**The Politics of Genomic Science**

**Jennifer Hochschild and Maya Sen**

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We plan to write a book on the politics and ideologies developing around genomic science, or perhaps around particular uses of genomics in distinct arenas. Although we will write it for an academic press, we plan to present the material in a way that will appeal to policy practitioners, public officials, and the (mythical?) educated lay audience. Jennifer is on leave in AY 2013-14, so we hope to have most if not all of a solid draft completed by the end of the summer, 2014.

Why genomics? The simplest answer lies in a comment from *The Economist* (2007)*:* “there is in biology at the moment a sense of barely contained expectations reminiscent of the physical sciences at the beginning of the 20th century. It is a feeling of advancing into the unknown and [a recognition] that where this advance will lead is both exciting and mysterious.” Twentieth century physics brought us deep understanding of the mysteries of the universe as well as nuclear bombs; twenty-first century biology could bring us equally deep understandings of human life, a cure for cancer, or a biological equivalent of the bomb. Genomics is a multi-billion dollar industry, and is likely to continue growing exponentially. It affects human lives in arenas ranging from dating services and testing the fish in sushi to convictions in courts of justice and cures for devastating rare diseases. It raises the deepest philosophical issues of the meaning of life, the possibility of free will, the boundaries of privacy, and one’s responsibilities to one’s children. It is also an arena of profound ignorance for the American public and for elected officials.

Any phenomenon as important as genomic science is likely to develop a partisan valence, normative dimensionality, and complex policy and regulatory structure. Consider the growth of embryonic stem cell research; opinions about stem cell research quickly became linked to views on abortion and family dynamics, with subsequent policy impact. Genomics research is equally important for society and just as personal, but its political, ethical, and policy ramifications are only now beginning to take shape. This slow development permits us to explore how innovations in genomics research are moving into the public arena. Rarely do scholars have the chance to watch a new policy regime emerge, especially in a field so important to Americans’ health and self-understanding.

**Analytic Framework**

We plan to organize the book around a fairly simple analytic scheme, shown in figure 1 below. In this initial formulation, it is a 2 x 2 table. [[1]](#footnote-1)

**Figure 1: The basic 2 x 2 framework for making sense of politics of genomic science**

|  |  |  |
| --- | --- | --- |
|  | **Technology optimism** | **Technology pessimism** |
| **genomic/genetic**  **fundamentalism** | (1)  *Law*: exoneration; more effective crime control  *Medicine*: cure for disease; Orthodox Jews control marriage for Tay Sachs carriers so reduce incidence  *Race*: find roots, go home; group sharpening or reification can be good thing OR finding multiracial ancestry can reduce racial barriers  *DTC testing*: will find high risks for conditions and work to prevent or mitigate them; people have right to information about themselves, and to decide how to use it  *Privacy*: people will share information freely and use it appropriately  *Evolution*: any new information about population genetics is good | (2)  *Law*: innate aggressiveness  *Medicine*: disease too complicated; pharmaceutical companies too rapacious  *Race*: will find genes related to undesirable traits, which will become racialized; racial ancestry testing will inappropriately reify groups OR will inappropriately blur boundaries that ought to be kept clear  *DTC testing:*  will find high risks for conditions, and create excess anxiety, unwarranted demands on medical system, confusion  *Privacy:* employers, insurance cos., criminal justice system etc. will get genomic information and use it against individuals  *Evolution*: Population genetics invades Native Am. tribal culture; creates myths of ancestry; can imply faster or further evolution of some groups than others |
| **Environmental**  **fundamentalism** | (3)  *Law*: rehabilitation strategies  *Medicine*: evidence based medicine, preventive care, lifestyle changes or improvements, pollution control  *Race*: progress toward more just society through social movements, electoral politics, economic gains etc.; racial ancestry testing might be fun but is purely recreational  *DTC testing*: patients will gain more knowledge of and control over treatment of medical conditions  *Privacy*: increasingly sophisticated ways to control own data (how?)  *Evolution*: archeology has increasingly sophisticated tools, computer programs… | (4)  *Law*: excessive or illegitimate genomic surveillance  *Medicine*: unwarranted biologization of socially-caused diseases; too many abortions with prenatal testing  *Race*: unwarranted re-biologization of race, move toward eugenics; racial ancestry testing is bogus but dangerous  *DTC testing*: consumers will look for magic bullet in genomics and ignore lifestyle or environmental factors in health  *Privacy*: high nongenomic surveillance – computer cookies, cameras, data-mining…  *Evolution*: temptation to research purportedly showing greater capacity of some groups… |
| *What isn’t included in this table*? : do we want to include genetically modified food? Synthetic biology?  (both would fit in readily) | | |
| *What doesn’t fit into cells of this table but is relevant for us*: | | |

