

Editorial

Social, Legal, and Ethical Implications of Cognitive Neuroscience: “Neuroethics” for Short

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For most of its history, cognitive neuroscience has been a branch of basic science. The principal goal of cognitive neuroscience has been to understand the neural bases of mental phenomena. Its occasional forays out of the ivory-tower research laboratory, into the “real world,” have generally been into education or its clinical cousin, rehabilitation. Such work rarely raises social, ethical, or legal concerns.

As our science has matured, its potential for broader application has grown. Better theories of mind–brain relations, coupled with increasingly powerful methods for measuring and manipulating brain function, have made possible a much wider range of applications. These applications will undoubtedly have both good and bad consequences for individuals and society. A growing number of neuroscientists and bioethicists, joined by social scientists, engineers, philosophers, and legal scholars, have begun to think about these consequences. The result is a new field, called by many of its participants *neuroethics*.

Some neuroethical issues are already familiar, having arisen in many different biomedical contexts in the past. For example, the protection of human subjects in research with transcranial magnetic stimulation or high-field magnetic resonance imaging does not involve any fundamentally different ethical issues from research in dermatology. The safety of research protocols, determination of informed consent, privacy of research data, and response to incidental findings are all problems that are faced in many areas of biomedical research, including neuroscience. Even so, the rapid development of cognitive neuroscience as a field often introduces new wrinkles on these familiar problems. The recent emergence of brain imaging centers in psychology, neuroscience, and cognitive science departments, located outside of medical institutions, for example, changes the mix of expertise, assumptions, and agendas that come into play when a supposedly normal research subject turns out to have a brain abnormality (e.g., Illes et al., 2006).

Other neuroethical issues are more specific to neuroscience, specifically cognitive neuroscience, which concerns the human mind most directly. Like the field of genetics, which has evoked decades of ethical analysis and debate, our field concerns the biological foundations of who we are, of our “essence.” The relation of

self to brain is, if anything, more direct than that of self to genome. Furthermore, neural interventions are more easily accomplished than genetic interventions.

Many of the new social and ethical issues in neuroscience result from one of two broad classes of development. The first is the ability to monitor brain function in living humans with a spatial and temporal resolution sufficient to capture psychologically meaningful fluctuations of activity. Coupled with new approaches to data analysis, brain imaging may soon be capable of delivering information about individuals’ abilities, personality traits, and attitudes that would have real-world value. Applications as diverse as personnel selection and criminal justice await these developments. Our responsibility as cognitive neuroscientists is to accurately assess the state of the art for these techniques, relative to both the technical issues involved in measuring brain function for such applications (reliability, generalizability, etc.) and the conceptual issues involved in interpreting these measures (e.g., the relation between the brain measures and socially relevant entities such as intelligence or prejudice). Such technical and conceptual analysis constitutes an important strand of neuroethical research (e.g., Phelps & Thomas, 2003).

The second scientific development is the ability to alter human brain function with a chemical or anatomical selectivity sufficient to induce specific psychological changes. At present, the most common way of accomplishing this is pharmacology, but transcranial brain stimulation techniques, including transcranial magnetic stimulation and direct current stimulation, are increasingly used for clinical and research purposes, including research with normal healthy humans. Deep brain stimulation and brain–machine interfaces are unlikely to be used for nonmedical purposes in the near future, but their ability to alter or augment many types of human capability is already established and continues to be studied. In 2007, we have ambitious college students turbocharging their attention with dopaminergic drugs and military-funded neuroscience research aimed at creating “enhanced war fighters.” What mental traits can be improved using the new toolbox of neuroscience, with what risks, tradeoffs, and changes in self-concept? How does the enhancement of individuals affect society, and what kinds of policy might we adopt to best manage these society-wide effects? Another strand of

neuroethical research addresses these types of questions (e.g., Farah et al., 2004).

Finally, neuroscience affects us all by changing the way we think about human nature. The neural underpinnings of responsible behavior, moral reasoning, consciousness, and spiritual experience have all been the subject of recent neuroscience research. This research seems to challenge the traditional worldview according to which people have immaterial minds or souls that control their behavior by the exercise of free will. Yet, another important strand of neuroethical research is concerned with the real and apparent implications of neuroscience for such metaphysically freighted concepts as morality, consciousness, and religion (e.g., Greene & Cohen, 2004).

As cognitive neuroscientists, we are not accustomed to thinking about the social and ethical implications of our work. Indeed, we are all too aware of our work's limitations and may be skeptical of its potential to play any role of consequence in the real world. But real-world applications are driven as much by market forces as by ivory-tower appraisals. In addition, scientific progress is notoriously hard to predict. For these reasons, it is time for cognitive neuroscientists to engage with neuroethics.

Beginning in 2007, the *Journal of Cognitive Neuroscience* will begin publishing articles on neuroethics. In so doing, it joins several other journals in disseminating scholarly work in this area. These include the *American Journal of Bioethics*, which has just established the quarterly *AJoB-Neuroscience*, the new journal *BioSocieties*, which describes itself as "an interdisciplinary journal for social studies of the life sciences, genomics and neuroscience," and the forthcoming *Neuroethics*. Each of these journals will come to occupy a different niche in the intellectual ecosystem of neuroethics, and each will be of interest to cognitive neuroscientists seeking a better understanding of the broader implications of their field. The decision to include neuroethics in the coverage of *JOCN* was based on the belief that cognitive neuroscientists have an important role to play in the development of neuroethics. Our

community is essential to keeping neuroethics rigorous and realistic about the current capabilities of our science, as well as attuned to its future prospects.

JOCN is especially interested in reports of empirical research and scientifically grounded analyses of the social, legal, and ethical implications of cognitive neuroscience. In keeping with our general editorial policy, work of a primarily clinical nature will not be considered. Just as *JOCN*'s patient-based research articles are limited to those that address basic science questions using clinical populations, our neuroethics coverage of clinical populations or methods will be limited to those that address nonmedical issues. For example, the use of neuroimaging for psychiatric diagnosis, despite its many important neuroethical dimensions, is not an appropriate topic for *JOCN*. The examples of neuroethics research given earlier are intended to provide some guidance. The Web site neuroethics.upenn.edu includes many examples of scholarly articles in neuroethics, both clinical and nonclinical. Authors are encouraged to contact me to discuss the suitability of their neuroethics manuscripts for *JOCN*.

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