

Reflecting on the Past and Future of Neuroethics: The Brain on a Pedestal

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Reflecting on the Past and Future of Neuroethics: The Brain on a Pedestal

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In October 2022, I had the privilege of joining Hank Greely on the opening panel of the annual International Neuroethics Society (INS) meeting in Montréal, *Tiohtiá:ke*, situated on the traditional territory of the *Kanien'kehà:kaa*, a place that has long served as a site of meeting and exchange amongst First Nations Peoples.

Warmly moderated by Paul Root Wolpe, we reflected on the past and future of the society, acknowledging the challenges that the original generation faced in creating not only a field but a sustainable organization; on the importance of staying closely aligned with science; and on the imperative to support an upcoming cohort of young neuroethicists when, at first at least, we were innovating neuroethics off the sides of our desks.

In this editorial, I share my impressions of where I see the science of neuroethics today: a mosaic of robust and interrelated activity, in evolution from the seemingly, although not necessarily, more orthogonal pillars (Figure 1a and b), we set for ourselves in early 2000 as an initial guide.

LOOKING BACK TO LOOK FORWARD

The Mapping the Field publication (Marcus 2002), which was more or less a transcript of the UCSF–Stanford meeting funded by the Dana Foundation, captured the four original pillars on which neuroethics has leaned for many years: *brain science and the self*; *brain and social policy*; *ethics and the practice of brain science*; and *brain and public discourse and training* (Figure 1, top). It was a meeting that Eric Kandel retrospectively rationalized well a few years later when he wrote, “Ethics in science is important because it is essential that the issues we confront in dealing with the mind be considered not only by the few narrow groups of individuals originally involved in delineating them, but by the larger group who can much better evaluate the ethical significance of these issues for society” (Illes and Bird 2006, 513).

At the foundational meeting and later, the focus on *brain science and the self*, a theme really cutting across the four pillars, captured discussions on human

nature, the biological basis of personality and social behavior, and the role of neurobiology in decision making. At the time, the field was motivated by, for example, Antonio Damasio’s studies of patients with ventromedial frontal lesions that provided a strong basis for discoveries about self and agency in neuropathology. Concurrently, Stephen Morse counseled that colorful imaging studies of the brain, such as those produced by functional magnetic resonance imaging (fMRI), might bring about a blindness to the fundamental legal assumption that people are rational agents and therefore responsible for their actions. Indeed, fMRI gave neuroethics much to think about as temporal and spatial resolution improved, and its technological successors have increasingly enabled and warranted consideration of topics extending well beyond responsibility.

The pillar of *brain and social policy*, which focused on nonclinical applications of neuroscience, or what I often called *brain in the wild*, initially garnered substantial attention in the peer-reviewed literature and popular press at the time for topics such as brain imaging for lie detection, dual-use technology, cognitive enhancement and impoverishment, and direct-to-consumer marketing of brain products and services. This pillar was a good call: the industry related to the latter has enjoyed massive financial investments that include wearable devices, opened the doors to unregulated animal research in the private sector for eventual human testing, and seen increasing intellectual property protections with sometimes dubious if not outlandish claims on brain regions. While lie detection had a relatively short life, manipulation of cognition continues to loom large: worrying about the authenticity of behavior at every stage of the life span is a theme that has been core to ethical and policy questions concerned with subclinical or nonclinical uses of pharmacological interventions and technological ones today.

Examples of challenges at the intersection of *ethics and the practice of science* carry on and are expanded today: ensuring that health benefits of neuroscience discoveries outweigh risks, and that access to new or

