

BRAIN MIND



NATIONAL NEUROETHICS
ADVISORY COMMITTEE MEETING



MEETING REPORT

February 27-29, 2020

SUPPORTED BY



CONTRIBUTORS

Steven Hyman, MD (Chair)
Harvard University, Broad
Institute

Nita Farahany, JD, PhD (co-
host)
Duke Law School

Stephanie Bird, PhD
MIT (retired)

Ed Boyden, PhD*
Massachusetts Institute of
Technology

Juan Enriquez, MBA
Excel Venture Management

Hank Greely, MD*
Stanford University

Martha Farah, PhD
University of Pennsylvania

Helen Mayberg, MD
Icahn School of Medicine

Michael McCullough, MD
BrainMind

Caroline Montojo, PhD
The Kavli Foundation

Jonathan D. Moreno, PhD
University of Pennsylvania

Tim Mullen, PhD
Intheon

Calvin Nguyen*
BrainMind

Matt Perault, JD
Duke Science and Society

Khara Ramos, PhD
NINDS/NIH

Laura Roberts, MD*
Stanford University School of
Medicine

Karen Rommelfanger, PhD
Emory University

Jacob Robinson, PhD
Rice University

Philip Rubin, PhD
Haskins Laboratories

David Sanford*
Office of Reid Hoffman

Diana Saville
BrainMind

Wendell Wallach, PhD
Yale University

Paul Root Wolpe*
Emory University

Gwill York, MBA
Lighthouse Capital Partners,
Partners Healthcare

*Contributors advising in
absentia

Sponsored by:

The Charles A. Dana Foundation
The Kavli Foundation

Hosted with:

Duke Initiative for
Science and Society

Report prepared by:

Daisy Robinton, PhD

Cover art by:

Sarah Cromer

Special thanks to:

David Choi
Abraham Dada
Madeline Liddicoat
Chaun Michael Madeiros

Timothy McDermott
Ben Shepard
Hannah Shoaf
Hope Tyson

“Because the brain gives rise to consciousness, our innermost thoughts and our most basic human needs, mechanistic studies of the brain have already resulted in new social and ethical questions.”

NIH BRAIN Initiative 2025 Report

Introduction

Neuroscience is in the midst of a significant step-change in capacity, akin to the sequencing of the human genome or the development of nuclear fission. Unlocking the mysteries of the brain will enable unprecedented advances in human potential, yet also create serious new challenges. Thought-provoking scenarios are emerging at the intersections of neuroscience, technology, brains, and minds with respect to areas such as memory and memory editing, identity, psychological continuity, agency, mind-reading, and boundaries between technology and the human experience. As we usher brain technologies out of the lab and into society, how carefully will we consider their potential impact on humanity, and how can we engage the best decision-making frameworks to maximize their benefit to individuals and society?

In 1975, Paul Berg convened a conference of biologists, lawyers, physicians, and others at the Asilomar grounds in California, to discuss how the biotechnology community should voluntarily regulate its use of recombinant

DNA. The outcome was a set of guidelines that, to this day, have enabled biotechnologists to make enormous contributions to human life in a safe and ethical manner. In neurotechnology, we have a new challenge: with the diversity of stakeholders involved in scientific discovery, product design, and company creation, we must find a way to integrate neuroethics into every stage of innovation. With a convergence of technologies including machine learning, data storage, and rapidly advancing brain imaging and recording tools, now is the time to hold an “Asilomar for Neurotechnology.”

On February 27—29, 2020, BrainMind convened a multi-sectoral neuroethics advisory committee meeting at Duke University in Durham, North Carolina. This summit brought together a group of the world’s leading neuroscientists, neuro- and bioethicists, entrepreneurs, policymakers, and investors to explore engaging diverse stakeholders with ethical frameworks among the advancement of neurotechnologies (Fig. 1).

