

Learning to Reflect or Deflect?:

U.S. Policies and Graduate Programs' Ethics Training for Life Scientists¹

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During a family vacation to Washington D.C. in the summer of 2003, I visited a new Smithsonian exhibit entitled “Genome: The Secret of How Life Works.” To enter the exhibit, prominently sponsored by the drug company Pfizer, the museum-goer is directed into a narrow passageway that tells “the story of you.” At the first turn, a large sized picture of a blastocyst is labeled, “this WAS you.” On the wall of the next turn, a mirror greets the patron along with the statement, “this IS you.” Finally, the narrow, winding passage ends with a picture of a double helix that claims, “this is the SECRET of you.” As the museum patron enters the exhibit proper, she walks by a 25-foot long strand of DNA. Meanwhile, a nearby video screen shows a vaguely familiar looking white man who effusively exclaims: “Hello! My name is Eric Lander. What you see before you is the DNA double helix. It's the secret of you, the secret of me, and actually the secret of all life on this planet. The DNA double helix is made up of genes which are sort of a recipe for who you are. The only problem is, that recipe is written in a secret code. It took a very long time to figure out how to read that code - but now we have it!!” (The exhibit is also published online: <http://genome.pfizer.com/menulong.cfm>, last accessed 15 November 2004). The remainder of the exhibit takes a similar tone, cheerfully describing the wonders of the human genome and its probable future applications to human health.

One could spend an entire chapter deconstructing this exhibit, tracing the ways in which genetic determinism and commercial interests in genetics are subtly intertwined. But for my purposes, the exhibit raises a related question: what was left out. The ethical implications of human genome research were barely mentioned. At the last station of the thirty-two in the exhibit, called “Reality Check Theater,” Eric Lander remarks: “[M]ost

scientists agree that trying to make a human baby by cloning is a bad idea. The chance of birth defects is just much too high to take the risk and there are serious ethical issue [sic] to think about.” He concludes: “The promise is enormous but not everything about genetics is clear cut so it’s important to separate fantasy from reality, entertainment from real issues.” This token attention to ethical concerns in genomic research nearly denies that they exist (except as “fantasy”) and raises the question of how and where biological scientists learn to think about issues such as how their work is communicated to world and whether it has commercial value.

Since October, 2000, the main federal funding agency in the U.S. for life scientists, the National Institutes of Health (NIH), has required grantees to complete certified training in research ethics, primarily in the treatment of human subjects. In so doing, the NIH asserted that scientists and scientists-in-training, not just clinicians, need to consider the social implications of their work. The logic of the NIH’s decision was based on an expectation of rational action on the part of graduate programs. This model of policymaking assumes that if funding is affected, scientists will have incentives to reflect seriously about the social and ethical context of their work. This chapter focuses on the degree to which U.S. doctoral programs in molecular biology have complied with the NIH’s new requirements.² Is there evidence that these educational policies are enacted and taken seriously by these programs, as the NIH’s incentive system suggests that they should be? Or do university scientists deflect the impact of such requirements by appearing to follow the federal guidelines while in fact resisting any real change?

To examine these questions, I use archival and interview data. I collected information on a random sample of 50 Molecular Biology and Biochemistry PhD

programs in 2001 and 2003, and conducted pilot interviews with life scientists about the implementation of the NIH guidelines. I explore when the ethical and social aspects of science might be discussed informally rather than being a part of the formal, visible curriculum, and why some scientists express an adverse reaction against government funding agencies legislating a top-down approach to research ethics. The results of this study have implications for understanding political and organizational institutions of science, and reasons why non-compliance with science policies might arise.

We might expect that PhD students would at least receive some training in research ethics in response to the NIH policy of 2000. Because so many predoctoral students are funded through NIH resources, graduate courses in research ethics should also be in evidence. In 1997, 44.9% of all biomedical graduate students received federal funding, and about 75% of those received funds from the NIH (NRC 2000: 24). Indeed, NIH discussion of the policy reminds investigators that graduate students funded by training grants are “required to comply with a program on the responsible conduct in research which includes protection of human subjects as a topic” (NIH 2002). Because most of the PhD programs either have training grants or plan to apply for them, in effect the NIH policy for investigators serves as another incentive to educate graduate students in research ethics. Accordingly, NIH mandates such as this one for ethics training certification should have an effect on graduate programs.

The monetary-based incentives from NIH signal that politicians and policymakers felt that scientists needed to change their behavior around ethical issues in biomedical science, yet were unlikely to do so voluntarily. As David Guston (2000) argues, the establishment of the Office of Research Integrity and other moves by Congress to

regulate science shows that the social contract—the trust in science to monitor itself—had broken down by the 1980s. If the trust in science is broken, the political solution seems to be to try to return it through top-down guidelines. Indeed, the history of the NIH policy is one of top-down direction from President to Cabinet Secretary to policymakers. According to 25 May 2000 testimony to the US Senate by William Raub, Deputy Assistant Secretary of Science Policy, the motivation for the education requirement came in part from President Clinton’s request that the Department of Health and Human Services assuage public concerns about the safety of clinical trials. In direct response to an initiative from then Secretary of Health and Human Services Donna Shalala, the NIH developed the policy that Principal Investigators had to be certified as passing an educational course in the treatment of human subjects (NIH 2000). The NIH requirement indicates that enforcement is needed to get researchers to pay attention to the ethical implications of science. Does change in the appearance of behavior, however, mean that scientists are receiving the sort of training that was intended?

Combining Schools of Thought to Understand How Schools Teach Thinking

Two schools of thought—the new institutionalism in organizational analysis and science and technology studies (STS)—provide insights into why graduate programs seem to resist complying with the mandate to educate life scientists in the ethical implications of their research. While each of these is a powerful perspective in its own right, the combination is particularly useful because the new institutionalism provides analysis at a more macro field level, while STS tends toward smaller-scale analysis.

