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Does it make sense to speak of neuroethics?

Three problems with keying ethics to hot new science and technology

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The field of bioethics has been split into subspecialties over the past few decades. In some cases, it was divided in terms of social domains, such as clinical ethics, research ethics and public-health ethics. In other cases, it was separated in terms of methodological approaches, including principle-based bioethics, virtue ethics and narrative ethics. Yet more divisions were made in terms of medical specialties, such as paediatric ethics, surgical ethics and psychiatric ethics. A more recent trend is to identify subfields in terms of new lines of scientific or technological investigation, such as genethics, nanoethics and neuroethics.

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Given the rich history of bioethics, we would not suggest that there is only one correct way forward or that speaking of new subfields is completely wrong. Indeed, Adina Roskies recently made a strong case specifically for neuroethics: "although neuroethics may appear to consist of a collection of diverse and unrelated concerns, the various issues emerging from the confluence of neuroscience and ethics are so densely interconnected that it is defensible, and may even be profitable, to consider them as a unified whole" (Roskies, 2006). Because no one has the infinite energy necessary to consider all aspects of bioethics, limiting oneself to a quasi-discrete scientific arena can help to focus attention. Moreover, because studying ethics requires a firm grip on the science—and it will take ethicists time to catch up with the latest research in fields as complex as genetics, nanoscience and neuroscience—we can appreciate the case for speaking of bioethical subfields. Nevertheless, although we grant that speaking in such terms can be reasonable, we also want to call attention to some of the dangers associated with carving up bioethics into ever more specialized subfields that are keyed to hot areas of science and technology.

The first problem is that keying ethical inquiries to apparently new and distinct lines of scientific investigation increases the risk of 'reinventing the bioethical wheel' and therefore squandering scarce resources. Technological lines of investigation—such as those implied by the terms genethics, nanoethics and neuroethics—are not nearly as distinct as they might seem, but are, in fact, converging. Indeed, while celebrating the prospect of using technology to enhance human capacities, Mihail Roco and William Bainbridge use the new acronym NBIC to label the convergence of nanotechnology, biotechnology, information technology and cognitive science (Roco & Bainbridge, 2003).

Similar to technologies, scientific lines of investigation are also converging. One notable example is imaging genomics, in which researchers use insights from the once-distinct fields of genetics and neuroscience to

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study endophenotypes, which are the building blocks of complex phenotypes (Hariri & Weinberger, 2003). For example, researchers have studied correlations between genetic differences and patterns of neuronal activity in the amygdala in response to fearful stimuli, and differences among individuals in their proneness to anxiety (Hariri *et al*, 2002). These differences in brain activity can be picked up by using neuroimaging technologies such as functional magnetic resonance imaging. In this case, not only is a technology that grows out of one scientific field (neuroscience) used in another (genetics), but it is also a site of convergence between once-distinct lines of scientific inquiry. Given this convergence of both technological and scientific lines of investigation, it is reasonable to ask whether it makes sense for genethicists, nanoethicists and neuroethicists to pursue ethical questions in parallel.

However, even if the science and technology were not converging, the fundamental ethical questions—on enhancement, identity, safety, informed consent, access or privacy—do not change from one technological or scientific context to another. Of course, some questions might be more pronounced in particular contexts. The ethical questions about safety, for example,

might be more pressing in the context of nanotechnology than in genetics or neuroscience. Martha Farah and Paul Wolpe observed that brain scans are closer to consciousness than genome scans (Farah & Wolpe, 2004); such scans might therefore raise questions about identity in a vivid way. However, the basic ethical concerns about threats to identity are not different in the context of neuroscience or genetics, just as worries about control, mastery, nature and enhancement are not unique to genetics. That is why, for example, it was easy to transfer, relatively unchanged, the bioethical conversation about enhancement from genethics to neuroethics. Of course, specific formulations of ethical questions, such as how to deal with unexpected findings from neuroscience research, will not have arisen before, but the fundamental ethical issues about health-related information and informed consent arise again and again regardless of context.

Given this convergence, and the re-emergence of the same important questions in each new context, we would prefer a more integrated approach (Landeweerd *et al*, 2006) that spends less time mapping the now-familiar litany of ethical questions and more time grappling with those questions, whether they arise at the centre of some traditional arena of scientific or technological investigation, or at the convergence of various lines of investigation. At a minimum, we believe it is important to bear in mind the obvious problem of reinventing the bioethical wheel (Wilfond & Ravitsky, 2005; Schick, 2005).