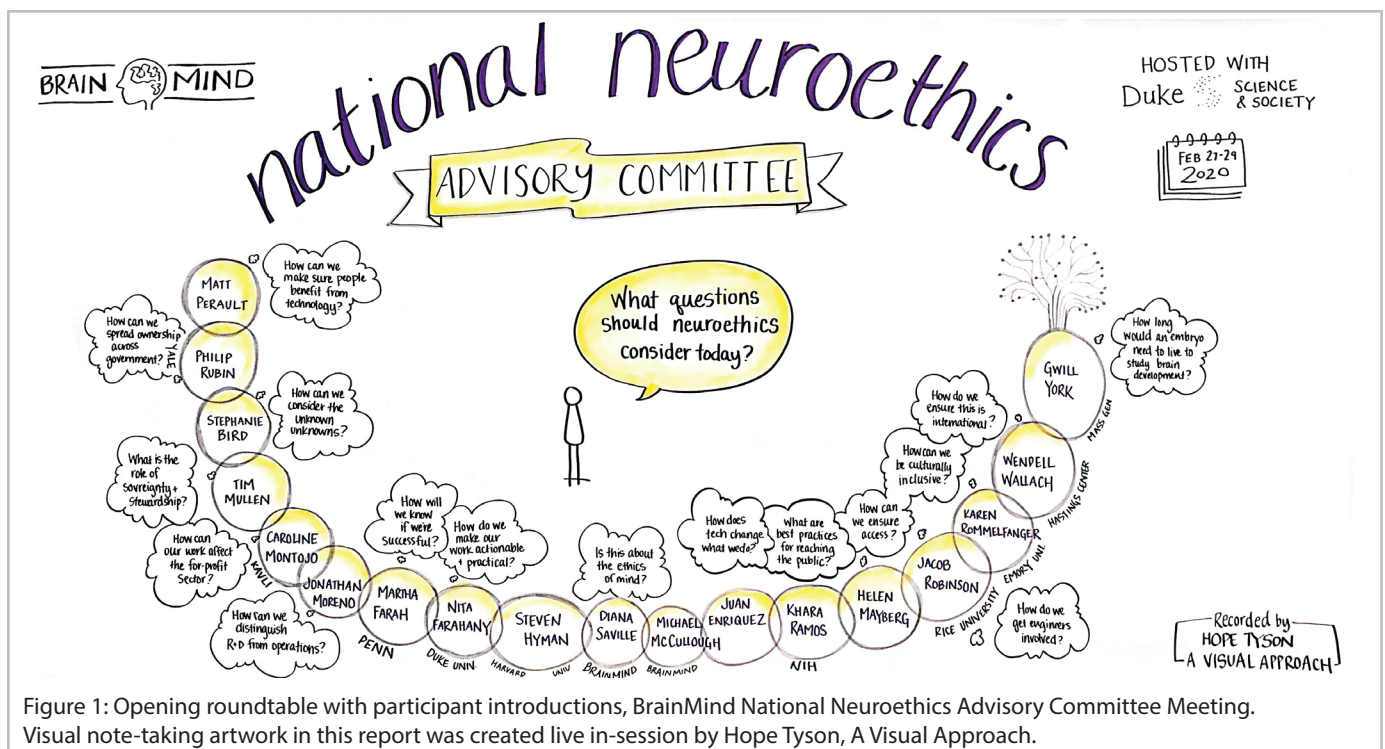


Figure 1: Opening roundtable with participant introductions, BrainMind National Neuroethics Advisory Committee Meeting. Visual note-taking artwork in this report was created live in-session by Hope Tyson, A Visual Approach.

Participants at this meeting included pioneers involved in the founding of neuroethics as a field (see Appendix, Table 1), as well as those who helped build ethics frameworks and toolkits for neuroscience innovation across multiple organizations including the Organization for Economic Cooperation and Development (OECD), the Institute of Electrical and Electronic Engineers (IEEE), the US BRAIN Initiative, and the International Brain Initiative (IBI). This cohort also included leaders from the International Neuroethics Society (INS), the Charles A. Dana Foundation — which convened one of the first-ever neuroethics meetings — and thought leaders who have guided the discussion of ethics in Artificial Intelligence (AI). The discussions held during this meeting focused on methods for collaborative engagement and implementation of existing ethical frameworks to guide near-term innovations in brain science, including the proposal of a multi-sectoral international summit at the Asilomar Conference Grounds in California.

This advisory meeting affirmed the opportunity to form a “practical layer” between neuroethics frameworks and the societal translation of the robust research and company projects emerging in neuroscience. The key findings of this meeting and graphical notes from the live discussion are compiled in this report, which will guide BrainMind and a number of international collaborators in the next planning steps of a Neuroethics Asilomar summit.

Neuroethics Guiding Principles

1. Make assessing safety paramount
2. Anticipate special issues related to capacity, autonomy, and agency
3. Protect the privacy and confidentiality of neural data
4. Attend to possible malign uses of neuroscience tools and neurotechnologies
5. Move neuroscience tools and neurotechnologies into medical or nonmedical uses with caution
6. Identify and address specific concerns of the public about the brain
7. Encourage public education and dialogue
8. Behave justly and share the benefits of neuroscience research and resulting technologies

Table 1: Neuroethics Guiding Principles, originally published in The Journal of Neuroscience, December 12, 2018.

Neuroethics: Groundwork and Challenges

The concept of neuroethics resurfaced in the 1990s with the recognition that advancement in neuroscience raised significant ethical and policy questions beyond the purview of traditional bioethics. Within a decade, the International Neuroethics Society (INS) was formed in Asilomar, California with support from the Dana Foundation. This professional group of neuroscientists, psychologists, philosophers, bioethicists and legal scholars met to discuss and consider the emergent ethical questions arising from the rapid acceleration of brain science.

In recent history, a spate of reports and guiding principles have been prepared in working groups with expert neuroethicists. In 2017, the Global Neuroethics Summit Delegates prepared a set of ethical questions to guide research in brain science, published in Neuron (see Relevant Resources in the Appendix) and also summarized existing guidelines. In December 2018, The Neuroethics Working Group of the National Institutes of Health (NIH) Brain Research through Advancing Innovative Neurotechnologies (BRAIN) Initiative proposed incorporating Neuroethics Guiding Principles into the research advanced by the Initiative (Table 1).

In December 2019, the OECD confirmed a set of neuroethics principles and recommendations; this interdisciplinary group is now developing a toolkit

Common Themes in Neuroethics







 Equity and Access	 Privacy	 Capacity and Consent
 Agency and Autonomy	 Safety and Patient Protection	 Dual/Unintended Use

Figure 2: Common themes in neuroethics. Figure adapted from the Neuroethics Guidelines Analysis from the Global Neuroethics Summit

for implementation, moving from the theoretical to the practical. Similarly, in early 2020, the IEEE developed a neuroethical framework to facilitate the development of guidelines for engineers working on new neurotechnologies.

