Scientific and Philosophical Perspectives in Neuroethics

While neuroscience has provided insights in to the structure and function of nervous systems, hard questions remain about the nature of consciousness, mind, and self. Perhaps the most difficult questions involve the meaning of neuroscientific information, and how to pursue and utilize neuroscientific knowledge in ways that are consistent with some construal of social ``good.´´

Written for researchers and graduate students in neuroscience and bioethics, *Scientific and Philosophical Perspectives in Neuroethics* explores important developments in neuroscience and neurotechnology, and addresses the philosophical, ethical, and social issues and problems that such advancements generate. It examines three core questions. First, what is the scope and direction of neuroscientific inquiry? Second, how has progress to date affected scientific and philosophical ideas, and finally, what ethical issues and problems do this progress and knowledge incur, both now and in the future?

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Scientific and Philosophical Perspectives in Neuroethics

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To Edmund Pellegrino,
physician, scholar, teacher, mentor, friend, and inspiration
``. . . *recta ratio agibilium*´´

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Preface

NEIL LEVY

Neuroethics is a truly exciting endeavor. For a very long time, human beings have puzzled over questions concerning the fundamental nature of the world in which we live and of ourselves. Why be moral? Do we have free will? How should we behave towards one another? Can we know anything? These are the questions of the discipline that has come to be called philosophy. For most of human history, these questions were pursued using the full range of tools available, but sometime in the recent past – perhaps as late as the nineteenth century – the philosophical questions became separated from scientific questions. Each was seen to have its own distinctive methodology, its own tools and conceptual resources; philosophers thought it was a mistake to think that science could shed much light on their research.

Neuroethics, along with a number of related developments (experimental philosophy; philosophy of biology; cognitive science) is part of a backlash against this separation. Science is the crowning achievement of human epistemology; its distinctive methods help to compensate for our cognitive limitations and to build a cumulative and reliable body of knowledge to an extent unprecedented in human history. For philosophers to cut themselves off from this body of knowledge would be madness. But philosophers have skills, in conceptual analysis and logic, that prove invaluable in understanding the human significance of science. Moreover, philosophers have a tradition of their own to draw upon, the fruits of which are, in some ways, no less impressive than the fruits of science. Drawing together science and philosophy promises to contribute to our understanding of human life, of our philosophical questions, to a degree unmatched by either alone.

But neuroethics is also important for another reason. The ethical issues with which it is concerned are truly pressing. It is illuminating, in this regard, to compare neuroethics to the applied ethics discipline

that preceded it: bioethics. Bioethics grew out of concerns over the potential for abuse of the dizzying array of new technologies stemming from the life sciences over the past three or four decades. These technologies were concerned with central aspects of human existence: with nothing less than the power of bringing life into the world and of extending it or ending it. Thus, the relevant technologies (from IVF through to stem cells and the genomic revolution) were properly the focus of moral concern. Yet, significant though these technologies undoubtedly are, there is a case for saying that techniques and technologies stemming from the sciences of the mind raise yet more profound questions about what it means to be human, and pose greater challenges to moral thought.

What could be more significant than life? There is a traditional answer to this question: the soul. Now the soul, if there is any such thing, is the province of theologians. But the closest secular equivalent of the soul is surely the mind. It is our minds that make us the individuals we are, at least on one plausible conception of personal identity; indisputably it is our minds that make us matter, morally, and which make our relationships meaningful. But the sciences of the mind seem to promise, or threaten, nothing less than the power to take control of the human mind, altering it, enhancing it, and remaking it as we wish. Given that the mind is the closest secular equivalent to the soul, there is no surprise that many wonder if this is a power that we ought to have.