Consider the complementary perspectives of neo-institutionalism and STS on national policymaking. Both offer culturally sensitive theoretical explanations that take a nuanced perspective on the effects of policy rather than assuming monetary incentives straightforwardly guide behavior. New institutionalists show how policies are interpreted and implemented through organizational cultures at the field level. Inertia plays a key role in the theory; new laws govern organizational fields that already have a cultural history and network of interests in place (Edelman 1992). The implementation of maternity leave policies in American firms, for example, depends on earlier organizational interpretations of public policy as much as on broad market forces like women entering the paid labor force (Kelly and Dobbin 1999). And yet while neo-institutionalism can tell us about the rise of science ministries and formal science policies worldwide in the past few decades (Drori, Meyer, Ramirez and Schofer 2003), it fails to provide analysis of scientific actors who strategically define their domain of expertise (Gieryn 2004).

Science and technology studies, on the other hand, does examine the localized cultures created by science policymakers (Jasonoff 1995; Hilgartner 2000). For example, Kerr's (2003) study of the content of bioethics policies in Europe describes how policy networks come to frame the issues uniformly in terms of individual choice and scientific progress. Although valuable, the localized STS perspective misses the important effects of organizational level dynamics and power structures (Klein and Kleinman 2002). Thus, their foci on different levels of analysis means that neo-institutionalism and STS highlight different aspects of social reality. I employ both schools of thought in order to take advantage of new institutionalism's insights into life science graduate programs as

an organizational field and STS's insights into the actions scientists take to deflect unpopular policies.

Perspectives on Scientific Ethics

Traditionally, ethics is defined as a rather static set of standards for conduct based on a system of moral values. Casper (1998: 138) offers a more practical definition of ethics as “a set of concrete social practices that can be captured [by] examining the social processes and judgments underlying what comes to count as an acceptable practice.” My study, rather than focusing on the *content* of ethical codes or practices, investigates whether the visible practice of teaching scientists to consider the ethical implications of their work occurs in university training. Thus the emphasis is on ethics training rather than on ethics, per se. What I mean by ethics training is formal education through a specific university course (e.g., “Research Ethics,” “Bioethics,” “Responsible Research Conduct,” etc.). A critic might argue that research ethics are best “learned by doing,” such as by observing a mentor’s behavior; this is also true of scientific research. Yet of course there are still curricular requirements for students on scientific topics. The visibility of ethics training is measured by course offerings and requirements publicly acknowledged on graduate program websites.

An important precedent for the awareness of ethical issues in life science organizations comes from the Human Genome Project. This is also a story of mandates by directors. Early in the history of the Human Genome Project at the Department of Energy (DOE), Charles DeLisi conceived of an ethical component (Cook-Deegan 1994). Later, James Watson mandated that a small percent of all NIH Human Genome Initiative

funds go to analyzing ethical and legal issues surrounding the project (Kevles and Hood 1992; Watson 1990). As a result, the Ethical, Legal and Social Issues (ELSI) office of the Human Genome Project was established as a joint NIH/DOE effort. Whether the founding of ELSI was motivated by genuine concern about the moral implications of genetics or by savvy strategy to ensure political support of the National Center for Human Genome Research (Cook-Deegan 1994), the initiative does seem to show that leading natural scientists are willing to support studies by social scientists, legal scholars and bioethicists on the history and potential moral consequences of the Human Genome Project. Yet the implications of the ELSI initiative are unclear. Does a specialized segment of funding mean that natural scientists are absolved from educating themselves in ethical, legal and social issues; in effect, allowing them to “outsource” concern for the ethical issues raised by their research? The separation of pure science from messy conflicts of interest or other social and ethical issues harks back to a longstanding objectivity ethos in American state supported science (e.g., Vannevar Bush’s report to President Roosevelt).

A basic idea in science and technology studies—that technology (and science) is not neutral—is in direct conflict with the objectivity assumption of science. As Robert Merton (1973) observed, one of the fundamental ethos of scientists is disinterestedness—ideally, that “pure research” is untainted by subjectivity and interests other than the advancement of knowledge. This objectivity assumption seems to imply that a well-intentioned, careful specialist is not responsible for the outcomes of his science. “Objective science” is an idea that resides at a deep cultural level, as apparent in Nelkin and Lindee’s (1995) description of the road map metaphor used by scientists. The

Human Genome Project uses mapping imagery, which “suggests that once a gene is located, its interpretation will be objective” (Nelkin and Lindee 1995: 8). The STS perspective, what Langdon Winner (1986) calls “technological politics,” in contrast, conceives of every technology as having an ideology embedded within it. Ironically, the objective, disinterested ethos of science actually is technological politics—an ideology that affects the science. For example, Nelkin and Lindee’s (1995) argument illustrates that the perspective of the Human Genome Project as a neutral map is a kind of political stance; one that probably benefits the status quo if it means that questions are not raised about genetic discrimination and other potential social/ethical dilemmas.

As an example of how political interests shape science, Paul Rabinow (1999) presents an ethnographic account of the aborted collaboration between Millennium Pharmaceuticals and the French government. The government ultimately balked at “giving away French DNA” to an American company. In discussing the circumstances of the impasse, Rabinow found that France had an early concern with ethical issues surrounding genetics and had established a national ethics board. Attention was paid to ethical issues, but only by bioethicist “experts.” The existence of a bioethics specialization, however, raises the question of whether scientists themselves are responsible for thinking through humanistic (or nationalistic, in France’s case) issues stemming from their research. Rabinow (1999: 110) argues that such a division of knowledge could mean that the use of ethics is only reactive while: “[T]he work on exploring, constructing, discovering, and inventing ‘the genomic’ is left to scientists and physicians (whose striving for advancing knowledge and health always carries the potential for excess) as well as to venture capitalists and the large multinational

pharmaceutical firms. Consequently, the distinct risk is present that the knowledge and truths about living beings that are emerging in molecular biology and genomics will be formulated by, and in the interest of, barbaric and/or decadent forces.” Whether pharmaceutical corporations are “barbaric” is arguable, but they certainly have economic interests that might affect the work of “objective” scientists who are imperceptive of ethical issues.³ This STS argument that science is not neutral although it claims to be provides one explanation for why courses on ethics might be unpopular: they contradict a deeply held belief about the nature of the scientific enterprise.