In light of the significant groundwork laid by multiple multidisciplinary organizations, advisory committee participants noted that there is still much work to be done to integrate and implement these recommendations. Neuroethics is a problem-solving framework that can be applied to specific scenarios and needs to be built into the process of technology development, not as an afterthought or a reaction to a technology that has already been developed and put in front of the public. Members of the advisory committee championed a tailored, case-study-based approach to engage diverse stakeholder groups with neuroethics. Each group should be invited to explore their specific challenges and opportunities for integrating neuroethics into practical decisionmaking. Such an exercise can provide a venue for the broader neurotechnology community to engage with neuroethics and create a shared path forward through the routine lifecycle of neurotechnology research, development, and translation into society.

A shortcoming of past frameworks has been the lack of substantive and critical engagement with private sector stakeholders and investors. Members of the neuroethics advisory committee were enthusiastic about the opportunity to translate the significant groundwork in this field well beyond the scope of academic meetings. BrainMind offers valuable partnership potential in this regard, as the BrainMind ecosystem includes a wide array of highly influential stakeholders across multiple sectors with a stated interest in brain science and neurotechnology. Ongoing interaction with this community would provide an opportunity for signal

amplification and broad engagement with those not immediately part of the neuroethics community.

A Role for BrainMind

BrainMind is a nonprofit platform and community comprised of scientists, entrepreneurs, investors, philanthropists, ethicists, and policymakers. This ecosystem is united by the shared mission to support and cultivate the most important and impactful ideas in brain science. Part of the BrainMind vision is to form the vital connective tissue amongst stakeholders (see List 1). Through convening this powerful international coalition at ongoing summits and special events, BrainMind is creating the infrastructure to reconfigure resources and connect stakeholders in new ways to accelerate the translation of high-impact ideas at the intersection of neurotechnology and brain science.

The main activities of the ecosystem center around supporting high-impact brain science ideas that might otherwise languish in the investment valley of death, or perhaps never leave the realm of academia. As we develop new philanthropic and investing approaches to promote the positive impact of brain science, we recognize that neuroethics frameworks should inform our decisions and those of our community. What’s more, given the economic stresses of the global pandemic, investors will need to be even more judicious than in the past.

By convening a series of neuroethics advisory meetings culminating in a multi-sectoral summit at Asilomar, BrainMind aims to serve as a facilitator, convener, and exemplar of how to integrate neuroethics into all aspects of neurotechnology, from academic research to commercialization.

Neuroethics Stakeholders

- Neuroscientists (basic to clinical)
- Scientist across disciplines
- Patients
- Clinicians
- Caregivers
- Entrepreneurs
- Corporations
- Investors
- Philanthropists
- Ethicists
- Philosophers
- Consumers
- Government, policymakers
- Employers
- Engineers
- Marginalized communities
- Educators
- Product designers
- Academic institutions
- Research institutions
- Professional organizations
- Anthropologists
- Religious groups
- Judicial system
- The broader public

List 1: Representative list of key stakeholders in brain science and neurotechnology

Implementation of Distilled Principles

Advisory committee participants noted that the frameworks and implementation tools being developed by groups like the OECD and IEEE can be used to engage the ecosystem of stakeholders making high-impact decisions in real-time on matters such as research translation and funding, company creation, and product design (Fig. 3).

The participants at this meeting agreed: it is not a question of which ethical concerns to discuss or focus on, so much as how to engage with neuroethics such that each group of stakeholders is empowered to develop a filter or lens derived from these principles as they make decisions to advance their work (Fig. 4). One of the major roadblocks to the kind of integration is failed translation between disciplines - often literally due to jargon, connotation, and implicit language patterns of each discipline. As people further specialize in a given field (ethics, neuroscience, business) we learn to speak and think in what can approach foreign languages. While there are optimistic exceptions, this problem not only makes literal understanding more challenging, but can also condition the zones of thinking for given fields. This is a challenge and opportunity that BrainMind hopes to

tackle through this collaborative work, one which will be further explored in subsequent advisory meetings.

We must also consider the incentives of each stakeholder group that would create a favorable environment to integrate ethical principles into basic and translational research, product design, investment decisions, new company creation, and philanthropic grantmaking. We must show how integration of these principles adds value to projects as they run their course. Importantly, neuroethics should be framed as integral to high-impact neuroscience innovation.

There was a general consensus that illustrative case studies--based on real-world narratives from our stakeholders--would be the most powerful means by which to demonstrate how these guidelines would be employed by individuals across sectors. In this context, we can collaboratively develop strategies to help these stakeholders incorporate neuroethics as a problem-solving framework applied to specific scenarios within their research and product development (Figure 4).

