Neurological Advances and Ethical/Legal Conundrums: Lessons from History

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Abstract. The scientific advances in the neurosciences are exciting and promise to advance our understanding of the human mind. The ethical and legal issues raised by neuroscience are distinctive but they are not unique to the twenty-first century. The ethical issues raised by these technologies deserve attention even while the science is in development. History teaches us to reflect on our humanity using insights from many disciplines and many times.

Keywords: Neuroethics, neurolaw, neuroprivacy, neuropolicy, research ethics, regulation of emerging technologies.

1 Introduction

The neurosciences are quickly outstripping our ability to fully assign human meaning to the very subject of our inquiry. What does it mean to say that we are mapping the mind? What does the map direct to our attention? How do we understand the meaning of what a mind is, or what it is capable of becoming? When we then image the mind, do we really understand fully how these images may be utilized for good or ill in society? How might we promote the good and dissuade the ill uses of our knowledge?

While the questions I pose are intriguing, they are not unique to the field of twenty first century cognitive neuroscience. A review of the issues we have confronted with prior neurotechnologies brings out important features that we may wish to consider and continue in conversation with one another. As an academic who works at the intersection of law-science-medicine, I am often asked why my law students see the world so differently from my medical students, and again differently from the science students in my ethics courses. While there are no simple answers, there are answers that are simply wrong. These wrong, and simple, answers often involve misattribution of divisions between "us" and "them". It is more complex, but more accurate to see the enterprise of science and society as one that necessarily involves all of us: inclusive, disparate, but interconnected and interdependent at the same time.

1.1 Historical Trends in Scientific Ethics and Law

It is often possible to see from a distance what seems confusing at close range. The distance of time allows history to offer such a perspective.

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The history of scientific research is filled with examples of scientific enthusiasm outstripping moral reflection. In 1966, Henry Beecher wrote a classic article detailing the ethical lapses in a survey of the experiments then underway at Harvard University's teaching hospital [1]. Beecher documented twenty-two cases of unethical research which went unnoticed prior to his report. Seven years later the world discovered that the United States government had sponsored a study of syphilis in black men in Macon County Alabama, and had actively denied these men medical care [2]. Public outrage followed, and included calls for ethical conduct of human subjects research as well as a civil rights lawsuit which was settled for ten million dollars. In quick succession the field of bioethics was born and raised questions of the propriety of research techniques, clinical uses of new technologies, and respect for human self-determination. The law followed with regulations governing research with human subjects [3], privacy regulations, and best practices guidelines.

Neuroethics and neurolaw, as topic areas of intellectual inquiry, focus on the relationship of established principles of bioethics and legal doctrine to emerging cognitive science. Much more than previous encounters between the research community and law, the fields of neuroscience, ethics, and law are in dynamic tension and shaping one another as we progress in our discoveries. Neuroscience is challenging many of our legal traditions by exposing fallacies in our legal thinking and provoking new questions of how best to incorporate understandings of the mind into legal doctrine [4]. Neuroethics is in turn challenging both law and neuroscience to rethink notions of justice, access, individual dignity, privacy, and authenticity. It is my goal to raise these issues, to show how they are interconnected, and to build on the lessons that history offers in finding ways forward into a future that respects our shared humanity as much as our shared knowledge.

2 Neuroscience and Neuro-Knowledge

Neuroscience began over 100 years ago with scientists who studied the most remarkable human organ – the brain. Franz Josef Gall, an anatomist and physiologist in Austria, observed in the nineteenth century that students who had prominent foreheads also had good memories. Gall set out his hypotheses that "it is possible to ascertain different dispositions and inclinations by the elevations and depressions upon the head" [5]. Gall was excommunicated from the Church and forbidden from lecturing in Austria in 1802 [6]. Although first condemned on moral and theological grounds, Gall's theories soon found practical applications in business, criminology, and educational contexts [7]. Judges gave weight to phrenology in decisions about the size of a brain and the capacity to make a will [8] and whether the fact that a man was "remarkably ugly" should be factored into decisions about whether he was guilty of murder [9]. The rise of phrenology occurred in a scientific world before randomized double-blind controlled trials and the inductive method. Its impact on society can be seen as arising out of that less scientific time, but the law is called upon to make use of the best science available. Today phrenology is called junk science, pseudoscience, and non-admissible [10]. During its heyday, however, it was used to exclude individuals from rights otherwise guaranteed under the law.