Another way to think about scientists’ reluctance to embrace required ethics education is to consider the organizational context in which technological politics emerge. Organizations are difficult to change, and when change occurs it is often only on the surface. Once an organization starts moving in one direction, it continues down the same path and can only be changed with great difficulty (Stinchcombe 1965). For example, once a restaurant is founded as a fast food place, it would be extremely difficult to switch into a fine dining establishment. A graduate program founded on the objectivity ethos is unlikely to be willing or able to quickly embrace an ethics requirement into its core curriculum.

Organizational inertia is compounded by the fact that organizations are not isolated entities. The broader institutional environment, the field in which organizations are situated, exerts influences as well. Once a particular way of setting up a graduate program is legitimated, other programs will probably look quite similar. This isomorphism may be due to copying other prestigious programs, or to normative pressures to look professional (DiMaggio and Powell 1983). Similarities between

organizations worldwide arise through the isomorphic pressures inherent in institutionalized ways of doing things. The threat of withholding resources produces coercive isomorphism in new institutionalist terms, which means that organizations come to look similar because they are coerced into doing so (DiMaggio and Powell 1983). At the same time, the new commonly used structure or organizational behavior may be a “rational myth,” or, the means that an organization uses to communicate its legitimacy as an “efficient” or “effective” collective, but which does not represent real change (Meyer and Rowan 1977). For example, Lauren Edelman (1992) illustrates how corporations instituted affirmative action offices in response to Equal Employment Opportunity legislation, but did little to actually change their hiring and promotion practices.

Although changing the design of a scientific organization is a conscious decision, the social processes guiding the decision may not be explicit or rational (i.e., who will use the technology and how they will use it is not always clearly considered). The result is usually unanticipated consequences. Decision-makers are not context-less rational calculators, able to mold organizations and technologies optimally regardless of past and ongoing social processes and structures. For example, rather than profit-maximizing, unethical business practices leading to technical disasters like the Challenger explosion, Vaughan (1996: 68, emphasis mine) shows that this tragedy was a result of organizational inertia: “Amorally calculating managers intentionally violating rules to achieve organization goals does *not* explain the Challenger disaster.... [P]roduction pressures became institutionalized...influencing decision making by managers and engineers *without* requiring any conscious calculus.” Observing organizational context reveals the

complexity of ethical issues in reality. Decision-makers design both organizations and technology based on institutionalized ways of doing things.

Clearly, though, people working in organizations are not puppets. New institutionalist studies of U.S. policies underline how organizational actors negotiate and interpret the social forces of legitimacy, resources, and legal constraints, instead of taking a knee-jerk response to these incentives. Dobbin, Sutton, Meyer and Scott (1993) provide a convincing institutional argument for the development of internal labor markets (ILMs). In contrast to rationalist theories that argue ILMs arose simply because they were more efficient employment structures, especially for larger, technology intensive organizations, Dobbin et al. (1993) show how ILMs emerged as an organizational response to Equal Employment Opportunity Commission (EEOC) policies. Further, the interpretation of EEOC laws in the courts shaped organizational behavior toward bureaucratic hiring and promotion through ILMs rather than the more contested use of hiring quotas or standardized testing. Personnel department professionals created normative isomorphism in firms by instituting ILM solutions, at the same time the state fostered coercive isomorphism through the policies. Edelman, Fuller and Mara-Drita (2001) show further how managers institutionalize policy in reinterpreting civil rights laws. Federal EEOC policies designed to promote workplace diversity by gender and race have been “managerialized” to mean diversity in the broader sense of people with differing viewpoints or regional origins.

As Clemens (1997) illustrates, implementing policy depends on having actively supportive constituencies, especially in a pluralist system like the United States. In her study of the Progressive Era, the combined effects of institutional environment and

stakeholder groups figure prominently in the outcomes for new policies. In Washington state, populists entered office and had their agenda pass through the legislature, but there was little follow through--as in the lack of enforcement of new worker's compensation laws. But in Wisconsin, corporatist coalitions of farmers and organized labor in the socialist party forged a voting block that supported state agricultural funding for small farms rather than University of Wisconsin and the larger agribusiness interests.

From empirical studies like those described above, neo-institutionalism's underlying assumption of the duality of structuration (Giddens 1984) is clear. Institutions in any kind of organization, whether firm or university, are a point of both constraint and agency.⁴ Taken for granted assumptions, like the institution that objectivity provides a mechanism for scientists' self-governance, shape the cognitions of organizational actors. Yet organizational actors also sustain and recreate institutions by enacting them.

With regard to training life science PhD students about the social and ethical consequences of their research, these insights from STS and new institutional theory suggest that graduate programs would be unlikely to implement full fledged ethics training into their courses of study. A more likely effect of the federal grant agency incentives is the appearance of change in graduate programs. A related question concerns which universities have ethics education, by the prestige of the school. Perhaps elite schools are more likely to feel external pressures to include ethical training for graduate students, since they are more visible to funding agencies, policy makers, and the media. On the other hand, the more elite programs may be those that have the power to resist outside pressures to shape their educational policies, and can omit any "non-scientific" training. If there is evidence that courses in research ethics or social issues in biological

sciences are offered in response to policies, the second question is whether the curriculum is taken seriously or rather provides a rational myth. This paper answers the first question and explores the second.

One way to measure inertia in the ethics education of life science PhDs is by similarities in the approach of different universities. In particular, I would expect that schools within the same level of prestige would look like each other in their training of scientists in ethical issues. Elite schools might be more likely than others to include ethics because of their greater visibility and number of resources. Alternatively, the field of life science programs may be uniform throughout in the treatment of ethics education because an elite model has diffused across programs. Mainly, some pattern of similarity based on institutional and organizational pressures (e.g., other schools may mimic elites' treatment of ethics) is expected.

