

Looking Back on the Human Brain Project's Foresight Lab 2013-2020

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Introduction

Building on earlier foresight and RRI work with technoscientific innovations such as synthetic biology (Marris and Rose, 2012), the Foresight Lab at King's College London was part of the HBP Ethics and Society division from 2013 to 2020. Its mission was to anticipate the social and ethical implications of the scientific knowledge and the technologies that may come out of the HBP. Foresight exercises are central to RRI as they aim to enable 'anticipatory' action to shape technoscientific development in desirable ways, and to assess and manage risks in a timely manner. Current approaches use two strategies, both used by the HBP Foresight Lab. The first studies the views, attitudes, and strategies of key stakeholders with empirical social scientific methods. The second uses systematic foresight techniques such as modelling, horizon scanning and scenario planning. The goals of these exercises are, first, to identify new developments and assess their potential impact over the short, medium, and longer term; second, to assess key ethical concerns such as privacy, autonomy, transparency, the appropriate balance of risks and benefits, responsibility and accountability, equity, and justice. Our foresight exercises aimed to bring out the breadth of issues that might be a concern to the wider public and specific stakeholder communities. A central objective was to feed back into the work of the HBP itself to encourage reflection among the project's researchers and managers (Aicardi, Reinsborough and Rose, 2017). Key aspects of our foresight work in the HBP are summarised below.

Data Governance, Protection and Privacy

The possibilities and hopes for computational neuroscience in generating future medicine (Rose, Aicardi and Reinsborough, 2015a), future neuroscientific understanding (Rose, Aicardi and Reinsborough, 2015b), and even future computing or robotics (Rose, Aicardi and Reinsborough, 2016) rely upon the use of large amounts of data, for example to build brain models, a collective brain atlas, or medical 'signatures' of psychiatric/neurological disease. By bringing together the researchers with stakeholders and experts the Foresight Lab was able to facilitate anticipatory discussions about ethical, societal, and practical issues of federating/sharing data and their use in personalised medicine or other innovation. We identified the need to consider legality, data protection of individuals, and the importance of trust. EU data law was very much in flux (pre-GDPR legislation); individuals might not have given 'broad' consent to the use of their hospital-collected medical data. Likewise, existing research repositories act as conservative guardians of individual data both legally and to maintain the trust of their own contributors. Individuals broadly supported use of their data for medical research but were less willing to do so if the benefits become privately-owned. The issue of data privacy and trust was a key early theme in Foresight Lab work that re-emerged throughout Human Brain Project activities.

Dual Use

Our research on 'dual use' concluded that this binary concept is inadequate to anticipate how neuroscience and neurotechnology can be used and misused (Mahfoud et al., 2018). Dual Use traditionally refers to research and technologies designed to benefit civilians but that can also be used for military purposes. It can also mean research and technologies that are used in 'good' and 'bad' ways. We found that in practice, these boundaries are blurred - research can be funded by both military and civil bodies, can be used by the military for civilian purposes, and what counts as misuse is not always clear cut. We argued that regulators and policy

makers must focus instead on harmful uses of neuroscience and neurotechnology in the following domains of application: political, security, intelligence, and military (PSIM) (Butorac, Lentzos, and Aicardi, 2021). To develop this expanded concept of dual use (Aicardi et al., 2021), we organised a series of workshops with scientists and engineers whose research we identified as more likely to raise dual-use issues of concern. Together, we co-developed science-fiction-like scenarios anticipating potential political, security, intelligence, and military uses of specific neuroscience and neurotechnologies - such as security concerns with open access supercomputing platforms. We found considerable awareness of, and concern about, these issues among the researchers themselves. These scenarios and discussions aided in the development of anticipatory capacities among HBP scientists and engineers, with the creation of a cross-project Dual Use Working Group (DUWG)¹⁵ (Ulnicane, Mahfoud and Salles, 2022).