The development of a set of guiding questions and 2-3 case studies for each stakeholder group is a promising place to start. Learning what motivates each stakeholder is key to developing the most relevant case studies and questions. Therefore, part of the next phase of this

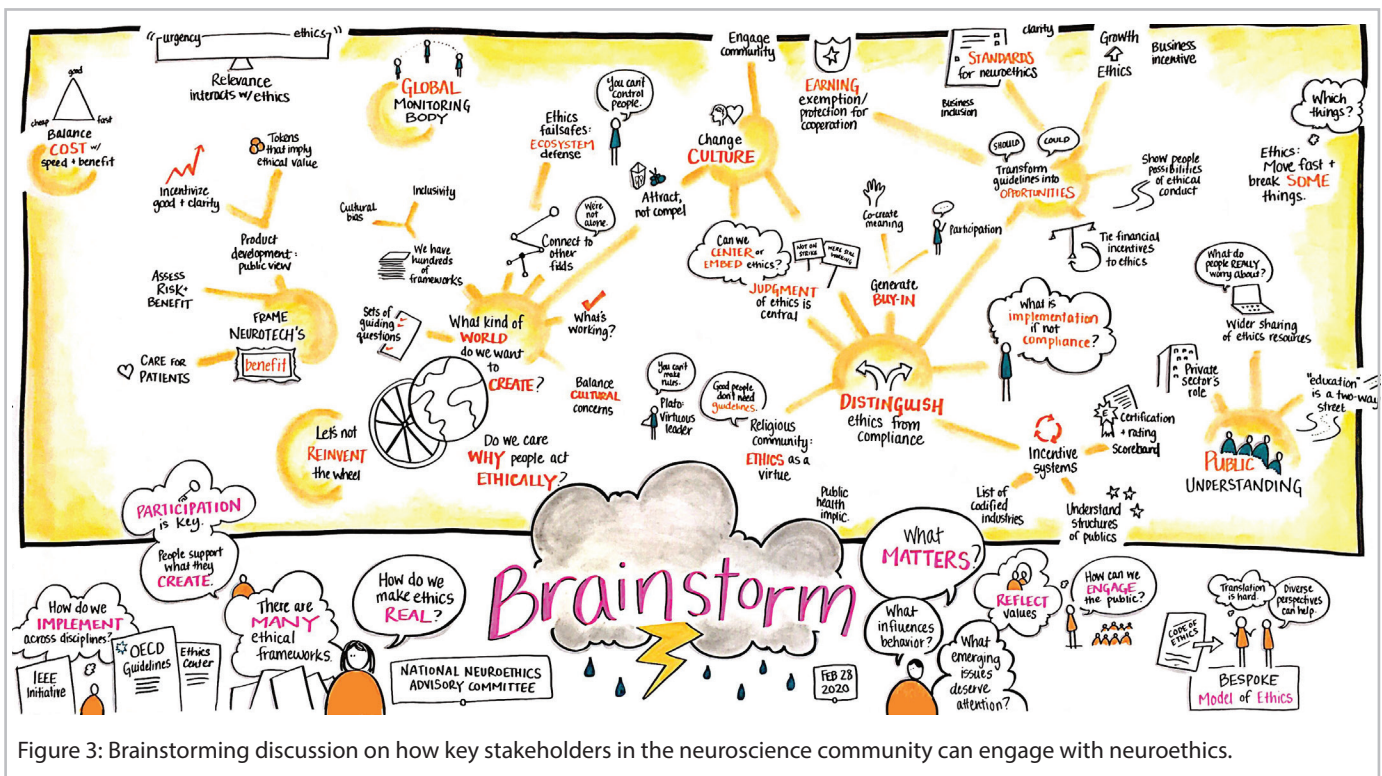


Figure 3: Brainstorming discussion on how key stakeholders in the neuroscience community can engage with neuroethics.

