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SELF-CRITICAL FEDERAL SCIENCE? THE ETHICS EXPERIMENT WITHIN THE U.S. HUMAN GENOME PROJECT

By Eric T. Juengst

I. Introduction

On October 1, 1988, thirty-five years after co-discovering the structure of the DNA molecule, Dr. James Watson launched an unprecedented experiment in American science policy.[1] In response to a reporter's question at a press conference, he unilaterally set aside 3 to 5 percent of the budget of the newly launched Human Genome Project to support studies of the ethical, legal, and social implications of new advances in human genetics. The Human Genome Project (HGP), by providing geneticists with the molecular maps of the human chromosomes that they use to identify specific human genes, will speed the proliferation of a class of DNA-based diagnostic and risk-assessment tests that already create professional ethical and health-policy challenges for clinicians. "The problems are with us now, independent of the genome program, but they will be associated with it," Watson said. "We should devote real money to discussing these issues."[2] By 1994, the "ELSI program" (short for "Ethical, Legal, and Social Implications") had spent almost $20 million in pursuit of its mission, and gained both praise and criticism for its accomplishments.

In this essay, I offer an evaluation of the ELSI experiment as one example of how society and the scientific community might go about addressing the policy issues raised by scientific innovation. My assessment is drawn from my experience as one of this experiment's principle lab techs and bottle-washers during my tenure as Chief of the ELSI Branch at the National Institutes of Health (NIH)'s National Center for Human Genome Research (NCHGR) between 1990 and 1994. Like any lab manager, I have both allegiances to the enterprise and reservations about the methods chosen—particularly when they leave unsightly stains on the glassware. For science policy experiments, one of the most troublesome precipitates is the buildup of false expectations. In fact, as I hope will become clear below, my main goal with this essay is to scrub off just such an encrustation.

[1] Harold Schmeck, "DNA Pioneer to Tackle Biggest Gene Project Ever," *New York Times*, October 4, 1988, pp. C1, C6.

[2] Leslie Roberts, "Genome Project Gets Underway at Last," *Science*, vol. 243 (January 13, 1989), pp. 167-68.

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This is not a philosopher's philosophical essay. It is intended to be a piece of "science policy analysis," and, as such, remains faithful to the conventions of no particular intellectual discipline. Developing public policy about scientific innovation is a promiscuous business. It makes strange bedfellows and inevitably infects the purer modes of discourse it picks up with dubious social agendas. In the spirit of this eclecticism, I have given this essay a hybrid genre-type: it takes the form of proposal, flanked by two brief histories, an opening argument, and a parting shot. Since that seems to describe the intellectual basis of most of our public policies about science, it should work just fine.

In brief, the theses I would like to pursue through the next five sections are the following:

1. The two intrinsic critiques of the ELSI program—that it necessarily amounts to either alarmist hype (because there are no special issues here) or public relations (because it cannot bite the hand that feeds it)—will both continue to be wrong as long as the program's original concept as a source of independent explorations of the social context of genome research is preserved.

2. The extrinsic critique of the ELSI program—that it is not an effective agent of change—is also being belied by the program's emerging track record of practical accomplishments. Cultivating a community of committed and expert genomics-watchers turns out to provide an admirably flexible capacity to develop and influence policy: an "un-commission" for professional and public policy on genetic issues.

3. On the other hand, the direction in which the ELSI program has been taken during the Human Genome Project's efforts to increase the pace of the program's accomplishments is not promising. By striving to recast the ELSI program as a more traditional commission, the HGP plays into the critics hands, and neglects the strengths and protections that the program's original conception supplies. Fortunately, it is not too late to regroup, and in Section IV of the essay, I propose steps the program can take to preserve its commitment to building a community while it becomes more "proactive."

4. The best evidence for the power of the "un-commission" is the ELSI program's most successful cascade of practical accomplishments to date: efforts to address questions about the conduct of genome research itself that were not even on the program's original agenda.

5. In the current national political climate, characterized by a receptivity to special pleading by specific constituencies and an (incompatible) commitment to cost-cutting, it is worth considering whether, in lieu of clamoring for a new (traditional) national bioethics commission, it wouldn't be better to pursue the "un-commission" approach for a wider array of bioethical and science policy issues.

II. The Very Idea of ELSI

It is a common misapprehension that the "ELSI set-aside" within the Human Genome Project's budget was an idea that Congress imposed upon the National Institutes of Health (NIH) when it approved that federal agency's plans to add a National Center for Human Genome Research to its roster of research institutes in 1989. Actually, the congressional appropriations subcommittee that funds NIH was as surprised and skeptical as the rest of the biomedical research community about Dr. Watson's initial announcement.

The fact that there were ethical and social issues to be attended to in genome research was not news. Both of the major feasibility studies for the Human Genome Project, by the quasi-governmental National Research Council of the U.S. National Academy of Sciences[3] and by the U.S. Congress's own Office of Technology Assessment,[4] contained sections forecasting the major ethical and social implications of mounting such an initiative. Chief among these were concerns about the potential commercialization of genetic science, the discriminatory use of genetic test results to stigmatize individuals or exclude them from social opportunities, and fears that genetic testing would be open to infection by social agendas and professional values that might curtail the autonomy of those who might avail themselves of the technology. In 1988, witnesses had urged Congress to take these implications seriously, in the presence of the agency personnel and scientists who would shortly thereafter gather to design the HGP.[5] No one had suggested, however, that the project itself should fund the work involved in articulating and addressing the social sequelae of genome research: for that, we have Watson to thank, and—perhaps the real hero of the story—the anonymous reporter who triggered his announcement.

To the agency's credit, the NIH stood by Watson's decision, and incorporated this new mission into its joint efforts with the Department of Energy (DOE) to create a formal plan for the first five years of the U.S. Human Genome Project.[6] The work of the ELSI branch was structured by two goals in that initial plan: to "[d]evelop programs addressed at un-

[3] National Research Council, *Mapping and Sequencing the Human Genome* (Washington, DC: National Academy Press, 1988).

[4] Office of Technology Assessment, U.S. Congress, *Mapping Our Genes: Genome Projects—How Big? How Fast?* OTA-BA-373 (Washington, DC: U.S. Government Printing Office, 1988).

[5] Tom Murray, "Testimony," *OTA Report on the Human Genome Project Hearing*, One Hundredth Congress, Second Session, Serial No. 100-123 (Washington, DC: U.S. Government Printing Office, 1988), pp. 52-74.

[6] The Department of Energy's interest in the Human Genome Project stems from its own research efforts to develop tools for measuring the biological effects of low levels of radiation in the environment. For a detailed political history of the DOE's involvement in the genesis of the Human Genome Project, see Robert Cook-Deegan, *The Gene Wars: Science, Politics, and the Human Genome* (New York: W. W. Norton, 1994).

derstanding the ethical, legal and social implications of the human genome project," and to "[i]dentify and define the major issues and develop initial policy options to address them."[7] The methods for achieving those initial goals were also prescribed in the plan: to adapt existing NIH review and funding mechanisms to create extramural grant support for research, education, and public participation projects on these issues, to collaborate with other institutes and agencies on initiatives of mutual interest, to encourage international collaboration in this area, and to work closely with those in the field to refine the research agenda, solicit public discussion, and communicate the results of the work to policymakers and society. The ELSI program was budgeted to scale up from 3 percent to 5 percent of the grant-making monies allocated to the NIH's new National Center for Human Genome Research over the first three years. Moreover, the Department of Energy, as joint sponsor of the plan, also found itself subscribing to the ELSI goals and, in 1989, was embarrassed into contributing 3 percent of its genome research funding to the effort as well.[8] By October 1, 1990, when the U.S. Human Genome Project officially started its fifteen-year clock, social impact assessment was part of the package of any self-respecting genome research initiative: as new genome research programs were established in other countries and within universities and research labs, ELSI-type efforts of varying styles and sizes were incorporated into them as a matter of course.[9]

Of course, there were still those inside the NIH who were willing to challenge Watson on the wisdom of his move. "I still don't understand," one senior official said after hearing Watson describe his plans at a 1990 briefing for the assembled directors of the NIH institutes, "why you want to spend all this *money* subsidizing the *vacuous pronunciamentos* of self-styled *'ethicists'*!?" When Watson responded that, for better or worse, "the cat was out of the bag" with respect to the public's concern over the ethical issues, the official retorted: "But why *inflate* the cat? Why put the cat *on TV*?"[10]

Why indeed? Why should the Human Genome Project fund its own social-impact studies, when there are all of us professional science-watchers around who would probably do the work anyway?

Suspicions about the very idea of an ELSI program came from both advocates and opponents of the HGP as a scientific venture. Pro-

[7] U.S. Department of Health and Human Services, U.S. Department of Energy, *Understanding Our Genetic Inheritance: The U.S. Human Genome Project—The First Five Years*, NIH Publication No. 90-1590 (Bethesda, MD: National Institutes of Health, 1989).

[8] Edward J. Larson, "Half a Tithe for Ethics," *National Forum: Phi Kappa Phi Journal*, Spring 1993, pp. 15-17.

[9] Eric Juengst, "Human Genome Research and the Public Interest: Progress Notes on an American Science Policy Experiment," *American Journal of Human Genetics*, vol. 54 (1994), pp. 121-28.