Trust and AI

The centrality of ‘trust’ in the development of artificial intelligence (AI) and AI-enabled technologies is now widely documented. The Foresight Lab aimed to understand *if* and *how* (especially *the extent to which*) ‘trust’ becomes embedded in the practices of laboratories engaged with AI research and development (Aicardi et al., 2019). Our work emphasised strong interpersonal relationships based on trust between end-users of AI-enabled healthcare technologies (clinicians) and researchers (data scientists, modellers) as key to meaningful and successful technology uptake. Findings further revealed that strong trust relationships were typically founded on greater transparency both in the datasets used for developing algorithms and in the logic of algorithmic construction, but also in the meaningful and early integration of clinician’s real-world experience (tacit knowledge) of patients’ needs in development processes.

Debates around what meaningful research-practice collaboration *should* or *can be* are not new. Still, our work calling attention to their salience in technology development processes was a provocation. Our (implicit) contention that the poorly quantifiable, poorly measurable, non-technical aspects (e.g., trust relationships, tacit knowledge integration) play a substantive role in the development processes of highly technical knowledge systems (such as AI-enabled healthcare) has however recently gained increasing currency as more socially responsive frameworks of innovation are preferred. Our work takes this further to identify spaces of research-practice collaborations as areas where a renewed attention to trust-building can have profound implications by helping embed more socially responsive ‘technical’ aspects in innovation processes (Burton et al., 2021).

Community and Collaboration

Neuroscience is not a unified field of research. Instead, it comprises a great variety of approaches to understanding and investigating the brain, which translates into much fragmented ways of building brain models. Early in the HBP, we worked with some HBP modellers and neuroinformaticians to explore possibilities, issues, and practicalities of collaboration between brain modelling communities within and outside the HBP (Rose, Aicardi and Reinsborough, 2015c). It had important outcomes in terms of sociological research and neuroscientific collaborations. Its main, and unexpected, long-term impact on the HBP was to start the conversation with The Virtual Brain (TVB) that led to TVB joining and then becoming a key component of the HBP¹⁶.

¹⁵ Read more about the Dual Use Working Group: <https://www.humanbrainproject.eu/en/science-development/ethics-and-society/dual-use/>

¹⁶ Read more about The Virtual Brain (TVB): <https://www.thevirtualbrain.org/tvb/zwei>

The HBP is a uniquely large-scale project that brings together more than 500 scientists and engineers from a range of very diverse disciplines. This has presented important challenges. One is how to monitor and foster collaborations between HBP partners. In our research, we paid attention to the formal and informal ways that HBP scientists and engineers collaborate. A key finding was that making collaborations visible requires much work and that not all collaborations translated into the HBP infrastructure (Aicardi and Mahfoud, 2022). We anticipate that to retain the diversity of the HBP community, the EBRAINS infrastructure will need to acknowledge these ‘invisible’ collaborations and ensure an inclusive membership and governance, involving not only basic researchers but also representatives of those communities with an interest in the practical applications of this research.

Science Fiction

Throughout our work, we spent much time researching foresight methods, debating how we could realistically adapt them to the HBP given our time and budget, and eventually writing near-future fictional vignettes to kick off discussions at a stakeholders’ foresight seminar on future medicine that we co-organised in October 2014 and in various workshops thereafter. This first inroad into using science fiction in foresight work has led to various collaborations and projects with sci fi writers. We have organised many activities and events aimed at fostering researcher awareness, engaging with the public, and generating insights into social and ethical issues in other contexts than the HBP. It also led some in the Foresight Lab to experiment with the medium of science fiction to express aspects of their experience as social scientists integrated in the HBP that could not be captured by traditional academic writing.

Conclusion

Foresight is a valuable exercise, and we outline our achievements in the sections above: supporting community building within the HBP and with other cognate projects; methodological developments using sci-fi inspired scenarios; and contributions to establishing the dual use working group and institutionalising RRI (Aicardi et al., 2018). However, mechanisms are needed to ensure that it has traction on the priorities and direction of research. While we increased ‘awareness’ of key ethics and society issues among some HBP researchers, more work is needed to institutionalise RRI in lasting ways. This has been done with the dual use working group, for example. But this is especially difficult in large consortia of diverse research groups, each of which has its own priorities, and many of which are working on ‘basic science’ seemingly far removed from practical application. To be effective, foresight researchers need to be engaged ‘upstream’ and have accepted and valued roles with the governing bodies of projects like the HBP. There is still much to do in developing effective models that will build social responsibility and research for social benefits into the heart of such large research consortia as the HBP.

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