

At the National Institutes of Health (NIH), the *Brain Research Through Advancing Innovative Neurotechnologies*® (BRAIN) Initiative (www.braininitiative.nih.gov) aims to revolutionize our understanding of the human brain by accelerating the development and application of innovative technologies.

The BRAIN Initiative is uniquely situated for cross-cutting and accelerated discovery in neuroscience that goes beyond the capability of any single Institute or Center at the NIH by tapping into synergies across multiple fields to address the personal and societal challenges imposed by human brain disorders.

Scientific Vision

- Seven priority areas outline the Initiative:



Discovering diversity: Identify different brain cell types and determine their roles in health and disease.



Maps at multiple scales: Generate circuit diagrams that vary in resolution from synapses to the whole brain.



The brain in action: Produce a dynamic picture of the functioning brain through large-scale monitoring of neural activity.



Demonstrating causality: Link brain activity to behavior with precise interventional tools that change neural circuit dynamics.



Identifying fundamental principles: Produce conceptual foundations for understanding mental processes by developing new theoretical and analytical tools.



Advancing human neuroscience: Develop innovative technologies to understand the human brain and treat its disorders; create and support human brain research networks.



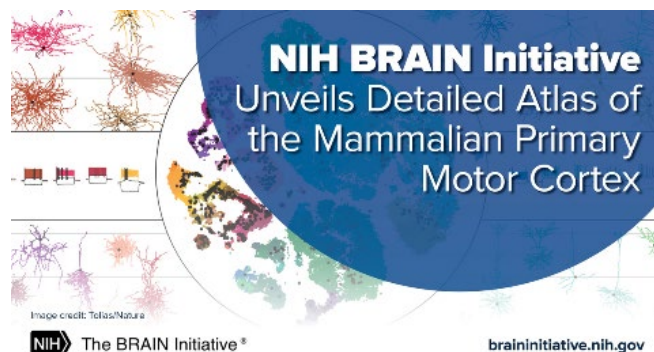
From BRAIN Initiative to the brain: Apply new technological/conceptual approaches to discover how neural activity patterns transform into cognition, emotion, perception, and action.

At a glance...



- ◆ Announced in 2013, the NIH BRAIN Initiative is revealing how the brain works, by developing and applying tools to precisely map and observe brain circuits.
- ◆ The 21st Century Cures Act provides NIH BRAIN Initiative funding through 2026.
- ◆ Since 2014, NIH has invested more than \$3.0 billion in the BRAIN Initiative, supporting more than 1300 awards.
- ◆ Ten NIH Institutes and Centers participate in the NIH BRAIN Initiative.
- ◆ The BRAIN Initiative Alliance coordinates and communicates BRAIN Initiative activities of Federal agencies and private organizations.

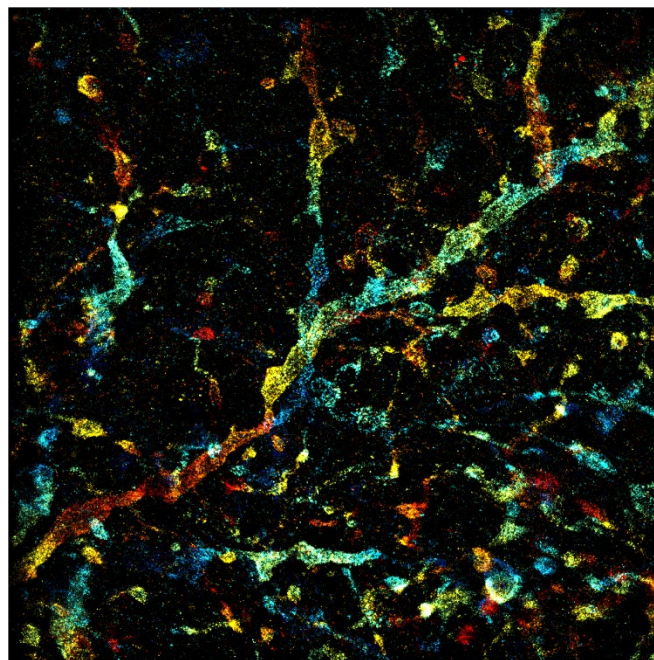
- The **BRAIN Multi-Council Working Group (MCWG)** provides ongoing oversight of the long-term scientific vision and informs Advisory Councils of the Institutes and Centers contributing to the NIH BRAIN Initiative.
- The **BRAIN Neuroethics Working Group (NEWG)** ensures that neuroethical considerations are fully integrated into the science and its work is complemented by BRAIN-funded neuroethics research.
- **Three large-scale transformative programs** (BRAIN Initiative Cell Census Network, BRAIN Connectivity across Scales Network, and the Armamentarium for Precision Brain Cell Access) will enable the development of novel molecular and gene therapies for human brain disorders.



