Supplementary Information
(Where is the Brain in the Human Brain Project? Frégnac and Laurent)

A few keywords and definitions

This section is to help—to the extent that we can—readers navigate around the complex EC administrative literature associated with Flagships. The curious reader is encouraged to check (and occasionally decrypt) the suggested official websites.

Horizon 2020: EU research and innovation program providing some €80 billion over the years 2014-2020 (7 years). According to the Horizon 2020 website, "Horizon 2020 is the financial instrument implementing the Innovation Union, a Europe 2020 flagship initiative aimed at securing Europe's global competitiveness."
More information at: http://ec.europa.eu/programmes/horizon2020/

Future Emerging Technologies (FET): FET is the EU's Information and Communication Technologies (ICT) Incubator for long-term research in this area: it supports collaborative research to extend Europe's capacity for advanced innovation in the area of information and communication technologies. Its mission is to foster scientific collaborations across the members of the EU, and across scientific communities and disciplines, on new, high-risk ideas, to accelerate development of the most promising emerging areas of science and technology. FET has three main programs: FET-Open; FET-Proactive; *FET-Flagships*.
More information at: http://cordis.europa.eu/fp7/ict/programme/fet_en.html

FET-Flagships: FET Flagships are "ambitious, large-scale, long-term, science-driven research initiatives tackling grand challenges in Science and Technology that aim to achieve a visionary goal". They correspond to *a joint effort of the EU and national programs to provide a large financial support* (ca. 100 M€/year over 10 years). According to the FET Flagship documents, "the overarching nature and magnitude of these initiatives implies that they can only be realized through a federated effort of the different EC services, along with Member States, regional and other funding agencies, and where appropriate, global partners and industry". This point is key to understand the hybrid nature of the funding scheme for HBP: about one half of the budget originates from the EU; the other must originate from investigators who wish to join HBP, via individual applications to their local funding agencies, plus a vetting by the HBP core team, according to criteria defined by them, to fit the Flagship's overarching goal.
More information at: http://cordis.europa.eu/fp7/ict/programme/fet/flagship/home_en.html

Framework partnership agreement (FPA): The objective of the FPA is to establish, for each one of the two funded FET-Flagships, a "*stable and structured*" partnership between the EC and the institutions/organizations who are committed to "*establishing, maintaining and implementing the strategic research roadmap of the Flagship*". The Framework Partnership Agreement has no budget. It has an overall "roadmap" and sets out most of the contractual conditions. S*pecific grant agreements* (SGA) are also established to execute parts of the roadmap. An SGA exists only within the context of an FPA. *Core projects* (implemented as successive SGAs) will take each FET-Flagship along the 10-year strategic roadmap. *Complementary projects* are foreseen to complement the core project, thus opening it up to the broader scientific community.

ERA-NET schemes: Long-term schemes "to step up the cooperation and coordination of research activities carried out at national or regional level in EU Member and Associated States through the networking of research activities conducted at national or regional level, and the mutual opening of national and regional research programs". These schemes are some of the tools set up to help co-finance European Partnership

Programs.
More information at: http://cordis.europa.eu/coordination/era-net.htm

FLAG-ERA scheme: FLAG-ERA is an ERA-NET scheme set up in Nov 2013, specifically to support the construction of the two FET Flagships Graphene and HBP (and also to help support the four runner-ups of the initial Flagship competition). It involves some 31 national and regional funding organizations from 24 countries.
More information at: http://www.flagera.eu