[10] Personal communication, NIH Institute Directors' Briefing on the NCHGR, June 15, 1990.

genomicists, like the NIH official quoted above, saw it as at best a waste of (increasingly scarce) NIH research dollars, and at worst an overblown hand-waving that could backfire badly on the scientific community if it actually succeeded in getting the public's attention. Anti-genomicists suspected that the program was, at best, a clever attempt to create a screen of ethical smoke behind which the HGP's juggernaut could build up speed, and, at worst, an attempt to buy off the very critics who might otherwise make trouble for the scientists.[11] The Council for Responsible Genetics, a public interest group with its roots in the recombinant DNA debate of the 1970s,[12] announced that, although it shared an interest in the issues to be addressed by the ELSI program, it would not be approaching the NIH for financial support, in order to preserve the independence of its views.[13] Congress, incarnate in the form of appropriations subcommittee member David Obey (D, Wisconsin), heard from both sides, and pressed Watson hard at the next round of appropriations hearings in 1990 to explain his rationale and goals for this new program.[14]

Watson's actual responses to these questions at that time were earnest, but anecdotal and programmatic.[15] However, he would later say that what he meant was this:

> It is a twentieth-century truism that science is not done in a vacuum and should not be pursued as if it could be. Good science affects its social context, and the practical effects of good basic science are often the most wide-ranging of all. Science, in turn, is constantly affected by the professional norms, social policies and public perceptions that frame it. Doing science in the real world means anticipating those interactions and planning accordingly. By pursuing the study of the ethical, legal and social implications of its scientific initiatives, the NCHGR assumes its responsibility to help make that planning timely, well informed, and productive.... The genome project is very basic science indeed: by the same token, however, the potential for the social impact of the HGP is proportionately broad.... Doing the Genome Project in the real world means thinking about these outcomes from the start, so that science and society can pull together to

[11] Ruth Hubbard and Elijah Wald, *Exploding the Gene Myth* (Boston: Beacon Press, 1993), p. 159.

[12] After the development of the first effective technique for recombining isolated pieces of DNA, discussion within molecular biology of the possible "biohazards" involved in performing this "genetic engineering" between species yielded a self-imposed moratorium on this research. In the wake of this moratorium, a wider public reaction occurred, leading eventually to the establishment of a public federal review process for all "recombinant-DNA" research. For the history of this episode, see Sheldon Krimsky, *Genetic Alchemy: The Social History of the Recombinant DNA Controversy* (Cambridge, MA: MIT Press, 1982).

[13] Jonathan Beckwith, personal communication, February 11, 1990.

[14] Cook-Deegan, *The Gene Wars* (*supra* note 6).

[15] James Watson, "The Human Genome Project: Past, Present, and Future," *Science*, vol. 248 (1990), pp. 44–49.

optimize the benefits of this new knowledge for human welfare and opportunity.[16]

At its best, this position reflects a laudable willingness to look beyond the laboratory in conducting scientific work, in order to help society craft its science policy in an "evidentiary" rather than an "extemporaneous" fashion.[17] It is important to remember that the generation of molecular biologists behind the Human Genome Project were either personally involved in, or cut their scientific teeth during, the recombinant DNA debate (see footnote 12), and still look back on that episode as a success story of scientific self-policing. For (some of) them, participating reflectively in the public discussion of their work and incorporating the results into their research is accepted as a natural and necessary part of doing science, and the ELSI effort is what provides the resources, collaborations, and "data" necessary for doing that part.

At its crassest, this position is simply enlightened scientific self-interest. To the extent that the social environment of genetic research can influence their work, it makes sense for scientists to pay attention to developing a social context in which genetic research can flourish. If the Human Genome Project can help society develop policies that protect people from being harmed by genetic information, it helps create an environment conducive to its research program. From this perspective, it makes as much sense for a scientific resource-building project like the Human Genome Project to address the environmental factors that might inhibit the use of its tools as it does for it to address any other bottlenecks in its program.

Notice that under either interpretation, this "Watsonian" rationale for supporting social-impact studies assumes that the enterprise of genome research itself and the knowledge to be generated by it are unalloyed prima facie goods. There are dangers to be avoided in the responsible conduct of genome research, and abuses of genetic knowledge to be prevented; but the scientific goals of genome research and the biomedical strategy it supports—seeking for clues to the cure of disease at the molecular level—are accepted as intrinsically unproblematic. The question that the ELSI program addresses is the virtuous genome scientist's professional ethical question: "What should I know in order to conduct my (otherwise valuable) work in a socially responsible way?"

Clearly, this orientation does put some limitations on the ELSI program from the start. For example, it effectively forecloses any ELSI-sponsored

[16] James Watson and Eric Juengst, "Doing Science in the Real World: The Role of Ethics, Law, and the Social Sciences in the Human Genome Project," in George Annas and Sherman Elias, eds., *Gene Mapping: Using Law and Ethics as Guides* (New York: Oxford University Press, 1992), pp. xv-xviii.

[17] Benjamin Wilfond and Kathleen Nolan, "National Policy Development for the Clinical Application of Genetic Diagnostic Technologies," *Journal of the American Medical Association*, vol. 270 (1993), pp. 2948-54.

discussion of the relative value of the Human Genome Project compared to other uses of public funds. But perhaps this is as it should be. As George Annas and Sherman Elias, early grantees of the ELSI program, point out about their own list of "social policy research priorities for the Human Genome Project":

> Perhaps the most important social policy issue of all—should the Human Genome Project proceed at this time?—received no priority rating. This is unremarkable. The Project itself is not the appropriate funder for any research designed to give an "independent" or "objective" assessment of its own priority in scientific research.... In this regard, we found workshop participant Eric Lander's response to the question "Will the Human Genome Project distort research for molecular biology?" both instructive and accurate. His response: "It is much more likely to distort research in bioethics"[18]

Moreover, Eric Lander's wry point is another example of a problem that the ELSI program cannot take much direct interest in. It is true that an ELSI program could distort the research agenda of bioethics, by attracting scholarly attention to issues that, in the grand scheme of current issues in biomedicine and health policy, might not merit top priority. Again, however, if that is a public policy problem, it is not a problem for genomicists, who want to recruit as much of the best talent that they can to collaborate on their research. Hence, the question of the relative merits of a genetics-centered ELSI program compared with other public and professional bioethical needs is also not very high on ELSI's agenda.

So what should critics make of this Watsonian conception of ELSI, given the limitations it imposes on the program's domain? Genome scientists, nervous about the public policy consequences of "putting the cat on TV," can grant Watson's point about doing science in the real world, but still worry that his approach will distort the bioethicists' agenda too much: that is, that a mountainous amount of attention will be called to their problems which, in reality, are relative moral molehills. Is genome research really that problematic—so problematic as to be the only form of biomedical research to warrant the level of scientific caution represented by this unprecedented and ongoing funding for social-impact assessment?

Similarly, social critics who are worried about (their colleagues) being bought off by ELSI funds can applaud Watson's gesture, but still complain that the program's context ultimately prevents its grantees from being directly critical of the Human Genome Project itself. To take Annas and Elias's point further, how "objective" can ELSI grantees be about any issue that bears on genome research, when their funding is provided by

[18] George Annas and Sherman Elias, "Social Policy Research Priorities for the Human Genome Project," in Annas and Elias, eds., *Gene Mapping*, p. 275.

the genome research community on the assumption that genome research is a good to be protected?

A. Putting the cat on TV

Is the celebrity status that ELSI gives to issues in genetics threatening to simply make matters worse by alarming the public, overselling the risks of genome research, or even exacerbating them (e.g., by giving insurance companies ideas)? What is special about these issues? It has become commonplace to point out that the Human Genome Project will give us molecular information that we can use to develop new risk-assessment tools for genetically influenced diseases well in advance of corresponding therapeutic or prophylactic breakthroughs, and most authors point to that "therapeutic gap" as the source of genomics' special moral burden.[19] Granted, the possibilities of acquiring and using this genetic information about individuals entail all the choices for public and professional deliberation that ELSI-ites enumerate ad nauseam:

> Choices for individuals and families about whether to participate in testing, with whom to share the results, and how to act on them; Choices for health professionals about when to offer testing, how to ensure its quality, how to interpret the results, and to whom to disclose information; Choices for employers, insurers, the courts and other social institutions about the relative value of genetic information for the decisions they must make about individuals; Choices for governments about how to regulate the production and use of genetic tests and the information they provide, and how to provide access to testing and counseling services; and Choices for society about how to improve public understanding of science and its social implications and increase the participation of the public in science policy making.[20]

But clinicians have coped with similarly lopsided diagnostic challenges in other settings,[21] from HIV testing to cholesterol screening, without making a special issue of them: why should genetic diagnostics uncomplemented by treatments merit special attention?[22] Indeed, the NIH/DOE Task Force on Genetic Information and Insurance, put together under the auspices of the ELSI program, argued that, as DNA-based risk assess-

[19] F. S. Collins, "Medical and Ethical Consequences of the Human Genome Project," *Journal of Clinical Ethics*, vol. 2 (1991), pp. 260-67; J. R. Botkin, "Ethical Issues in Human Genetic Technology," *Pediatrician*, vol. 17 (1990), pp. 100-107.

[20] Watson and Juengst, "Doing Science in the Real World," p. xvi.

[21] George Guyatt et al., "The Role of Before-After Studies of Therapeutic Impact in the Evaluation of Diagnostic Technologies," *Journal of Chronic Disabilities*, vol. 39 (1986), pp. 295-304.