Consider some of the potential applications envisaged – some of them arguably already available, in a crude form – as stemming from the sciences of the mind. Already there are technologies that their advocates hold allow us to determine, with some degree of certitude, whether someone is lying or telling the truth. But this is only the first step toward the development of mind-reading technologies, some think. We have made huge steps in the direction of directly reading thoughts from the brain: judging how subjects have chosen to resolve an ambiguous figure, thinking of a particular person or building; we can even predict, with 60% accuracy, which of two buttons a subject will choose to push a full ten seconds before they press! Some fear that this is a technology with frightening implications, putting Orwellian paranoia in the shade. In the wrong hands, reliable thought-reading machines would be the ultimate invaders of our privacy. Moreover, with a technology this powerful, are any hands right? We should recall the adage: power corrupts; absolute power corrupts absolutely.

Some philosophers suspect that we have little to worry about, at least for the near future, and perhaps always; that genuine

mind-reading machines will be forever out of reach. But if mind-reading is frightening, how much more worrying is mind *control*? This, unfortunately, is not a technology likely to prove impossible: in some form it is already here.

We can use techniques from the sciences of the mind covertly to modulate thought in a variety of ways. We can use oxytocin, a neurotransmitter that is potentially deliverable in a gas, to increase the propensity of people to trust. Trust, we might think, is generally a good thing – but think of how this power might be used by demagogic politicians, or used car salespeople. We can structure the environment that subjects encounter in ways known to run down their resources of self-control: we might do this, too, to increase sales. We can administer a beta-blocker, Propranolol, to dim people´s memories. In the future, we might be able to intervene more dramatically, perhaps erasing precisely targeted memories or inserting new beliefs (though once again some philosophers think that this will prove impossible, given the holistic nature of belief).

These are obviously frightening possibilities. But perhaps we ought to worry less about what might be done, sometime in the future, and instead be concerned with what is happening right now. We need not wait to see technologies stemming from the sciences of the mind widely applied. It is happening right now, on a truly vast scale. In 2004, twelve million prescriptions for anti-depressants were dispensed through the Pharmaceutical Benefits Scheme in Australia alone (Bell 2005); this is a state of affairs that is replicated across the developed world (and increasingly common in the developing world too). More worrying for many people is the use of methylphenidate for the treatment of attention deficit hyperactivity disorder (ADHD), since this is a drug that is overwhelmingly dispensed to children and adolescents. Are we medicating away childhood, some ask?

Concerns about the widespread use of psychopharmaceuticals center on issues concerned with authenticity (Elliott 1998), the mechanization of mind (Freedman 1998), and the proper attitude we ought to have toward them (Sandel 2007), as well as on the potential for injustice they seem to carry when they enhance cognitive ability (e.g. Sahakian & Morein-Zamir 2007). All these questions are urgent and intrinsically fascinating; on their resolution rests the shape of the society we shall shape for ourselves.

So neuroethics has two branches: ethical reflection on new technologies and techniques produced by neuroscience (and other sciences of the mind), closely analogous to – sometimes overlapping

with – the kinds of issues that are the traditional territory of bioethics, and a second branch, which resembles more closely traditional philosophy of mind and moral psychology than it does bioethics. Roskies (2002) calls these two enterprises the ethics of neuroscience and the neuroscience of ethics. A central reason for the fascination of neuroethics is that these two branches are not separate; instead, the results we obtain from reflecting on the mind in ways that are informed by the sciences of the mind inform our understanding of the ethical issues we consider under the heading of the ethics of neuroscience. In the rest of this foreword, I consider how this comes about.

RATIONALITY

When we reflect upon moral problems, we hope thereby to come to rational solutions. We aim to assess whether, say, cognitive enhancement will really have the effects that some fear on the texture of our society, or whether it is really innocuous; if it is likely to have negative effects we need to discover what are the best ways to avoid or mitigate these effects and how effective social policy is best implemented to this end. All of this requires rational enquiry. One way in which the sciences of the mind could dramatically affect our ethical enquiries is by demonstrating that we cannot engage in this kind of rational thought, at all, or to anything like the extent to which we hitherto believed.