Diagram illustrating the funding structure of a FET-Flagship
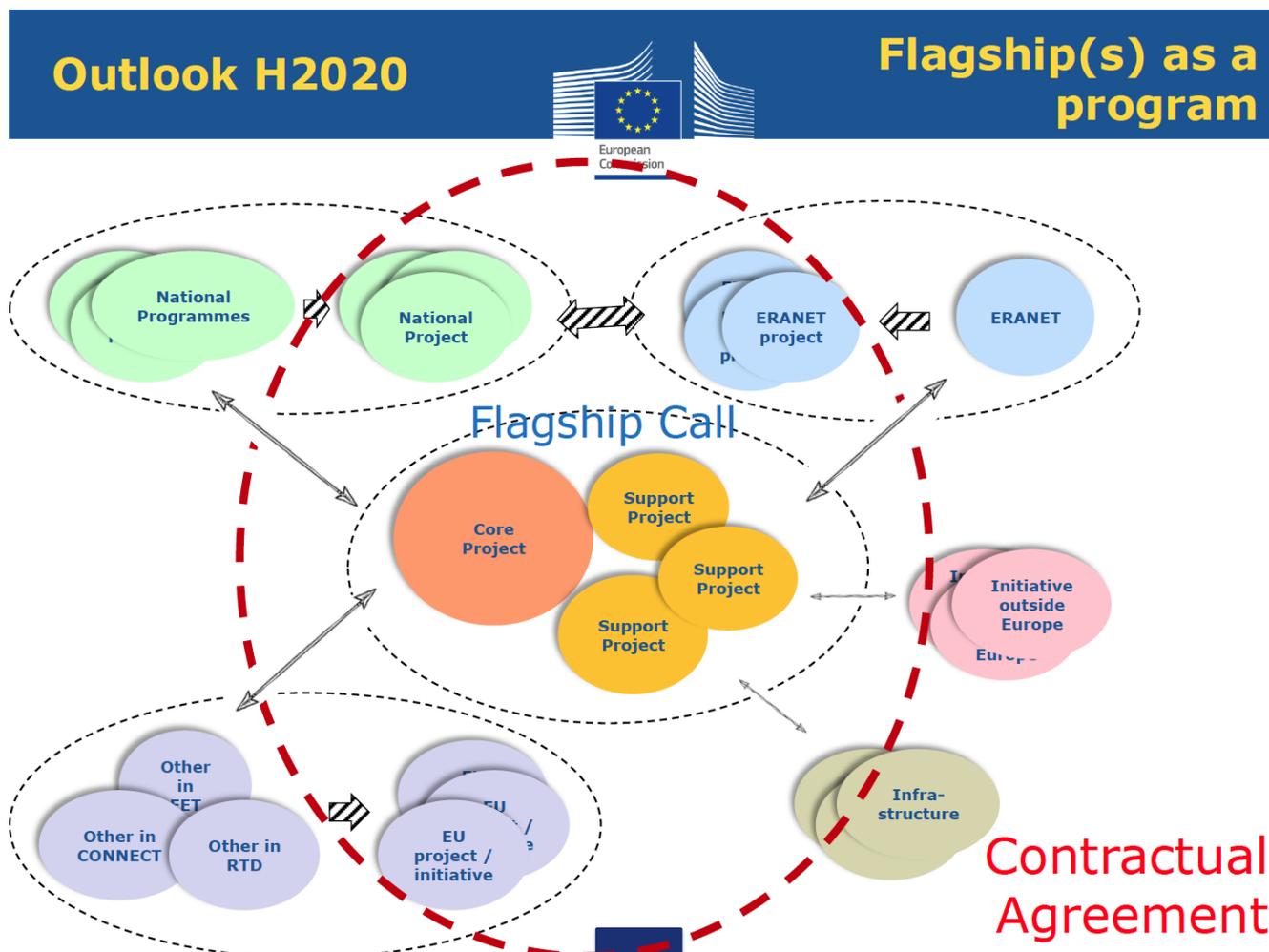
This diagram illustrates the actual complexity of the funding structure of a Flagship project. While a Flagship's overall budget is on the order of €1B, only part of this budget is guaranteed and provided by the EC (core in figure). The remainder must be raised by individual scientists (via "partnering programs") from a variety of local (national, regional etc) sources and be accepted by the executive/decisional structure of the Flagship.