[22] John Maddox, "New Genetics Means No New Ethics," *Nature*, vol. 364 (1993), p. 97.

ments become relevant for a wider spectrum of multifactor health problems, the distinction between "genetic" and "nongenetic" diagnostics is increasingly indefensible for professional and public policy purposes, and should be abandoned.[23] The members of this task force point out that, as the nosological line between diseases defined genetically and those defined environmentally becomes blurred by the discovery of the reciprocal influence of both kinds of causal factors, and as the technological domain of DNA-based diagnostics (e.g., "genetic tests") expands to include nongenetic diseases (like HIV disease and malaria), it will become increasingly arbitrary to single out some subset of genetic diseases or genetic tests for special regulatory attention. To this extent, they concur with the skeptics about the wisdom of "putting the [Genome Project's] cat on TV."

There are three answers to such a challenge: an incomplete one, a short one, and long one. The incomplete response is to argue that, while the issues provoked by genome research are not new in kind, it is nevertheless true that as the number and range of new gene-based tests expands, these issues will become concrete problems for more and more health-care professionals, patients, and policymakers. As the frequency of these problems increases, it is argued, moral economies of scale will kick in to change the way the problems are framed and resolved. "The sheer volume of new information and new technologies promised—or threatened—by the Genome Project gives the old questions new urgency and hints that relatively novel ones will emerge."[24] "It is primarily the complexity of that broadened context that gives these issues their urgency as social policy making problems."[25] Well, this may be true; but so far no one has explained this response well enough to decide how one would go about deciding whether it is true or not. In what ways should we expect to see existing moral problems change as their frequency increases?

The short answer is less mysterious, but has dramatic consequences. This is to concede that, in fact, there is little to distinguish human genetics from other parts of biomedicine in terms of the urgency or importance of the social challenges it raises, and then to draw the opposite conclusion from the skeptic's. Perhaps *all* the institutes of the NIH should put aside resources to support social-impact studies of the basic science research they sponsor! This response was recently embraced by a Health Sciences Policy panel of the National Academy of Sciences/Institute of Medicine

[23] NIH-DOE Working Group on Ethical, Legal, and Social Implications of Human Genome Research, *Genetic Information and Health Insurance: Report of the Task Force on Genetic Information and Insurance* (Bethesda, MD: National Center for Human Genome Research, 1993), p. 19.

[24] Thomas Murray, "Speaking Unsmooth Things about the Human Genome Project," in Annas and Elias, eds., *Gene Mapping*, p. 247.

[25] Eric Juengst and James Watson, "Human Genome Research and the Responsible Use of New Genetic Knowledge," *International Journal of Bioethics*, vol. 2 (1991), pp. 99-102.

deliberating on how best to make public policy on bioethical issues, and led to the same conclusion:

> The committee recommends that the National Institutes of Health provide funding mechanisms to support (1) the exploration by individual investigators of social and ethical aspects of biomedical technologies as they are developed and (2) the creation of a social and ethical knowledge base for all of biomedical science (e.g., extend the ELSI program to other institutes and programs within the NIH).[26]

The long answer to the question "Why pick on genomics?" draws on the short but dramatic social history of human genetics. It begins by pointing out that, whether it is entirely rational or not, public policy discussions about new advances in genetics in our society do seem to be animated by moral and social tensions that do not characterize policy-making in other areas: there is a special public interest and concern that needs to be addressed, if only for prudential reasons.[27] The argument then goes on to spell out the special features of predictive genetic testing, genetic explanations of illness, the professional ethos of medical genetics, and the historical and cultural context of contemporary genetic research that generate and make sense of those tensions as indicators of substantive policy problems.[28] It suggests that, in fact, for both extrinsic and intrinsic reasons, there is something "special" about the generation of new genetic tools that warrants special societal scrutiny.

In essence, those who would develop and use new genetic risk information find themselves caught in the scissors-action of two broad forces: our society's inclination to invest genetic information with occult power to define our identities and predict the future, and the lessons of our long history with other attempts to use genetics for the public good. The former inclination is understandable enough, given the deterministic paradigms that the public uses to understand genetic health problems: diseases like Huntington's disease or Tay-Sachs disease that do unfold in a lockstep manner and eventually consume the carrier's identity. But it also leads to the overinterpretation of more uncertain risk assessments,[29] the stigmatization of mutation carriers,[30] and social discrimination by those

[26] Ruth Bulger, Elizabeth Bobby, and Harvey Fineberg, eds., *Society's Choices: Social and Ethical Decision-making in Biomedicine* (Washington, DC: National Academy Press, 1995), p. 179.

[27] Eleanor Singer, "Public Attitudes towards Genetic Testing," *Population Research Policy Review*, vol. 10 (1991), pp. 235-55.

[28] Eric Juengst, "Patterns of Reasoning in Medical Genetics: An Introduction," *Theoretical Medicine*, vol. 10 (1989), pp. 101-7.

[29] Neil A. Holtzman, *Proceed with Caution: Predicting Genetic Risks in the Recombinant DNA Era* (Baltimore: Johns Hopkins University Press, 1989).

[30] Evelyn Fox-Keller, "Genetics, Reductionism, and Normative Uses of Biological Information," *Southern California Law Review*, vol. 65 (1991), pp. 285-91; Daniel Brock, "The

who think they have been told the future.[31] The history of social discrimination is replete with examples of well-meaning programs gone awry, including the involuntary-sterilization programs of the eugenics movement,[32] the XYY and sickle-cell screening programs of the 1970s,[33] and the dilemmas of genetic counseling under the emphatically individualistic "client-centered" ethos to which genetics professionals currently subscribe.[34] For those willing to learn from experience, all these episodes bear evidence of the volatility of genetic interventions, and the need for approaching new developments with caution and forethought.

This long answer is the one on which the Human Genome Project primarily relies in explaining its investment in social-impact assessment. Since the long answer is elaborated in many other places,[35] I will not fill in its details here. But notice one thing in passing: according to the long answer, the real burden borne by new genetic tests is not their novelty at all. Rather, it is the context into which they are delivered and through which they are understood that is the source of the challenges they pose. This explains the significance of the "therapeutic gap" for the ELSI program. Genetic tests do not pose radically novel issues during this gap; rather, its just that this is when the new genetic tests are most traditionally "genetic." That is, it is during this technological gap that these tests behave most like our paradigms of genetic risk assessments (providing uncertain risk estimates of familial health problems we can do little about), and, as a consequence, pass on to their users the psychosocial burden and the professional ethical challenges traditionally associated with genetic explanations of illness. Against this backdrop of public and professional expectations, the prospect of a groundswell of new genetic tests is daunting. In the face of the pressures created by commercially driven efforts to disseminate convenient and technically accurate genetic risk assessments to a public that is likely to overinterpret the significance of the test results for themselves, their families, and their neighbors, geneticists must decide how much of their distinctive client-centered ethos they can afford to preserve, and policymakers must resolve regulatory dilemmas with long histories of controversy.

Human Genome Project and Human Identity," *Houston Law Review*, vol. 29 (1992), pp. 19-21; R. H. Kenen and R. M. Schmidt, "Stigmatization of Carrier Status: Social Implications of Heterozygote Genetic Screening Programs." *American Journal of Public Health*, vol. 49 (1978), pp. 116-20

[31] Dorothy Nelkin and Laurence Tancredi, *Dangerous Diagnostics: The Social Power of Biological Information* (New York: Basic Books, 1989).

[32] Philip Reilly, *The Surgical Solution: A History of Involuntary Sterilization in the United States* (Baltimore, MD: Johns Hopkins University Press, 1991).

[33] Troy Duster, *Backdoor to Eugenics* (New York: Routledge, 1990).

[34] Alexander M. Capron et al., eds., *Genetic Counseling: Facts, Values, and Norms* (New York: Alan R. Liss, 1979).

[35] Cf. Robert Weir, "Why Fund ELSI Projects?" in Robert Weir, Susan Lawrence, and Evan Fales, eds., *Genes and Human Self-Knowledge* (Iowa City: University of Iowa Press, 1994), pp. 189-95.

In other words, to the extent that the Human Genome Project has an unusually strong need for social-impact studies (compared to other biomedical initiatives), that need stems more from the unusual cultural environment in which genome research is being pursued than from the novelty, complexity, or "sheer volume" of its specific products. This, of course, is what one would expect, given the ELSI program's basic assumptions about the prima facie value of the Project's work and the ELSI program's own role as the Project's "environmental interface."

Moreover, one consequence of embracing the long answer I have just set out is that it puts a premium on studies that will help illuminate the dynamics of that historical, social, and cultural context, rather than on narrow efforts to keep up with the individual spin-offs of genome research. Indeed, this emphasis was present in the solicitation that announced the program in 1990: its broad-based menu of nine research needs still ranges from "individual psychological responses to knowledge of genetic variation" to "uses and misuses of genetics in the past" to "conceptual and philosophical implications of the Human Genome Project."[36] In turn, this contextual orientation has been reflected in the research portfolio that the program has begun to build over its first years of grant-making.

B. Ethics with strings attached?

There are also several ways to respond to the fear that the availability of research funding from the Human Genome Project will mute the voices of those who would otherwise be critical of genome research, either by professionally indebting them to the Project or by redirecting their attention "downstream" from the Project to its applications.

