

Ethics and social policy in research on the neuroscience of human sexuality

Paul R Wolpe

The potential benefits of neuroscientific research into sexuality are great, but neuroscientists must participate in debates over the social, forensic and therapeutic implications of their findings. If serious research in sexuality is to be supported by the public, researchers must continue to earn society's trust with responsible and thoughtful presentation of their work.

The history of sexuality research over the last century or so is not admirable; neither, for that matter, are large swaths of the history of neuroscience. When the two have come together, the results have been particularly troubling. For a century after the development of sexology in the late 1800s, for example, medicine almost uniformly defined culturally unacceptable sexual behaviors as pathological, and often as brain disorders. Suggested remedies for activities such as masturbation, homosexuality or fetishism included castration or hysterectomy, hormonal therapies, electroshock and other forms of 'heterosexual rehabilitation.' The Nazis experimented with psychosurgery for homosexuality, whereas post-World War II approaches included the more 'humane' aversion therapy. Antonio Egas Moniz won the Nobel Prize for his development of the prefrontal lobotomy, which Walter Freeman in the US tirelessly promoted until it became a medical technique recommended not only for schizophrenia, but also for 'hereditary defectives' and 'moral degenerates.' (Between 1936 and 1956, doctors performed more than 60,000 psychosurgical procedures in the US¹.) Of course, history is also filled with laudable science, groundbreaking discoveries and thoughtful therapeutic applications. But given the abuses, it is not just squeamishness that makes people wary when scientists claim to be uncovering empirical truths about our sexual nature.

Paul Root Wolpe is in the Department of Psychiatry and Center for Bioethics, University of Pennsylvania, Philadelphia, Pennsylvania 19104, USA.
e-mail: wolpep@mail.med.upenn.edu

Published online 27 September 2004;
doi:10.1038/nrn1324

Recent advances in neuroscience and neurotechnology portend a period of renewed interest in the brain. Brain imaging, psychopharmacology, implantable brain chips, computer-brain interfaces and other emergent technologies have caught the attention of the media and the public at large. Newly minted fields such as neuroethics²⁻⁴, which examines ethical developments in neuroscience and neurotechnology, and social neuroscience^{5,6}, which tries to apply insights from the brain sciences to social interactions, are highlighting the challenges of translating the rapid developments of neuroscience into useful therapies and thoughtful public policy. With increased interest, however, comes increased scrutiny. Particularly in sensitive areas such as sexuality research, neuroscientists must concern themselves with the political, religious and cultural context of their work, both because it leads to better, more thoughtful science and because it helps scientists become more effective advocates of their own research.

Scientific inquiry into sexuality is among the most ethically charged of all behavioral research. All three Western Abrahamic religious traditions have developed systems of ethics based largely on the nature and types of proper sexual relationships. Current challenges to the legacy of those traditions, such as gay marriage or the debate over sex education curricula, are signifiers of deeper conflicts over basic values in society. Sociologists, philosophers and historians of science have made it clear that the questions science poses, the theories it formulates and the problems it sees fit to explore are products of a particular historical moment, which science both reflects and influences. In that context, current neuroscientific

claims about our sexual nature reflect a larger cultural tension, especially when they are used to support or refute the role of genetics and biology versus environment and learning in explaining sexual behavior.

Good science demands that the underlying assumptions of an inquiry always be questioned. Neuroscientific research into sexuality has made great strides in its attempt to remove its more pernicious religious and ideological underpinnings, and the best neuroscience tries to understand and categorize sexual behavior without moral judgment about it. Still, our understanding of sexual behavior is based on definitions that are historically and culturally situated—one is hard-pressed to formulate sexual categorizations that are not. Take, for example, scientific studies of sexual orientation. Researchers have often approached the pursuit by contrasting 'homosexuality' and 'heterosexuality' and then trying to find their morphological or functional correlates. The current concept of homosexuality itself, however, is an invention of the late nineteenth century, and its counterpart, heterosexuality, has fundamentally changed its meaning over the last 100 years. (The 1901 Dorland Medical Dictionary defines heterosexuality as "Abnormal or perverted appetite towards the opposite sex."⁷) The elevation of the homosexuality/heterosexuality distinction as a—if not the—defining classification of human sexual behavior is very recent historically and is, even today, more characteristic of Western Judeo-Christian societies than of others.