Federal Policies, Universities, and the Institutionalization of Science

To assess how the 2000 ethics certification policy has affected universities, similar cases can be considered. A related U.S. policy change occurred when federal granting agencies required universities to design a systematic way to deal with research misconduct (e.g., publishing fraudulent results) during the 1980s. After the NIH announced in 1987 that grantee universities would have to describe their procedures for investigating misconduct, congressional hearings were held in 1988-89. Chubin and Hackett (1990: 134-5) describe the proposals from these hearings as ranging from the “drastic” measure of establishing an independent agency to evaluate research quality to the “ineffectual” requirement of establishing research ethics courses in graduate

education. Presumably, graduate curriculum changes would be ineffective because these ethics courses are usually not taken seriously and lessons learned seem to have little effect on students' later careers.

The outcome of congressional concern about research misconduct was the establishment of the Office of Research Integrity (ORI) within the Office of the Secretary of Health and Human Services by 1995. ORI is not an independent agency per se, but is what Guston (2000) calls a "boundary organization," straddling the divide between organized politics and institutionalized science. ORI has given universities a mandated definition of misconduct and accountability for scientists. Ethics training policy is more diffuse, decentralized, and seems to be less salient to congress, perhaps because the issues (e.g., stem cell cloning, genetic discrimination) present more difficulty in labeling an individual "bad guy" than high-profile misconduct cases of the 1980s did. As such, the ethics certification policy may be more comparable to the research integrity issue prior to its centralization in ORI. In this earlier period before the research integrity policy was well defined, scientists continued to take the long established objectivity ethos for granted.

Despite the establishment of ORI, the popular press still tends to portray science as self-governing, including in ethics education. A New York Times article (Kolata 2003) noted that the government does not provide data on the number of research ethics courses offered to biological scientists. Yet based on observation of one in-depth, required, full credit course in research ethics, the Times journalist opined that, "more and more, universities are instituting *real* courses...and requiring students to take them"

(emphasis mine). Is this a fair summary of graduate science curriculum, or is it overly optimistic?

Institutions have inertia not just within the boundaries of relevant organizations, but also within the expectations of broader publics. The objectivity ethos of science is not limited to scientists, but becomes the rhetoric for justifying an elite specialist rather than democratic role for science in society. Chubin and Hackett (1990: 4) question this basis of legitimacy for science: “[W]e usually delegate to experts the authority for making decisions in areas we do not understand or have not been trained to know. We trust the experts to bear our best interests in mind. We hope that if our trust is misplaced the expert’s own profession will take swift and decisive corrective action on our behalf. But is this an appropriate relationship between science and a democratic society?”

Data and Methods

How does someone become certifiably trained in research ethics? One way is for Principal Investigators (PIs) to visit the website accessible through the NIH homepage (www.nih.gov). This method reaches leaders of research teams, but not the graduate students who are working in the lab supported by the grant. Closer investigation of the certification website reveals that passing the course is accomplished by clicking through dozens of webpages on codes of conduct and case studies, and by answering some brief multiple choice questions along the way.

Indeed, the most common mode for teaching research ethics is the use of case-based lessons, including the curriculum PIs encounter on the web. The following is one example from the National Cancer Institute site (http://cme.cancer.gov/c01/g05_01.htm,

last accessed 11 November 2004): “Investigators wish to study an association between a particular gene and shyness. They have designed a study as follows: Research is to be performed on a cohort of second-grade children at a large public school. The children will be observed in the classroom by the research team and samples of their saliva will be collected for genetic analysis.” The student receiving this internet education is prompted to respond to a question about the risks of this case. The following four issues are provided as answers: “The children’s privacy may be violated when their classroom behavior is observed; children who are identified as ‘shy’ may be stigmatized; [there may be] state laws governing genetic testing or use or disclosure of genetic information; and, uncertainty about what will be done with genetic samples at the conclusion of the study.” Thus, the ethical and social problems with looking for a gene for shyness are narrowly identified as issues of maintaining confidentiality, following legal guidelines and avoiding individual harm. The site does not, however, tell the reader exactly how to protect subjects from harm. Also, the broader problem of recognizing how shyness is socially constructed in given situations and cultures (i.e., behavior considered “shy” in one context might just be good manners in another), and how this study would thus be a misdirection of scientific resources is not raised. In fact it *cannot* be raised by the internet student in this online course.

Overall, the test-based internet certification seems a rather superficial way to ensure the diffusion of knowledge about protecting human subjects and research ethics more generally. Scientists seem to agree: typically, when asked about this training requirement they roll their eyes and shake their heads to signal disdain, as if it is not even

worth speaking about. When prompted by further questions, the verbal responses I heard also ridiculed it (e.g., “silly,” “laughable,” “a joke”).

While the internet is not the best place to conduct training on complex topics like research ethics, it is a good place to search for information on the training available in graduate programs. To assess the extent of ethics training in life science graduate programs, I conducted a content analysis of course information available on the websites of U.S. universities in 2001, and replicated the analysis with the same programs in 2003. While the content analysis was designed to be a qualitative look at a manageable number of graduate programs and their requirements as a whole, part of the sample was selected randomly to provide a more representative picture. The sampling frame was provided by the list of all American universities with life science PhD programs ranked by the National Research Council (1995). I selected a stratified random sample of about 25% of the schools (N=50). The sample was stratified by the prestige of the university’s ranking in Biochemistry and Molecular Biology. I coded all of the top ten programs because these are the most visible. If mimetic isomorphism is in progress, these are the schools that would be the source of copying. Also, the elite ten confer nearly a third of life science PhDs (see Smith-Doerr 2004 for further discussion of the graduate program categories). I randomly selected 20 schools in each of the other two categories: ranked 11-50, ranking 51+. Life science is an evolving area of knowledge, and the lack of standard departmental/program names reflects the interdisciplinary nature of the enterprise. Based on conversations with knowledgeable interlocutors, I chose to focus on Molecular Biology as the most central to life science. When searching a university

selected from the NRC list, I searched for the department most closely representing the study of molecular biology.

