

The BRAIN Initiative promises to revolutionize our understanding of how the brain works, and foster development of tools that can precisely intervene on brain function. This research may deliver great insight and treatments to help affected patients and families. As part of this work, research teams might interview deep brain stimulation research participants about atypical side effects, such as personality changes, and how they perceive these as compared to their original symptoms. Or, researchers might explore disease- and/or treatment-induced fluctuating consent capacity and whether it suggests a need for changes in informed consent for brain stimulation studies. These are examples of how neuroethics can contribute to neuroscience research.

What is neuroethics? A tool for the advancement of neuroscience

Familiar topics in bioethics such as privacy, fairness, and autonomy can take on new dimensions and complexities given the unprecedented abilities of new neurotechnologies, and the brain's centrality to fundamental aspects of our selves¹. As such, **neuroscience research raises ethical questions beyond typical research ethics or the ethics of emerging technologies**. Such questions may include:

- How might new neurotechnologies disrupt fundamental notions of free will and agency? What broader implications could this entail for legal policies or commercial realms?
- What are the post-trial responsibilities of researchers (and funders) to participants who benefit from experimental implanted neural devices?
- If collecting and sharing neural data is crucial to effective research, how does this intersect with protecting participants' privacy? How do patients' and investigators' perceptions of the risks and benefits of data sharing align or differ?
- Will improved understanding of brain circuitry allow for predicting risk for future brain disorders and resilience against injury? How might this affect healthcare, insurability, and healthcare policy?

Neuroethicists can work with neuroscientists to address these and other questions that arise in association with neuroscience research.

Neuroethicists can help scan the horizon for ethical challenges, identify and explore the underlying values and assumptions of a variety of stakeholders, and assist in mitigating and navigating potential ethical concerns. As such, neuroethics can empower neuroscience research and help inform how research is designed, conducted, interpreted, and applied. Importantly, neuroethics is not a policing mechanism meant as a constraint on neuroscience progress, but rather a useful tool scientists can harness to facilitate neuroscience research. For these reasons, neuroethics is a priority for the NIH BRAIN Initiative.



¹ Henry T. Greely, Khara M. Ramos, Christine Grady *Neuroethics in the Age of Brain Projects* *Neuron*, 2016 Nov 2, 92(3): 637–641.

How is neuroethics research conducted?

Utilizing a series of analytical and philosophical frameworks² to identify and explore the underlying values and assumptions of a variety of stakeholders, a neuroethicist can work as part of a neuroscience research team to help inform how neuroscience research is designed, conducted, interpreted, and applied. **Neuroethicists work to anticipate and help mitigate challenging value conflicts – particularly those that may arise given the privileged status the brain has in human life and self-identity – to empower neuroscience research.**



There are two major modes of neuroethics research. Just as in other scientific research, neuroethics research can be exploratory or hypothesis-driven. Conclusions from neuroethics research aim to inform and help guide neuroscience research and/or application of research findings.

1. **Conceptual/philosophical research** involves analysis of core concepts such as consent capacity or agency, and may involve analysis and synthesis of existing literature and practices from law, policy, ethics, and neuroscience. Conceptual analysis can elucidate ethical challenges and draw from similar previous challenges. For example, it may include creating a taxonomy of different conceptions of privacy that are relevant to neural data, to inform data sharing practices.
2. **Empirical research** involves systematic data collection to provide input for assessing and resolving neuroethical challenges. This may involve acquiring factual data (e.g. how shared data is being used) or perspectives of relevant stakeholders around neuroscience research and neurotechnology. Stakeholders' perspectives can be gathered using established quantitative methods (e.g. surveys) and/or qualitative methods (e.g. interviews). Qualitative data can provide rich insights on, for example, human experiences (e.g. exploring how closed-loop DBS affects patients' perceived sense of autonomy), while quantitative data can explore the prevalence and extent of phenomena (e.g. how many DBS patients have such experiences).

How can I integrate neuroethics into my project?

Integrating neuroethics into a research project can be a powerful way to maximize positive impact of the research. Such opportunities could include:

1. Seeking the advice of an ethicist on experimental design, research protocols, etc.
2. Collaborating with an ethicist to explore an ethical concern related to the research or possible implications of study findings.
3. Collaborating with an ethicist to conduct parallel empirical ethics studies with patients, participants, the public, or researchers.

To learn more about neuroethics and available funding opportunities please visit:

<https://www.braininitiative.nih.gov/about/neuroethics.htm>

And see: *Neuroethics Guiding Principles for the NIH BRAIN Initiative*, Greely et al., J Neurosci. 2018; and *The NIH BRAIN Initiative: Integrating Neuroethics and Neuroscience*, Ramos et al., Neuron 2019.

² Martha J. Farah *An ethics toolbox for neurotechnology* Neuron, 2015 Apr 8, 86(1): 34-7.