*Technology Optimism and Pessimism:* The horizontal dimension indicates technology optimism or pessimism (alternatively described as a preference for type 1 or type 2 errors in technological or scientific innovation, or being relatively risk-seeking or risk-averse in technological or scientific innovation). At its core is the question of whether an individual, group, policy, or polity should, at the margin, be more engaged with protecting vulnerable individuals or the society against possible or probable disasters, or more focused on promoting possible or probable gains. Ideally, of course, one will do both -- but where a choice must be made, actors differ dramatically in where they place priority. [[2]](#footnote-2)

Psychologists treat technology optimism or pessimism as a property of individuals. Research shows that some people are by nature, or perhaps by socialization, cognitive biases, or interpersonal interactions, optimistic. They are willing or eager to try and learn about new things and tend to assume that new experiences and opportunities will be more beneficial than not. Others are, under the same type of causal force, pessimistic. They are less inclined to try or learn about new things, more likely to assume that new experiences or conditions are potentially harmful, or more broadly fearful of substantial change.

Sociologists look at contexts , affiliations, or group practices that induce technology optimism or pessimism. For example, researchers have found that a history of oppression or privilege will incline individuals or groups to assume that the world is fundamentally benign or malign. Sociologists have also implicated the play of market forces, the influence or family or friends, or even modernity itself in explanations for why individuals, organizations, or whole societies tend toward technology optimism or pessimism.

Policy analysts examine the content of laws or institutions through this lens. A technologically optimistic institution or policy will promote research and development, provide funding, minimize regulation, and create incentives for innovative practices. It will focus, in short, on achievement. A technologically pessimistic institution or policy will encourage oversight, set high barriers to approving controversial new products, move cautiously in reconfiguring governmental agencies, and seek rules to limit misuse of genetic information. It will focus, in short, on protection.

One can even look at constitutional structures through this lens. For example, the American governance system with its multiple veto points, strong courts, and federal layers of government is very risk averse; a parliamentary system with a single national government, in which one party controls all policy making between elections is much more risk accepting.

As this quick canvass suggests, theorizing around propensities to accept or guard against risk is rich and subtle, but also unsystematic and underdeveloped. Part of our project will be to sort out which of these levels of analysis provides the most analytic leverage in understanding the politics around genomics – or perhaps better, we hope to sort out the links and tensions among these various levels and disciplinary lenses.

*Biological and Environmental Determinism*: The vertical dimension indicates biological or environmental fundamentalism – more commonly known by the old rubric of “nature versus nurture.” Roughly speaking, a biological fundamentalist assumes that most important human traits, behaviors, attitudes, and physical attributes are caused or at least profoundly shaped by inheritance. People are not automatons, but they make choices within a narrow range of genetically fixed options. An environmental fundamentalist assumes the opposite – that most important human traits, behaviors, attitudes, and physical attributes are caused or at least profoundly shaped by socialization through environmental forces or perhaps by free will. Individuals are born as a *tabula* *rasa*, although their plasticity diminishes more or less as they encounter environmental conditions, make choices, and move down one pathway or another.

As with the horizontal dimension, one can frame environmental or biological fundamentalism at various levels of analysis -- as a feature of individuals, groups or other entities, or whole societies or cultures. At the level of individuals, for example, a psychologist can see intelligence, weight, morality, or ambition as a result of what one inherited from parents and previous ancestors or as a result of one’s choices made as a result of socialization, cognitive biases, interpersonal interactions, or choice. [[3]](#footnote-3) A biologically deterministic sociologist will differ little from a similarly inclined psychologist when explaining individual traits or behaviors; an environmentally deterministic sociologist, however, will focus more on the choices offered by one’s position in a societal structure, by market forces, or by culturally induced behaviors and practices or self-images and perceptions.