In fact, there is no *a priori* reason to believe that our parochial categories of homosexual versus heterosexual are biological categories for which we should find explanatory physio-

logical correlates. Yet, much time and money has been spent researching that cultural construct as if it defines some deeply embedded neurological or biological truth. True, men have always had sex with both men and women, and women with both as well, although in most Western cultures this has been seen as less problematic (another bias reflected in the current scientific literature). The designation of one's choice of sexual partners as a defining characteristic of individual identity, however, is a very recent Western social construct. 'Sodomy' and 'buggery' were terms for something one did, not who one was. In that sense, the very act of researching the area of 'sexual orientation', even by gay researchers, is an acceptance of a set of historical and cultural claims about the nature of our sexuality.

In many parts of the world, sexual behavior is not conceptualized in a way that neatly fits the terms homosexuality and heterosexuality. For example, in Latin America, as well as in some Arab and some Asian societies, human sexual behavior is categorized as 'masculine' and 'feminine'. Feminine behavior is defined as being penetrated, whereas masculine behavior is defined as actively penetrating another, no matter the gender of the one being penetrated. In Nicaragua, for example, a man who penetrates another man is considered a *hombre-hombre* (a 'manly man') for being able to so subjugate another male, and only the man who is penetrated is subject to social sanctions analogous to the historical treatment of homosexuality in many other societies⁸. Imagine, for a moment, that this cultural model is closer to some innate physiological truth, and it is this masculine/feminine, penetrated/penetrating dichotomy that is hard-wired into our genes. The bulk of Western scientific inquiry into homosexuality, then, would be flawed, suffering from a definitional bias based on unexamined cultural assumptions about sexual behavior.

Similarly, we must carefully consider claims made about the transferability of animal studies to human behavior. The study of animal sexual behavior is important and illuminating in its own right, and scientists have made impressive strides in unraveling genetic, physiological and environmental underpinnings of that behavior. We must be careful, though, not to use animal models to reduce the complexity and historical contingency of human sexuality to simple hormonal or genetic causes. Research has confirmed that gonadal hormones, particularly androgens, influence brain development and are determinative of aspects of sex-typical behavior in rats and other nonhuman

mammals. However, human sexual behavior is far more nuanced, may involve areas of the brain not involved in animal sexuality and is mediated by a host of psychological, social, cultural and religious factors. Rodent copulation patterns are not directly analogous with patterns of human sexual behavior. That is not to say that animal models do not illuminate aspects of human behavior (they do), or that there are not hormonal and genetic influences on human sexuality (there are)⁹. But the degree to which biology is determinative, or influences early sexual development more than later development, or is a mediator of behavior, is not at all clear¹⁰. Simple analogies are unsupportable scientifically, and they unnecessarily provoke reaction from social scientists who study the history of sexuality, as well as the public who resents the apparent attempt to reduce their lived experience to an unqualified biological determinism.

Unexamined assumptions about sexuality research thus have potential political and scientific consequences. Without a critical neuroscience, Western Judeo-Christian standards of monogamous heterosexual pairings can too easily be accepted as the normal state of human functioning, with deviations from that model presented as puzzling subjects of scientific inquiry, or even as pathology. The media and policymakers capitalize on this conceptual confusion, interpreting the discovery of neurobiological correlates to behaviors as confirmation of their status as abnormal or diseased¹¹. Uncritical acceptance of social definitions of sexuality in neuroscientific research can thereby make researchers complicit with the very sexual politicking that they often hope science can help adjudicate.

Increased funding from the Department of Defense, Homeland Security and other federal agencies are supporting brain imaging research for forensic, security and civil uses. Law enforcement officers, prosecutors, defense attorneys and others may soon be arguing in court about the admissibility, and the reliability, of brain scans or other neurotechnologies in determining the sexual desires and proclivities of those accused of sexual offenses. Yet the science is still preliminary, and the potential for premature application outside the laboratory is real. Perhaps more disturbing, research is now examining how imaging can help diagnose learning disabilities, or perhaps even determine aptitudes in healthy schoolchildren^{12,13}. How long will it be before parents begin to look for signs of precursory homosexuality or other undesired sexual traits in their children's scans? As

scans reveal more and more information about the nature of the brain, how will we cope with the increasing threats to privacy and civil liberty^{1,2}?