The second problem is that keying ethics research to hot areas of scientific research puts bioethicists—and others—at increased risk of exaggerating how much scientific research can tell us about who we are (Martensen, 2004). Of course, bioethicists in general have criticized hyperbole—as have some who identify themselves as neuroethicists (Illes & Racine, 2005). But we would do well to remember how many smart and well-intentioned genethicists were caught up in hyperbolic claims about what genetics could tell us about ourselves.

To appreciate this argument fully, it is important to remember the history and achievements of genetics research. Classical genetics, based on family, twin and adoption studies, demonstrated that genetic variation helps to explain variations in most complex human phenotypes. A few decades ago, this finding came as important news to people who believed in what Eric Turkheimer has referred to as the one environment, one disorder (OEOD) model (Turkheimer, 2005). According to this model, a single environmental factor, such as toilet training, could cause a disordered personality. Molecular genetics showed that some rare disorders, such as Huntington disease, are caused by mutations in single genes. In those rare cases, it is legitimate to use what Robert Plomin and colleagues called the one gene, one disease (OGOD) model (Plomin *et al*, 1994).

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Unfortunately, these insights from classical and molecular genetics spurred fantasies about applying the OGOD model to common diseases and complex behaviours. They gave rise to the hope of sweeping explanations that would offer neat single-gene linear accounts of the emergence of these diseases and human behaviour.

However, to paraphrase Kenneth Schaffner (2006), recent results from genetics research show that we must give up the hope of sweeping explanations. We need to settle for patchy, fragmentary or partial explanations. These will still represent progress—albeit incremental. They will involve individual genes, but probably also interactions among genes and with many other variables at the level of RNA, proteins, receptors, cells, tissues, childhood treatment by family and peers, social class and economic status, to name a few.

The fantasy of one all-encompassing explanation for complex human traits affected not only exuberant scientists and the media, but also some bioethicists. In 1995, for example, George Annas and colleagues drafted a Genetic Privacy Act based on the idea that genetic information is exceptional. They argued that genetic information is "uniquely powerful and uniquely personal, and thus merits unique privacy protection" (Annas *et al*, 1995). To capture the putatively unique power of genome scans, the authors used the metaphor of 'future diaries' to propose that our genomes are the record of the lives we will live.

As Tom Murray has suggested, however, this metaphor manifests several fears: that our future diaries—our genomes—were not written by us but by an agency completely outside our control; that our future diaries not only can be read, but can be read by others without our permission or even our knowledge; and that these others can use our genetic secrets to harm us (Murray, 1997).

As has been amply demonstrated by geneticists, however, the metaphor of genomes as future diaries was based on an exaggeration of how much we could learn about our futures from our genome sequences alone. Sweeping genetic explanations for complex human traits have not emerged and are not likely to emerge. Comparing single genes in isolation from their cellular, tissue and social environments does not produce the sort of robust results that geneticists were hoping for when they persuaded the US Congress to fund the Human Genome Project (Hamer, 2002; Silverman, 2004). The OGOD model is dead.

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None of this means that genetic differences are unimportant or that genetic explanations are not valuable. Instead, it implies that our genomes by themselves do not tell us as much about complex behaviours—much less about who we are—as some smart scientists and bioethicists expected 10 years ago. If this could happen in genetics, it could happen in neuroscience.

We understand that some neuroethicists are not only aware of the problem of exaggeration, but also actively trying to reduce it. It might indeed be possible for neuroethicists to work closely with neuroscientists without succumbing to the hyperbole that genethicists once succumbed to at the elbows of geneticists. As we work to resist that temptation, we need to be vigilant about using the complexity-reducing shorthand that scientists, journalists, bioethicists and others often

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use. Whenever we hear anyone talk of 'the part of the brain for' complex behaviour X, we should remember that, once upon a time, geneticists spoke of 'the genes for' complex behaviour X. Whenever we hear that neuroscience threatens our self-conceptions or identities in a uniquely powerful way, we should remember that we once said the same about genetics. Moreover, whenever we hear anyone say that neuroimages are 'thought maps', we should remember that once upon a time, geneticists and genethicists spoke of our genomes as future diaries.

The third problem with creating putatively new bioethical subfields is that it puts ethicists at increased risk of inflating expectations of, or otherwise mistaking, what they can deliver in the form of 'new moral frameworks', 'guidelines' and 'expert answers' to vexing ethical questions. The issue of what is realistic to expect from bioethicists is surely not new. Since the inception of the field, bioethicists have moved back and forth between at least two aims, which are not mutually exclusive but stand in a fertile tension with each other.