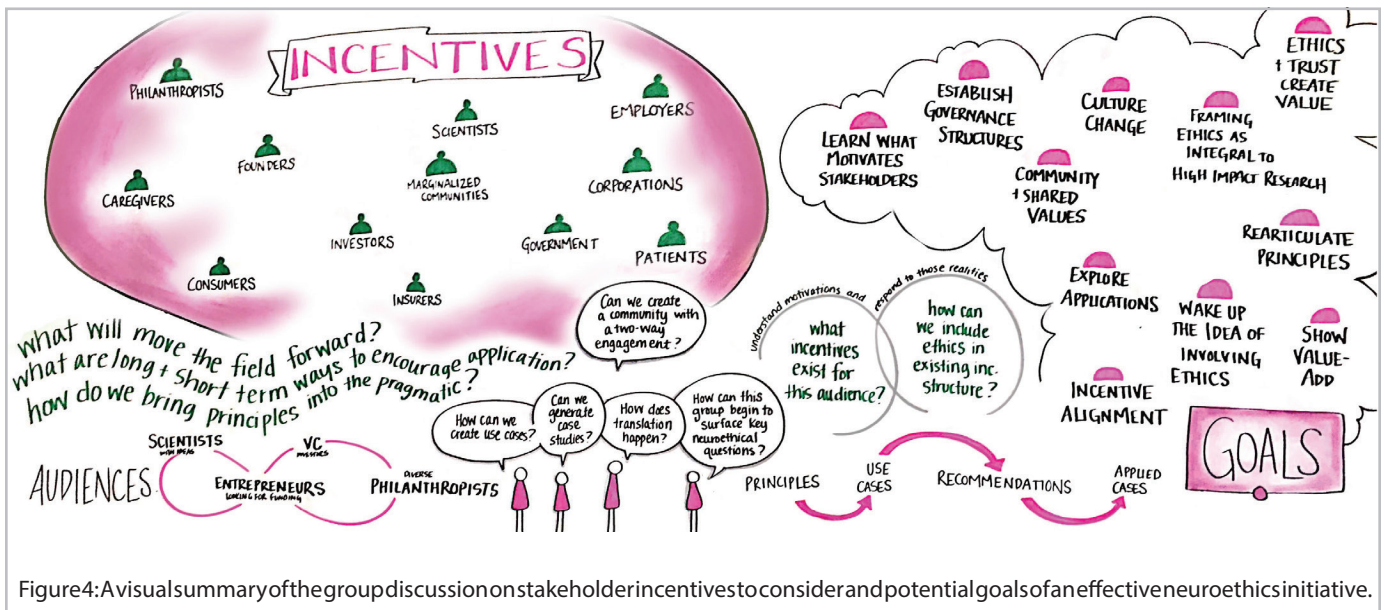


Figure 4: A visual summary of the group discussion on stakeholder incentives to consider and potential goals of an effective neuroethics initiative.

initiative is to develop a deep understanding of the concerns and motivations of each group (Figure 5). Before the next larger advisory gathering, these insights should be collated in virtual roundtables comprised of small groups of stakeholders including entrepreneurs, operators, investors, and philanthropists. A goal of the next series of focused, multi-sector advisory meetings in 2020 and 2021, before the Asilomar gathering, should then be to develop stakeholder-specific case studies for expanded development and implementation at Asilomar and within BrainMind.

The entrepreneurs and scientists present at this meeting affirmed the sentiment that their respective communities are seeking guidance integrating neuroethics into their workflows. We must intellectually engage leaders from these communities, as well as investors, entrepreneurs, philanthropists, and even experimental researchers, to engender shared enthusiasm and support from each group and co-create resources with them.

A critical audience for this roadmap is the entrepreneur community. Because of the intense competing pressures entrepreneurs experience, incorporating (time-consuming) ethical consideration into their workflow is particularly challenging. Creating bespoke sets of guidelines and case studies for this group will facilitate an efficient mechanism to drive progress and product design in a way that incorporates neuroethics along the entire life cycle of their technologies. Additionally, for this group in particular, it is especially critical to distinguish ethics from regulatory oversight or compliance. Ethicists

must be seen as collaborators rather than regulators. The salience for this group may reside in the opportunity to avoid future regulatory headaches by creating sustainable products endorsed a priori by a community of neuroethicists. BrainMind is working to facilitate a more innovative, inclusive, and fruitful way of integrating neuroethics in this subcommunity.

Similarly, venture capitalists (VCs) and angel investors are an important group to engage in this initiative. These stakeholders are frequently evaluating businesses, mostly looking for reasons not to invest. They are focused on financial returns and scalable innovation, a particular challenge in this nascent field. Most VCs also want to align with positive outcomes for society, but they are often unaware of how to structure that alignment. BrainMind and its partners need to identify and resolve the incentive structure that would promote engagement of neuroethical principles as part of this decision-making process, as well as maximize positive impact. These communities must incorporate both risks and ethics innovation into their investment decisions, and they need to be equipped with the tools to do so.

Members of the BrainMind ecosystem convene regularly to support and cultivate the most transformative ideas in brain science, creating rich opportunities for the integration of neuroethics along the developmental life cycle of neurotechnology as it moves from research to commercialization.



Morning discussion session at BrainMind's Neuroethics Advisory Committee Meeting; February 28, 2020

Potential Processes to Support Integration of Neuroethics

Existing US regulatory/policy infrastructure is already in place to assess many of the brain technologies that raise ethical questions. This robust regulatory system, which includes the FDA and other agencies such as the Federal Trade Commission (FTC), has been designed to oversee uncertainties in biomedical innovation for decades. Neuroethicists are already collaborating with these agencies to review emerging topics such as brain organoids design, closed loop deep brain stimulation (DBS), and brain-computer interfaces (BCIs). There is no need to recapitulate work undertaken by bioethicists and Institutional Review Boards (IRBs) in our efforts herewith. Members of the advisory committee suggested that it would be helpful to engage leadership from these government agencies in the development of the Asilomar summit.

While the group agreed that neuroethics must be viewed as a decision-making framework rather than a prescriptive set of rules, there is a case to be made for developing a system of engagement based on projected future regulations for companies as a strategy for early idea development. Many companies pursue regulation

before developing or launching a product because they want to know that they are not pouring efforts into something that will be shut down. Establishing strong regulatory frameworks allows them to better understand what they will be accountable for as it relates to their products and services. Entrepreneurs and companies do not want to be held responsible for emergent properties or uses that they cannot predict.

Members of the committee also suggested that leading neuroethics professional groups might offer ongoing rigorous ethics risk assessments for entrepreneurs and investors as insurance against future penalties for emergent properties that were unable to be anticipated. This service could also be formulated as an expert consulting panel with topic specific expertise.

Whatever the mechanism may be, we need a community to offer solutions for issues as they emerge. Importantly, regulations are typically founded on a set of principled values, some of which may be outdated. Ethics can help evaluate the underlying values that regulations are trying to protect and consider how they may need to change.