First, it is possible that at a subliminal level people's scholarly conclusions are influenced by their relationships with their funding sources: gratitude, intimidation, and funding-security anxieties could all come into play. But then, scholars who try for a grant and do not succeed, or those who conscientiously abstain from federal funding, are just as likely to be vulnerable to equally powerful subliminal influences: disappointment and frustration, or suspicion and pride. Either way, the influences are likely to be too subtle to do much about: they blend too quickly with all the other psychological background that any investigator brings to a study. As a result, it is hard to know what to do with this concern, except to be alert to systematic differences of opinion between the funded and unfunded that might expose some form of institutional pressure on the part of the NIH. Beyond that, it remains up to the professional integrity

[36] National Center for Human Genome Research, "Program Announcement: Ethical, Legal, and Social Implications of Human Genome Research," *NIH Guide to Contracts and Grants*, vol. 19, no. 4 (1990), pp. 23-26.

of the individual investigators to go where leads lead and to call conclusions as they see them.

Moreover, the ELSI program does have some built-in saftety features to buffer its researchers from this kind of influence. The principle virtue of the program's design as an extramural, investigator-initiated, peer-reviewed grant-making program is that it places the researchers as far as one can from government influence and still provide them with public monies. In this respect, the ELSI program takes special advantage of the system that American scientists have devised to protect their own scientific freedom in the face of their need for public assistance. Federally funded scientific studies have long been classified as "federal demonstration projects," which is the most unfettered form of federal support. The academic latitude that this gives to investigators is a constant source of tension for the rest of the Human Genome Project (because of the freedom it gives them to wander from the Project's stated goals); it is the ELSI program's primary means of insuring that its grantees' explorations of the context and implications of genome research are as unconstrained as possible. The fact that the one embarrassing political infringement on the sanctity of this system—the cancelation and subsequent reinstatement of a peer-approved ELSI conference grant—provoked a national controversy is an indication of how important and reliable a protection it usually provides.[37]

Finally, the contextual orientation of the ELSI program—that is, its focus on the cultural backdrop of genome research and its applications—also serves to foster critical inquiry about the HGP itself. Even though the program begins with a positive assumption about the value of genetic inquiry and asks the scientists' ethical question (How should we proceed?), it does not stop there. Inevitably, in examining the history, the conceptual assumptions, and the social context of *applied* genomics (e.g., DNA-based risk testing), the scholars pursuing these contextual studies will be lead to explore the culture, dynamics, and values of the genomic juggernaut itself. The proof here is already in multiple puddings. For example, sociologist of science Stephen Hilgartner began by studying the impact of the Human Genome Project on "small science" in molecular biology in order to assess the claims that the Project would damage the tradition of decentralized, independent research within the field. He now writes about the dynamics of priority setting within the HGP, including the dynamics of the ELSI program.[38] In the course of analyzing the assumptions about genetics conveyed to the public through the popular media, Dorothy Nelkin dissects the metaphors that genome scientists use

[37] See John Marshall, "Violence Research: NIH Told to Reconsider Crime Meeting," *Science*, vol. 262 (1993), pp. 23-24.

[38] See, e.g., Stephen Hilgartner, "The Human Genome Project," in James Peterson et al., eds., *Handbook on Science, Technology, and Society* (Newbury Park, CA: Sage, 1992), pp. 1-32.

to promote their work.[39] Historian Lily Kay turns an exploration of the influence of postwar information theory in molecular genetics into a critique of the tacit conceptual underpinnings of genome research.[40] Sahotra Sarkar uses the genome project itself as the central case for a philosophical study of the strengths and limitations of "genetic reductionism" in biomedicine.[41] And so on. Together, the contextual orientation and the academic freedom built into the ELSI program actually encourage efforts to press against the HGP's prima facie assumptions. As one geneticist remarked at the end of an ELSI review meeting: "This is the only federal science program I've ever seen that feeds the dogs that bite it."

Moreover, it is even conceivable that ELSI's bite could hurt the Human Genome Project. The juggernaut is remarkably delicate in some respects: it runs on an annual budget that is in the hands of elected public representatives. If enough ELSI-ites, having scrutinized, clarified, and evaluated the forces influencing the social impact of new advances in genetics, were to argue in a politically persuasive way that, all things considered, now is *not* the time for our society to pursue such a project, they could effectively derail the HGP. It is instructive here to recall the fate of the last major federal initiative in human genetics, the National Genetic Diseases Act, which established an elaborate network of regional genetic-services organizations in the 1970s, only to have the tap steadily turned off by the bad press garnered by its mass carrier screening programs.[42]

This should have brought us to the end of this essay. Unfortunately, you cannot please all the people all the time from a Glass House like the NIH. For some, the contextual, critical studies I have been describing are the realization of their worst fears about the ELSI program. Such studies are more often than not "qualitative" and "normative," involving methods from the humanities, jurisprudence, and the social sciences that seem inordinately hard to operationalize in a grant application (and sound ridiculous in most attempts). They rarely end with policy recommendations. They usually appear as books (and NIH scientists consider proposals for such books as quaint as you would your graduate student's request to produce her dissertation as an illuminated manuscript). They almost always represent nothing more authoritative than the personal views of the authors (and their arguments and evidence). And they do nothing immediate either to reform the enterprise of genome research or to help the world prepare to live in its wake. It was not long before the action-

[39] Dorothy Nelkin, "Promotional Metaphors and Their Popular Appeal," *Public Understanding of Science*, vol. 3 (1994), pp. 25-31.

[40] Lily Kay, "Who Wrote the Book of Life? Information and the Transformation of Molecular Biology," in Michael Hagner and Hans Rheinberger, eds., *Experimentalsysteme in den Biologische-Medizinschen Wissenshaften: Objekt, Differenzen, Konjunkturen* (Berlin: Academie Verlag, 1994).

[41] Alfred Tauber and Sahotra Sarkar, "The Human Genome Initiative: Has Blind Reductionism Gone Too Far?" *Perspectives in Biology and Medicine*, vol. 35 (1992), pp. 220-35.

[42] Cf. Duster, *Backdoor to Eugenics*, pp. 58-63.

oriented folk in ELSI's audience—the engineers,[43] clinicians, and activists—began to complain that the program just looked like a welfare program for underemployed philosophers. "We've had enough of this Hastings Center stuff," these critics cried.[44]

III. The ELSI Program and the Mechanistic Policy Worldview

It is this last critique—that ELSI cannot make policy—and the Human Genome Project's attempts to address it that have dominated the last two years of the ELSI experiment. In addressing this issue, the HGP has begun to build up a thick crust of problematic expectations about the ELSI program's role which, in my view, threatens to bury the very ability to put genome research in context that ELSI was created to provide.

The catalyst for this precipitate was in the ELSI mix from the beginning. The HGP did promise to "identify the most urgent issues and develop policy options to address them" in its first five-year plan; and when Representative David Obey pressed Dr. Watson for a plan for achieving practical results from his ELSI program, Watson was quick to reinterpret the program's promise as a policymaking agenda rather than a research goal.

In February and September 1990, two convocations of ad hoc external consultants were convened, both including the six consultants who had written the first five-year plan for the ELSI grant-making program in 1989 and both chaired by the chair of that initial working group, Dr. Nancy Wexler. This time, they met to help the NIH (and, by then, the DOE) to assign priorities among the program's issues for policy-development purposes, in response to Obey's queries. The two groups identified four categories of issues as "high priority areas" for policymaking purposes within the first five years of the HGP: (1) issues concerning the clinical integration of new genetic tests; (2) issues concerning the privacy of personal genetic information (such as genetic test results); (3) issues of unfair discrimination on the basis of personal genetic information (as in insurance underwriting and employment); and (4) issues in professional and public education. White papers were commissioned from outside experts on each of these topics, to help further refine the research agenda that the ELSI program might promote in each area.

By the end of the September meeting, however, the six consultants providing continuity from the prehistory of the ELSI program had also gained a distinct corporate identity as the "NIH-DOE ELSI Working

[43] Engineers make up a large cohort of "genome scientists," if not by professional affiliation then by personal inclination. The Human Genome Project, after all, describes itself as a "toolmaking" effort, and approaches its task accordingly.

[44] Leslie Roberts, "Taking Stock of the Genome Project," *Science*, vol. 262 (1993), p. 22.

Group," and a mission of their own. At Watson's urging to become "proactive," the group agreed to extend its life and expand its advisory role, by designing and coordinating special initiatives to address each of the four high-priority categories of policy issues. Each of these initiatives took a different approach to its goal of producing "policy options," each becoming a little ELSI experiment of its own. The stories of these initiatives are instructive:

1. *Clinical integration of new genetic tests.* The issues identified here were mainly issues of clinical policy and professional ethics: questions of when or for whom testing is "medically indicated," informed consent and confidentiality standards, pre-test education and post-test counseling practices, levels of professional skills and knowledge. In this sphere, the ELSI Working Group could take advantage of two time-honored approaches to professional policy development at NIH: contracting with the National Academy of Sciences/Institute of Medicine for a normative study by the professional leadership, and sponsoring clinical studies of the psychosocial impacts of genetic testing with an eye toward developing professional consensus statements from the results. The first approach produced a report containing a broad range of professional and public policy recommendations, which continue to percolate through the genetics community. In some cases, such as the recommendation that even routine newborn genetic screening (such as the testing for phenylketonuria that is performed in every state) be preceded by a clear informed-consent process, the report is generating controversy in its wake—while in others, such as its plea for increased health-professional education in genetics, it is not clear that anyone is listening.