The NIH BRAIN Initiative Cell Census Network (BICCN) unveiled an atlas of cell types and an anatomical neuronal wiring diagram for the mammalian primary motor cortex, derived from detailed studies of mice, monkeys, and humans (October 2021).

BRAIN Initiative Highlights:

- Since FY2014, the NIH BRAIN Initiative has supported over 1400 principal investigators across more than 200 institutions and organizations.
- BRAIN investigators bring new multidisciplinary perspectives to brain research, including engineers, physicists, mathematicians, computer scientists, and other experts as well as neuroscientists.
- New technologies enable researchers to map, monitor, and manipulate brain circuits in animal models with unprecedented precision in time and space, which may lead to new therapeutic approaches in humans.
- The BRAIN Initiative has taken a concerted approach to promote scientific excellence through increasing diversity and inclusivity in the research community. This includes focused funding opportunities for diverse trainees across career stages; capacity building at under-resourced institutions; and creating the Plan for Enhancing Diverse Perspectives (PEDP) grant application requirement.
- BRAIN continues to invest in the dissemination of tools, training, and data resources that will energize the entire neuroscience research community.
- The BRAIN Public-Private Partnership Program encourages collaborations between researchers and manufacturers of neural stimulation and recording devices.
- An annual meeting convenes the BRAIN community, including BRAIN investigators, partners, and collaborators.



The BRAIN Initiative supports innovations in the next generation of imaging technologies to visualize and map the brain. A 3D super-resolution view of immunofluorescence-labeled dendrites in the mouse visual cortex captured by a powerful optical imaging system. Credit: Fang Huang, Purdue University.

Collaborations beyond NIH:

- BRAIN Initiative partners beyond NIH include other government agencies, private foundations, industry, and professional and international organizations.
- Federal agencies include:
 - ◊ Defense Advanced Research Projects Agency (DARPA)
 - ◊ National Science Foundation (NSF)
 - ◊ Food and Drug Administration (FDA)
 - ◊ Intelligence Advanced Research Projects Activity (IARPA)
- Private foundations include:
 - ◊ Institute of Electrical and Electronics Engineers
 - ◊ The Kavli Foundation
 - ◊ Allen Institute for Brain Science
 - ◊ Simons Foundation
 - ◊ American Brain Coalition
 - ◊ Dana Foundation
 - ◊ International Neuroethics Society

NIH FY 2014-2022 investments: Not business as usual

DATE	INVESTMENT	NEW AWARDS
FY 2014	>\$45M	>55
FY 2015	>\$85M	>65
FY 2016	>\$155M	>105
FY 2017	>\$260M	>110
FY 2018	>\$400M	>200
FY 2019	>\$420M	>165
FY 2020	>\$495M	>175
FY 2021	>\$540M	>200
FY 2022	>\$600M	>195
TOTAL	>\$3.0B	>1300

Global collaborations have expanded to include the **International Brain Initiative**. NIH has supported brain research in more than a dozen countries since 2013.

For more information on the NIH BRAIN Initiative, see www.braininitiative.nih.gov