Publishable Summary for the Periodic Report Ramp-Up Phase (M13-30)

The goal of the Human Brain Project (HBP) is: "to build a completely new ICT infrastructure for neuroscience, and for brain-related research in medicine and computing, catalysing a global collaborative effort to understand the human brain and its diseases and ultimately to emulate its computational capabilities."

In its Ramp-Up Phase, the HBP was divided into thirteen Subprojects (called SPs): four neuroscience SPs focusing on data and theory (SPs 1-4), six ICT Platforms (SPs 5-10), Applications (SP11), Ethics and Society (SP12) and Management (SP13). The neuroscience Subprojects contribute "strategic data" to fill critical gaps in experimental knowledge of the brain's structure and functioning, and to provide the experimental basis for understanding brain organisation. The data and resulting knowledge will be used to refine our theoretical understanding of the brain, to develop models and to populate specialised ICT Platforms for neuroinformatics (including brain atlases and a "brainpedia"), brain simulation, medical informatics (centralising information on brain diseases), neuromorphic computing (ICT which mimics the functioning of the brain) and neurorobotics (allowing virtual testing of brain models and simulations). Platforms and neuroscience Subprojects are supported by the High Performance Computing Platform (SP7).

This document is the second of two Periodic Reports on the results of the HBP's Ramp-Up Phase (RUP - October 2013 to March 2016). After providing a comprehensive overview of the Subprojects, work progress and achievements, it will describe in detail the dissemination and use of knowledge generated by the Project, as well as management aspects, Deliverables, Milestones and other performance indicators.

The Project has achieved the goals it set itself for the RUP. Most importantly, the Platforms were made available to the international scientific community via the "Collaboratory" web interface. The six ICT Platforms were released to the public on 30 March 2016 by a physical event at the Biotech Campus in Geneva, which reached a large community via web streaming techniques. The launch itself was accompanied by in-depth workshops, presentations and tutorials, all accessible to online audiences. A total of 253 scientific articles (211 that acknowledged HBP (Grant Agreement No. 604102) and 42 that did not include formal acknowledgment), with several in leading journals, plus numerous presentations at conferences and invited lectures, helped to highlight the scientific strength and impact of the Project.

The HBP underwent significant changes during the last 18 months, to help it to achieve its high-level scientific goals better, to implement modifications requested by the European Commission's independent, international review board (evaluation in January 2015), and those suggested by the Mediation Process (led by Wolfgang MARQUARDT, head of Forschungzentrum Jülich, Germany) proposing changes in neuroscience and governance (March 2013), and to prepare the FPA and the SGA1, which is accompanied by transitions in the funding conditions (from FP7 to Horizon 2020) as well as in HBP governance towards a legal entity. Major changes made in response to these inputs included:

1. A URIS (User Recruitment and Infrastructure) working group was set up in order to provide a detailed work plan of how the Human Brain Project's Platforms will be transformed into a community-driven infrastructure for brain research. Researchers from both Platform and neuroscience SPs were part of URIS: Thomas SCHULTHESS (URIS chair and Co-Leader of SP7), Katrin AMUNTS (Leader of SP2), Alain DESTEXHE (Leader of SP4), Chris EBELL (HBP Executive Director), Marc-Oliver GEWALTIG (Co-Leader of SP10), Andreas HERZ, Chair of computational neuroscience, Ludwig Maximilians Universität, Munich

(external), Sean HILL (Co-Leader of SP5), Thomas LIPPERT (Leader of SP7), Karlheinz MEIER (Leader of SP9) and Jeff MULLER (HBP Technology Coordinator). Their activity resulted in a White Paper, which became part of the Framework Partnership Agreement governing the remainder of the Project after completion of the RUP.

2. In order to overcome shortcomings in integrating research work with Platform development, Co-Design Projects (CDPs) have been established, involving transdisciplinary, cross-SP teams which combine expertise in (neuro-)science and technical implementation. Detailed work plans and data flows have been developed, to enable a smooth start for the CDPs in SGA1. The six CDPs are: CDP1 (Development of the whole brain mouse brain model and atlas), CDP2 (Mouse-based cellular cortical microcircuit models), CDP3 (Multi-level human brain atlas), CDP4 (Visuo-motor integration), CDP5 (Functional plasticity for learning in large-scale systems), and CDP6 (Drug development). CDP Leaders will be represented in the SIB in SGA1, to strengthen their integration, and to foster the efficient and effective development of the Platforms.

