Insight

The International Brain Initiative: enabling collaborative science

Over the past two decades, neuroscience has expanded massively, and it is now tackling complex questions with profound implications for our society. Technological developments are transforming the study of neural mechanisms, and neuroscientists might be soon able to disentangle how human beings think and the bases of cognition. In parallel, we now know that many brain diseases have a strong genetic component, so further efforts must be put into neurogenetics. New experimental approaches, theoretical models of brain function, and computational power to store and manage large datasets will be required. A concerted effort by clinicians, neuroscientists, engineers, theorists, and social scientists is needed, because understanding brain function and neurogenetics will open the way for the prevention and treatment of neurological and psychiatric diseases.

Neuroscientific advances will unquestionably also have other effects. For instance, the development of brain–computer interfaces and neural algorithms will impact on artificial intelligence. Identifying the architecture and workings of brain networks will be of considerable value for machine learning, computing, and robotics. These ongoing developments will also affect the way in which neuroscience is conducted. Neuroscience is a relatively young discipline, with few coherent theories, and has relied on the diversity and creativity of individual researchers to make conceptual progress so far. In this respect, the funding provided by the European Research Council is crucial to enable high-risk high-gain projects. However, future breakthroughs will also require multidisciplinary teams focusing on the same project.

Opportunities and challenges in research collaboration were the focus of a workshop in the European Parliament on Oct 12, 2021, in which the International Brain Initiative (IBI) was presented. The formation of the IBI builds on a declaration of intent from 2017. The IBI was created to facilitate communication, exchange of experiences, and to identify common goals and opportunities for synergies among seven major brain research initiatives formed in the past decade (table). The IBI has established a governance structure, topical working groups, and a strategic plan. Common goals are to understand the neurobiological basis of cognition and behaviour, and to develop neurotechnologies, in a responsible and ethical manner.

The IBI is neither a funding body nor a research project, but it has a coordinating role. Each brain research initiative has its own funding stream and objectives. Through a core set of working groups, the IBI develops recommendations for short-term or long-term actions in key areas, including neuroethics and data standards and sharing. Other areas include transdisciplinary education and training in neuroscience, with an international perspective. The IBI aims to have an impact that goes beyond that of its participating organisations. To shape the direction of research and benefit society, the strategic plan of the IBI includes extensive consultation with the global neuroscience research community, as well as citizens, patients, and other stakeholders.

During the workshop at the European Parliament, participants discussed the challenges of studying the brain and how collaboration between different initiatives can help to overcome these challenges. Cooperation on a global scale is an ambitious endeavor, including the challenge of real-time communications across continents and time zones. But interactions and collaborations within the IBI network seem essential, and should therefore increase. The IBI provides a forum for such interactions and can act in a primarily coordinating role.

The value of the IBI will lie in its ability to facilitate networking and promote collaboration in different countries and sectors, as long as this networking is supported by the brain research initiatives and their funders. The IBI should become a trusted source of thought leadership in neuroscience—that is, an international forum or think-tank that can drive discovery and translation of knowledge to the benefit of all. All the brain research initiatives are willing to engage with this working model, but the model can be improved. The IBI should be also considered a valuable resource to gain consensus on neuroscience priorities for the scientific community and societies worldwide. But greater recognition of the relevance and worthiness of the IBI from national governments and policymakers is needed.

Participants at the workshop emphasised the importance of data standardisation. Although difficult to implement at present, the use of standardised protocols would eventually add value to current efforts. The benefits of data sharing were highlighted. An infrastructure for sharing data among the brain projects should be implemented, taking advantage of ongoing efforts in each of these projects. It was stressed that analysing large datasets requires specialists able to integrate experimental neuroscience with computational analyses, modelling, and theory. Specific education programmes to train young scientists to exploit the convergence between artificial intelligence and neuroscience are needed. Such training should be open to everyone, regardless of nationality. However, although many countries accept foreign students in PhD and postdoctoral programmes, there are still substantial obstacles to accessibility. Greater flexibility and the removal of national barriers for funding opportunities

For more on the **required concerted effort** see *Cell* 2017; **168:** 956–59

For more on the **European Research Council** see https://erc.europa.eu/

For more on the **workshop at the European Parliament** see https://www.europarl.europa.eu/stoa/en/events/details/the-international-brain-initiative-shapi/20210917WKS03781

For more on the **International Brain Initiative** see *Neuron* 2020; **105:** 212–16.