The pursuit of the second approach fell to the NIH ELSI grant-making program, with a ready-made issue for its subject. The molecular mutations that cause cystic fibrosis were being elucidated, raising the prospect of direct heterozygote ("carrier") testing for the general population. Yet, against the backdrop of our history with mass carrier screening programs, most experts conceded that the health-care system was poorly prepared to provide such screening competently. Little was known about the public's interest in such testing, about the psychosocial consequences of such testing outside the context of specialized genetics clinics, or about the forms of education and counseling that best enable individuals and families to integrate such information into their health planning. In order to help develop the clinical standards for such testing, and to see whether, in fact, mass screening could feasibly be done in an ethically acceptable way, the NIH ELSI program solicited proposals for studies of these issues and created a consortium of clinical research projects from among the top-ranked applications. In the interim, the American Society for Human Genetics, the principal professional organization for medical genetics and a proponent of such preliminary clinical studies, endorsed this action by

issuing a statement urging caution with respect to cystic fibrosis carrier testing until these studies were complete.[45]

The NIH cystic fibrosis studies consortium is now in the process of compiling, comparing, and drawing professional policy conclusions from its three-year studies. Meanwhile, an important science policy precedent has been set for the introduction of new genetic risk assessments: that new genetic services should be evaluated in terms of their psychosocial impact on individuals and families as well as in terms of their medical safety, reliability, and utility. One contextual point underscored repeatedly by the social scientists, clinicians, and patient advocates involved in the cystic fibrosis studies is the need to develop and use client-centered criteria in assessing new genetic technologies. The promise of genetic information lies in its ability to allow individuals and their families to name, understand, and sometimes control their inherited health risks. Thus, if genetic testing and counseling are to be judged successful, it must be from the recipients' point of view, in terms of the recipients' ability to use the results to enrich their lives.

The power of this precedent is visible in the speed with which the notion of conducting preliminary "social-impact assessments" of new genetic tests has already been adopted and applied in other areas of genetic technology development: ELSI is already sponsoring a second consortium with the National Cancer Institute to assess genetic testing for cancer risk, and similar psychosocial research initiatives have been undertaken by the Heart Institute, the National Institute of Mental Health, and the National Child Health Institute.

2. *Genetic privacy protections.* The issues contained in this category are almost exclusively legal and public policy issues concerning the management of stored genetic information about identifiable individuals—either in medical records or systems of personal identification, like the Army's "DNA Dog-tag project."[46] For this privacy initiative, the Department of Energy's ELSI grant-making program took the lead, by more or less directly commissioning a cohort of studies designed to review the current state of personal genetic information collection and storage, and to draft model legislation for protecting the privacy of such information. The researchers who conducted these studies presented their work in 1994, and the model law they produced was introduced as a bill in the Maryland legislature in the spring of 1995. It remains under discussion in the 1995-96 session.

[45] American Society for Human Genetics (ASHG), "Statement of the American Society of Human Genetics on Cystic Fibrosis Carrier Screening," *American Journal of Human Genetics*, vol. 51 (1992), pp. 1443–44.

[46] Nachama Wilker et al., "DNA Data Banking and the Public Interest," in Paul Billings, ed., *DNA on Trial: Genetic Identification and Criminal Justice* (Plainview, NY: Cold Spring Harbor Laboratory Press, 1992), pp. 141-51.

3. Genetic discrimination prevention. The issues involved in the exclusionary use of genetic test results by employers or insurers were also clearly public policy questions. On discrimination by employers, the ELSI Working Group was able to look to the recently passed Americans with Disabilities Act (ADA) for help, and to query the Equal Employment Opportunity Commission (EEOC) about that law's prospects for preventing exclusionary genetic screening by employers.[47] This relatively simple action provoked a three-year cascade of behind-the-scenes argument and political negotiation between the EEOC, ELSI grantees active on the issue, the Senate Committee on Disability Policy, and the Justice Department—negotiations which have only recently been concluded. The EEOC had initially responded negatively to the inquiry, arguing that because genetic risk assessments and carrier tests did not identify existing disabilities, only diagnostic genetic tests could legitimately be counted among the preemployment "medical exams" which the law forbids employers to use in selecting applicants. Now, the EEOC agrees that for the purposes of implementing the ADA, all forms of preemployment genetic testing fall under the law's protection.[48]

On the issues involved in the use of genetic risk information in insurance underwriting, the ELSI Working Group took yet another approach. These were issues that already involved clear stakeholders: the life and health insurance industries, consumer and public-interest groups, and the state government officials who are charged with regulating insurance practices. Under the leadership of two Working Group members, a separate group of consultants was created, composed of representatives from each of these constituencies and the set of ELSI grantees studying these issues. Leaning heavily on conceptual and empirical work from the grantees, the resulting report argued that the only secure way to prevent "genetic discrimination" in this context would be to reform the health-care system to do away with the need for individual risk underwriting altogether. Specifically, they recommended that:

> 1. Information about past, present, or future health status, including genetic information, should not be used to deny health care coverage to anyone....
>
> 2. The U.S. health care system should ensure universal access to and participation by all in a program of basic health services that encompasses a continuum of services appropriate for the healthy to the seriously ill....

[47] National Institutes of Health-Department of Energy (NIH-DOE) Joint Working Group on Ethical, Legal, and Social Implications of Human Genome Research, "Genetic Discrimination and the Americans with Disabilities Act," *Human Genome News*, vol. 3, no. 3 (1991), pp. 12-13.

[48] Rick Weiss, "Gene Discrimination Barred in Workplace," *Washington Post*, April 7, 1995) p. A3.

> 3. The program of basic health services should treat genetic services comparably to non-genetic services, and should encompass appropriate genetic counseling, testing, and treatment....
>
> 4. [T]he cost of health care coverage borne by individuals and families for the program of basic health services should not be affected by information, including genetic information, about an individual's past, present or future health status....[49]

This report was submitted to the White House Task Force on Health Care Reform in 1992, and Hillary Clinton, the chair of the task force, was subsequently briefed on its recommendations by the chair of the ELSI Working Group, Dr. Nancy Wexler (between courses at an awards dinner). The argument of the report became part of Mrs. Clinton's public case for health-care reform, and its specific recommendations were incorporated in the administration's health reform bill, the Health Care Security Act of 1993. Along the way, the ELSI Insurance Task Force dissolved and a committee of public-interest lobbyists and lay organizations was created in its place ("the Coalition of People with Genes") to press the task force's point with Congress. The rest (unfortunately) is history, in the wake of the Clinton administration's failure to realize its health-care reform proposals.

4. Genetics literacy. Even the best-crafted professional and public policies will not prevent the misuse of genetic information if those who collect and use it do not understand its significance correctly. One perennially and universally safe goal for the ELSI program to espouse has always been professional and public education. Skeptics at both ends of the spectrum agree that education is important—even though, in practice, one or the other camp is always upset by the content of any particular educational project.

Here, the focus of the Working Group's special initiative was to be a series of public forums on new advances in genetics, which could serve both to promote public awareness and discussion of the issues, and to solicit public input into the ELSI planning process. In fact, while twenty such local forums have now been sponsored by the ELSI program in almost as many states, only one was hosted by the ELSI Working Group itself, the one held in Iowa City in 1993. The rest have been sponsored through the extramural grant-making program, and organized by local hosts.

Two things about this group of four "high-priority" initiatives are worth noticing. First, all these initiatives really are focused downstream from the Human Genome Project itself. One of the interesting criticisms that

[49] NIH-DOE Joint Working Group, "Genetic Discrimination and the Americans with Disabilities Act," p. 2.

eventually started coming from the genome scientists was that the ELSI Working Group was "losing touch with genome science" and pursuing social problems for which the Human Genome Project had no reason to take responsibility. "If the Working Group wants to reform the health-care system, let Hillary pay for it," one frustrated scientist grumbled, in lobbying to add more scientists to the group in order to focus it (self-critically?) on the problems facing genome researchers themselves.

Secondly, none of these initiatives really depended on the active participation of the ELSI Working Group to be brought to conclusion. Unlike a grantee consortium, or even the expert panel brought together by the National Academy of Sciences, the ELSI Working Group as a corporate body does no work itself. It lacks the opportunity for sustained deliberations, and the common focus required for concerted action. Individual members of the group have been quite active in these initiatives, but usually while wearing other hats, as contractors or grantees of the ELSI program, members of the Institute of Medicine panel, or chairs of ELSI satellites like the Insurance Task Force. The driving forces in accomplishing what has been done across all of the program's "high-priority areas" have been the grantees who have gotten involved: people who have a stake in the specific issues because of their own professional and scholarly commitment to illuminating the contexts that create them.

Unfortunately, even this fact was not apparent at the midpoint of the ELSI program's first five years, when none of these initiatives had yet been brought to fruition. This was the point at which the House Committee on Government Operations convened a hearing on the federal management of genetic information as part of a series of hearings in support of an (ultimately unsuccessful) bill that would have established a Data Protection Board in the United States. NIH Director Dr. Bernadine Healy testified on behalf of her agency, reporting on the protections currently provided for genetic information gained through federally sponsored research and on the efforts of the U.S. Human Genome Project to anticipate and address such issues through its Ethical, Legal, and Social Implications (ELSI) programs.[50] Her description of the ELSI program focused on its mission of cultivating, through research, the information that would be necessary to address public policy issues involving genetics in a responsible way.