3. The Mediation Report requested that Cognitive Neuroscience to be reintegrated into the HBP Core Project. To achieve this, an SP1-4 Working Group was formed, led by Katrin AMUNTS. The HBP issued a Call for Expressions of Interest on Systems and Cognitive Neuroscience (CEoI) to recruit Partners form a new Subproject 3. The Writing Team for the Call text consisted of Katrin AMUNTS (SP2), Stanislas DEHAENE (SP3), Alain DESTEXHE (SP4), Rainer GOEBEL (SP4), and Sten GRILLNER (SP5). In total, 57 eligible proposals were submitted. A two-step evaluation procedure by an independent, international review board, chaired by Tarek YOUSRY from the UK, selected four proposals, which formed the new SP3 with 10% of the HBP's SGA1 budget. The call was jointly performed by teams from Jülich and Munich, supported by the admin team at EPFL, Geneva. This call not only addressed re-integration of cognitive and systems neuroscience, but also included cross-cutting activities, to link the new SP3 from the very beginning to research in other SPs, and to the Platforms. The open call was the result of an HBP working group on neuroscience, which was formed after the evaluation in February 2015, to re-integrate cognitive neuroscience, and to re-organise neuroscience projects on the basic of their interactions, relationships with the Platforms, and contribution to HBP goals.

1.1 Neuroscience SPs (1-4)

The HBP Neuroscience SPs in the RUP were:

1. Strategic mouse brain data (SP1)
2. Strategic human brain data (SP2)
3. Cognitive architecture (SP3)
4. Theoretical neuroscience (SP4)

Subprojects 1-4 aim to contribute to a better understanding of the structural and functional organisation of the human brain, from the level of genetic and molecular architecture including genes, single cell transcriptomes together with data on epigenetics, genetic regulatory networks, proteome composition and organisation, distribution of transporters, ion channels, transmitter receptors, cells and their microcircuits, cytoarchitecture and fibre tracts, right through to complex cognitive systems. Since not all of the available techniques can be applied to the human brain, data derived from mouse (and if necessary from other animals) brains is included for comparison and extrapolation.

Neuroscience contributes to co-developing the Platforms with SPs 5-10, iteratively via the co-design process. SPs 1-4 represent first users, piloting the opening up of the Platforms to the broader scientific community. Empirical research will enable the formulation of multi-scale theories and predictive neuroinformatics by modelling and simulation to identify organisational principles of spatial and temporal brain architecture. Addressing the multi-scale organisation of the human brain as a complex system is only possible through integration of top-down modelling and bottom-up simulations on different spatial and temporal scales. Methods and techniques to characterise development and inter-subject variability as well as tools for big data management and HBP Brain Atlases will be developed.

1.1.1 Subproject 1: Strategic mouse brain data

The goal of SP1 is to acquire strategic data on mouse brain molecules, cells and cognitive capabilities, and in particular to develop technologies to acquire gene expression data on single cells, which can make a fundamental contribution to brain modelling.

Building on achievements during the first reporting period, including a proof-of-concept for cell-type transcriptomic analysis, SP1 completed cortex and hippocampus tissue scans of synapse densities, counted fluorescently stained neurons in whole brain and collected strategic data on neurons, axonal projections and blood vessels for brain modelling.

SP1 continued developing tools for mapping the mouse brain and provided a first draft of strategic mouse brain datasets across the key domains of the transcriptome, proteome, neuroanatomy, channel function and behaviour. New protocols were developed for many applications, including freeze fracture replication, FIB/SEM immunogold channel labelling and acquisition of 3D electron microscope data on the cortical neuropil. From the hippocampus, 88 cells have been fully reconstructed, supplemented by 36 cortical neurons and 10 cells from the striatum. In addition, first versions of vascular maps of the mouse brain were generated, based on various high-resolution imaging methods. These initial studies have established a strong foundation for supporting development of the HBP Platforms, in particular those for Neuroinformatics and Brain Simulation. Two strategic mouse data packages have been generated and data have been characterised in data information cards, a prerequisite for data sharing. A large number of journal articles and book chapters has been published during the past 18 months, confirming the high level of research activity within this Subproject.