Functional magnetic resonance imaging (fMRI) is now in its second decade. fMRI localizes changes in blood oxygenation when an individual performs a mental task [11]. Far from the pseudoscience of phrenology, fMRI is utilized to identify prodromal Huntington's Disease, and has numerous uses in established scientific investigation. It is also being used to correlate brain structure to dozens of physical and mental conditions, behaviors, characteristics and predispositions. These include major depression, schizophrenia, bipolar disorder, ADHD, social and racial evaluation, social cooperation, altruism, sexual arousal, ethical decision making, pedophilia, intelligence, humanity, empathy (and its lack), trust, humor and even the difference between the way men's and women's brains process information [6]. Ordinary individuals who lack specialized training in neuroscience interpret brain images as "proof" of the existence or non-existence of these traits [cite]. Businesses have found clever ways to market fMRI to screen potential employees for desirable mental traits [12].

Brain mapping has the potential to prospectively identify biological functions amenable to treatment, new drugs to treat disease, and dozens of other uses [13]. Contemporary neuroscience offers new tools for understanding human thought and will be incorporated into society. As Michael Gazzinaga noted almost twenty years ago: "The modular organization of the human brain is now fairly well accepted. The functioning modules do have some physical instantiation" [14]. These important accomplishments point to an equally impressive future, but they only tell part of the story of neuroscience.

Even the best neuroscience techniques cannot ascertain an individual's moral beliefs or the content of their religious convictions or hopes for the future [15]. As Martha Farah put it: "Although brain waves do not lie, neither do they tell the truth; they are simply measures of brain activity" [16]. It is important to keep in mind as scientists, while the science is important, it is only a part of the puzzle that informs how neuroscience will be used in a complex and interdependent society.

3 Neuroethics: Intriguing But Not Necessarily New

The issues raised by fMRI, PET scans, and other neurosciences are foreshadowed by the history of phrenology, and to some extent by the broader history of research with human subjects. Whether we are talking about neurodeterminism, neuroexceptionalism, neurorealism, neurosurrealism, neuroage, neuroeconomics, neuromarketing or any of the other vast array of social topics impacted by neuroscience, it is important to keep in mind that neuroscience is a part of the larger world that we all live in. History cautions us to reflect upon the consequences of the meanings that we ascribe to scientific knowledge. Even if the new neurosciences are as powerful as some would hope they might be, they are limited. Some of the issues raised in ethics and legal scholarship include:

- If the mind is a biological construct, who is the real me? [17]
- Where is volition located in the brain, and if not identifiable, does this imply a more holistic notion of the brain/mind question? [18]
- Should we engage in cognitive enhancement through neurotechnology? [19]
- If so, how should we assure conditions of access to all who might benefit? [19]

- How should we assign responsibility in criminal law? How can we protect neuroprivacy? Does the law have the right to force an accused to undergo neurological examination? [20] Is this a violation of the Fifth Amendment? [21]
- These are not necessarily new issues, although they may be packaged in neurolanguage.

4 Neuropolicy, Neurorealism, Neurolaw: Garnering Attention as the Science is Developed

The fields of study affected by neurosciences has been estimated to produce over 1000 articles a month [18]. Neuroethics is a large and expanding sub-discipline within the field of bioethics, and is the subject of numerous journals devoted to the ethical issues that arise from these technologies [22].

Science is expanding our understanding of the brain, but it cannot fully answer the questions that are raised about the contents or sources of the mind. Many thoughtful commentators have attempted to offer a conceptualization of the mind. Stephen Pinker has written extensively, and exhaustively on the mind. He describes the project thus:

> The opening chapter presents the big picture: that the mind is a system of organs of computation designed by natural selection to solve the problems faced by our evolutionary ancestors in their foraging way of life. Each of the two big ideas - computation and evolution - then gets a chapter. I dissect the major faculties of the mind in chapters on perception, reasoning, emotion, and social relations (family, lovers, rivals, friends, acquaintances, allies, enemies). A final chapter discusses our higher callings: art, music, literature, humor, religion, and philosophy. There is no chapter on language; my previous book *The Language Instinct* covers the topic. [23]

Pinker observes the complexity of the mind at close range and finds a fascinating range of potential human endeavors enabled by the mind. However, the book ends with the observation that some things are simply not explainable in scientific, humanistic, or psychological terms. In response to the question of whether the mind is located in the brain or in the soul, I would answer "neither." A full explanation of the mind and how we should regard the mind in society entails much more than science or philosophy. As scientists, ethicists, and lawyers, we should all be concerned with how neuroscience is appropriated by society. None of us has the full answer, but perhaps we each understand a part of the whole.