One caveat of studying website content is reliance on a particular type of information. Perhaps some schools have more resources for web design than others. In 2001 and 2003, every school sampled had a professional-looking website for a biochemistry/molecular biology related program. There were some differences in the extent of information provided about the programs on the web, and this was taken into account in the analysis. I did use a rather conservative measure of whether a program had ethics training. For example, Harvard was coded as having an ethics elective because one course, “Stem Cells and Cloning,” was described as: “An advanced course in developmental biology. Embryonic and adult stem cells in different organisms will be examined in terms of their molecular, cellular and potential therapeutic properties.... Current findings will be considered in a historical context; *ethical and political considerations will not be ignored*”

(www.msb.harvard.edu/Education/Graduate/courses.html, accessed 9/30/2003, emphasis mine).

The real question is whether a website does an adequate job of reflecting the priorities of an educating organization. Certainly online data are not available on the informal organization of graduate programs,⁵ such data can only be gathered through qualitative observation. What a website does provide is information on the public face of an organization. It may be the case that ethical issues are taught to PhD students informally although they are not mentioned on a program’s website. Nonetheless, a program’s website provides an interesting message about “what’s important about us.”

The publicity given to ethics training for scientists is information about organizational goals and the framing of proper roles for life scientists. Qualitative content analysis also reveals whether including some ethics training is mostly “window-dressing” to appear legitimate to funding agencies, university administration, or other audiences.

Discussion of Results

One year after the 2000 NIH policy, relatively few courses appeared in the ethical and social implications of research in biochemistry and molecular biology graduate programs. Two-thirds of the 50 universities sampled in 2001 did not list any required or elective courses in their graduate program information online. By 2003, there was some improvement. The programs not offering any visible ethics training decreased to two-fifths of the total.

<table 1 about here>

Table 1 summarizes the data on how the prestige of programs is related to the requirement of formal ethics training, regardless of how extensive the credit is for courses. In 2001, programs at research universities ranked in the top 50 were more likely to have requirements, while lower ranked schools had proportionately more elective courses (see Figure 1). By 2003, more of the lower ranked schools had required courses, and more of the top ranked schools had elective courses that included some aspect of social or ethical aspects of research (see Figure 2). Nearly all schools list courses on their websites. In 2001, lower ranked schools were less likely to have their programs fully articulated online, but had caught up to other programs by 2003.

<figures 1 and 2 about here>

One possible explanation of these findings is that in the earlier observation, there was simply not enough information about graduate programs available on websites, especially for the less highly ranked departments. From the last column of Table 1, we see that 88% of the programs listed their courses on the web in 2001, but some did not. In particular, schools like Kansas State University and the Medical College of Georgia are not highly ranked by the NRC, and also did not provide specific information on course numbers, titles and descriptions. Both did describe course requirements generally, though. At KSU, students take a “core (two-semester) biochemistry course.” The core courses at MCG include topics such as “molecular cloning, gene isolation and analysis, gene therapy, transgenic animals, cell culture and transfection, patch clamp technology...”. Yet in these specific descriptions of the programs, research ethics issues are not mentioned. Thus, although these two websites are less explicit about numbered course requirements, the assumption that ethics is not part of the curriculum is based on a holistic analysis of all available information. In 2003, both of these schools did list courses and requirements clearly (and at that time, MCG had a required ethics course and KSU had an elective one).

Even if some programs have ethics requirements that do not appear on their websites, the fact that they are not showcasing their ethics training is illustrative. Keep in mind that the primary audience for websites describing graduate programs is prospective students. Are schools assuming that bachelor’s level biologists would recoil from discussion of ethics in graduate training? If so, this preference probably comes from their socialization as life science majors in college (perhaps with little ethics training at that level as well).

Qualitatively, recent trends that arose in the 2003 content analysis indicate that the newly offered courses may be pro forma attempts to appease the NIH rather than change the professional socialization of graduate students. Four programs now explicitly state that their courses meet the NIH requirement, making clear that meeting the requirement, rather than learning about ethics, is the key goal. For example, the University of Southern California gives a 1 credit course in “Ethics and Accountability in Biomedical Research” which is described as follows: “This course is designed as an option for meeting current federal regulations which require that all predoctoral and postdoctoral fellows paid from federal contracts and grants have a component of ethical training.” These legalistic course descriptions signal that the programs are taking care to be seen as rule followers, familiar with the letter of the law. Another trend new to the 2003 data is that some programs are following the NIH’s lead and offering these courses online, rather than spending regular class time and faculty hours covering ethical and social issues. Three universities offer online options. University of Massachusetts at Lowell, for example, offers “Bioethics” as a one-credit course. Students can take the regular course which features guest lecturers from industry, or take the online version. Either option seems problematic.

Another way to gauge how seriously programs take the mandate to educate students in the larger social issues surrounding their research is how much credit they give for courses that meet the NIH standard. Of the 20 schools requiring ethics training in 2003, only three clearly give full credit for these courses (this includes Loma Linda University, which requires “Religion” in its Seventh Day Adventist tradition). Two schools do not specify the credits for the research ethics course. The remainder give no

credit or a fraction of regular credit (mostly 1 credit). In other words, rather than the New York Times' estimate of "more and more" universities requiring "real" research ethics courses (Kolata 2003), a mere three out of 50 visibly demonstrate such a commitment.

The content analysis data show some initial evidence supporting the idea that life science graduate programs construct a rational myth of ethics training rather than responding to the funding incentives of NIH policy with real change. Institutional isomorphism also seems to be taking place, as there is relative uniformity in the kind of ethics training across organizations.

In conversational interviews with academic life scientists, there was variation in how seriously individuals took the importance of the broader implications of their work. Some are very serious and thoughtful about the issues, but view their interest as something to be pursued outside of NIH enforced policies. Others view the policies as bothersome and the issues as outside of their purview.