In follow-on advisory meetings, it will be useful to focus one discussion around the efficacy of using an



Presentations at BrainMind's Neuroethics Advisory Committee Meeting; February 28, 2020

exemption or protection from regulatory red tape in exchange for ongoing collaboration with an independent entity offering ethical guidance. Can such a third party provide a valuable affiliation that represents ongoing and rigorous ethical evaluation? And what body would be a trustworthy broker of this? Ideas of discernment, accreditation and best practices were all raised and discussed in the meeting, and continue to be important topics for follow-on discussion.

Is there a way in which we can incentivize ethics engagement and transparency throughout product development? Whatever infrastructure we collectively build must create buy-in. If we are able to co-create meaning with stakeholders, we will achieve much more.

Asilomar

As neuroscience and neurotechnology mature, we need to keep pace with the development of neuroethical considerations keep pace. It is particularly timely to engage in a concerted effort to establish a multi-sectoral, international collaboration that will include diverse stakeholders in an effort to move the field forward while supporting the integration of neuroethics in tandem with ideation and project development. In collaboration with a group of international partners, BrainMind plans to host an international, multi-sectoral summit series focused on the research, development, distribution and use of existing and near-term innovations in brain science, first

in virtual settings, and then at the Asilomar Conference Grounds when larger gatherings become feasible. With the rapidly changing landscape of neurotechnology, interactions need to be agile and iterative. The large gathering will kick off a decadal review of the ethical principles and implementation strategies to guide how scientists, industry and users engage with major innovations in the field.

This initiative will be distinct from previous neuroethics initiatives by deeply engaging with the private sector, including their perspective and collaboration from the earliest stages. This goal is unlike any prior neuroethics & neuroscience meeting to date. We consider the inclusion of entrepreneurs, executives from technology and life science sectors, and investors to be important because of the tremendous amount of resources committed to brain research by these groups, and the powerful influence their work will have on individual lives and society as a whole.

BrainMind's desired outcomes for the Neuroethics Asilomar Program are as follows:

- 1) We conserve and direct energy to the technologies that have the greatest potential for meaningful impact for people as guided by ethical principles vs. profit motive.
- 2) We minimize the risk of unintended negative consequences of powerful technologies.
- 3) We establish a venue for collaborative navigation of complex or ambiguous ethical situations.

Asilomar is an opportunity to create an ethical decision-making framework guided by questions and illustrative case studies for each stakeholder group. With bespoke models for key stakeholders, we can integrate neuroethics into research, product design, company creation, and investment.

Values can shift across cultures, and they also evolve with time as new technology and circumstances arise. Asilomar summits should be held regularly to stay up to date on the values around which the field is orienting.

The Neuroethics Summit at Asilomar will be focused on neuroethics, neuroscience and neurotechnologies that will impact human lives in the coming decade. The summit will kick off continued engagement within the BrainMind ecosystem with neuroethics and an ongoing program collaboration with neuroethicists in all BrainMind activities and funding decisions.

Immediate Action Steps

Participants in the Neuroethics Advisory Committee Meeting suggested a series of tasks to prepare and execute BrainMind's follow-up advisory committee meetings which will engage a larger share of stakeholders from the private sector. To this end, BrainMind will compile a distillation of the current guidelines and principles previously prepared by international neuroethics and

professional groups for distribution to all participants in the Neuroethics Summit at Asilomar and future preparatory meetings for this summit (see Relevant Resources in the Appendix for source material).

To move to the next step of engagement, BrainMind will convene a series of diverse virtual advisory groups to curate the key questions and case studies from these resources and organize them as proposed summit content. BrainMind's next advisory meetings will be focused on co-creating use cases based on themes presented in the last meeting and distilled from the previously published guidelines, with a focus on creating buy-in for each stakeholder group.

The key outcomes of the upcoming virtual advisory sessions will be a set of well-developed illustrative case studies to effectively engage the key stakeholder groups within the BrainMind ecosystem, namely scientists, entrepreneurs, investors and other funding bodies such as philanthropic organizations. Throughout the process, BrainMind will highlight the need for global collaboration between the scientific, medical, entrepreneurial, investment, and end-user communities with input from ethicists to further define and exemplify responsible approaches to neuroscience and neurotechnology.

Bringing diverse voices to the table is critical to moving this initiative forward in the most meaningful way. To add depth, diversity, inclusivity and equity to the