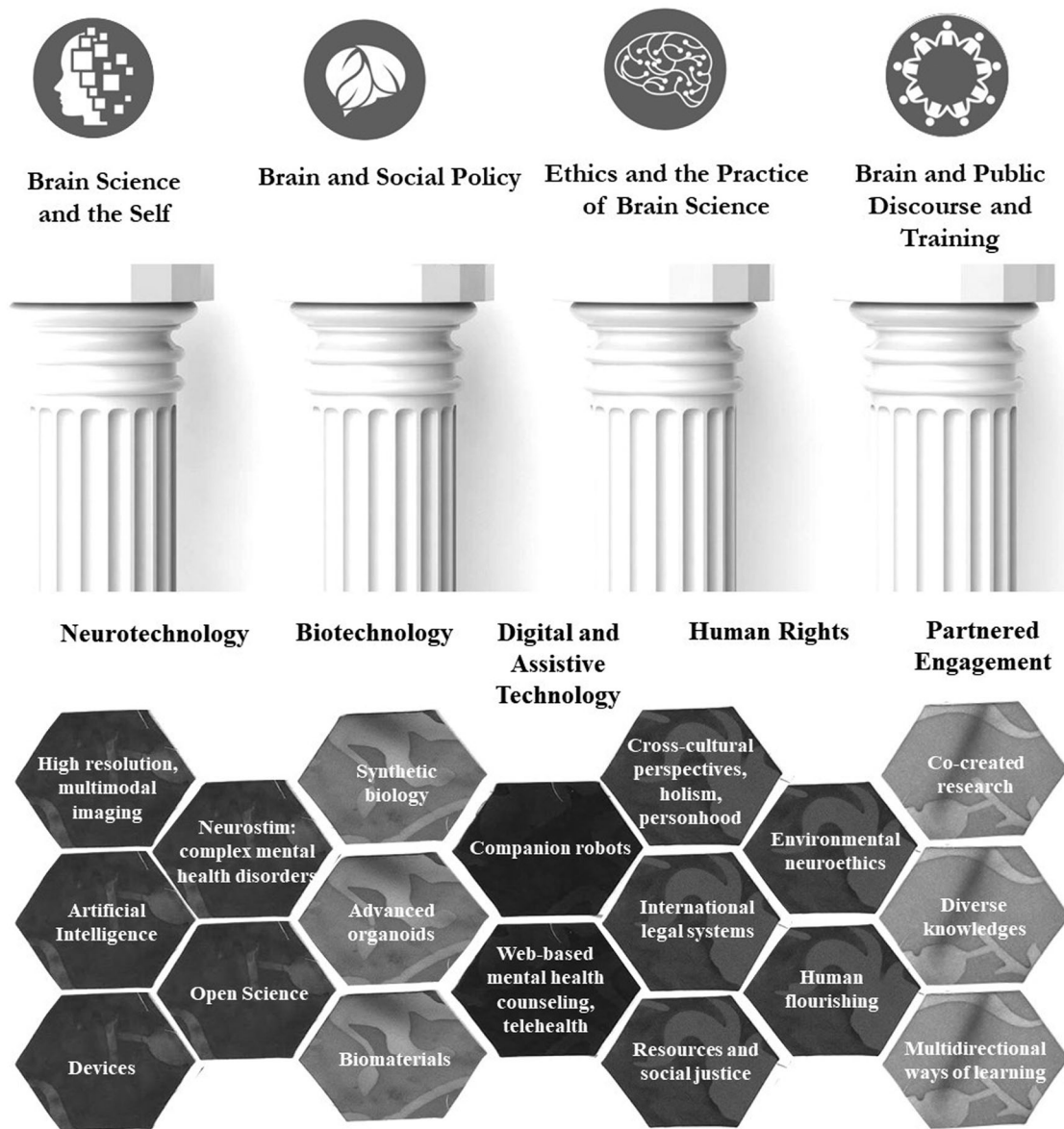


Figure 1. Original pillars of neuroethics (top); a mosaic of interconnected neuroethics today (bottom).

reemerging technologies (e.g., transcranial magnetic stimulation, electroconvulsive therapy) is fair and just. The balance between the pull from society for new innovation and the push for evidence-based results from clinical or case-based trials remains in tension. Neuroethics scholars established credibility for the field by providing practical guidance for incidental findings in neuroimaging research and publishing it in journals read by research users as well as theoreticians, moving from predicting disease to intention and behavior, and even measuring brain signals that reveal some level of consciousness in otherwise clinically unresponsive people after brain injury.

The pillar of *brain and public discourse and training* drew attention to the importance of good reporting and dissemination of information from the scientific world to the public, most often with the media as the

intermediary. Hype is still a concern, as is marketing of cures and treatments with no scientific basis, especially as they may adversely affect people shouldering the burden of neurologic or mental health conditions. Today's world of misinformation and predatory practices has elevated the associated challenges.