A thoughtful, self-described biologist who was a postdoctoral fellow at an elite school, argued: "Even in the absence (or ridiculed presence) of ethics training per se, the conversations are still going on. I must admit that the prevalent attitude is that any new [scientific] knowledge is good knowledge. Even so, I have noticed that more and more, ethical issues are being discussed in science journals, over coffee, in classrooms." Her point was that ethics training was not the place where the real thinking about the broader issues goes on, so whether or not it is offered is of little relevance in the day to day life of the average student. The educational goal of the NIH policy seems miss the intended target, even those students who do keep the larger issues in mind. One graduate

director at a research university saw the policies as bothersome, and opined that most graduate students also viewed attempts at ethics training as a nuisance: “Most of them see it as a joke, frankly.” When asked if he thought that attitude reflected faculty sentiments as well, the director smiled sheepishly and admitted, “Yeah, faculty are no better.” The way scientists treat the ethics requirement does not look like the way other organizational actors interpret policies to fit within existing institutions, using new policies for their own organizational or political agendas (Edelman et al. 2001; Clemens 1997). Instead, life scientists seem to focus on how to get by the rules from the state—either in order to take ethics more seriously or to avoid “extra-scientific” demands.

The attitudes toward graduate ethics training that I encountered were similar to the responses Chubin and Hackett (1990) found in their interviews of scientists about the problems of peer review: denial that there was any problem with the status quo; belief that only scientists can govern science; and when acknowledging that scientists may not always play by the rules, still remaining confident that scientists recognize the best work and thus require no outside input. They quote an academic administrator on the requirement of establishing misconduct hearing procedures: “Like so many [universities], we have been tardy in setting up official mechanisms for handling this problem because of what might be called a form of psychic numbing. It never occurred to us that it could happen to us” (Chubin and Hackett 1990: 133). When the taken-for-granted legitimacy of science is called into question, the institutional features and inertia became more visible.

Another graduate director I interviewed who was also the dean of his college discussed his experience with inertia in setting up a brand new graduate program in the

life sciences. He personally felt it was important to include formalized ethics training from the inception of the program, but faced conflict from faculty opposed to any “non-science” course. In recalling how his program initiated their course in research ethics, he said: “In fact, all the faculty here did not immediately buy into it [the ethics course]. I was strongly in favor of requiring a course in ethics. Some faculty were saying, ‘Why should we sustain something that’s not about the methods or content of science?’ But we’re trying to have our students become leaders here and go out and do important things, and they need to be aware of the implications of what they’re going to do.” Once he had convinced his colleagues of the necessity of the course, whether it was worth the same as a “real” course was the next issue: “Some faculty only wanted to make it a two credit course. You know, not quite up to the regular course--only two credits.” He used his influence as the founder of the program (and Dean of his college at the time) to make sure the ethics requirement counted as a “real” course: “So it’s there as a full fledged course, the same amount of credits as anything else.” This graduate director used moral suasion and his prestige as a nationally known scholar to convince his colleagues to take training students in the ethical and social implications of science seriously. This departmental conflict occurred before the 2000 NIH policy was in place, or the policy might also have been used as an argument in his favor. This may be a major benefit of the federal grant policies—they can be used as tools for those who would bargain in their departments for a broader graduate education.

I also spoke with an “activist scientist” (on this role see Moore 1996; Frickel 2004) who had successfully implemented an interdisciplinary seminar to explore the social and ethical aspects of science at his university. He indicated that this initiative was

“outside of and despite” federal policies. To accomplish bringing together this lively campus group, he used his experience in social movement organizing to identify key faculty and students around campus who had a strong interest in the social and ethical implications of recent developments in the biological sciences. This kind of local level, grass roots organizing of scientists, together with interested others, may be a more effective way to spark the interest (and education) of neophyte life scientists in the complexities of the social and political issues surrounding their work. Whether this kind of movement could be sustained at the national level would likely depend on the broader political opportunity structure (McAdam 1982).

Why is the attitude of life scientists toward the ethics education policy fundamentally one of minimal compliance? The unique combination of new institutional and STS perspectives taken in this study can help answer this question. A new institutional perspective on the content analyses is that graduate programs interpret the federal policies so that while ethics courses are formally offered, departments have isomorphically adopted a model of giving no or low credit (and legitimacy) to them. In graduate programs we see a decoupling of the formal policy from the partial implementation of ethics courses on the margins of curricula. Conversations with scientists show deflection of the federal requirements, in some cases in order to enact more local solutions for reflecting on the place of life science in society. An STS perspective on the interviews reveals that scientists, rather than uniformly treating the social aspects of science as unimportant, can create grassroots strategies to provide legitimate discourse about ethical issues.

Conclusions

Through the way ethics training is being integrated into universities, life science graduate students may be learning an unintended lesson: how to deflect policies that come from the state in a top-down fashion. Quantitatively, the adoption of research ethics courses may be increasing, yet there is huge variation, qualitatively, in how scientists learn to reflect on the social-ethical issues in their work. The active, continual contestation of what is within the purview of science also defines what is *not* science (Gieryn 1999). Both the institutional arrangements of graduate programs and the discourse of many individual scientists define ethical issues as outside of science. And there is no universal way to change this professional culture. A narrowly rational assumption in national level policy does not work. In this case, monetary incentives have only led to partial, incomplete and widely varying adoption of ethics training.

This study may have implications for other research that reveals unexpected contradictions in governmental science policy. Consider the puzzle raised by two chapters in this volume that seem to point in conflicting directions. On the one hand, Steven Epstein describes how social movement activists are able to help shape “biopolitical paradigms,” such as how governmental science agencies define minority groups. On the other hand, Jenny Reardon illustrates the inability of indigenous people groups to enter dialogue with scientists in federal agencies during the process of defining racial categories. This seeming contradiction in the U.S. science policy to involve civil groups in definition processes could perhaps be further illuminated by an institutional view of the decoupling between policy formation and implementation. Large, bureaucratic, loosely-coupled systems like the NIH allow ample room for differential

application and interpretation of procedures. Activists may encounter this organizational space differently; affluent white gays and lesbians may find it a resource for maneuvering while impoverished indigenous peoples find it a place where informal discrimination is hidden behind a formal facade. Rationalized policy systems are interpreted, used, and sometimes rejected in unexpected ways. Policymakers may have a machine model in mind, where cost-benefit ratios are welded to desired behavioral outcomes. In reality, scientists (and other relevant publics whom institutions permit to play) treat policy more like Lego bricks⁶ to take apart, stack, or cast aside.