Neurotechnological advances are providing powerful new ways to both identify and potentially modulate sexual behaviors. Despite the advances of contemporary neuroscience, our knowledge of the working of the brain is still elementary, and the specter of lobotomies and electroshock for 'moral degenerates' should still haunt us. One author has suggested that unilateral irradiation of an area near the anterior cingulate sulcus might partially destroy the patient's volition based on intuition, while retaining their will based on language, and thus possibly diminish an individual's desire to commit felonious sex crimes¹⁴. The article asks whether some patients who reject chemical castration might accept such unilateral irradiation. While the article is meant to be speculative, such partitioning of neuroscientific speculation and public policy recommendations should not be made lightly, and any premature applications of such theoretical constructs, neurotechnology or neurotherapeutic intervention must be vigorously resisted.

The recent promotion of social neuroscience should also give us pause. Despite thoughtful caveats and cautions from its most prominent practitioners^{6,15}, history has shown us again and again that society tends to use science to reinforce the moral assumptions and biases of the cultural moment. There is clearly a role for a thoughtful social neuroscience, where findings become part of considered policymaking around controversial issues. For example, research into addiction has provided new perspectives and tools for policymakers willing to use them. But if scientists are not clear about the scope and nature of their work, eager policymakers can seize preliminary and speculative findings and implement programs unsupported by the science itself.

Neuroscientific research into sexuality is important, and the public must be made to understand that responsible science can help heal sexual dysfunction, understand behaviors that are socially destructive and illuminate truths about the nature of sexuality itself. The potential benefits of our advances in understanding the brain are great. It is therefore crucial that neuroscientists become involved in debates over the social, forensic and therapeutic implications of neuroscientific findings. The time is long past that scientists could ethically disavow the social impact of their work. Society has shown reluctance to openly debate issues of sexual science, yet seizes upon its findings to support preexist-

ing prejudices. The public has a right to control the purse strings of federal research dollars and to direct them to the areas of scientific inquiry it values; yet the neuroscience community is also part of the public voice, and has a right to advocate for the kind of research it values. If serious research in sexuality is to be supported by the public, however, researchers have to continue to earn the public's trust with responsible and thoughtful presentation of their work. Powerful new technologies provide great promise for understanding the mysteries of the brain, and great danger in their misappli-

cation. The neuroscience community, as the keepers and translators of those technologies, has a responsibility to be a leading voice as society negotiates through the promising and perilous decades ahead.

1. Feldman, R.P. & Goodrich, J.T. *Neurosurgery* **48**, 647–657 (2001).
2. Wolpe, P.R. *Brain Cogn.* **50**, 387–395 (2002).
3. Farah, M.J. & Wolpe, P.R. *Hastings Cent. Rep.* **34**, 35–45 (2004).
4. Farah, M.J. *et al.* *Nat. Rev. Neurosci.* **5**, 421–425 (2004).
5. Cacioppo J.T. *et al.* Introduction to the special section on social neuroscience: promise and caveats. in *Social Neuroscience Series* (MIT Press, Cambridge, Massachusetts, 2002).
6. Harmon-Jones, E. & Devine, P.G. *J. Pers. Soc. Psychol.* **85**, 589–593 (2003).
7. Katz, J.N. *The Invention of Heterosexuality* (Dutton, New York, 1995).
8. Lancaster, R.N. *Ethnology* **27**, 111–125 (1988).
9. Hines, M. *Ann. NY Acad. Sci.* **1007**, 272–282 (2003).
10. Byne, W. & Lasco, M. The origins of sexual orientation: possible biological contributions. in *Same Sex: Debating the Ethics, Science, and Culture of Homosexuality* (ed. Corvino, J.) 107–120 (Rowman & Littlefield, Lanham, Maryland, 1999).
11. Bing, J. *Women Lang.* **22**, 4–12 (1999).
12. Tracy, J. *et al.* *Cereb. Cortex* **13**, 904–910 (2003).
13. Richards, T.L. *Learn. Disabil. Q.* **24**, 189–203 (2001).
14. Brown, D.W. *Med. Hypotheses* **45**, 383–385 (1995).
15. Raichle, M. *Political Psychol.* **24**, 759–764 (2003).