THE BRAIN REMAINS ON A PEDESTAL

Neuroethics has evolved. Without abandoning the key principles or foci, the field has achieved a dynamic that is both expansive scientifically and an enabling pipeline for future scholars and leaders. My image of this is a mosaic with many interconnected parts (Figure 1, bottom). It illustrates the momentum from the past toward some of the newer issues I have just described, as well as

the interrelatedness of its features into the present and projected future. It is not comprehensive and I am sure many other depictions are possible. This is merely mine.

I start with *neurotechnology*, marveling at high resolution, multimodal imaging capabilities, and the opportunities that portable MRI will afford. The explosion of work well beyond incidental findings and discussions of return of results has demonstrated, among many contributions, the importance of thinking about research impacts on communities in addition to individual autonomy in consent to brain research. There cannot be enough said in a short editorial about the extraordinary advances in artificial intelligence in every domain neuroethics touches today. Concerns about pills and pharmaceuticals have given way to thinking about devices for complex mental health disorders as well as for the augmented the human condition. Where in mid 2000 there were concerns about *get-it-yourself imaging*, such as unregulated consumer-driven computed tomography (CT), *do-it-yourself stimulation*, such as with transcranial direct-current stimulation (tDCS), has taken hold. And, while the ethics of commercialization and intellectual property protections remain debated, Open Science has taken on momentum that challenges economic incentives to neuroscience inventors and institutions and defends the rights of society to access publicly funded innovation, and efficiencies afforded by open data sharing.

In the earlier years, much discussion about *biotechnology* was focused on stem cells. My own work with trainees made some serious and unexpected breakthroughs in understanding perceptions of and willingness of people affected by a spinal cord injury (SCI) to undergo experimental trials depending on post-trauma timepoints, level of injury, and extent of disability. Today, synthetic biology, advanced biomaterials, and organoids are moving the dial in SCI and other areas of neuroscience. Transparency and inclusive dialogue are vital to continuing to anticipate this movement, advancing conversations already started, and ensuring ethical responsiveness.

Progress and neuroethical discussion about *digital technology* includes social media, assistive devices, cars and companion robots, Web-based mental health counseling, and telehealth. They are legitimately taking up far more space than before as the population ages, health care resources are taxed, and the pandemic introduces a new normal that relies on ever-increased uses of screen time.

Free will and compatibility were hot topics in neuroethics circles in the 2000s. Today *human rights* globally are in focus, as are cross-cultural perspectives about mind and brain, holism, just access to health care resources, and respectfully different definitions of personhood. Although the impact of neuroethics on the law was largely a matter of thinking about criminal responsibility in the past, today

neuroethics scholars are researching and writing about international legal systems and guidance for responsible innovation, how these systems intersect, where gaps exist, and how harmonization, where appropriate, might be a way forward. Human values have always been important, but human flourishing is an even loftier goal. Climate change, contamination from natural resource development and pesticides, and eco-anxiety have introduced environmental neuroethics to the existing field of environmental ethics. The field must build on the latter to advance the goal of remediating the effects of adverse neurotoxins on brain, and the detrimental impacts of environmental change on mental health, personhood, culture, and community.

Unidirectional approaches to teaching and outreach, sometimes tuned too much to the deficit model of knowledge, have opened up to partnered engagement in research that is co-created. It embraces genuine enthusiasm for multidirectional ways of individual and community learning and knowing, and expands on inclusivity of people with lived experience in research to ensure it is relevant and culturally safe for all stakeholders—people affected by neurologic conditions, people with disabilities, people with substance use disorders, and historically marginalized communities.

THE FUTURE

Whatever continuity and evolution the field may experienced, there is one factor tying these themes and others together: people. It is the exceptional respect, kindness, generosity and collegiality of those who practice neuroethics that has brought the field forward from where it started to what it has become. Through the dedication of the community and the trust promoted and imparted in the next generation, neuroethics and other multidisciplinary disciplines are challenging prior conventional and more conservative norms in academia. Neuroethics has found itself in neuroscience and bioethics programs worldwide, and is at a forefront of the global neuroscience movement. The sky is the limit. There is much work to be done.

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