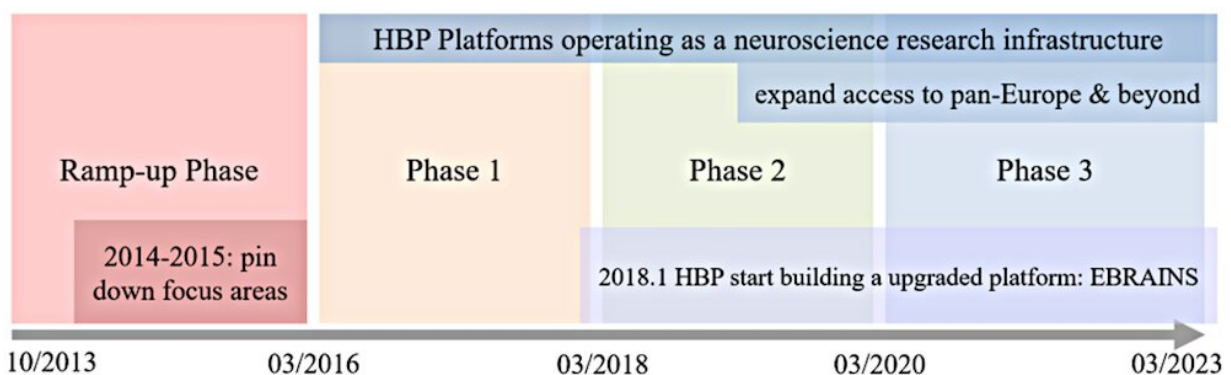


Despite scientific squabbles, the decade-long Human Brain Project benefited neuroscience collaboration

March 22 2023, by Lucy Xiaolu Wang and Ann-Christin Kreyer



The Human Brain Project aimed to achieve ambitious milestones despite major restructuring and controversy. Credit: [Lucy Xiaolu Wang and Ann-Christin Kreyer, CC BY](#)

Recent years have seen both impressive [advances in computational technologies and neuroscience](#) and [increasing prevalence of mental disorders](#). These forces sparked the launch of [brain science initiatives](#) worldwide. In the past decade, a "brain race" between Europe, the U.S., Israel, Japan and China has taken off with the goal of [understanding human brain function](#).

One of the earliest brain initiatives was the 10-year, 1 billion-euro

(US\$1.33 billion in 2013) [Human Brain Project](#), which launched in 2013 as a flagship science initiative of the European Commission's [Future and Emerging Technologies program](#). The project [initially sought to simulate the entire human brain](#) in a supercomputer within a decade, continuing the work its founder, neuroscientist [Henry Markram](#), started with his 2005 [Blue Brain Project](#). Not only did it seek to digitize the brain, but research and laboratory work were also [designed to be completely digital](#), with researchers distributed across Europe.

However, the project was rife with controversy among neuroscientists worldwide. It [faced skepticism](#) before it even started and gathered [heated criticism](#) and [debate](#) once funded. After over 800 neuroscientists worldwide [signed an open letter](#) calling for a revamp of the program, it was [completely reorganized](#) in 2015. From then on, its aim was to develop a European digital research infrastructure to advance brain science and create "[brain-inspired information technology](#)."

Now, 10 years later, the project is coming to a close. It remains an open question whether it achieved its goals.

[We are economists](#) who study how [digital infrastructure](#) can help scientists collaborate in challenging times. Our [recently published research](#) found that while the Human Brain Project experienced major changes in its structure and goals, it was able to promote collaboration through its [online forum](#).

Evolving research focuses

The project was composed of [scientists from various disciplines](#), including neuroscience, computer science, physics, informatics and mathematics. More than 500 scientists and engineers at over 120 [research institutions](#) across Europe and beyond have [engaged in HBP research activities](#).

Although many neuroscientists view [brain network simulation](#) as an important step to advance brain science, many others criticized the project's [initial focus on computer simulations](#). Scientists argued that simulations will [never be enough](#) to explain the [function of the entire brain](#) without complementary experiments on animals or tissues. Some viewed the program as [an IT project](#) rather than one on neuroscience. Others worried that [other important research areas](#) would be neglected. Combined with perceived [lack of transparency](#) and [mismatch between](#) the size of its task, time frame and setup, the reorganization the [open letter](#) called for was inevitable.

After revamping, the project dropped its original goal of complete brain simulation to focus on advancing [brain](#) sciences with computational science.

The project also started hosting supercomputer-powered online research platforms [on the Collaboratory](#) for researchers to virtually collaborate in 2016. This infrastructure enabled the development of [advanced software and complex brain simulations](#) by providing cloud-based platforms for collaboration and [data storage](#), as well as data analytics, supercomputers and modeling tools.