A sociologist or anthropologist can also examine groups, organizations, societies, or cultures through the lens of biological or environmental determinism. In the nineteenth and early twentieth centuries, scholars sought to determine the essence of a given ethnicity or nationality, or the core of American, German, or French culture. In such a case, the concept of biological fundamentalism shifts back and forth between a metaphor and the view that a culture persists through literal inheritance. Franz Boas revolutionized anthropology by rejecting scientific racism, the idea that cultures moved through a fixed set of evolutionary stages from primitive to modern, and the whole logic of group or societal inheritance. He substituted culture for biology, and choice or social interaction for inheritance. That remains the position of most sociologists and anthropologists, although there is some and perhaps increasing attention to the interactions between “nurture” and “nature.”

The dichotomy between biological and environmental fundamentalism also operates at the level of policy choices. A biological determinist might believe that some children are born bad and that policies must be designed to monitor and control them—but a biological determinist might also argue that children born with certain inheritances are disadvantaged through no fault of their own and warrant extra care and resources from the public sector. Conversely, an environmental determinist might pursue policies that nurture children’s sense of autonomy and choice, that focus on the literal environment so as to protect against toxins-- or might perceive some young adults to be so irremediably damaged by their treatment in childhood or socialization in peer groups that policies must monitor and control them.

In short, as with the dimension of technology optimism or pessimism, part of our task in this project is to sort out the most analytically useful level of analysis or the best way to combine various levels.

*Ideological Connotations*: As these descriptions of the vertical and horizontal dimensions imply, each end of each dichotomy has strong normative connotations, and each is the distillation of long histories of philosophical discourse. The book will review the history and philosophy standing behind each position with enough detail to show their depth and resonance, but we do not anticipate original research in this context-setting section. For now, we simply remind readers of this rich background by invoking the names of a few relevant philosophers and contemporary authors.

On the vertical dimension, Plato, Descartes, Hobbes, Noam Chomsky (on language) and more generally the nativist tradition are associated with elements of biological determinism, while Locke, Rousseau, Albert Bandura’s social learning theory, Freud, John Money, and more generally the empiricist tradition are associated with environmental determinism. Aquinas, Kant, Kierkegaard, Richard Lewontin, and the existentialist philosophers represent the position that humans have free will or construct their own environment.

The horizontal dimension of technology optimism or pessimism is most easily characterized in terms of broad political philosophies, succinctly characterized by Albert Hirschman in *The Rhetoric of Reaction.* In his formulation, conservatism is associated with technological pessimism because conservatives react to innovation or proposals for policy reform with three reasons not to make changes. The futility argument holds that the change cannot accomplish its goal; the perversity argument holds that the change will worsen the problem that it is intended to ameliorate; and the jeopardy argument holds that change will threaten or damage some prior state or accomplishment that is too valuable to lose. Liberals, in contrast, are technological optimists, perhaps with equally reductionist views: “history is on our side,” there are no necessary tradeoffs between desirable policies or practices, and the status quo is so problematic that almost any change is preferable to it.

*Genomics:* Where does genomic science fit into these frameworks? First, all four cells of the basic 2 x 2 table of figure 1 are filled, and their contents cut across conventionally defined arenas of genomic science. That is, we do not locate medical research in one cell, forensic biobanks in a second, DNA ancestry testing in a third, and so on; instead, we locate views about one or another aspect of medical research in all four cells, along with views about one or another aspect of forensic DNA testing, and so on.