The sciences of the mind threaten our conception of ourselves as able to engage in rational reflection in many ways. First, they apparently show that far fewer of our actions are guided by reasons than we might have thought. The evidence here comes largely from work in social psychology, on the *automaticity* of actions. Automatic actions are effortless, ballistic (uninterruptible once initiated), and typically unconsciously initiated; that is, they are not made in response to conscious reasons of ours but are instead more like reflexes, triggered by features of the situation in which we find ourselves. In the influential terminology introduced by Stanovich (1999), automatic actions are system 1 processes, not slow, effortful, conscious, and deliberative system 2 processes. System 1 processes are evolutionarily more ancient; they are the kind of cognitive process we share with many other animals, whereas system 2 processes are the kind distinctive of us. If we are rational animals, and that is what distinguishes us, it is only inasmuch as we deploy system 2 processes that this is true. The threatening finding from social psychology is not that we often deploy system 1 processes; it is that these are *by far* the more common. The

overwhelming majority of human actions are guided by automatic mental processes (Bargh & Chartrand 1999). In the light of the sciences of the mind, our claim to be rational animals suddenly looks somewhat shaky.

Worse is to come. Even when we do deploy system 2 processes, the rationality of our thought is less than we might have hoped. The evidence for this claim comes largely from cognitive psychology, especially work in the heuristics and biases traditions. *Heuristics* are mental short cuts and rules of thumb that we deploy, usually without realizing we are doing so; *biases* are the ways in which we weight the significance of information in making judgments. There is a huge mass of evidence showing that when we assess arguments or make decisions, we deploy such heuristics and biases, often in ways that mislead us. I shall mention only a few of the ways in which we assess information badly.

Human beings are pervasively subject to the *confirmation bias*, a systematic tendency to search for evidence that supports a hypothesis we are entertaining, rather than evidence that refutes it, and to interpret ambiguous evidence so that it supports our hypothesis (Nickerson 1998). The confirmation bias (along with a substantial dose of wishful thinking) helps to explain many people´s belief in supernatural events. Suppose your hypothesis is that dreams foretell the future. The confirmation bias makes it likely that you will pay attention to confirming evidence (that time you dreamt that your aunt was unwell, only to learn that around that time she had a bad fall) and disregard disconfirming evidence (all the times when you dreamt about good or bad things happening to people you know when no such event occurred). The confirmation bias works in conjunction with the *availability heuristic*, our tendency to base assessments of the probability of an event on the ease with which instances can be brought to mind (Tversky & Kahneman 1973). Because confirming instances are more easily recalled, memory searches, carried out in good faith, lead us to conclude that our hypothesis is true.

You may think that the tendency to believe in the supernatural is harmless and trivial. This may or may not be right (think of the occasional cases of parents preferring to have their seriously ill children treated by new-age healers rather than qualified physicians), but there is no doubt that the kind of biases at issue here do real world harm. One instance is the recent rash of claims involving ``recovered memories´´ of sexual assault. There is no evidence that *any* such recovered memories were true, but we do know that many of them

were false. There is therefore no reason to regard such memories as reliable. Yet on the basis of this evidence, many people were imprisoned, and many more families ruptured irrevocably. Why was there this sudden rash of recovered memories? Part of the explanation lies in the techniques used by some therapists to elicit possible repressed memories. Since they believed that these memories were deeply repressed, they encouraged their patients to visualize events they could not recall, or to pretend that they happened. But these techniques are known to be effective in producing false memories, or in otherwise bringing people to mistake imaginings for reality (Loftus 1993). Why did they do this? Confirmation bias helps to explain their behavior: they noticed that patients sometimes appeared to improve when they used these techniques, and ignored alternative explanations of these improvements (was the mere fact that someone was listening to them helping their mental state? Might the passing of time by itself be playing a role?) and ignored cases in which the techniques failed to help (Tavris & Aronson 2007). Ignorance of our systematic biases and cognitive limitations – for instance, on the part of patients who take the vividness of a ``memory´´ as evidence of its veracity, of therapists who are unaware of the need to test hypotheses systematically, and courts who take sincere memory and eyewitness testimony as irrefutable evidence – can cause great harm.