In response to these hearings, the Committee on Government Operations released a report on April 2, 1992. The report concluded that, while the existing ELSI programs were well designed to support extramural research and education, they "had no process" for developing or presenting policy recommendations to Congress in a timely, authoritative, and

[50] Bernadine Healy, "Testimony on the possible uses and misuses of genetic information," *Human Gene Therapy*, vol. 3 (1992), pp. 51-56.

independent fashion; and it recommended that a formal advisory commission be established jointly by the Secretary of Health and Human Services and the Secretary of Energy to provide that service.[51] The committee ignored the ongoing efforts of the ELSI Working Group entirely, but commented that, in any case, it would be too narrow a group to develop proposals with enough constituency support to be persuasive to policymakers.[52]

The ELSI program's lack of formal policy-development "processes" or "mechanisms" for getting the attention of policymakers quickly became a handle for other observers and science policy analysts unwilling "to wait until the extramural cows come home" for ELSI policy options. Citing the committee's report, the Office of Technology Assessment described the ELSI program a year later this way:

> The program operates on the model of peer review competition for grant funds. The ELSI Working Group, which advises both [the NIH and DOE ELSI grant-making programs], initially framed the agenda and establishes priority research areas. Nevertheless, the nature of the grant programs means the ultimate direction evolves from the bottom up—i.e., from the individual perspectives of researchers pursuing independent investigations—rather than from the top down—i.e., through policymakers or an overarching federal body. Furthermore, no formal mechanisms exist for ELSI-funded research findings to directly make their way back into the policy process.[53]

Two years later, a National Academy of Sciences/Institute of Medicine (NAS/IOM) background paper on the ELSI program still cites the committee's report, and concludes that

> [t]he basic flaw in the design of the ELSI program and its working group is that it has no authority to affect policy and no clear route for communicating the information it gathers to the policy arena.... There is no mechanism for ensuring that the results of these scholarly pursuits will make their way back to the policy arena unless one

[51] Committee on Government Operations, House of Representatives, U.S. Congress, *Designing Genetic Information Policy: The Need for an Independent Policy Review of the Ethical, Legal, and Social Implications of the Human Genome Project* (Washington, DC: U.S. Government Printing Office, 1992).

[52] It could have also pointed out that, in the eyes of the Federal Advisory Committee Act, the ELSI Working Group does not even exist between its meetings: strictly speaking, it is reconstituted for each meeting as a new "working group."

[53] Office of Technology Assessment, U.S. Congress, *Biomedical Ethics in U.S. Public Policy—Background Paper*, OTA-BP-BBS-105 (Washington, DC: U.S. Government Printing Office, June 1993), p. 8.

relies, in the words of one grantee's abstract, on absorption of the facts by "a general audience of intelligent readers."[54]

Against the backdrop of the policy initiatives described earlier in this section, the complaint that ELSI lacks "policy mechanisms" is quite mysterious. Granted, there is no single vehicle that ELSI always uses to deliver its findings "to the policy arena." But the issues that the ELSI program addresses span a number of policymaking spheres, from institutional to professional to public. In adapting its approach to each sphere, ELSI takes advantage of the "mechanisms" that seem most effective within that sphere. Thus, to speak authoritatively to health professionals, it combined the voice of the professional leadership (through the NAS/IOM) with a form of argument which that profession respects (peer-reviewed empirical research studies). To communicate public policy options, it can digest research into "reader-friendly" reports (like the Insurance Task Force Report), convey them freely to other government entities (like the White House Task Force or the EEOC), and use all of Washington's usual informal "mechanisms" (like personal contact) to get the attention of policymakers. To embarrass industry, it can make statements to the press (like the statement on recent efforts to commercialize genetic testing for breast-cancer risks). From the evidence, in fact, it appears that ELSI's repertoire of "policy mechanisms" is as robust as anybody else's inside the beltway. Certainly, for a program primarily designed to support academic research, ELSI has had a particularly active track record in the "policy arena."

Nevertheless, this running commentary on ELSI's policy potency did come at a particularly sensitive period in its history. By 1993, the program had disbursed over $10 million,[55] but its only visible "products" had been its initial round of introductory conferences and the first wave of academic publications on the "contextual studies" that had been born from those meetings. It was into this situation that Francis Collins stepped when he became director of the NCHGR after Watson resigned.

Collins came to NIH fresh from his experience as a clinician and researcher working on familial breast cancer, and, as he put it, he felt personally responsible for potentially "putting thousands of women at risk of discrimination" by helping to find the breast-cancer gene.[56] Against that frame, his own view was (and presumably remains) that the ELSI program should put practical matters first and reflect on the Genome

[54] Kathi E. Hanna, "The Ethical, Legal, and Social Implications Program of the National Center for Human Genome Research: A Missed Opportunity?" in Bulger, Bobby, and Fineberg, eds., *Society's Choices* (*supra* note 26), pp. 432–58.

[55] The same amount that went to one genome researcher, Eric Lander, that year alone—just to keep things in perspective!

[56] Cf. Barbara Biesecker et al., "Genetic Counseling for Families with Inherited Susceptibility to Breast and Ovarian Cancer," *Journal of the American Medical Association*, vol. 269 (1993), pp. 1970–74.

Project's "environmental interface" only when it has the luxury to do so. At an ELSI Working Group meeting in December 1993, he argued strongly that the program should reorient itself to allow the Working Group to function more effectively as a deliberative, policymaking body. According to the critics, this would require expanding the group to improve its representation of various stakeholders, finding for it a legitimate niche in the advisory-committee structure of the NIH and the DOE, providing it with its own research staff, giving it the resources to directly commission and contract for studies related to its policy initiatives, and, of course, providing it with a clear "policy mechanism" for delivering its conclusions.

To Collins's credit, instead of funding this new activity out of the "fat" in the ELSI portfolio, as some had proposed, he followed Watson's lead: he committed funds out of the budget for his new intramural genome laboratories to support two professional staff positions for the ELSI Working Group. The Working Group has also now been significantly expanded to include representatives from the clinical professions, lay constituencies, and genome scientists. It has settled on the "task force" model that produced its insurance report as its official "mechanism" for promulgating policy, and has already launched a new Task Force on Genetic Testing to explore the regulation of commercial DNA-based diagnostics. Its new mission statement reads: "The National Advisory Council for Human Genome Research (NIH) and the Health and Environment Research Advisory Council (DOE) delegate responsibility to the ELSI Working Group to explore and propose programmatic and policy options for the development of sound professional and public policies related to human genome research and its applications."[57]

One consequence of this shift, of course, has been a corresponding de-emphasis of the role of the extramural community in monitoring, shepherding, and nurturing ELSI's policy agenda. Plans to convene the subsets of grantees working on related issues in order to harvest their ideas have slipped to the back of the stove. Plans for a new extramural funding category to support interdisciplinary graduate training relevant to the study of ELSI's issues have been tabled. "Contextual" studies of the historical background, philosophical assumptions, and cultural underpinnings of the Genome Project's environmental interface require increasingly prolonged post-peer-review defense by staff in order to be awarded.

As I suggested above, ELSI's ability to weave together its community of researchers into a variety of policy initiatives tailored to specific spheres does give it the "mechanisms" to do exciting policy work. But to the extent that it is the program's extramural resources that make it special, redirecting the program's energy and the public's attention to the ELSI

[57] NIH-DOE Joint Working Group on the Ethical, Legal, and Social Implications of Human Genome Research, "Mission Statement," December 1, 1994.

Working Group is risky. By recasting itself in the image of a deliberative commission, the Working Group is preparing to play its critics' game, and that is a mistake. Fortunately, there is a vision for the program that makes sense of all its activities to date, and can be translated readily into a blueprint for future development. This is the vision of ELSI as supporting an ongoing community of scholars and professionals devoted to tracking, analyzing, and developing policy on new advances in human genetics.

IV. Reinventing ELSI

A. The ELSI program's mission

The ultimate purpose of the ELSI program is to help society and the scientific community successfully resolve the ethical, legal, and social issues that are raised by new advances in human genetics. But that is true only in the same way that the ultimate purpose of the Human Genome Project is to help science successfully answer the biological questions raised by the association of genes with DNA. Helping society resolve issues is the program's purpose, but its mission must be more focused than that if it is to be effective. The HGP focuses its helping mission on building the tools and infrastructure that will be required (by others beyond the HGP) to answer the fun biological questions. In the same way, the ELSI program should focus its helping mission on building the tools and infrastructure that will be required (by others beyond the ELSI program) to resolve the hard issues.

Specifically, the ELSI program's mission should be to build two things that will be prerequisites for society's successful resolution of genetics issues: (1) the body of knowledge necessary to anticipate new issues and assess arguments for and against policy options, and (2) the community of informed and committed people, professional and lay, required to generate and use the body of knowledge in a sustained policy-development process.

Just as the technical programs at the NCHGR support and facilitate the genomics community's autonomous efforts to achieve its members' scientific goals, the ELSI program should proceed on the assumption that effective social and professional policymaking is best pursued by researchers and policymakers in the field, working directly with their colleagues in the affected constituencies. In other words, the ELSI program's own involvement in policy development should be to serve as an "uncommission": an institutionalized source of support that sustains an evolving network of independent policymaking initiatives in different spheres.