1.1.2 Subproject 2: Strategic human brain data

SP2 is analysing the human brain on multiple levels of organisation, and studies the relationships between these different levels. A major question concerns the biological basis of cognition and the organisation of large functional systems such as visual processing, memory and number processing. These aims are directly related to research undertaken in SP3 and SP8. Studying similarities and differences between species at the cellular, molecular and microcircuit levels creates natural links to the mouse brain work in SP1, but also to theory and simulation. For example, data from more than 90 human pyramidal neurons were generated. They were used to generate data-driven models and to simulate functional properties of human pyramidal neurons. Other strategic data were acquired on the level of transmitter-receptors, where 19 areas were analysed for 15 different receptor types. These human brain data were delivered to the HBP atlas. They are supplemented by whole brain rat data of the muscarinic M2 receptor, which were transferred to Waxholm space.

Post-mortem data were accompanied by datasets of the living human brain, e.g. high-quality and high-resolution maps of brain activity as a basis for novel brain atlases developed during SGA1/CDP3, a new U-fibre atlas with over 100 bundles and developmental data on maturation of fibre tracts, which provide new insights into the principles of organisation of the human connectome. Computational models of information processing within cortical layers were developed for the visual cortex, taking advantage of comparative research in human and macaque brains.

Finally, a rich dataset of intracranial EEG data from 30 patients in combination with other functional and connectivity imaging (fMRI, DTI, CCEP) has been made available. These data sets pushed the development of a new concept of cortical areas. Publications in top journals (e.g., Neuron, PLoS Biology, Cerebral Cortex) show a high quality and productivity of this SP. The data of this SP will be major contributor to CDP3, Multilevel human brain atlas.

1.1.3 Subproject 3: Cognitive Architecture

This Subproject aims to understand the fundamentals of human cognition. It addresses a broad spectrum of cognitive tasks including perception, action, motivation, decision & reward, learning & memory, space, time & numbers, multimodal perception. it also looks at capabilities that are characteristic for humans, including processing of symbols or syntax. A major achievement concerns the publication of a special issue of Neuron in October 2015, one of the top journals in neuroscience, which was devoted to cognition work undertaken by SP3 researchers. In addition, several international workshops were organized, to provide the link between cognitive neuroscience, data-driven models and theoretical approaches. For example, a first hippocampus model that uses one-shot learning, and a striatum model that uses reinforcement learning were introduced. Key data sets have been delivered to the HBP. Furthermore, functional analysis of fMRI data revealing the role of bilateral temporo-parietal junctions (TPJ) and insular cortex for the sense of self, and classified anatomically of the right and left temporo-parietal junctions (rTPJ and lTPJ) were performed. However, the implementation of data-driven models related to the sense of bodily-self will not be further pursued within the HBP. The very successful research undertaken by the RUP SP3 will unfortunately not be continued in SGA1. The topic of cognitive and systems neuroscience will be addressed by a new SP3, recruited through the Expression of Interest for an Open Call on Cognitive and Systems Neuroscience, which was performed and finalised in 2015.

1.1.4 Subproject 4: Theory

The aim of this Subproject is to develop theory and models bridging scales, from detailed to simplified, and from single cells to population of neurons. A detailed overview of all models developed in the Ramp-Up Phase, as well as the programme codes of these models were made available to HBP Partners. High-level publications including Nature Communications and Nature Scientific Reports reflect the quality of research undertaken in this period. Our models span from the cellular level, through neuronal circuits, up to cognitive tasks such as spatial navigation. Synaptic plasticity rules have been linked to assembly formation, to structural connectivity, to memory and to supervised learning schemes. SP4's European Institute of Theoretical Neuroscience (EITN) has developed into a hub for the international scientific community in the field of theoretical neuroscience – several internal (SP3 & SP9) and international workshops were organised in this period, increasing the visibility of the HBP's activities.

1.2 Research Platform SPs (5-10), and Applications

Figure 1: Shrigley Hall, Cheshire, UK: venue for 3rd Education Workshop and CodeJam007

These Subprojects and Work Packages are summarised separately, but in fact the necessary cross-SP collaborations are now becoming firmly established. In particular, attention is drawn to the CodeJam which took place at Pott Shrigley, Manchester 11-15 January 2016, and to which software engineering staff from SPs 4-11 and the Allen Brain Institute were invited. This event was co-located with the 3rd Education Workshop on Future ICT, to which PhD students were invited.