On the one hand, many bioethicists have long pursued what we might call the Socratic aim of exploring such philosophical questions as: What is a person? What do we owe to each other as members of human communities? What is human improvement? On the other hand, many bioethicists—often the same ones who are chasing the first aim—have pursued what we, invoking the American pragmatist John Dewey, might call the Deweyan aim of using philosophical skills to improve the world, to answer such questions as: How should geneticists conduct the informed consent process with people enrolling in their protocols? What should be done with incidental findings from neuroimaging research? How much risk should we tolerate with the diffusion of nanotechnologies?

It is not surprising, however, that owing to naivety, exuberance, a desire to secure funding or a combination of all three, bioethicists sometimes mistake or exaggerate what we can accomplish. We would like to offer two examples where one of the authors—Erik Parens—engaged in unintended exaggeration.

For his first major project in bioethics, Parens and colleagues promised the funding body that they would offer advice on how policy-makers should regulate so-called enhancement technologies. One of their hopes was that once they were able to distinguish between treatment and enhancement, they could create a new moral framework, guidelines and expert answers to the ethical questions surrounding enhancement technologies. The second major project promised advice about how policy-makers should regulate prenatal genetic testing. If Parens and colleagues could clarify the distinction between disabling and non-disabling traits, then they could create a new moral framework, guidelines, expert answers and so forth.

Those distinctions turned out to be far more complicated and contested than Parens—who was then a newcomer to bioethics—imagined. The interpretations that people chose or their refusal to make such distinctions reflected differences in worldviews that could not be settled by bioethicists. In the end, the policy advice that the enhancement project's working group offered was essentially that more public conversation is needed about what constitutes genuine enhancement, which we have come to understand is the same as calling for more public conversation about the nature of human flourishing. The policy advice offered in the prenatal genetic testing project was essentially that we should promote and then respect the truly informed decisions of individuals—we did not come up with the new moral frameworks, guidelines or expert answers that we and our funding agency had hoped for. This anecdotal evidence might of course show no more than the inadequacies of one researcher. However, it is worth considering the possibility that this researcher's promises depended on common but unrealistic expectations of what bioethics research can achieve.

This is not to say that bioethics analysis is unimportant or that guidelines or answers to questions should never be proposed—just that we should be as realistic and accurate as possible about what we say we can accomplish. The aforementioned projects produced conceptual analyses that have been useful to those who want to think about enhancement and about the critique of prenatal genetic testing by the disability community (Parens, 1998; Parens & Asch, 2000). The members of the enhancement project engaged in a small public conversation about what is at stake ethically in the use of enhancement technologies. Moreover, the members of the second project aired the important but then under-studied disability rights critique of prenatal genetic testing. Thinking together is deeply valuable. After all, public policy is ultimately affected by how people think—albeit not always as quickly as bioethicists and their funding agencies might wish.

We need to distinguish between the questions that we can answer for policy-makers and those that we cannot resolve

Perhaps in the particular context of new science and technologies, it is not surprising that funding bodies sometimes have exaggerated or inaccurate expectations of what bioethics research can produce, or that we bioethicists exaggerate or make mistakes about what we can deliver. Given the hyperbolic terms in which bioethical questions are often framed by one-line newspaper headlines, many seem to cry out for immediate and revolutionary solutions. Without a doubt, the problem of exaggerated or inaccurate expectations also plagues scientific researchers and their funding agencies (Gernsbacher, 2006). One danger of exaggerating about bioethics—as for other fields—is that ultimately we might inspire cynicism in the public.

The first step toward dealing with this problem is to be aware of it. We need to distinguish between the questions that we can answer for policy-makers and those that we cannot resolve. Additionally, we need to improve the argument that promoting public conversation *per se* is worth supporting with public and private funding. Muddling through, and trying to reach compromises and equilibrium in the face of competing values, is what the democratic process is for. Bioethicists can have a hugely important role in facilitating informed and nuanced public conversation—and thereby democracy. Appreciating the problems that accompany the creation of new subfields within bioethics is an important step toward this goal.

It is not unreasonable to speak of distinct subfields such as genethics, nanoethics or neuroethics. However, if and when we speak in such terms, we should bear in mind the potential problems, including those we describe here—namely, the problem of reinventing the bioethical wheel, the problem of exaggerating what the science can teach us about who we are, and the problem of exaggerating what bioethics research can deliver.

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