The first part of the book will explicate each cell in turn, showing how a given understanding of genetic inheritance and approach to genomic science generates enthusiasm about, resignation to, ameliorationist caution about, or rejection of a given aspect of genomic science. To suggest only one example from figure 1: in the arena of forensic biobanks, a person in cell 1 would argue that biobanks can provide definitive evidence for exoneration of the falsely convicted or be a much more effective tool for crime control and conviction than strategies such as fingerprinting, eye witness reports, or conventional police investigation. A person in cell 2 would argue that some people have an inherent, unavoidable tendency toward aggression, and effective use of legal biobanks might help law enforcement officers identify those people at an early age and monitor, control, or help them so that their sociopathic genetic makeup does not lead to actual crime. A person in cell 3 would reject the use of forensic biobanks in any but a narrow courtroom context, and focus on childhood socialization, environmental conditions, moral or religious suasion, or conventional policing to reduce crime and rehabilitate those convicted. Finally, a person in cell 4 would be deeply hostile to the construction of forensic biobanks and the use of DNA in the courtroom, fearing racial bias, faulty or corrupt laboratory work, or most generally “genetic surveillance.”

As figure 1 shows schematically, one can go through a similar exercise in other arenas, such as racial ancestry testing, medical diagnosis and prescription for diseases especially common in certain groups (e.g. sickle cell anemia or Tay Sachs disease), medical diagnosis and prescription for diseases such as diabetes or Alzheimers, direct-to-consumer testing, use of genomics in prenatal testing, privacy concerns, and so on. We could even expand the contents within the cells of the basic typology to incorporate genetically modified food, synthetic biology for energy use, cloning, and other aspects of genomic science – though our project will probably not extend that far.

Stepping back from the particular cells and particular uses of genomic science, we will explore a paradox crucial to the developing paradox around genomics: genomics bucks the usual tendency of liberals to be technology optimists and conservatives to be technology pessimists. In general, that association works well. Liberals are enthusiastic about most scientific endeavors such as environmental technologies, development of evolutionary theory, or stem cell research. Surveys show clearly that liberals tend to support federal funding of scientific research, use of scientific knowledge to solve social problems, and loosening of patent restrictions; they have more confidence in scientists and the medical profession than do conservatives. Conservatives tend to be technology pessimists in all of these regards. However, some possibilities associated with genomics are deeply unsettling to political liberals, leaders of many leftist advocacy groups, and left-leaning social scientists. By focusing on the role of inheritance in certain human traits or behaviors, genomics research seems to call into question humans’ ability to control their environment and the worth of any efforts to do so. Thus, redistributive education reforms, public health measures, job training, or other liberal-minded interventions can seem futile, perverse, or jeopardizing. [[4]](#footnote-4)

Thus the two dimensions may be causally related in the political realm; liberals are often technology pessimists with regard to genomics because they tend to be environmental rather than biological determinists. The epitomizing case is the conviction that race is a social construction without biological content; other examples include explanations for IQ scores or changes in IQ scores, criminal behavior or changing levels of criminality, and gender roles. Conversely, conservatives tend to be biological determinists on these and similar issues.[[5]](#footnote-5) Since at least in its simpler incarnations, genomic science seems to support biological rather than environmental determinism, the vertical dimension seems to explain liberals’ anomalous position on the horizontal dimension.

But this causal association is incomplete for two reasons. First, liberalism is not always associated with environmental determinism. Liberals, but not conservatives, tend to see homosexuality, gender identity, drug addiction, or obesity as genetically inherited rather than socialized or an individual choice. Second, as our suggestions above implied, one can respond to a perception of genetic determinism of a disadvantage or disability by calling for more extensive policy interventions to help solve the problem or reduce the inequity; that is, one can offer liberal policy responses to inherited problems rather than blaming the individual with the problem. Thus genomics points us toward the need for a larger mapping of political or ideological views onto particular types of science or issues within science policy.

*Genomics and Race:* In this initial proposal, we have developed some of the complexities in the relationship between political ideology and the cells of figure 1. The book itself will develop other complexities, especially though not only with regard to race and ethnicity. African Americans generally hold internally consistent views on many policy issues such as support for more progressive federal taxes, stronger measures to combat discrimination, more redistributive social welfare policies, or more robust government efforts at job creation. But the evidence shows interesting intragroup splits with regard to genomic science. For example, some blacks enthusiastically endorse DNA ancestry as a way of “leaping over” the Middle Passage, while others find it almost abhorrent because it seems to imply that race has a biological meaning. Although overall blacks support forensic biobanks less than whites do,[[6]](#footnote-6) there are deep internal splits about its efficacy in reducing crime and in the appropriate balance between the risks of surveillance and the benefits of exoneration of those wrongly convicted. Blacks were also divided over the FDA’s licensure of BiDil, although that is now a moot issue. Most generally, a survey of the relevant literature shows that African Americans as a group are relative technology pessimists about genetic research in general, but are often eager to participate in genetic testing and sometimes more inclined to attribute behaviors or traits to genetic inheritance than are whites.