	Major objectives	Organisation and timeframe
Australian Brain Alliance	To develop a coordinated brain research and neurotechnology strategy that will deliver new insights and technologies, sustain a thriving environment in Australia, and engage global collaboration across industry and science	Consortium of Australian institutions Timeframe: not defined
Canadian Brain Research Strategy	To build a common vision on how to better understand the CNS and alleviate related disorders by fostering a transdisciplinary approach, from the physical and computational sciences to the life sciences and humanities To advance Canada as a world leader in collaborative, open, and ethical brain research	Community-led initiative uniting 30 Canadian institutions Timeframe: not defined
China Brain Project	To elucidate the neural circuit basis of cognition To develop diagnostic and intervention tools for brain diseases To develop brain-inspired artificial intelligence technology	Project funded through Ministry of Science & Technology of China Timeframe: 2021–30
EU Human Brain Project	To deepen our understanding of the human brain in its multi-layered complexity in space and time To transfer the acquired knowledge to brain-derived applications in health, computing, and technology To build the European research infrastructure of data and tools, EBRAINS	EU Future and Emerging Technologies Flagship project, with 122 partners from 17 European countries Timeframe: 2013–23
Japan Brain/MINDS Project	To comprehensively analyse brain images from healthy to diseased states To develop artificial intelligence-based brain science technologies To comparatively study neural circuitry of human and non-human primates	Riken Brain Science Institute, with participation by other universities and institutes Timeframe: 2014–24
Korea Brain Initiative	To fill the lack of knowledge in fundamental neuroscience for better treatment and prevention of brain diseases, with a pilot project to develop novel tools for brain circuit mapping, focusing on the prefrontal cortex and basal ganglia	Korean Brain Research Institute, Korean Institute of Science & Technology, with participation by other universities and institutes Timeframe: 2016–26
US BRAIN Initiative	To accelerate the development and application of innovative neurotechnologies aimed at understanding how the healthy brain functions, including how individual cells and neural circuits interact To find new ways to predict, treat, cure, and prevent brain disorders	Portfolio of projects funded by the National Institutes of Health, the National Science Foundation, and other public and private funders Timeframe: initiated in 2013

Table: **Brain research initiatives**

should be explored. The Human Brain Project is a good example of a cross-national initiative, but more efforts are needed to also achieve intercontinental operability. The laws and policies of individual countries differ with regards to sharing data, particularly data involving human beings, often making international collaboration difficult. Addressing this issue is a major challenge to ensure that, while intellectual property and privacy are protected, science can advance.

For more on the **standards for sharing data** see https://psyarxiv.com/esz9b/

The ethical issues raised by the use, development, and application of neurotechnologies have international relevance. Neuroethics is key, since neuroscience can challenge our notions about (for example) consciousness, personhood, and personal responsibility. The potential impact of neuroscience must be, therefore, addressed within an international and humanistic framework.

For more on the **ethical issues** see *Neuron* 2018; **100:** 19–36

For more on the **STOA Panel** see https://www.europarl.europa.eu/stoa/en/home/highlights

A final point discussed at the workshop was the relation between science and policy. Calls were made for closer integration of research evidence in decision making. Scientists and policymakers often feel disappointed about each other; the scientists feel that they are not sufficiently listened to, and policymakers feel that their advice is unexpected or not easy to understand. Scientific and political approaches are very different, and science in itself is often not homogenous. The scientific approach is usually linear, following a step-by step process to meet a predefined objective, using clearly outlined methods. The aim is to answer a question, rather than to recommend a specific action. Many scientists usually work with a reductionist focus, that might not have direct social relevance. Neuroscientists who want to communicate effectively with policymakers therefore need a good understanding of the political process. A lack of effective communication between scientists and policymakers can mean that policymakers are likely to rely on representatives from external organisations that might put their own interests ahead of the general public interest. Moreover, effective communication is necessary both with members of the respective parliaments and the executive bodies, such as ministries. It is to be noted that positive examples of successful dialogue between scientists and policymakers exist at the national and EU levels, including the work of the STOA Panel in the European Parliament, and of other similar bodies in member states.

For more on **science and decision making** see **Comment** *Lancet Neurol* 2015; **14:** 242–45

Neuroscience is not a homogeneous field of research, but rather an alliance of different disciplines. Such a variegated community of researchers can bring to light breakthroughs by working towards common goals. The IBI will strive to bring about an extraordinary collaborative effort for scientific advances, but also to inspire new methods and ways of thinking, for the benefit of society as a whole. The IBI highly values the continuing engagement with the European Parliament in assessing progress and fostering European and international collaboration.

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