Source: Public presentation by Wolfgang Boch, FET-Flagship information day, Bratislava, SK, 23 May 2013 :
"*FET Flagship Initiatives: Concept, Call and Evaluation results* "

Additional Information concerning Funding and HBP:

Over the past ten years, the FET program has financed a number of interdisciplinary initiatives at the interface of neuroscience and information technology (IT) (e.g., Life-like Perception Systems; Bio-inspired intelligent information systems; Bio-ICT Convergence), each funding mid-sized "integrated projects" with up to €12M over 4 years. Examples can be found at:
http://daisy.ini.unizh.ch/24.html,
http://facets.kip.uni-heidelberg.de/
http://brainscales.kip.uni-heidelberg.de/
As indicated in our analysis, these biology-inspired and interdisciplinary projects are historical antecedents (together with the Blue-Brain-Project) to the HBP-Flagship. These projects, however, provided balanced funding to their computer science, physics/microelectronics and neuroscience components.

The funding structure of HBP follows a two-step process. Funding for HBP started less than a year ago with a short "ramp-up" phase (to last 2.5 years), organized as one of the above FET projects, but with a larger budget. The bulk of the funding, however, will come during phase 2. The official statement of the EC is: "*The overall EC contribution to each FET Flagship initiative in Horizon 2020 is expected to be around EUR 50M/year, subject to several factors such as budget availability, quality of proposals and performance of the action*". According to new rules ("Horizon 2020" see above), funding will be split in two shares. One half (430 M€) will originate entirely in the EC (via FET), and will fund what is called the "core team", limited coordination actions (<€5M) and a limited set of trans-national open calls (FLAG-ERA, €3M). The other half is at present entirely hypothetical, and depends on so-called "partnering funds", to be raised by investigators in and across the different nations of the European Community via independent national and regional open calls and private funds. The successful applicants to these calls who wish to join HBP will then undergo selection by HBP—through a process yet to be defined, but presumably requiring promise of data transfer—and given an HBP label. Thus, what appears to most observers as a €1B initiative from the EC will in fact rely on "partnering" investigators and institutions bringing about half of the money.

Extended reading list

1 – FET, Flagship and EC

(1.1). Research EU Focus on "Future Emerging Technologies: Science beyond fiction", N°9, May 2011, ISNN : 1831-1901.

(1.2). Sestini, F. and van der Pyl, T. (2005). Future Emerging Technologies: a vision for tomorrow of EU IST research. ACM SIGCOMM Computer Communication Review. Volume 35, N°2, pp 87-91.

(1.3). Future and Emerging Technologies (FET): FP7 Projects Compendium 2007-2013. Edited by the European Commission. 100 pages.

(1.4). The FET flagship model, key policy and implementation issues: Conclusions from an external consultation workshop, 29 April 2014, Brussels, Digital Agenda for Europe, 75 pages.

(1.5) http://www.7rp.sk/fileadmin/user_upload/infodni/Boch_FET_Flagship_Initiatives.pdf

2. – Selected FET projects at the interface of Neuroscience, Computer Science and Physics

FP6 : Bio-inspired
- http://daisy.ini.unizh.ch/24.html,
- http://facets.kip.uni-heidelberg.de/

FP7 : Bio-ICT convergence
- http://brainscales.kip.uni-heidelberg.de/).

3 – Flagship Pre-projects linked to Neuroscience

(3.1). The Human Brain Project. (April 2012). A report to the European Commission. HBP-PS Consortium, 107 pages.

(3.2). The Robot companions for citizens manifesto: More than future. (2012). FP7-ICT-2011-FET-F 284951, 13 Pages.

4 – The "Blue Brain Project"

(4.1) Markram, H. (2006). The Blue Brain Project. *Nature Reviews Neuroscience* (Perspectives), 7: 153-160.