In this study, pilot interviews with scientists provide suggestive data rather than definitive answers for how informal, local organization of discourse on science in society issues might occur. Further research is needed on how scientific actors use governmental and academic organizational contexts to deflect state policies. Recent scholarship has focused on increasing democratic participation in science policymaking (Kleinman 2000; Lengwiler 2004; Moore 2005). The institutionalization of activities such as the credentialing of scientists' ethics training, however, may be one way that democratization of science is deflected. Once a credentialing system and the attendant organizational routines are in place, public discourse is unlikely to enter into science ethics education, just as governance of equal opportunity (Edelman et al. 2001; Dobbin et al. 1993) and science misconduct (Chubin and Hackett 1990) seem to be sealed off from public discourse. Again, combining STS analysis of scientists' boundary defining negotiations along with neo-institutional examination of constraints and opportunities presented by organizational and state contexts could be fruitful.⁷

A substantive factor that may add to scientists' ability to deflect educational requirements, and for university programs to decouple the requirements from their actual activities, is that the policies concern bioethics. The policy context of bioethics in the United States, as John Evans (2002) charts, is one in which an earlier, deeper debate thinned into a rationalized formula. Part of this thinning can be attributed to the role played by Congress in calling for simple ethical principles that could be enforced by federal funding agencies. In any case, bioethics is now an institutionalized niche, and has been criticized for its narrow and shallow treatment of a set of standardized ethics issues such as informed consent (Evans 2002; Corrigan 2003).

The problem with a critical perspective on science policy, however, is that it can leave a vacuum in terms of recommending what should be done. I believe there are at least some hints in this study toward productive directions for educating life scientists about the context of their work. In the U.S., it seems that less top-down (i.e., more local) methods for discussing science in society are better received. Practically, this means that universities would do well to provide the resources to allow for creative, grassroots solutions to the question of how best to educate graduate students. The NIH policy is actually broad enough to permit this creativity, it has just become institutionalized practice to employ narrow bioethics case studies on the internet for certification. (A factor contributing to this paperwork response to the policy may be that the enforcement is a letter signed by the principal investigator promising that all key personnel on the project have been properly trained in the ethical treatment of subjects.) As one possibility of a more creative approach to teaching the social and ethical issues in science, consider an example. Instead of distributing a curriculum of standard cases with

the “right” ethical solutions, imagine a seminar in which PhD students design a course for undergraduate science majors. Collectively, graduate students could collate a reading list and discuss how to select pedagogical themes that emerge from the literature on science, ethics, and society. Through teaching, they would learn. Unfortunately, as this chapter has shown, there are no easy, straightforward, universal policy solutions.

Encouraging scientists to engage in reflection is a goal that will require creative local efforts, but will be eminently worthwhile if the result is enlightened scientific agendas and practices. A differently trained life science community might produce a different message in a Smithsonian exhibit on genetic discoveries, for example. Instead of giving the message “you are your genes” sponsored by Pfizer, an exhibit might ask up front, “what do you think?” Such exhibits already work well in asking museum attendees what they think about theories of dinosaur living conditions and morphology. Asking museum patrons what should be done with genetic information could lead to provocative discussions about genetic discrimination, public funding and commercial outcomes of science. Surely, for whomever engages in thinking about the thorny ethical issues in the life sciences, reflection will arise from asking hard questions. It is unlikely, however, to originate in highly rationalized institutional systems.

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Table 1. Number (and Percentage) of Life Science PhD Programs with Required Ethics Training by NRC Ranking, 2001 and 2003

NRC Ranking	N	Ethics Required		Ethics Electives Offered		List Courses on Website	
		2001	2003	2001	2003	2001	2003
1-10	10	3 (30%)	5 (50%)	0	4 (40%)	9 (90%)	10 (100%)
11-50	20	7 (35%)	9 (45%)	2 (10%)	3 (15%)	20 (100%)	19 (95%)
51-200	20	1 (5%)	6 (30%)	4 (20%)	4 (20%)	14 (70%)	19 (95%)
Total	50	11 (22%)	20 (40%)	6 (12%)	11 (22%)	43 (86%)	48 (96%)

