- A research programme on the genomics of biodiversity, endangered species and climate change.
- A coherent and ambitious European microbiome programme. The collection of microbes living in and on our body have been associated with numerous diseases, yet we have barely understood their role in the context of life-style and genetics.
- The European capabilities for standardised big data processing and integrated analysis, which can provide us with the opportunity to change the standard of care, for example, of many cancer types within the adult population.
- A European equivalent to the US-based 4D Nucleome project, an area in which many European researchers have made important progress but where a coherent European research programme is missing.
- Imaging and omics technologies (i.e. highly multiplexed imaging, as well as spatially resolved omics), crucial for a better understanding of disease mechanisms and the development of novel therapies.
- Quantitative biology for whole cell/tissue modelling
- An ambitious research programme on resilience and the neural basis of environmental adaptation, a major goal of current neuroscience research across the globe.
- An ambitious research programme on antimicrobial resistance, enhancing our understanding of virulence, resistance mechanisms, host-microbiome and host-pathogen interactions

Spreading Excellence and Widening Participation

Some EU countries continue to experience low participation in the EU Framework Programme for Research and Innovation. EMBL sees that the three widening actions (Teaming, Twinning and ERA-Chairs) are well suited to address the participation rates in the long run, each with their own approach, and recommends maintaining ring-fenced finances for the R&I widening measures in FP9.

Excellence should, however, remain as the main criterion of the actions and widening proposals should continue to be judged based on commitments from the regional government to provide funds, good working conditions for scientists, and institutional independence.

In bridging the R&I divide, EMBL is also supportive of calls to increase the use of structural funds for investing in research and innovation capabilities, as this would support both regional development and research.

Science with and for the next generation of scientists

The horizontal initiative 'Science with and for Society' (SWAFS) has been an important first step with regard to issues such as gender, science education and public engagement. Unfortunately, these have been severely underfunded in H2020, having received only around 0.6% of the total budget. Further action in this area should be taken and more prominence should also be given to tackle enduring institutional gender imbalances.

Regarding science education and the non-adult population, FP9 should boost the creation of a European science-literate public with a sufficient level of familiarity with the enterprise and practice of science. This would entail an increase in opportunities for European children and teachers to interact with and access science.

Towards integration of innovation instruments

EMBL, along with EIROforum, has been supportive⁴ of the European Innovation Council (EIC) pilot as a new European instrument to support innovation. Further development of the EIC beyond the pilot stage should aim for a simple and transparent structure. Moreover, the future EIC should not limit itself to funding only small and medium-sized enterprises, but should remain open to public research organisations as well.

Concerning the future of the FET Open instrument in the foreseen EIC pilot and FP9 and in view of its current strengths, the instrument should keep funding consortia carrying out both blue-sky exploratory research as well as technological objectives, rather than just the latter.

The launch of the EIC-pilot is also a good opportunity to re-examine the roles of other existing instruments designed to support innovation, such as the European Institute of Innovation and Technology.

Funding aspects

The significant oversubscription and very low success rates during the first half of H2020 threaten to discourage brilliant young scientists from submitting applications. To counter oversubscription, EMBL recommends extending the use of a two-stage application process for calls in FP9.

An additional simplification would be to acknowledge organisations' own accounting practices and to adapt a more trust-based approach to audit, highlighting accountability and performance rather than compliance and control. This approach has been proposed by many H2020 beneficiaries, members of the European Parliament and the European Court of Auditors and would be a major simplification.

⁴ European Innovation Council: position of EIROforum (May 2016)

V. Concluding statement

EMBL continues to be a staunch supporter of the EU Framework Programmes for Research and Innovation and calls on European policymakers to significantly increase funding for the ninth Framework Programme as well as for the instruments with clear European benefits, such as Marie Skłodowska Curie Actions, European Research Council grants and the Research Infrastructures programme.

To further develop Europe's world-class scientific excellence, the next programme should be guided by scientific excellence, support for the data-driven science revolution, multidisciplinary, engagement of the non-adult population in the practice of science, and a focus on long-term impact. Support should also be provided to curiosity-driven fundamental research in exploring uncharted territories in the quest for solutions to issues affecting the health of the European and global population.

This paper presents a consensus view of EMBL and its sites in France, Italy, Germany, Spain and the United Kingdom. Please direct further questions and comments to:

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