The Platform Subprojects are responsible for providing hardware and software support for the HBP's six ITC-based Research Platforms. In some cases, the hardware is already present in the form of European Supercomputer Centres. In others, such as SP9 (Neuromorphics), hardware developments started prior to the HBP have been expanded and refined under the HBP. However, all of the Platforms have required new software to be written specifically for them. In many cases, existing software (NEURON, NEST) has had to be revised to take account of the greater scale on which HBP expects to work. This "software sustainability" activity is anticipated to continue throughout the duration of the HBP.

The HBP Research Platforms (with their abbreviations and responsible SP) are:

1. Neuroinformatics Platform (NIP, SP5)
2. Brain Simulation Platform (BSP, SP6)
3. High Performance Computing Platform (HPC, SP7)
4. Medical Informatics Platform (MIP, SP8)
5. Neuromorphic Computing Platform (NCP, SP9)
6. Neurorobotics Platform (NRP, SP10)

1.2.1 SP5: Neuroinformatics Platform (NIP)

The Neuroinformatics Platform (NIP) is responsible for the Brain Atlasing and Data Analysis for the HBP. The NIP was released for public use released on 30 March 2016. WP5.3 has produced an Electrophysiology Analysis Toolkit (Elephant) Python library for the NIP. This

tool has been extensively used via the Collaboratory to show cross-SP use-cases (linking to SPs 6, 7 and 9). In WP5.5, several strategic datasets have been created and delivered for integration in the Neuroinformatics Platform, containing an updated version of the Jubrain cytoarchitectonic atlas (V. 2.2c, Jülich), an improved 3D reconstruction of the Big Brain (2015 release, Jülich/McGill, original publication: Amunts et al., Science 2013) together with an initial release of a grey and white matter surface contours, initial native parcellations of cytoarchitectonic areas in the Big Brain (auditory areas, Jülich), probabilistic maps of major white matter bundles (CEA), and quantitative measures as well as spatial distributions of concentrations of different receptor binding sites for selected cytoarchitectonic areas.

There has been some delay in providing the Data Registration App; this occurred because of misunderstandings concerning terms of service and data licensing issues. In addition, the "FIM" method for time-series analysis has been postponed to late 2016. All other SP Deliverables and Milestones in the DoW have been submitted.

Going forward, NIP will be closely involved in all of the Co-Design Projects.

1.2.2 SP6: Brain Simulation Platform (BSP)

For the first time ever, whole human cortical pyramidal (L2/3) neuron models have been created. This includes: cable properties; dendritic spines; synaptic potential (from other L2/3 cells); NMDA/AMPA properties and axonal spiking activity. In addition, a major validation of the reconstruction and simulation strategy, which underlies the BSP, was published by Markram et al. (2015), and represents an unparalleled collaborative effort of 82 authors. The results have been made available via the Collaboratory. The BSP was released for public use on 31 March 2016.

Important additional work in the period included integration of the modelling activity with SP10's virtual robotics environment for closed-loop experiments (WP6.1). Further software sustainability work has been undertaken by WP6.2 on STEPS, NEURON and NEST, seeking to ensure that these systems remain functional when run on peta-scale supercomputers and beyond. Use of the molecular modelling tools is undertaken by WP6.3. Finally, initial scaffold models have been placed in the Collaboratory by WP6.4.

Despite some modelling issues with Purkinje Cells, which caused delays, all SP objectives in the DoW have been achieved, and there are no outstanding deviations or difficulties remaining.

Going forward, SP6 will be building models at different scales. It will be closely involved in the Co-Design Projects, in particular with CDP2, but also CDPs 1, 5 and 6.

1.2.3 SP7: High Performance Platform (HPCP)

The High Performance Computing Platform provides the hardware and base-software infrastructure to support many other HBP Platforms. To do this effectively, WP7.1 is engaged in pre-commercial procurement and has focused on "interactive supercomputing". Phases I and II of the procurement process were completed in M15 and M21 respectively, while Phase III is still on-going, according to the revised timeframe. WP7.2 provides mathematical and software tools to enable the delivery of other Platforms. In particular, new versions of NEST have been released and analysis of CoreNEURON undertaken with a view to improving the performance of NEURON for SP6. Key work on provenance and visualisation has been completed in WP7.3 and WP7.4. WP7.5 has combined the resources of the four supercomputer centres using the PRACE high-speed

network, which gives a significant performance advantage over standard internet-based communications.

