HBP SCIENCE MARKET

BRAIN SIMULATION PLATFORM

SP6

What we do

The Brain Simulation Platform (BSP) is an internet-accessible collaborative platform designed for the digital reconstruction and simulation of brain models. Researchers can access the BSP to reconstruct and simulate models of the brain at different levels of detail to study their structure and function. In June 2017, the second version of the BSP was released. This new version is more user-centric and user-friendly, so that users with different levels of neuroscientific or technical expertise can benefit from the BSP for their research or just for curiosity.
Along with the new version of the BSP, we released the first MOOC (massive open online course), on simulation neuroscience. There will be three MOOCs that will teach participants how to use the state-of-the-art modelling tools of the BSP to simulate neurons, build neural networks and perform simulation experiments. In the first MOOC, you can learn how to digitally reconstruct a single neuron. The first run of the first MOOC has finished, but the course will be available in the autumn as self-paced and open to all. If you are interested in our goal to reconstruct and simulate the brain, do follow the MOOC!

How we are organised

WP6.1 SUBCELLULAR AND MOLECULAR MODELLING. This workpackage creates multiscale scaffold models of key signalling cascades in neurons for use in bootstrapping data-driven community modelling efforts. It uses inputs from SP1, SP2 and the molecular dynamics community to parameterise subcellular models and it integrates models of key signalling cascades into single neuron models, which should make it possible to model neuromodulation and plasticity.
WP6.2 CELLULAR-LEVEL AND WHOLE-BRAIN MODELLING. We build cellular-level scaffold models of target areas of the rodent brain and a point-neuron whole mouse brain model, adapting tools and workflows developed for the somatosensory cortex for use in other brain regions (cerebellum, hippocampus, basal ganglia), and the whole mouse brain. In parallel, we will continue the exploratory modelling of human neurons pioneered in the Ramp-Up Phase.
WP6.3 RECONSTRUCTION AND SIMULATION TOOLS. This workpackage is building tools and workflows for data-driven reconstruction and simulation of brain models at different levels of biological organisation, exploiting data available through the Neuroinformatics Platform (SP5). The tools, which are essential in the development of the scaffold and community models, will include a Hodgkin- Huxley Neuron Builder and tools for *in silico* experimentation.
WP6.4 BRAIN SIMULATION PLATFORM. We design, implement and operate the HBP Brain Simulation Platform. This comprises a collection of Apps, APIs and Platform Foundation Software, which support collaborations to build, simulate, analyse, validate and disseminate data-driven brain models. Part of the software underlying the Platform will be developed in WP6.3; other parts will come from efforts of WP6.1 and WP6.2, and from community activities. We will seed the development of Apps and APIs for a subset of this software, which has reached a high level of maturity.
WP6.5 COORDINATION AND COMMUNITY OUTREACH. This workpackage coordinates the work of SP6 and its interaction with the HBP management, other SPs and the wider community.

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WORK PACKAGE LEADERS

- WP6.1 Subcellular and Molecular Modelling: Jeanette HELLGREN KOTALESKI
- WP6.2 Cellular-Level and Whole-Brain Modelling: Egidio D'ANGELO
- WP6.3 Reconstruction and Simulation Tools: Felix SCHÜRMANN
- WP6.4 Brain Simulation Platform: Michele MIGLIORE
- WP6.5 Coordination and Community Outreach: Jeanette HELLGREN KOTALESKI

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Publication highlights

Eyal G *et al.* (2016). ***Unique membrane properties and enhanced signal processing in human neocortical neurons.*** Elife 5:e16553. DOI: 10.7554/eLife.16553.

Markram H, Muller E, Ramaswamy S, Reimann MW, Abdellah M, Sanchez CA *et al.* (82 authors). ***Reconstruction and simulation of neocortical microcircuitry.*** Cell 2015;163:456–492. DOI:10.1016/j.cell.2015.09.029.

Ramaswamy S, Courcol JD, Abdellah M, Adaszewski SR, Antille N, Arsever S *et al.* ***The neocortical microcircuit collaboration portal: a resource for rat somatosensory cortex.*** Front Neural Circuits 2015;9:44. DOI: 10.3389/fncir.2015.00044.

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Human Brain Project

Co-funded by
the European Union