The rationale for drawing ELSI's mission this way is fourfold:

1. It acknowledges the true complexity of the ELSI challenge. Resolving the ethical, legal, and social issues raised by new advances in human genetics means enacting new public policies, reforming professional practices, and influencing basic assumptions and beliefs in the public mind. These are not goals that any single program, commission, or initiative can

hope to accomplish on its own during a fifteen-year span, any more than the larger purpose of the HGP—understanding all the genes—could be so achieved. Building expectations on the part of Congress, the public, or the scientific community that ELSI can "make the world safe for genomocracy" in short order, only lays the basis for disappointment and frustration with the program.

2. On the other hand, cultivating a community and a body of knowledge is the most important contribution the HGP can make at this time to help society meet the larger challenge. The program could focus its resources on getting specific, high-profile tasks accomplished: e.g., a particular genetics privacy law or educational campaign. But without a growing knowledge base or a stable community of people who know how to use it, such achievements would be ephemeral and quickly outdated. If one looks at the ELSI challenge as analogous to a civil rights campaign, history suggests that before major legal changes will be possible, the growth of committed constituencies armed with knowledge will be necessary.

3. This vision plays to the strengths of the ELSI program. The ELSI program is not well positioned to directly resolve genetics issues. To that extent the program's critics are right: the ELSI program has no authority to directly formulate public policy, no resources to provide timely ethics consultations on professional practices, and no capacity to help members of the public with their individual problems. On the other hand, the ELSI program does have the authority, resources, and capacities to provide support for generating knowledge and cultivating a community that can apply that knowledge. This is, arguably, what the NIH does best.

4. Finally this mission reflects the advice of ELSI's most knowledgeable advisors. In preparing for the HGP's second five-year plan, the ELSI program undertook a five-step process of gathering advice about the program's mission and priorities from the ELSI research and education community, the public, and the scientific community. The resulting planning summary stresses the need for ongoing efforts in multiple areas of research and community building, not the need for ELSI to act as a commission or to pursue mass-education campaigns.[58]

B. The ELSI program's methods

The ELSI program can best achieve its mission by using the grant-making and contract-letting authorities and mechanisms of the NIH to support six kinds of projects:

1. Reconnaissance papers. These are commissioned papers which survey current knowledge and forecast research and policy needs with respect to

[58] NIH-DOE Joint Working Group on Ethical, Legal, and Social Issues, *Five Year Planning Summary* (Bethesda, MD: NIH, April 15, 1993).

newly emergent ELSI issues. This has proven an efficient mechanism in several contexts: in the first year of the program, commissioned papers on cystic fibrosis screening, insurance issues, and employment-discrimination issues helped set the stage for subsequent programmatic initiatives; and the papers that were commissioned in 1992 on human-subjects issues in genetic family studies were instrumental in subsequent policy development at the NIH Office of Protection from Research Risk. The DOE privacy collaboration also involves a number of commissioned papers. However, this activity has never been regularized as a part of the program. If it were, it would provide the program with a vehicle for following up on new issues raised to its attention by the community and its advisory groups, and would further the program's knowledge-building mission. If $100,000 were devoted to supporting ten major commissioned papers a year, the program could respond quickly to almost all new needs, and would have an annual set of interim products to use in stimulating the community.

2. *Descriptive studies.* These are research projects that seek to discover information relevant to anticipating and addressing ELSI policy issues. One advocate of science education argued to me that "[p]eople will always ponder the ethical issues; but education projects just won't get done without ELSI support." But good pondering requires good facts, and good facts require research, which costs money. The research required for clear pondering includes not only psychosocial-impact and health-services studies performed to assess new genetic-testing modalities in the clinical setting, but also background studies of the economic, cultural, and historical context of new genetics services, public and professional attitudes and understandings of genetics concepts, and the philosophical assumptions underlying different policy approaches to genetics issues. These studies are not expected to yield particular policy recommendations, but aim at getting straight about the facts.

3. *Normative (policy) analyses.* These are research projects that seek to construct, compare, criticize, and defend arguments for and against particular policy positions on specific genetics issues. Pondering may be spontaneous, but actually developing a persuasive case for a particular public or professional course of action requires hard work. This work includes not only projects designed to produce recommendations for public policies, regulations, legislation, and standards governing professional or clinical practices, but also basic (e.g., theoretical) legal and ethical analyses of particular issues and basic background critiques of the value assumptions that underlie different positions on the issues. Without the latter, the former proceed in a vacuum.

4. *Policy conferences.* These are conferences that are designed to bring together researchers and policymakers to facilitate the development of sound policy options. Meetings, consultations, and workshops, as tiresome as they sometimes are, are necessary tools for synthesizing research results and achieving the critical mass of human resources to galvanize

policy development. In order to make a success of ELSI's initial goals, I would propose using these vehicles heavily over the coming year to flush out the policy lessons of the program's current research portfolio.

5. *Education projects.* These are education and public-participation projects designed to alert different communities to ELSI research findings and policy recommendations. In line with the program's basic mission and goals, the education projects ELSI supports should be primarily focused on efforts to build infrastructure for ongoing policymaking on genetics issues. As a result, efforts to enhance ELSI components of teacher training, health-professional education, and science-education policy should be emphasized, as should efforts to build stable forums for grassroots public participation in ELSI policy development. Less important are ephemeral (but expensive) public education efforts like television series and specific (quickly dated) educational tools. Science education per se is part and parcel of producing more informed understandings of ELSI issues; but the ELSI program should not be held responsible for ensuring the genetics literacy of the American public.

6. *Training grants.* These are training grants to help develop professionals with a commitment to ELSI research and policymaking. Part of the community-building mission of the ELSI program is to train professionals who are capable of moving easily between the scientific and policy worlds. ELSI currently supports only postdoctoral cross-disciplinary training, partly because there are no clear training sites that could support full-blown graduate programs. As research and education projects accumulate at particular institutions, however, centers of ELSI inquiry are emerging across the country—centers which could support interdisciplinary training programs. To ensure the future of the ELSI program's mission, the program could begin to support predoctoral graduate training grants as well. This would be a new category for ELSI, but one which fits its mission statement and which the community is ready to pioneer.

C. The role of the NIH-DOE ELSI Working Group

The ELSI program has benefited tremendously from the advice and energy of the Working Group in helping NIH and DOE experiment with different visions of the program's mission. One vision that the program is not too well equipped to fulfill is the vision of the Working Group as an independent policymaking commission to which members of the community can submit their findings for analysis. By their nature, "working groups" have an episodic existence, which is a weakness for this vision (though a strength for others). If our society needs a policymaking commission that can cover genetics issues, the Working Group might lobby for its creation, but should not volunteer to take on its responsibilities.

On the other hand, the vision of ELSI's mission described above would allow the Working Group to take on a leadership role that can play to the program's strengths. In brief, the Working Group's job would be to help

the ELSI program capture the body of knowledge and nurture the community that it was meant to create. It would do so by providing the main forum in which the ELSI program grantees are brought together with relevant policy people and the public to report and discuss their results. By providing the institutional memory that links the variety of "policy conferences" that will be needed to harvest the first round of work, the Working Group could be in an excellent position to highlight important recommendations for those who need to hear them, and to identify new information-gathering needs. These are tasks that the episodic nature of the group's existence can accommodate, and tasks which would actually help the larger program succeed in achieving its goals.

Again, the great opportunity for the Working Group is to function as the hub of the "un-commission" on ELSI matters and to be the midwife of a new field and its community.

V. An ELSI Success Story

Is there any evidence from the annals of ELSI that the advice I have given in the previous section is sound? Yes. In fact, one of ELSI's most influential policy initiatives to date attests to its merits, because this initiative was also almost entirely a creature of the extramural community's "contextual" explorations.

Because research on isolating and identifying disease genes often involves extended, geographically dispersed families, researchers face questions which current regulations for research with human subjects simply do not address.[59] These include questions concerning strategies for recruiting extended-family members, the relevant risks to disclose during the consent process, and the subsequent research use of collected tissue samples; they also include questions of confidentiality—for example, questions about access to study data by subjects and their families, and about the publication of family pedigrees and research results. These questions, internal to the conduct of the Human Genome Project but relevant to much else besides, were never on the ELSI Working Group's list of "high-priority" areas for policymaking. They did not even make it onto the broad menu of topics on which the grant-making program solicits applications.

Questions about the research ethics of gene-hunting studies were originally raised for the ELSI program by scientists and genetic disease support-group members (e.g., research subjects) at one of the (much maligned) early agenda-setting conferences sponsored by the program in February 1991. This led to a second funded meeting, sponsored by the American Association for the Advancement of Science (AAAS) in June 1992, to

[59] Cf. Robert Levine, *The Ethics and Regulation of Clinical Research* (New York: Urban and Schwartzenberg, 1986).

assess the professional state of the art in this area. Genetic family studies, after all, have been conducted for at least as long as our twenty-year-old set of federal research rules has been around: surely by now institutions and research teams have developed policies and procedures for addressing these questions.

