

## **Neuroethics: The discourse taking place today and being implemented tomorrow**

As neuroscience and neurotechnology continue to rapidly advance on the global stage, it is crucial to cultivate the emerging field known as neuroethics. This up-and-coming area of study encompasses ethical evaluations of neuroscientific research and addressing the complex issues that follow. James Giordano is a Professor in the Departments of Neurology and Biochemistry, as well as a prominent leader in this field who has developed the Neuroethics Studies Program of the Pellegrino Center for Clinical Bioethics at Georgetown University Medical Center. This paper seeks to reflect on his ongoing work and future aspirations in and for the field. It is Prof. Giordano's belief that with proper assessment, preparation, and interdisciplinary collaboration, neuroscientific developments may thrive through the ethical guidance of the leaders of tomorrow.

In order to understand what neuroethics entails, it is essential to first understand the ongoing neuroscience and technology developments taking place. Neuroscience has made great strides in understanding how the neurological systems are structured and work, and has shifted focus to study the brain on a more cellular level (DeFranco and Giordano, 2019). Novel techniques such as various types of neuroimaging, alongside investigations of neurological and cognitive function have been useful to identify targets for forms of intervention. For example, deep brain stimulation and gene editing have the potential to ameliorate the symptoms of a wide range of neurological disorders, as well as alter personality or human performance. Such research simultaneously pushes the boundaries of how we define, and perhaps affect, consciousness, cognition, and humanity at large.

This exciting research also poses significant neuroethico-legal and social issues that must be carefully considered. The first issues that must be examined relate to the introduction of previously untried technology that accesses and modifies the functions of the brain. Although

past research may give scientists an idea of the possible mechanism through which new techniques can be effective, there will always be potential risks and unknowns in these techniques' long-term use. Further, although these innovative developments certainly have relevance across cultures and contexts, the implications may differ based on specific social values and perspectives. This brings about concerns including the limits of treatment or enhancement and issues of distributing access to promising neurological techniques. Importantly, how each person defines "flourishing" or what is "good" varies greatly and impacts perspectives on if and how these neuroscientific tools or methods should be used.

Prof. Giordano proposes an effective Operational Neuroethical Risk Analyses and Management Paradigm (hereafter referred to as "ON-RAMP") for addressing these key neuroethico-legal and social issues. ON-RAMP entails a thorough evaluation of the neuroscience and technology to include a "what-why-who-when-where-which" set of essential questions to consider any technological abilities, benefits or burdens, technological abilities, timeline for implementation, and circumstances for administering neuroscientific approaches (Giordano, Toward an operational neuroethical risk analysis). Additionally, Prof. Giordano proposes framing contingencies, such as the 6 C's of capacities, consequences, character, contexts, continuity of clinical care and research, and consent to further characterize the use of neuroscientific development.

Although the ON-RAMP framework provides a viable approach to analyze and mitigate risk, it does not have significant bearing without being merged with some sort of underlying ethical system from which moral claims regarding the development of neuroscience can be asserted. Prof. Giordano believes that this prompts review of the role that ethics should play globally, and as it relates to medical decision making. As mentioned earlier, ethics can vary

substantially based on cultural contexts. Some might contend that a “Western” ethical approach is apt for a definitive system of ethical principles to judge neuroscience and neurotechnology.

However, only considering Western ethical approaches will fail to consider the growing impact that Asian countries are exerting in quickly developing new neurotechnology and perspectives regarding their use. Researchers in China, for example, are encouraged to push the boundaries of neuroscience and expedite the process of translating research into practice. Reflective of this, the first full body-to-head transplant was even set to occur at China’s Harbin Medical University in 2020 by invited Italian neurosurgeon Sergio Canavero and his Chinese colleague, Xiaoping Ren, although it had been prohibited in other countries (Giordano, Looking Ahead). Given the diversity of research taking place on a global level, a more inclusive view may be better suited to developing neuroethical principles (Giordano, A principled and cosmopolitan neuroethics). If we can appreciate other ethical systems at work and engage in appropriate and applied technical and philosophical discourse, it may be possible to create a multi-faceted system of neuroethics (Shook and Giordano, 2019). Learning from one another and growing as an international community of neuroscience and neurotechnology, rather than research entities separated by cultural ideals, values, and norms, would be valuable to fostering international cooperation as a priority.

