Human Brain Project Successfully Enters the Next Phase

Human Brain Project

The Human Brain Project (HBP) [1] is one of the first two projects funded by the European Union's Future and Emerging Technologies (FET) Flagship Initiative [2]. With over a hundred partner institutions from more than 20 countries, HBP is building a European research infrastructure for the neuroscience community. It was launched in October 2013 and successfully entered its third project phase in April, 2018.

Gaining a comprehensive understanding of the brain is one of the grand scientific challenges of our time. Several countries have initiated longer-term brain research initiatives in recent years, and HBP was among the first. While other projects focus on certain neuroscientific research aspects, the HBP takes the unique and sustainable approach to build and operate a research infrastructure (RI) co-designed by the neuroscience community. This RI will enable scientists to gather, organize and disseminate data, to build and simulate multi-scale models of the brain, and to develop brain-inspired computing, data analytics, robotics software and technology. In December, 2017, the HBP and four other international projects signed the Canberra Declaration to create an International Brain Initiative (IBI) and join forces in neuroscience research [3].

The HBP RI is organized in six information and communication technology (ICT) platforms that were first released at the end of the project's ramp-up phase in March, 2016 [4]. In the last two years, these platforms significantly advanced and were more closely integrated. The High-Performance Analytics and Computing (HPAC) Platform—coordinated by the Jülich Supercomputing Centre (JSC) at Forschungszentrum