The most significant issue affecting delivery involves staffing problems at the Barcelona Supercomputing Centre, which delayed achievement of WP7.2's MS137. New recruitment has now filled these posts and MS137 has been achieved in M30, rather than M18 as originally planned. In WP7.4, there remain integration issues with the MonetDB/javascript bindings; these issues have been pushed back to SGA1. All other SP objectives in the DoW have been achieved, and there are no outstanding deviations or difficulties remaining.

Going forward, the High-Performance Analytics and Computing Platform, as SP7 is renamed for the SGA, will be driven by the requirements of the SPs and CDPs. One particular item of note is the Federated Data Pilot Project (FeDaPP), which is looking at how to satisfy the user-requirements for CDPs 1, 3, and 5 and SP 5 for M6 in SGA1.

1.2.4 SP8: Medical Informatics Platform (MIP)

The Medical Informatics Platform (MIP) provides a platform for clinicians, neuroscientists, statisticians, pharmaceutical, and biotech companies to use big-data analytics to look for disease signatures in clinical trials data. Of special significance is the ability to use the Bayesian approach to hunt for disease signatures in the otherwise-discarded data from patients receiving placebo treatment in double-blind clinical trials. As the data is added to the system, the clustering algorithms improve their classification power.

The MIP has recruited five hospitals to participate in the evaluation of an innovative data analytics system. These five hospitals are: CHUV (Lausanne), CHRUL (Lille), Grande Ospedale Metropolitano (Milan), Universitatklinikum (Freiburg), and Sourasky Medical Center (Tel Aviv). A prototype of the Platform was made available to HBP users in M19 and used in the recruitment of subsequent hospitals. The public release of the MIP took place on 30 March 2016.

Underlying the MIP are a number of specialised components: support for R and Matlab (in addition to Java and Python, used elsewhere in HBP); image processing; and data-mining (in conjunction with WP11.2).

Despite some integration issues, all SP objectives in the DoW have been achieved, and there are no outstanding deviations or difficulties remaining.

Going forward, the MIP will be seeking to shape the system according to User Acceptance Testing.

1.2.5 SP9: Neuromorphic Computing Platform (NCP)

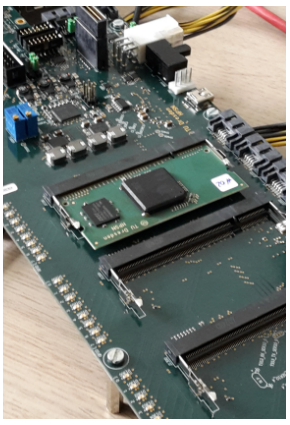

Figure 2: SpiNNaker-2 Test chip on evaluation board

The Neuromorphic Computing Platform (NCP) permits extremely fast execution of simplified point models. There are two machines provided by this Platform: a physical-model system (NM-PM, BrainScales), running at 10,000 times real time, which permits the study of brain development; and a traditional digital many-core system (NM-MC SpiNNaker), which runs in real time, and is suitable for robotics applications. Both systems are also of interest to the computer engineering community, as they represent substantially more energy-efficient approaches than traditional supercomputer architectures, where running costs can be substantial.