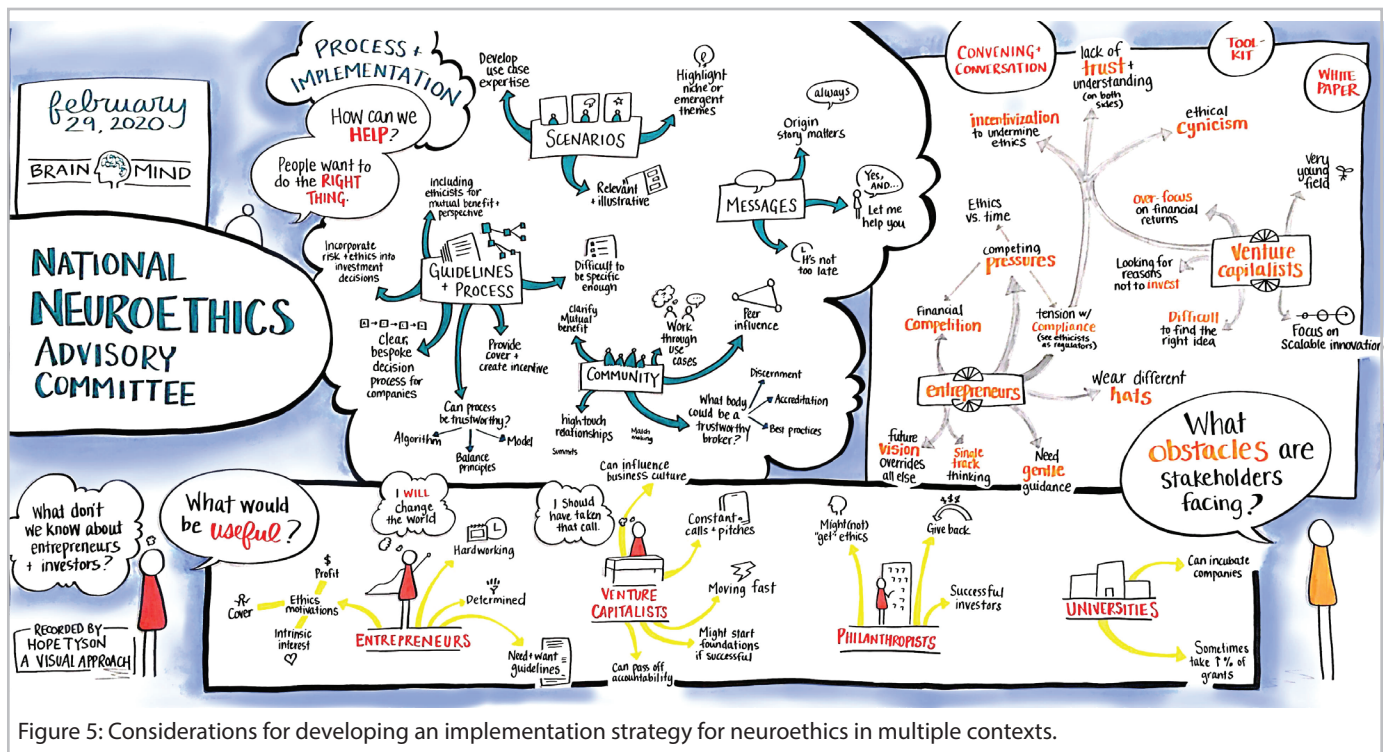


Figure 5: Considerations for developing an implementation strategy for neuroethics in multiple contexts.



Group photo: BrainMind Neuroethics Advisory Committee Meeting; February 29, 2020.

perspectives present at these meetings, BrainMind will seek out experts from stem cell science involved in cell replacement treatments, geneticists who can advise as predictive technology is being developed, a greater diversity of social scientists, and ethics thought leaders from communities outside of academia and secular science. Including the perspectives of these groups will help build a robust strategy that includes ethical approaches of under-represented communities.

Long-Term Efforts

In the years to come, BrainMind will convene small working groups to continue evolving neuroethics as neuroscience and neurotechnology move forward, with a focus on building bridges across stakeholder groups, neuroethicists, and the broader public. The vision for this initiative over time is to strengthen the integration of neuroethics across all stakeholders, and for BrainMind to help build the infrastructure and culture supporting incorporation of neuroethics at every stage of neuroscience innovation. As part of this longer-term set of goals, members of the advisory committee proposed the establishment of an expert neuroethics council available for support to BrainMind-funded ideas and others seeking advice within the BrainMind ecosystem. In the future, BrainMind and an independent expert

neuroethics council will support labs, investors and companies that are navigating ethical product design. Similarly, BrainMind will facilitate the coordination of efforts toward responsible regulation and policy, especially as more research translates into clinical and commercial products.

Lastly, to create sustainable impact and effective integration of neuroethics into future efforts on a long-term basis, BrainMind will explore how to support the integration of a neuroethics curriculum into current neuroscience and business curricula in order to seamlessly incorporate social responsibility across these disciplines. Teaching these principles early during malleable stages of intellectual and professional development will ensure that ethics and stewardship are concepts kept at the front of mind.

Conclusion

With the rapid advancement of this field and the emergence of never-before-seen technologies that will influence our brains, behavior, and minds, it is critical to learn how to engage ethical frameworks to inform decision-making during translation and company creation and to encourage interdisciplinary collaboration in this pursuit. The importance of these deliberations is

evident in the increased international investment in brain, the rapidly accelerating progress of the field, a growing neurotechnology industry, and rapid innovation across multiple sectors that converge with neurotechnology to change the way we interact with our bodies, our minds, and each other.

As BrainMind develops new philanthropic and investing approaches to accelerate positive impact in brain science, ethical frameworks will be necessary to guide idea curation in this space. The surge in new tools in neurotechnology offers the promise to alleviate human suffering and advance human potential, but also warns of the potential dangers to manipulate the brain and mind. As we build momentum and ready ourselves to allocate capital and resources, we are placing a high priority on neuroethics.

This meeting successfully identified key strategies to facilitate a multi-sectoral summit geared towards integrating ethics into neurotechnology based on principles developed by several key players in this area, including the OECD, NIH, and IEEE. With an initial focus on neurotechnologies, the platform will create a model for broader applications to neuroscience innovations (drug development beyond novel delivery systems for instance).