The example of repressed memory has two morals for us. First, it helps to suggest how the issues dealt with by neuroethics are practically important. Applying the knowledge gained from the sciences of the mind, in court rooms and in clinical practices, would lead to less harm and more good. Second, however, we should appreciate how disturbing is the evidence of the limitations of our rationality, the fallibility of our memory, and the unreliability of our experience as a guide to reality. We think we are rational beings; we think that our memories are transcriptions of past events, we think that we have a good grasp of what the world immediately around us is like, but we may be wrong.

MORALITY

Threats to rationality are perfectly general; they threaten our ability to engage in rational deliberation across all domains. In addition to these general threats, there are threats more particularly to *moral* deliberation. In the eyes of some, the sciences of the mind demonstrate that we are not capable of deliberating about moral questions. The threats to moral

deliberation are of two kinds: those that threaten moral deliberation across the board, and those that focus on a particular account of moral judgment or a particular (purportedly) moral principle.

Much of this work purports to show that moral deliberation is too emotional to be truly rational, thereby placing pressure on particular moral theories. One of the most influential theories, the theory that (arguably at least) underlies the notion of human rights, is *deontology*, the theory, most closely associated with Immanuel Kant, that morality is essentially about rights and duties. One way to understand deontology and its associated rights and duties is as follows: these rights and duties place constraints on what we might do to improve general welfare. That is, we ought always to improve welfare, *except when* doing so would infringe a right; then we have a duty to refrain from acting to improve general welfare. Consider a well-known illustration, the famous trolley problem (Foot 1978). The problem is designed to demonstrate how rights constrain welfare maximization. In the problem, we are presented with two variants of a scenario in which we might act to maximize welfare, by saving the greater number of people:

(1) Imagine you find yourselves by the tracks when you see an oncoming trolley heading for a group of five people. The people cannot escape from their predicament and will certainly be killed if you do nothing. In front of you is a lever; if you pull it, you will divert the trolley to a side-track, where it will certainly hit and kill one person. Should you pull the lever?

Most philosophers have the intuition that we ought to pull the lever; moreover, most ordinary people, tested by the growing number of psychologists interested in morality, agree (Cushman *et al*. 2006). But now consider this variation on the problem:

(2) Imagine you find yourself on a bridge over the tracks when you see an oncoming trolley heading for a group of five people. The people cannot escape from their predicament and will certainly be killed if you do nothing. Next to you is a very large man. You realize that if you push the large man onto the tracks, his great bulk will stop the trolley (whereas your slight frame will not); he will certainly die, but the five people on the tracks will be safe. Should you push the large man?

Most philosophers have the intuition that you should *not* push the large man; once again, most ordinary people agree (in fact, the split is about the same in both cases, with around 90% of people in the same

camp (Hauser 2006)). At first glance, this is puzzling: the cases seem to be relevantly similar. In both, you are faced with the choice of acting to save five people at the cost of one. Why should it be right to save the five in case (1), but not (2)?

The standard answer is that people have rights, including a right to life, and that pushing the large man would infringe his rights. But redirecting the trolley is not infringing anyone´s rights (perhaps because we use the large man as a means to an end – were it not for his bulk, we could not stop the trolley – but since the presence of the man on the side-track is not necessary for stopping the trolley, we do not use him as a means). Recent research by neuroscientists has thrown doubt on this explanation.