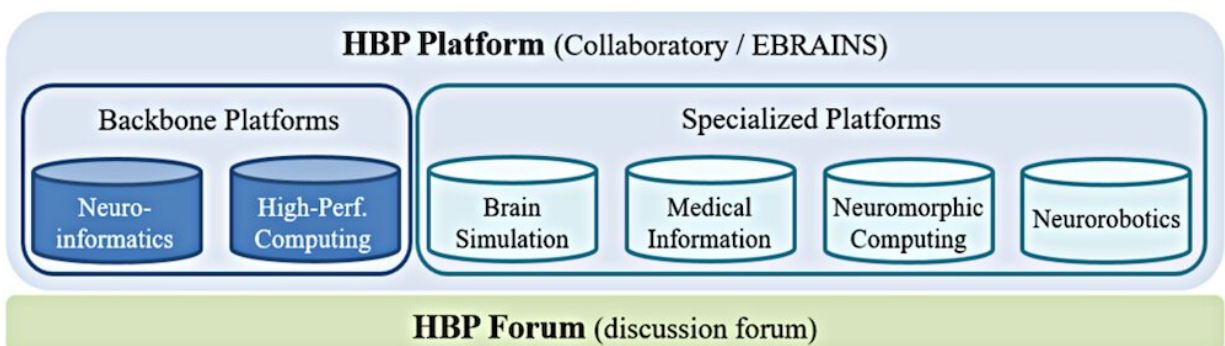
In 2018, the platform host transitioned from the project to [EBRAINS](#) as an upgraded and permanent version powered by new E.U. neuroscience supercomputing centers. EBRAINS is intended to serve as the backbone for a pan-European online neuroscience research platform after the project ends. Through EBRAINS, the project's research data, models, tools and results [will be made accessible](#) for further research.

The HBP online forum

To complement the research platforms, the [Human Brain Project Forum](#) was launched in July 2015 to facilitate informal collaboration and

knowledge-sharing. Users discussed both project-related activities and broad neuroscience programming challenges on this public forum. All topics and discussions could be viewed freely online, and anyone could make an account to post a question or comment on an existing thread. Opening the forum to the public was intended to facilitate the [exchange of results and expertise](#) with outside researchers to help achieve the project's ambitious goals.

We wanted to know if the forum succeeded in its goal of [connecting researchers](#) both within and beyond the project community. To answer this question, we examined patterns of user interaction and problem-solving on the forum from when it opened in July 2015 through March 2021. We measured user interaction by collecting data on all posted questions and replies, linked with available user information on the site or via public search. To analyze what factors facilitated collaborative problem-solving, we examined the solution status of the questions and users within each thread.



The structure of the Human Brain Project platforms and the online forum.
Credit: [Lucy Xiaolu Wang and Ann-Christin Kreyer, CC BY](#)

We found that the average interaction within each posted thread is comparable to [Stack Overflow](#), a popular Q&A website for programmers. On average, each Human Brain Project forum thread [received 3.7 replies](#) compared with [1.47 replies per question](#) on Stack Overflow. Despite a drop in usage during early 2020 at the start of the COVID-19 pandemic, forum use rose substantially in late 2020 and early 2021.

Questions about programming related to the project's core research areas gathered more attention, active discussion and faster resolution. While questions that attracted users from many countries are discussed more actively, they took longer to resolve. Problems with administrator support were solved faster overall. Patterns of online interaction did not significantly differ by project affiliation status, gender or seniority level.

Overall, the forum appeared to be an inclusive online community that fostered collaboration.

Digitizing the life sciences

There is a need to partially digitize the traditionally more laboratory-based life sciences. The U.S. Department of Energy highlighted this need when it created the [National Virtual Biotechnology Laboratory](#) in 2020, a consortium of national laboratories that uses supercomputer facilities to help scientists coordinate a united response against the COVID-19 pandemic.

But digitization doesn't guarantee successful collaboration. While Europe's Human Brain Project began with one specific goal that soon fell apart with controversy and disagreement, the ongoing U.S. [Brain Research Through Advancing Innovative Neurotechnologies Initiative](#) had no single vision. Following a more traditional research approach, multiple teams work independently on various topics. The BRAIN

Initiative had received [over \\$3 billion in funding by 2022](#)—three times the amount for the Human Brain Project.

While the long-term impact of the project may not be fully understood, the [Human Brain Project Summit 2023](#) from March 28 to 31 is set to provide a venue for open discussion with the broader community on what the HBP has achieved. Institutional support for neuroscience research can yield tremendous returns, but it remains unclear how to best design scientific organizations and use digitization in the process. We believe studying the science of science research could help achieve the collaboration and shared goals these initiatives seek.

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