5 Proposal for Connection: Engaging the Broader Conversation

If history teaches us anything, it is that scientists must become involved in the conversation about the ethical, social, and legal uses of the knowledge created. The law, judges, policy makers and the attorneys who represent clients are all concerned with the appropriate use of neuroscience in the courtroom. As scientists, the courtroom

may be the most common point of intersection with the law as an expert witness, but it is not the only contribution available. Ethical issues have an enduring quality, and there is always something to contribute from one's own experience. New technologies have always garnered attention, and neuroscience is similarly situated. Neuroscientists will be increasingly called upon to explain the significance of their work in terms of the ethical meaning they hold, as well as in scientific terms. There are several contributions that scientists can make following a review of the lessons from history.

Lessons from Tuskegee. The Tuskegee Syphillis Study is an important part of American history, and still resonates with the many groups in American society [24]. Researchers engaged with human subjects have an ethical and legal obligation to inform subjects of their right not to participate in research, and explain the risks and benefits of participation. The broader message from Tuskegee may well be the obligation of science to stop and reflect on the ethical implications of the way that knowledge is produced. Many studies today have an ethics core as an integral part of the design and methodology of the study. The trend towards integration of ethics and science, started in the aftermath of Tuskegee, should be a required connection of all neuroscience with larger social issues.

Lessons from Phrenology. New scientific advances are often met with great expectations. The optimism of a greater knowledge should be tempered with the wisdom of those who came before us. Neuroscience that becomes a part of the popular consciousness can become more influential than the science is actually capable of delivering. Businesses that value truthfulness and cooperation as virtues in their employees may want to find these qualities of character in a neurological image. We should make limited claims about our ability to make predictions about anything as difficult to define as the mind. Similarly, the law is premised on notions of the free will of individuals and responsibility for decisions. The courts have struggled with assigning criminal responsibility based on scientific information. Yet even if the best images could locate decision making in action, it does not follow that there is no free will. Neuroscience has the ability to inform the thinking of our best philosophers and jurists, but it does not supplant human experience and reflection.

Lessons from fMRI. Like phrenology, fMRI techniques raise important questions about the mind and personal identity. Researchers have demonstrated that individuals in the prodromal stage just prior to onset of Huntington's disease have reduced striatal volume and changes in the caudate putamen compared to earlier images of the same patient. Some clinicians argue that disclosure of these changes should be disclosed to patients, arguing that it will facilitate long-term planning. Others urge that disclosure should not occur until clinical manifestations of the disease are evident, arguing that the burdens of the disease are best postponed. We will not know how best to act on this knowledge until some consensus has been achieved, with the viewpoints of patients and scientists leading the way towards an understanding of "who" the patient is, and "when" they become a patient.

Lessons from Prior Ethical Deliberation. Ethicists have raised additional issues that will benefit from a broad conversation about the impact of neurotechnologies. Should we use neuroscience to enhance human capabilities? The answer to the question will depend upon our ability to deliver the science reliably and in a cost-effective manner. The current state of these mind-altering drugs is likely not sufficiently developed to cause a large societal upheaval. Many mind-altering substances are used by millions of people without undue societal disruption. However, drugs designed to alter memory or to change moral emotions such as trust could easily become problematic should they become truly effective and accessible.

An especially important and related topic for the brain-machine interface is the potential for the manipulation and abuse of others through what may be coined "mind wars". The United States government utilized secret experiments with LSD in the military [25] and provided evidence that the administration of intensely mind-altering drugs can be accomplished at will. In the only documented case in the legal literature, the United States government suffered no sanctions for this activity. Memory enhancement through machine interface could be enormously helpful in a time of combat, and could be required of troops, and perhaps without their consent if prior case law is extended to these new circumstances. Scientists and researchers should be aware of these possibilities for the misuse of neuroscience, and they should consider the agenda of those who would fund their work.

Like the atomic scientists and geneticists before them, neuroscientists and those working at the brain-machine interface will likely bear the burden of the possibility for great harm from the scientific knowledge produced. Such is the burden of success.

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