Greene *et al*. (2001) scanned the brains of subjects considering the trolley problem and similarly structured dilemmas. They found that when subjects consider *impersonal* dilemmas – in which harms caused are not up close and personal – regions of the brain associated with working memory showed a significant degree of activation, while regions associated with emotion showed little activation. But when subjects considered *personal* moral dilemmas, regions associated with emotion showed a significant degree of activity, whereas regions associated with working memory showed a degree of activity *below* the resting baseline. The authors plausibly suggest that the thought of directly killing someone is much more personally engaging than is the thought of failing to help someone, or using indirect means to harm them. But the real significance of this result lies in the apparent threat it poses to some of our moral judgments. What it apparently shows is that only some of our judgments – those concerned with maximizing welfare – are the product of rational thought, whereas others are the product of our rational processes being swamped by raw emotion. This result has been taken as evidence for discounting deontological intuition, in favor of a thoroughgoing consequentialism (Singer 2005).

If Greene´s results seem to challenge one important class of moral judgments, revealing them to be irrational, other work seems to threaten the entire edifice of morality, conceived of as a rational enterprise. In a series of studies, Jonathan Haidt has apparently shown that ordinary people´s moral judgments are driven by their emotional responses, and that the theories they offer to justify their judgments are *post hoc* confabulations, designed to protect their judgments (Haidt 2001). We assume that we reason our way to our moral judgments, but in fact our reasons are just rationalizations, Haidt suggests. Together with Wheatley,

Haidt has shown that inducing emotional responses by using post-hypnotic suggestion influences people´s moral judgments (Wheatley & Haidt 2005). These results seem to suggest that the idea, beloved of philosophers, that morality is responsive to reasons is false. They also threaten the notion that moral argument can lead to moral progress.

Once again, the implications of this work for our self-conception are potentially dramatic. When we proudly proclaim that we are moral animals, we do not mean that our behavior is driven by affective responses, in the kinds of ways which characterize the reciprocal altruism and sense of fairness possessed by chimps, monkeys, and even much simpler animals (see Trivers 1985; de Waal 1996). Instead, we pride ourselves on a rational morality, which transcends our merely animal inheritance. This flattering image of ourselves may need heavy qualification. More immediately and practically, there may be policy implications of some of these findings. If, for instance, it can be shown that some (and only some) of our moral responses are irrational, because driven by raw emotion, then we have a powerful reason for rewriting policy to discount these responses.

These are just some of the topics covered by the incipient discipline of neuroethics. You will find many covered in these pages. Here you will find introductions to, as well thoughtful reflections on, much of the work in contemporary neuroscience that is challenging our conception of ourselves as a rational and moral animal, as well as important contributions to both branches of neuroethics: the ethics of neuroscience and the neuroscience of ethics. These will not be the last words on these topics, but they will serve as indispensable guides to this rapidly growing and fascinating field.

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Introduction

Neuroethics: coming of age and facing the future

J. J. GIORDANO

The field of neuroscience has ``evolved´´ as an inter-disciplinarity of neurobiology, anatomy, physiology, pharmacology, and psychology, to focus upon the structure and function of nervous systems (in both human and non-human organisms). Growing from older iterations of experimental and physiological psychology, neuroscience initially addressed mechanisms of neural function as related to sensory and motor systems, learning and memory, cognition, and ultimately consciousness. These basic approaches fostered subsequent studies that were specifically relevant to medicine (e.g. neurology, psychiatry, and pain care), and, more recently, social practices (such as consumer behavior, and spiritual and religious practices and experiences).

In the United States, the congressionally dedicated Decade of the Brain (1990–2000) provided political incentive to support neuroscientific research with renewed intensity. As a result, significant discoveries were achieved in a variety of areas including neurogenetics, neuro- and psychopharmacology, and neuroimaging. This progress was not limited to the United States; rather, the Decade of the Brain served to provide a funding base that catalyzed international cooperation. We feel that this was the beginning of a ``culture of neuroscience´´ that was created from, and continues to engage a world-wide ``think tank´´ atmosphere that facilitates academic, medical, and technological collaboration, rapid scientific developments, and widely distributed effects in research, health care, and public life.

In addition, neuroscience has become a venue for the employment of cutting edge biotechnology that is extending the capabilities and boundaries of both investigation and intervention. Still, what