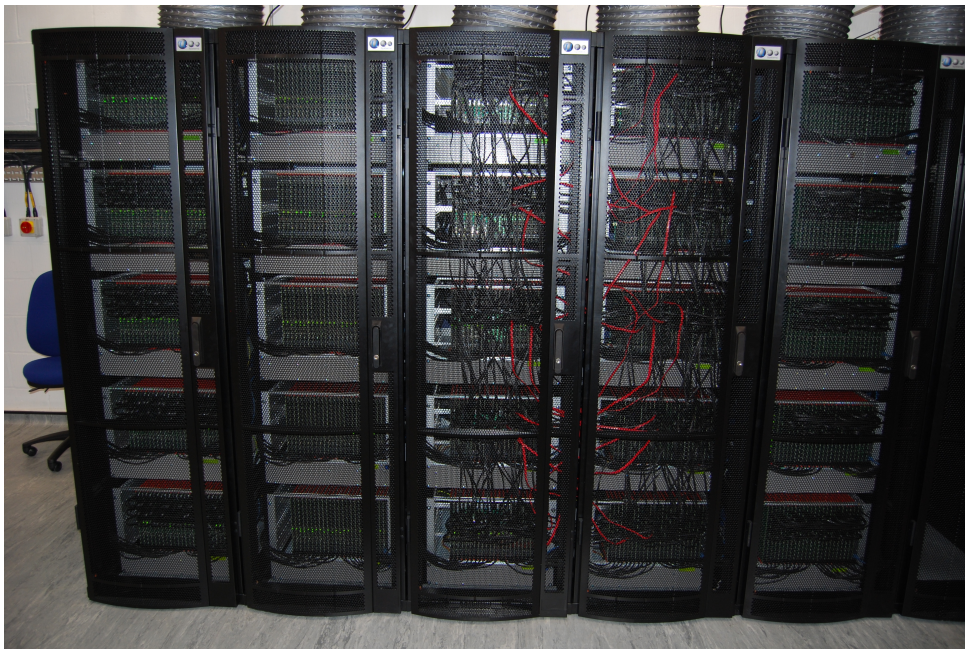

Figure 3: *SpiNNaker system used for the NCP*

The NCP has produced the world's first, remotely accessible, large-scale neuromorphic machines, which give access to 500k ARM cores (SpiNNaker) and 20 wafer modules (BrainScaleS). The access to both machines is via the Collaboratory. In addition, both systems provide low-level software access. Prototypes for next-generation neuromorphic chips have been developed and tested for both SpiNNaker and BrainScales architectures.

All SP objectives in the DoW have been achieved, and there are no outstanding deviations or difficulties remaining. Going forward, the NCP is a major contributor (with SP4) to the Co-Design Project CDP5 on plasticity and learning, where it is expected that the ability to run faster than supercomputer models will permit learning experiments where simulations covering time periods of days may be required. In addition, tight collaboration is expected to continue with NEST development, which is moving to SP7 in SGA1.

1.2.6 SP10: Neurorobotics Platform (NRP)

The Neurorobotics Platform (NRP) is an internet-accessible set of tools and hardware that allows scientists from different disciplines to demonstrate how models of neural systems, developed by other SPs, can control robots (virtual and real) in complex environments. With the NRP, users can create and run new experiments, and they can invite other researchers to join their experiments or share their experiments with others for use in their work. The NRP provides internet-accessible tools (including the Robot Designer,

Environment Builder and Closed Loop Engine) to design and customise models of robots, experiments and environments.

Most design tools are embedded in the Neurorobotics Cockpit, the central set of tools with which users view and interact with an experiment. An exception is the Robot Designer which is offered as a plug-in to the powerful 3D modelling software Blender. The NRP can be used on computing platforms ranging from mobile devices such as tablets, through desktop computers, to video or power walls.

The Platform integrates a unique combination of open-source tools and makes them available via HBP's Collaboratory. Among them are widely used open source tools such as Razebo/ROS for robot and environment simulation, and NEST for neural system simulations.

The NRP offers a variety of pre-configured neurorobotics experiments, illustrating the Platform's main features. Extensive documentation is available to guide users through the neurorobotics modelling workflow. This has involved significant interaction with other parts of the Project, in particular SPs 2, 5, 6, and 7.

All SP objectives in the DoW have been achieved, and there are no outstanding deviations or difficulties remaining. Going forward, the NRP expects to be a major contributor to Co-Design Project CDP1.

1.2.7 SP11: Applications

The Applications SP is largely populated with teams recruited via an open call conducted early in the RUP, and these groups started work for the HBP in M12. Their work has focused on three areas: Future Neuroscience (WP11.1), Future Medicine (WP11.2) and Future Computing (WP11.3), which were linked scientifically to SPs 10, 8 and 9, respectively. Administrative support was provided by STC/STO (SP13).

Major achievements of the Applications Work Packages were: a retinal model and its integration into the NRP (WP11.1); the generation of biological disease signatures, using five different machine-learning algorithms and a Bayesian estimation of the underlying models, which were integrated into the MIP (WP11.2); and a stereovision system (T11.3.3), connected to ATIS vision sensors (T11.3.5) and neuromorphic benchmarking (Tasks T11.3.4 and T11.3.6), all of which have been used as drivers for the Neuromorphic Computing Platform (WP11.3).

All SP objectives in the DoW have been achieved. Overall, the main difficulty encountered was the non-availability of the requisite Platform when the WPs were ready to start work after the open call. Usually, there was sufficient other work to occupy them, so these delays merely resulted in the re-ordering of the work plan. The most significant problem occurred with MS203, where WP11.1 encountered difficulties because the compute resource required to run the virtual environment of the NRP proved insufficient. Apart from MS203, there are no outstanding deviations or difficulties remaining in SP11.