The BrainMind ecosystem is ripe for connecting key stakeholders in the conversation around neuroethics. Interdisciplinary participation and peer influence are critical to achieve maximum effectiveness toward this goal. BrainMind can also help expand public engagement in neuroethics by working with key thought leaders and influencers in the ecosystem.

This meeting outlined the next critical steps toward building broader engagement with neuroethics principles and guidelines that have been prepared by previous multidisciplinary working groups and academic experts. The meeting also underscored how BrainMind can and should embed neuroethical considerations across all programming within the organization.

This moment in neuroscience is critical for our diverse community to engage in a dialogue about responsible integration of neuroethics, and to engage today's scientists, entrepreneurs, and investors with neuroethics frameworks that will guide the development of this vibrant and influential field. BrainMind is committed to providing leadership in the responsible pursuit of progress in brain science and neurotechnology and to work together with neuroethicists and neuroscience stakeholders to build a more thoughtful and inclusive development pathway for neurotechnology.

Appendix

Relevant Resources

1. Global Neuroethics Summit Delegates, Rommelfanger KS, Jeong SJ, Ema A et al. Neuroethics Questions to Guide Ethical Research in the International Brain Initiative. *Neuron*. 2018; 100(1):19-36.
2. Greely HT, Grady C, Ramos KM et al. Neuroethics Guiding Principles for the NIH Brain Initiative. *The Jol of Neuroscience*. 2018; 38(50):10586-10588.
3. IEEE. IEEE Neuroethics Framework: Addressing the Ethical, Legal and Social Implications of Neurotechnology. 2020.
4. Lee S and Uh S. Existing Neuroethics Guidelines. Global Neuroethics Summit. 2017.
5. Lee S and Uh S. Neuroethics Guidelines Analysis. Global Neuroethics Summit. 2017.
6. Neuroethics and Philosophy of the Brain: A collection of books and articles. Centre for Research Ethics & Bioethics. 2014.
7. OECD, Recommendation of the Council on Responsible Innovation in Neurotechnology, OECD/LEGAL/0457. 2019.

Appendix

Table 1: Meeting participants

Name	Title and Affiliation
Stephanie J. Bird, Ph.D., M.S., M. Phil.	Founding Editor, Science and Engineering Ethics at MIT (retired)
Ed Boyden, Ph.D.*	Y. Eva Tan Professor in Neurotechnology at MIT; Leader, Synthetic Neurobiology Group; Professor, Departments of Biological Engineering and Brain and Cognitive Sciences, Media Lab and McGovern Institute
Juan Enriquez	Author/Managing Director, Excel Venture Management
Martha J. Farah, Ph.D.	Walter H. Annenberg Professor of Natural Sciences, University of Pennsylvania
Nita Farahany, Ph.D., J.D.	Professor of Law & Philosophy; Director, Duke Science & Societies, Duke University School of Law
Hank Greely, J.D.*	Professor by courtesy of Genetics, Stanford School of Medicine; Director, Center for Law and the Biosciences; Director, Stanford Program in Neuroscience and Society; and Chair, Steering Committee of the Center for Biomedical Ethics
Steven E. Hyman, M.D.	Distinguished Service Professor, Harvard University; Core Institute Member, Broad Institute of Harvard and MIT; Director, Stanley Center for Psychiatric Research, Broad Institute
Helen Mayberg, M.D.	Director, Nash Family Center for Advanced Circuit Therapeutics; Professor of Neurology, Neurosurgery, Psychiatry and Neuroscience Icahn School of Medicine at Mount Sinai
Michael McCullough, M.D.	Founder & CEO, BrainMind; Entrepreneur in Residence, Greylock Partners
Caroline Montojo, Ph.D.	Co-Director, Science; Director, Brain Initiatives, The Kavli Foundation
Jonathan D. Moreno, Ph.D.	David and Lyn Silfen University Professor, University of Pennsylvania
Tim Mullen, Ph.D.	Research Director & CEO, Intheon
Calvin Nguyen	Co-Founder and COO, BrainMind
Matt Perault, J.D.	Director, Duke Center on Science & Technology Policy; Associate Professor of the practice, Sanford School of Public Policy at Duke University
Khara Ramos, Ph.D.	Director, Neuroethics Program; Chief, Neuroscience Content and Strategy, NINDS/NIH
Laura Roberts, M.D.*	Chairman, Katharine Dexter McCormick and Stanley McCormick Memorial Professor, Department of Psychiatry and Behavioral Sciences, Stanford University School of Medicine
Jacob T. Robinson, Ph.D.	Associate Professor, ECE & BioE, Rice University; Adjunct Associate Professor, Neuroscience, Baylor College of Medicine
Karen Rommelfanger, Ph.D.	Director, Neuroethics Program, Emory University Center for Ethics
Philip Rubin, Ph.D.	CEO Emeritus, Haskins Labs; Professor Adjunct, Yale School of Medicine, Haskins Laboratories and Yale University
David Sanford*	Chief of Staff, Office of Reid Hoffman
Diana Saville	Co-Founder & COO, BrainMind; Co-Founder, Entrepreneur of Your Own Life
Wendell Wallach, M.Ed.	Chair, Technology and Ethics Studies, Yale University Interdisciplinary Center for Bioethics
Gwill York, M.B.A.	Co-Founder, Lighthouse Capital Partners

* Contributors advising in absentia



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