Figure 1. Percentage of Ph.D. Programs with Ethics Courses by NRC Ranking, 2001

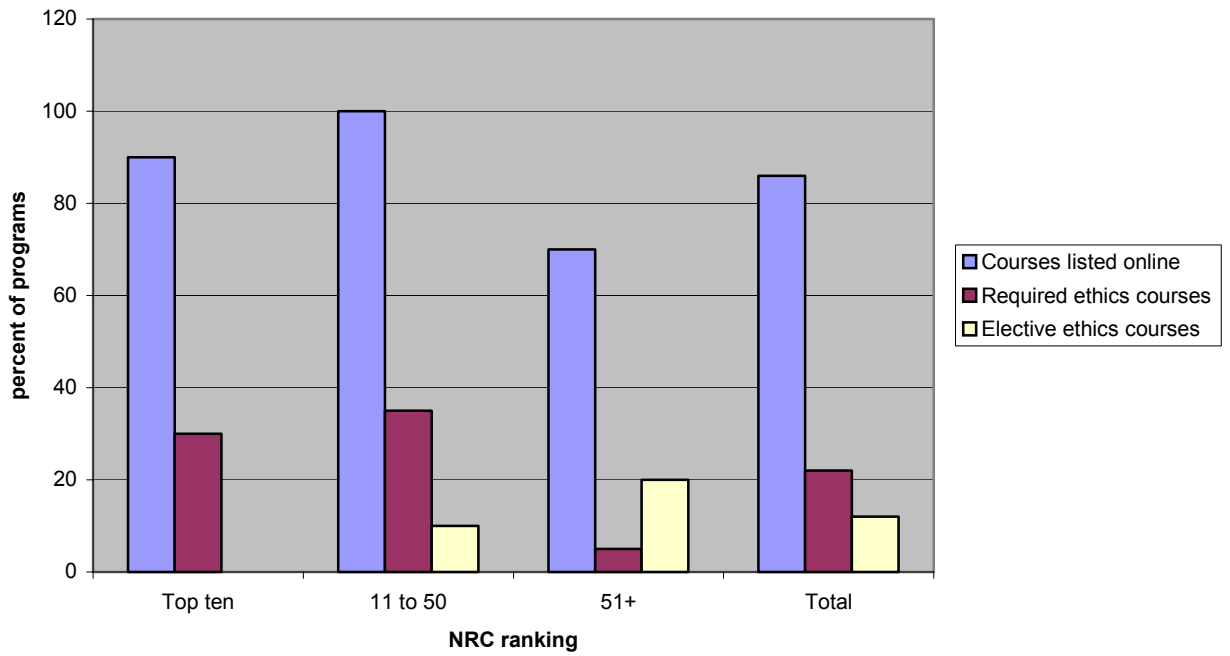
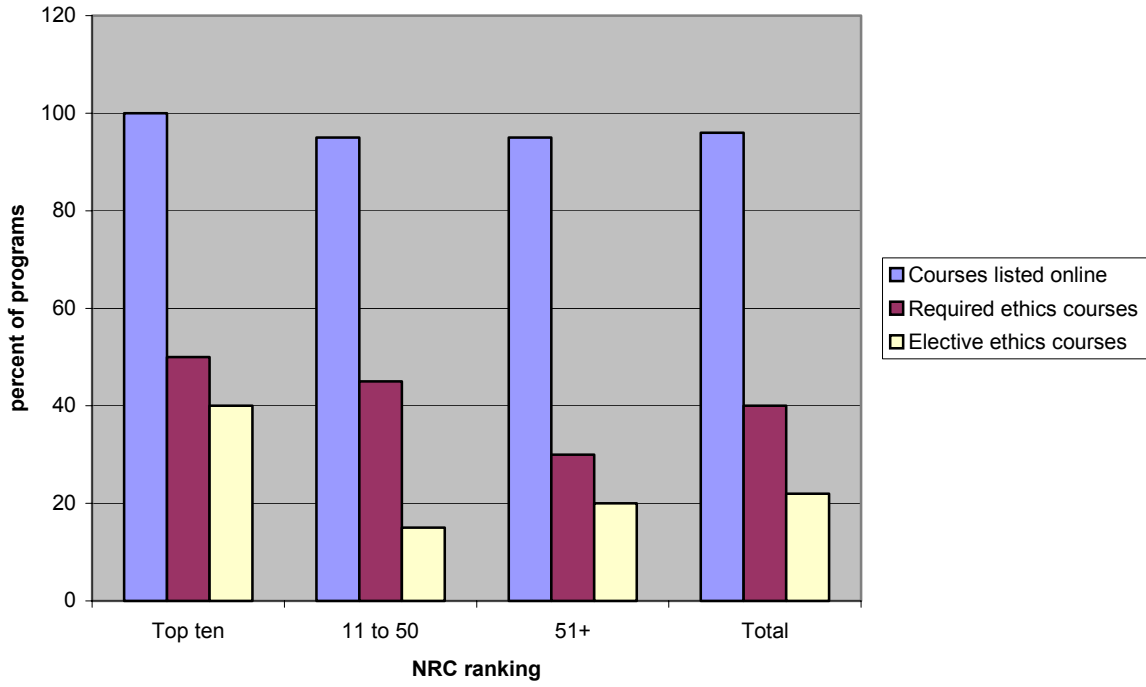


Figure 2. Percentage of Ph.D. Programs with Ethics Courses by NRC Ranking, 2003



¹ A version of this chapter was presented at the 2003 annual meetings of the Society for Social Study of Science, Atlanta, GA. I would like to thank the editors Kelly Moore and Scott Frickel for their encouragement to pursue this project and for insightful comments on the paper. Kelly Moore went above and beyond the call of duty in providing detailed suggestions for revisions. I am also grateful for the helpful comments I received from Maren Klawiter, Dave Guston, Daniel Kleinman, anonymous reviewers of this volume, and for research assistance from John Underwood. Any remaining errors are mine alone.

² The Molecular Biology/Biochemistry area of study was selected because of its: 1) breadth and centrality in the life sciences (Smith-Doerr 2004), and 2) relevance for human therapeutic applications and the biotechnology industry, where an understanding of the social/ethical context of research is particularly important.

³ To be sure, Merton (1973) himself also argued that science conducted in for-profit organizations could not fit the ideal ethos. In particular, the norm of “communism”—shared knowledge—is violated by proprietary, patented science. But as many have noted before, Merton’s formulation is more a theoretical discussion of what science should be than an empirical assessment of disinterestedness and other norms in action.

⁴ Perhaps, then, the juxtaposition of incentives and rational myths is also a false dichotomy. One might say that federal policies provide the institutional material for both incentives and rational myths. However, it is still important to recognize the distinction between a simplistic cost/benefit reaction to an incentive and the construction of a myth of rational rule following while behavior remains inert.

⁵ But interestingly enough, Harvard publishes entire interviews with students and postdocs about the program and life in the lab. These interviews include discussion of informal norms such as whether students hang out with people from their labs, or if faculty believe jobs in industry are as good as academic ones.

⁶ Indeed, similar processes have been called bricolage (Levi-Strauss 1966).

⁷ For example, comparing the U.S. case to nations in the European Union (in terms of how scientists are educated to think about the social and ethical contexts of their work) might reveal some interesting differences in both the institutionalization of science policy and local meanings of science curriculum.