Prof. Giordano also emphasizes that neuroethical principles cannot be stagnant. Rather, they must be flexible, in order to complement global events at any given juncture in time. Over the past few years, Prof. Giordano has emphatically called for “no new neuroscience without neuroethics,” as well as “no new neuroethics without neuroscience.” The former statement is relatively straightforward. Brain science research should only be conducted with thoughtful assessment of its related ethical implications. The latter statement, however, requires a bit more nuanced thinking. Given the exciting discoveries in neuroscience, it can be easy to exaggerate

the implications of developments within the field to the point that they become something of science fiction. Instead of dedicating time and resources to ideas which are not grounded in reality, Prof. Giordano implores the need to focus ethical deliberation on the research and its uses that are current or on the verge of occurring in the near future. Given this collaboration, neuroethics can be a useful resource that is harmonious with the science and culture that necessitate its development.

The level of involvement and engagement across cultures that is required to devise a cosmopolitan system of ethics certainly begs the question of why. Why develop guidelines that could only hinder an explosion of scientific discovery? One of the primary goals of neuroethics is to assess the potential for brain science to go wrong and to prevent such things from happening. Undoubtedly, some things are bound to go wrong. In these instances, Prof. Giordano highlights the importance of learning from these situations and correcting the problems that arise. In this way, he suggests that issues may be addressed in ways that render them preventable, or if not, then recuperable, recoverable, retractable, and forgivable. Recuperation could be financial or social, whereas recoverability speaks more to physically rebalancing what went wrong. What is retractable can be seen as the elimination of certain technology or practices being conducted in such ways in the future. Forgivability may be possible if substantial insight from an error is gained in ways that could not have been understood if something had not gone amiss. Yet, it is still up for debate if, and to what extent, forgiveness of any transgression of brain research and its uses might be permissible. By assessing potential risks, applied ethics provides preparatory guidance to reveal which neuroscientific paths should be pursued and which need further consideration.

Ultimately, Prof. Giordano believes that the best way to ensure the ethical conduct of neuroscience and neurotechnology in the future is to prepare now. This encompasses research being continually monitored and developed in order to better address both scientific issues and

the ethical implications they generate. A key step in putting ethics into practice is the development of relevant policy (DeFranco and Giordano, 2019). Policy should be determined alongside current research, rather than only in response to problems that arise. Such preparation could include gathering subject matter experts to track research trends and consider what neuroscience and neurotechnology is likely to be realized in the near future (DeFranco and Giordano, 2019). Once key trends are identified, an international community of scientists, philosophers, and policy makers alike can revisit ethical approaches to assessing such emerging research, and attempt to employ ethical principles to best meet the issues at hand.

But real preparation must include training future generations of scientists and ethicists so that they will be well-equipped to take on the challenges posed by neuroscience as a global entity. As a translational neuroscientist by training, Prof. Giordano is in full support of education within the fields of science, technology, engineering, and mathematics (STEM). Yet, he is also a strong advocate of supplementing that learning with a profound appreciation for the humanities. It is no longer enough to simply consider one specific focus of scientific or technological research, without any regard for how that research could be affected by perspectives from other domains. Prof. Giordano hopes to see a more multidimensional approach to education that emphasizes integrative science, technology, ethics, and policy studies (Giordano, *Keeping Science and Technology Education In-STEP*). Cultivating such interdisciplinarity from a young age would encourage collaboration across domains and cultures that is essential to navigating the successes and failures of the past, present, and future; a future that will certainly rely upon neuroethics.

## Works Cited

- DeFranco, J., & Giordano, J. (2019). Mapping the Past, Present, and Future of Brain Research to Navigate Directions, Dangers, and Discourses of Dual-Use. *EC Neurology*, *12*(1), 01-06.
- Giordano, J., & Olds, J. (2010). The interfluence of neuroscience, neuroethics, and legal and social issues: The need for (N) ELSI. *AJOB Neuroscience*, *1*(4), 12-14.
- Giordano, James. "Keeping science and technology education In-STEP with the realities of the world stage: Inculcating responsibility for the power of STEM." *Synesis: A Journal of Science, Technology, Ethics, and Policy* 3.1 (2012): G1-G5.
- Giordano, J. (2015). A preparatory neuroethical approach to assessing developments in neurotechnology. *AMA Journal of Ethics*, *17*(1), 56-61.
- Giordano, J. (2016). Commentary: The Value of Patient Benefit: Consideration of Framing Contingencies to Guide the Ethical Use of DBS—a Case Analysis. *Cambridge Quarterly of Healthcare Ethics*, *25*(4), 755-758.
- Giordano, J. (2017). Toward an operational neuroethical risk analysis and mitigation paradigm for emerging neuroscience and technology (neuroS/T). *Experimental neurology*, *287*, 492-495.
- Giordano, J. (2018). Looking Ahead: The Importance of Views, Values, and Voices in Neuroethics—Now. *Cambridge Quarterly of Healthcare Ethics*, *27*(4), 728-731.
- Shook, J. R., & Giordano, J. (2014). A principled and cosmopolitan neuroethics: considerations for international relevance.