What emerged from the discussion at the AAAS meeting was that, indeed, research groups from across the field did have homegrown answers to these questions, of whose merits they were convinced. But no one seemed to have quite the same approach, and some of the differences left scientists in heartfelt disagreement. Should one routinely modify pedigree data in order protect the confidentiality of one's subject family in publication? Is it appropriate to use a family member to recruit her relatives into a study, or is it better to contact extended-family members out of the blue to solicit their participation? What does it mean when a subject insists on his right to "withdraw" from a pedigree study? Are subject's entitled to your flaky early results, or only to solid (e.g., publishable) findings about themselves? Geneticists were reading from the same rule book, but with contradictory results. The AAAS recommended that perhaps this was a topic on which the NIH Office of Protection from Research Risk (OPRR), charged with interpreting the federal research regulations, should provide a reading.[60] In response, the NCHGR and the OPRR collaborated in October 1992 to bring to town a group of geneticists, ELSI grantees, and self-styled ethicists to develop improved guidance for investigators and research review boards considering genetic studies involving families. Within the year that followed, the deliberations and suggestions from that meeting were developed as a new chapter for the OPRR's *Institutional Review Board Guidebook*, a concordance of commentary and interpretation of the federal research regulations that is supplied to every institutional review board in the country.[61] Just the rumor that the OPRR was going to make suggestions in this area prompted some leading genetic research institutions (the University of Utah, Johns Hopkins, and even the NIH Clinical Center) to develop preemptive (and stricter) institutional policies of their own.

Moreover, that was not the end of the story. First, the major family and patient organization for people with genetic diseases, the Alliance of Genetic Support Groups, produced a brochure for its constituency that recasts the OPRR's points for institutional review boards to consider, in the form of questions for families to ask of investigators when approached about participating in genetic studies.[62] That brochure, distrib-

[60] Fred Li et al., "Recommendations on Predictive Testing for Germ-Line P53 Mutations among Cancer-Prone Individuals," *Journal of the National Cancer Institute*, vol. 84 (1992), pp. 1156-60.

[61] Office of Protection from Research Risk, *Protecting Human Subjects: Institutional Review Board Guidebook* (Bethesda, MD: OPRR, NIH, DHHS, 1993).

[62] Alliance of Genetic Support Groups, *Informed Consent: Participation in Genetic Research Studies* (Chevy Chase, MD: Alliance of Genetic Support Groups, 1993).

uted in bulk to the two hundred different organizations that make up the alliance, will help ensure that where institutional review boards neglect to ask these questions of investigators, their subjects are increasingly likely to do so themselves.

Next, the Council of Biology Editors, the professional organization for biomedical journal editors, became interested in the controversy over the appropriateness of "disguising" identifiable family pedigrees for publication in lieu of getting permission from subjects to publish clinical information about them. The council released a statement condemning the (widespread) practice, following closely the lines of argument elaborated by a philosopher grantee, Madison Powers, who wandered into this issue while thinking about what we could possibly mean by "genetic privacy."[63]

Next, researchers at the Centers for Disease Control (CDC) become interested in the questions involved in research with identifiable stored tissue samples, since they realized they had been transforming cell lines for genetic studies from identified blood samples collected as part of their national health survey, without ever having asked the donors to consent to genetic research. Two joint NIH/CDC workshops have now been held on this topic, and a lengthy position paper has been produced.[64] It is already being echoed by professional society statements as preferred policy in this area.[65]

Finally, into the midst of all this discussion fell the population geneticists' proposal for a sequel to the Human Genome Project: the Human Genome Diversity Project. This would involve the collection and genotyping of DNA samples from five hundred of the world's isolated indigenous populations, and the preservation of these samples as a research resource for studies of human migration, lineage, and evolution. At yet another workshop held in March 1993 to discuss the research-ethics issues involved in conducting such a project, Bill Schneider, a historian of science who received funding from ELSI and the National Endowment for the Humanities to trace the history of the genetics of "race" in prewar hematology, accurately forecast the negative political reaction of Third World interests to such a project.[66] This workshop led to the creation of an "ethics committee" for the project, whose main function has been to open lines of communication between the population scientists and the advocates for those whom they would study. Meanwhile, unlike the Human

[63] Madison Powers, "Publication-Related Risks to Privacy: Ethical Implications of Pedigree Studies," *IRB*, vol. 15 (1993), pp. 7-11; International Committee of Medical Journal Editors, "Altering Data for Publication," Statement to the Office of Protection from Research Risk, December 14, 1994.

[64] Ellen Clayton et al., "Informed Consent for Genetic Research on Stored Tissue Samples," *Journal of the American Medical Association*, vol. 274 (December 13, 1995), pp. 1786-92.

[65] American College of Medical Genetics, "Statement on Storage and Use of Genetic Materials," *American Journal of Human Genetics*, vol. 57 (1995), pp. 1499-1501.

[66] Margaret Locke, "Interrogating the Human Genome Diversity Project," *Social Science and Medicine*, vol. 39 (1994), pp. 603-6.

Genome Project, it is the ethical complexity of the Diversity Project which has become the primary challenge to its advancement: so far, only the National Science Foundation's physical anthropology program has expressed interest in having the Diversity Project proceed before its proponents establish better relations with its potential subjects, while both the DOE and the NIH have demurred.[67] Not that ELSI should be proud to stand in the way of progress, but here is a striking example of ELSI considerations being used self-critically by federal science to put the brakes on a juggernaut.

Notice that throughout the cascade of policymaking in this story the "mechanisms" that were key to its progress were the arguments, insights, and initiative of people whose participation in the "policy arena" was unplanned and unpredictable. Bring a historian to a population-genetics planning meeting? Ask a philosopher to consider biomedical publication practices? Invite lay support groups to help design a scholarly research agenda? It was the "un-commission" working at its best.

VI. Conclusion: Time for the Un-Commission?

It is important to notice that almost all those who have criticized the ELSI program for lacking "policy mechanisms" have done so in pursuit of another agenda: building the case for the creation of some new federal body intended to develop policy on ethical, legal, and social issues in biomedicine. Part of making that case, of course, is demonstrating that no existing federal program, like the ELSI program, can meet the needs that the new entity would satisfy. To that extent, many of ELSI's troubles have been the result of "friendly fire" in the campaign to recreate a national forum in the U.S. for bioethical policymaking.[68]

It has been friendly fire because up until now, the Human Genome Project has been happy to lend its voice to that campaign. The HGP presents its own efforts to "upgrade" the ELSI Working Group as an admittedly stopgap measure, necessitated only by the absence of some overarching federal bioethical policymaking body to which ELSI grantees could report their research findings. Presumably, if a national commission were established, the ELSI program could relinquish its quest for policymaking mechanisms, and return to supporting a field of inquiry. Of course, that would mean scraping off again all the accoutrements of deliberative policy analysis that have been allowed to build up on the ELSI Working Group along with its policy promises. That might turn out to be more

[67] Francis Collins, "Statement on the Human Genome Diversity Project," Senate Committee on Government Affairs, Hearings on the Human Genome Diversity Project, April 26, 1993.

[68] For a history of the country's other efforts at national bioethical commissions, see Office of Technology Assessment, U.S. Congress, *Biomedical Ethics in U.S. Public Policy* (*supra* note 54), Appendix A.

difficult than it sounds, since a busy National Bioethics Commission could easily see ELSI as a useful place to delegate its responsibility to address genetics issues.

In the wake of the recent national political convulsions in the U.S., however, I wonder if even a National Bioethics Commission is as attractive a prospect as it once was for protecting the public interest in this area, compared with the un-commission model. For a while in the early 1990s, it looked as if the federal door was open again to establish an effective bioethics commission: health-care reform, the radiation research commission, and the Genome Project all seemed pointed in the same direction. But now that the White House Health Care Task Force Ethics Group and the NIH Embryo Research Panel have joined the Congressional Bioethics Board and the NIH Fetal Tissue Panel as frustrated efforts at national bioethical deliberations, it raises the question of whether a national body can really be much more successful than the ELSI program at "communicating its policy recommendations effectively." Commissions come and go, and while they are here they are captive to the political process. Grantees will devote their sustained energies to monitoring the issues (as long as the funding is there!), and are relatively better protected by the First Amendment from political compromise in articulating their views. Commissions have a scope beyond which unanticipated issues can fall unexamined. The ELSI research community has few bounds on its curiosity, and has proven itself capable of rewriting the ELSI program's agenda from the inside when unanticipated issues arise. Perhaps, in order to provide adequate "social-impact assessments" of other scientific innovations as they emerge, society and the scientific community should also look to the "un-commission" of their colleagues in the humanities, social sciences, the professions, and the public.[69]

In pursuing its goal of identifying and developing initial responses to the most urgent ethical, legal, and social issues posed by genome research, the ELSI program has been challenged to establish and direct a wide variety of policy-development vehicles, including grantee consortia, commissioned expert panel studies, advisory task forces, interagency workshops and working groups, public consultations, and conferences. The common hallmarks of these efforts have been their collaborative spirit and the diversity of the perspectives they have involved. Rather than settle on any one format for policy development, and thereby raise expectations which it will be difficult to fulfill, the ELSI program—and any others that seek to emulate it—should keep its options open, by concentrating on cultivating the contextual studies of science and technology

[69] The National Center for Human Genome Research has already been approached, for example, by representatives of the planned "Human Brain Project" at the National Institute of Mental Health about replicating an "ELSI" funding program within their efforts to compile and correlate all our knowledge of the brain.

that are its raison d'être. Taken collectively, these studies and the early policy products they have helped generate serve as strong preliminary evidence in favor of the "ELSI hypothesis": that combining scientific research funding with adequate support for complementary research and public deliberation on the uses of new knowledge will help our social policies about science evolve in a well-informed and robust way.

Biomedical Ethics, Case Western Reserve University