(4.2) Markram, H. (2009). A Brain in a supercomputer. TED ideas worth spreading.
http://www.ted.com/talks/henry_markram_supercomputing_the_brain_s_secrets

 (4.3). Evaluation of the Blue Brain Project and Human Brain Project. (2011). EPF internal Report. Committee chaired by G. Shepherd. 19 pages.
http://www.ethrat.ch/sites/default/files/BBP_HBP_Evaluation2011.pdf

5 - Scientific debate on Big Data and HPC in Neuroscience

(5.1) Seung, S. (2013). Connectome: how the brain's wiring makes us who we are. 359 pages. Houghton Mifflin Harcourt. A dialog between Henry Markram and Sebastian Seung can be watched in the movie "Blue Brain" directed by Noah Huton (2009) (http://bluebrainfilm.com/bb/).

(5.2) Sporns O (2013). Commentary – Focus on brain mapping: Making sense of brain network data. *Nature Methods*. Volume 10, 6: 491-493.

(5.3) Eliasmith, C. and Trujillo, O. (2014). The use and abuse of large-scale brain models. *Current Opinion in Neurobiology* 25: 1-6.

(5.4) Kandel, ER, Markram, H, Matthews PM, Yuste R and Koch C (2013). Neuroscience thinks big (and collaboratively). *Nature Reviews Neuroscience* (Perspectives), 14: 659-664.

(5.5) Einevoll, G. Generosity in Brain Research (in Norwegian). Reply letter in Morgenbladet Journal, July 17, 2014.

(5.6). Markram, H., Meier, K et al. (2011). Introducing the Human Brain Project. *Procedia Computer Science*. Vol.7: 39-42. See also Markram, H (2014). Building electronic brains for in silico Neuroscience. AAAS 2014 Annual Meeting. 13-17 February, Chicago. Meeting global challenges: discovery and innovation.

(5.7). Monard, D., Summary of the conference "perspectives of high power computing in Neurosciences. Conference series "the Big Six-spotlight on the EU-Flagship initiative. In: 2012 Report of the Swiss Academy of Sciences. www.akademien-schweiz.ch/fr/flagshipseries

(5.8). In the Press:
Dessibourg, O. (2012). Le cerveau virtuel qui échauffe les esprits. Le Temps. Rubrique Neurosciences du 01 Février 2012.
Waldrop, M. (2012). Brain in a Box. *Nature*, vol. 482, 456-458

(5.9) Frégnac Y (2013). Big science needs new concepts. *Cell*. In "Voices": Brain initiative and Human Brain Project: Hopes and Reservations. Volume 155, Issue 2, 265-266 DOI: 10.1016/j.cell.2013.09.037

6 – Open letter to the European Community and HBP replies

(6.1) Open letter: Open message to the European Commission concerning the Human Brain Project. July 7, 2014. Collective letter coordinated by Zach Mainen and Alexandre Pouget.
http://www.neurofuture.eu/

(6.2) Frackowiak, R (2014). Defending the grand vision of the Human Brain Project, 16 July 2014. New Scientist Magazine, issue 2978.

(6.3). Aebischer, P. (2014). Interview in http://www.rts.ch/info/sciences-tech/6021226-patrick-aebischer-repond-aux-critiques-sur-le-human-brain-project.html.

(6.3). Official reply of HBP: the vital role of neuroscience in the Human Brain Project. 4 pages. https://www.humanbrainproject.eu/documents/10180/17646/HBP-Statement.090614.pdf

7 – Comparison with other international large-scale initiatives

(7.1) Palca, J (1990). Genome backlash going full force. *Science*. 18 May 1990:Vol. 248 no. 4957 pp. 803-804. DOI:10.1126/science.11642769

(7.2). Brain initiative: Brain 2025, a scientific vision: Brain Research through Advancing Innovative Neurotechnologies (BRAIN) working group report to the advisory committee to the Director, NIH. June 5 2014. 146 pages.

(7.3). Poo, Mu-Ming (2014). Where to the mega brain projects? *National Science Review*. 1: 12-14. Doi: 10.1093/nsr/nwt019.

(7.4). Qiu, J. (2014). FORUM on China's funding system and research. *National Science Review*. 1: 161–163, doi: 10.1093/nsr/nwt034