Going forward, a number of groups from SP11 will be integrated into other SPs in SGA1.

1.2.8 SP12: Ethics and Society

The HBP is committed to upholding and implementing the principles of Responsible Research and Innovation (RRI) in all its research and development, and SP12 is the hub of RRI in the HBP. It undertakes foresight research on social, ethical, legal and cultural implications of HBP research (WP12.1), explores conceptual and philosophical issues and challenges raised by HBP research (WP12.2), engages HBP researchers with external stakeholders and the general public (WP12.3), builds awareness and capacity for social and

ethical reflection among HBP researchers (WP12.4), and supports the robust management of ethical issues of the HBP as a whole (WP12.5). SP12 contributes HBP's research in social sciences and humanities (WPs 12.1-12.4), and also the ethics management of HBP (WP12.5).

The aims of SP12 include conducting systematic foresight exercises (WP.12.1) to identify social impacts of the new knowledge and technologies produced by HBP, along three themes, each of which result in Foresight Reports. Three reports, on future medicine, neuroscience and computing & robotics have been produced in collaboration with other SPs, notably SPs 8 and 10. The aims of SP12 also include theoretical reflection within WP12.2, which focuses on theoretical/philosophical and ethical concepts related to simulation, consciousness, human nature and identity, and problems in philosophy of mind, epistemology, moral philosophy and ethics. Consciousness and simulation are topics that link SP12 to SP2, 3, 4, 6 and 10, in particular. In this context, several peer review articles have been published in collaboration of SP12 with SP3 and SP6. Dual use represents another important topic, which has been addressed, for example, in workshops.

A third major field of activity concerns the dialogue with the society (WP 12.3), which aims to identify emerging controversies and formulate recommendations for HBP research. Furthermore, realising that ethics is not merely a matter of following regulations and guidelines, SP12 has also focused on developing research awareness among HBP participants (WP12.4). The aim of was to foster ethical and social reflection within the HBP Consortium, and in particular among young researchers, clinicians and technology developers.

The general goal of ethics management in SP12 (WP12.5) is to support HBP decision-making on issues with significant social and/or ethical implications and to ensure that the project fully complies with European and national legal and regulatory requirements. It also provides management and support of the Ethics Advisory Board (EAB), an independent body that advises the HBP on ethical, regulatory, social and philosophical issues. The Ethics Advisory Board was formed by combining the Research Ethics Committee and the Ethical, Legal and Social Aspects Committee. The merger of these two committees happened in March-June 2015, with the first physical meeting of the members of the new EAB taking place in June 2015 in Paris. In parallel to the creation of the EAB, the Ethics Rapporteur Programme was created which identified individuals in all SPs who are designated points of contact for ethical issues. EAB members and Ethics Rapporteurs were paired up to ensure that there is a two-way communication between EAB and all parts of the HBP. The EAB was officially constituted in September 2015 during the Madrid Summit. Since its inception the EAB has worked successfully with SP12 but also with all other parts of the HBP. Its contribution to the development of the Conflict of Interest SOP was crucial to dealing with CoI issues. The EAB has proposed principles for the appointment of an Ombudsperson to be implemented during the SGA1.

SP12 has organised a number of seminars, conferences, workshops, webinars, surveys and interviews, joining researchers from within and outside the HBP, seeking to identify and use innovative communication formats. Jointly with the EAB, SP12 has formulated an Opinion on Data Protection and Privacy that has been distributed to all the SPs for comments before being officially adopted.

1.2.9 SP13: Management

roject management highlights in this period included finalising and signing a heavily modified Framework Partnership Agreement (FPA) in October 2015 and submission of the

HBP's 1st Specific Grant Agreement (SGA1) proposal in November of the same year. Implementation of the new governance structure set out in the FPA began with the election of new SP leaders and deputies in April 2016. Risk Management was strengthened by the creation of a new Risk Management Group. The Science and Technology Coordination function delivered a substantial Systems Engineering Package to the EC and largely completing a comprehensive mapping of data flows across the whole Project. The Collaboratory web interface for HBP Platform users was delivered, and two HBP Summits were organised, in Heidelberg (2014) and Madrid (2015). The Education programme conducted two Workshops and one School, plus a Young Researchers' event in Budapest in April 2016.

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