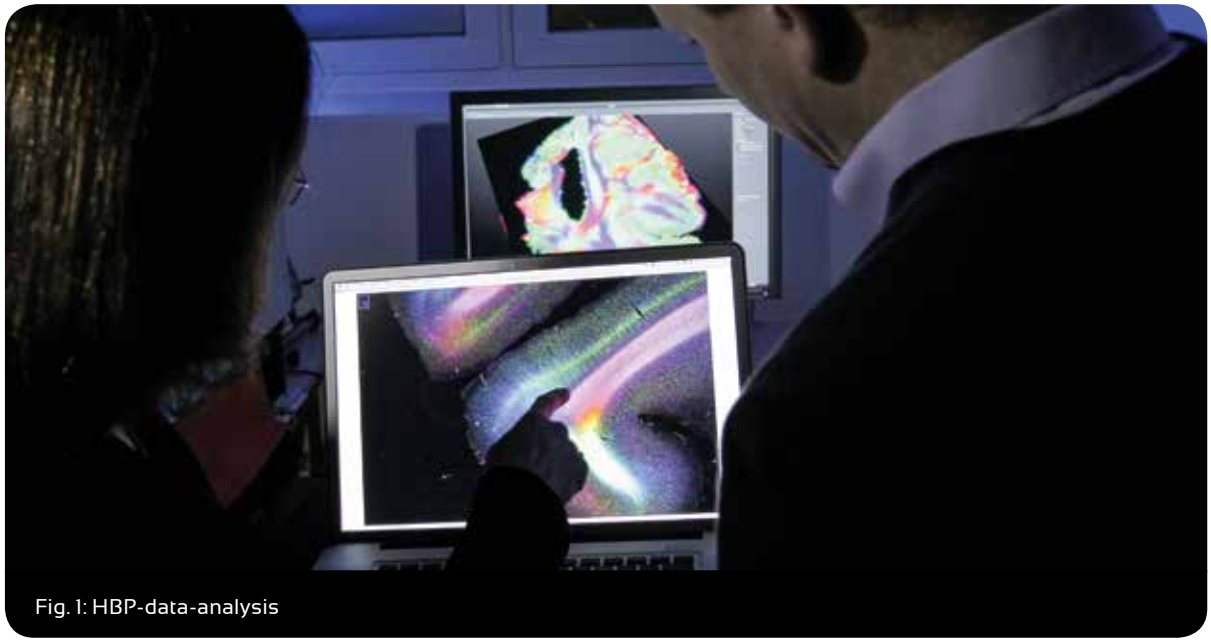

Fig. 1: HBP-data-analysis

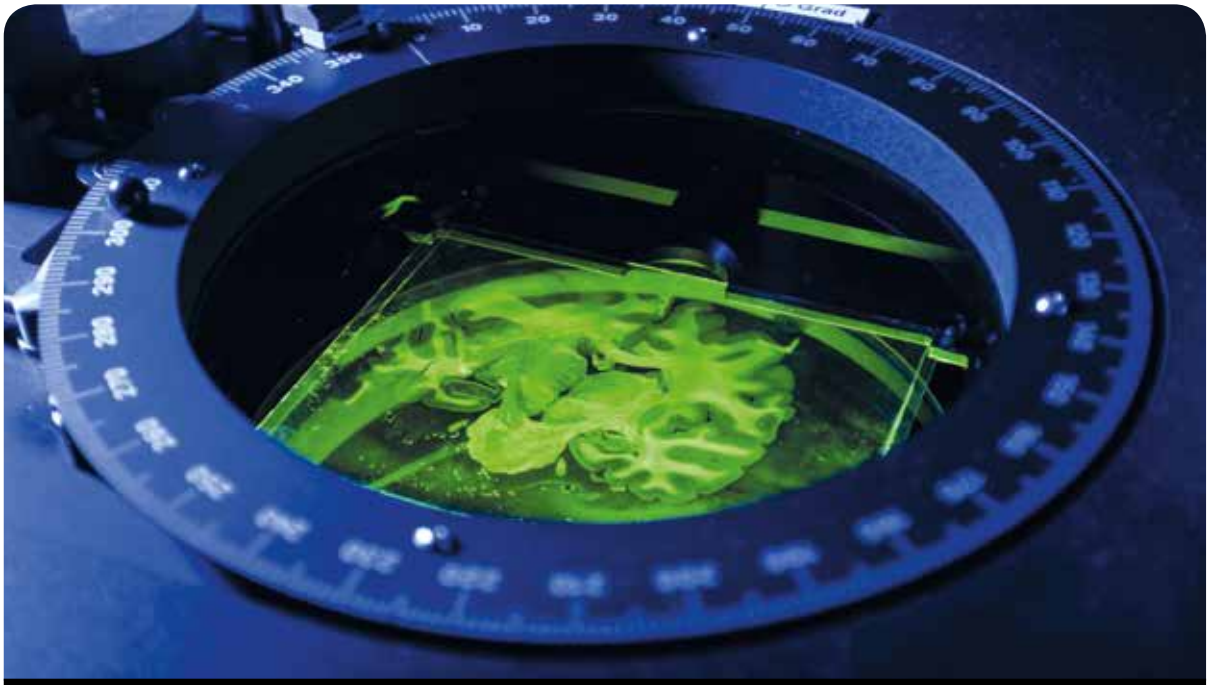

Fig. 2: HBP-data-gathering

Jülich and the Swiss National Supercomputing Centre in Lugano (CSCS)—plays a crucial role in the HBP RI. The mission of the HPAC Platform is to provide the basic data and computing infrastructure that enables scientists to store their data, integrate it into models, use it in simulations, as well as to analyze and visualize it. The participating centers BSC, Cineca, CSCS, JSC and, starting with the third phase of HBP, the TGCC of CEA in France are jointly developing the infrastructure in co-design with early adopters from the HBP community. Including CEA, tier-0 HPC systems of all five PRACE hosting members are now integrated into the HPAC Platform and available to HBP scientists for their research. The five centers are also working closely together to develop the federated Fenix infrastructure, which receives funding through the recently started ICEI project [5]. While primarily driven by HBP use cases, the scope of Fenix goes beyond neuroscience, as the infrastructure should also benefit other research areas with similar requirements, such as materials science.

One of the main goals for the recently started HBP phase will be to bring the six ICT platforms together in a single platform, the HBP Joint Platform [6]. The strength of the HBP approach lies in the support of complex, interactive workflows including modelling, simulation and data analysis. These workflows require the combined use of several of the individual platforms and—importantly—their seamless integration,

to provide a user experience that allows researchers to focus on scientific problem solving rather than technical details. To this end, the HBP Collaboratory [7] will be transformed into a convenient and reliable user portal for the HBP Joint Platform. In addition, the HBP is about to establish the HBP High-Level Support Team (HLST), a group of active, experienced scientists and technology experts that will support users in the implementation of complex workflows, with the welcome effect that parallel development will be avoided and synergies used. The HLST will also help with applications for resource allocations.

The HBP Joint Platform will build on the base infrastructure provided by Fenix. The HPAC Platform will be migrated to operate on top of this federated infrastructure and take care of the community-specific, platform-level interfaces to the generic Fenix services and resources. Already in the previous project phase some of the other HBP ICT Platforms migrated parts of their service portfolios to the HPAC infrastructure. These efforts will be intensified in the next two years of the HBP Flagship endeavor in order to enable neuroscience research that will bring us closer to a comprehensive understanding of the human brain.

References

[1] **Human Brain Project:**
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[3] **Canberra declaration:**
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[4] **Human Brain Project:**
Towards a European infrastructure for brain research, http://inside.hlrs.de/editions/16autumn.html#human-brain-project-towards-a-european-infrastructure-for-brain-research (Reference to an article in a previous InSiDE edition)

[5] **Fenix Consortium to build a Federated Data and Computing Infrastructure for the Human Brain Project**
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[6] **HBP Joint Platform:**
https://www.humanbrainproject.eu/en/hbp-platforms/hbp-joint-platform/

[7] **HBP Collaboratory (registration required):**
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