Why African Americans are distributed in all four cells of figure 1, and whether their reasons for support or opposition differ from the arguments of people in other groups, remains to be sorted out more clearly.

*The Diffusion of Political Information and Allegiance:* Another angle of vision on the 2 x 2 table of figure 1 focuses on differences between the mass public and academic experts. The most knowledgeable members of the public are technology optimists with regard to various uses of genomics (we have not yet analyzed the relationship between knowledge and biological or environmental determinism). But genomics experts in many social science disciplines are technology pessimists with regard to this arena. How tensions between popular support, especially from liberals and the knowledgeable, and expert skepticism play out in the political and policy realms is a question that we as political scientists will need to engage with.

Related to that point is the way in which knowledge and attitudes about genomics and its uses will diffuse through American society. One possible dynamic is that attitudes and information flow from experts to nonexperts. Researchers, doctors, and genealogists will inform citizens and policy actors about the genomics revolution. They will explain what is known and hypothesized; they will explicate what they see as appropriate controversies and deflect attention from what they see as mistaken presumptions. Most generally, experts will provide enough useful information so that nonexperts will have consistent normative positions, grounds for their degree of technology optimism or biological determinism, and coherent policy goals. From this starting point, political and partisan alliances would develop in predictable ways.

Alternatively, idiosyncratic circumstances could shape initial attitudes, which would then be diffused through political channels. A particular court case, a patient’s publicized dilemma, an ancestral discovery, or a family dispute will capture the public’s or an advocacy group’s attention. Elected officials and perhaps even policy makers and judges will follow suit. Biomedical experts will try to show that this is the wrong concern, or that the inferences drawn from what is arguably a legitimate concern are mistaken. This kind of diffusion may lead to a different policy agenda, partisan configuration, or set of normative judgments than the expertise-driven diffusion described above. It will not necessarily be less rational or even less appropriate, but it will be different -- following a democratic political logic rather than an elite-framed scientific logic.

In short, the book will examine the processes by which people come to be in one or another of the cells in figure 1, making the analysis political and dynamic as well as expository and static.

**Evidence**

In addition to the extant academic literature, the book will be based on three types of evidence:

* *two new public opinion surveys*: a 12-item module in the 2010 General Social Survey (GSS) designed by Eleanor Singer, Gail Henderson, and Jennifer, and our own Genomics Knowledge and Politics (GKAP) survey. The latter was conducted on-line in 2011 with a representative sample of 4300 respondents, stratified by race and ethnicity. GKAP included roughly 50 questions about genetics and genomics, and we received Knowledge Network’s demographic information on these respondents as well as self-reports on technology use, religiosity, personal and family health status, and political activism. The survey included knowledge items, views of the importance of inheritance and environment in determining traits, support for various uses of genomics, views on government regulation and funding, links between genetics and morality or religion, trust in various actors, the role of genomics in racial differences, and other questions.[[7]](#footnote-7)
* *elite interviews*: so far, we have conducted and transcribed about 50 interviews with genomic scientists, knowledgeable public officials, scholars, leaders of organizations or advocacy groups, and other experts. We plan to conduct up to 50 more interviews; realistically, it will probably be slightly fewer. Each interview lasts up to an hour; the questions are tailored to the particular individual and often quite loosely structured (e.g. “tell me the most important things I should know about the relationships between genomics and politics.”) Interview subjects were promised confidentiality if they wanted it; roughly half did so, for at least part of the interview. In addition to relying on individuals’ insights, we will also systematically code the transcripts with a computer program designed for this purpose, such as NUDIST or NVivo. We also conducted a brief online survey of genomics experts in various fields; the response rate was too low for the results to be treated as a survey, but we can selectively use quotations for illustrative purposes or to garner their insights.
* *content analysis of written material through coding*: using various coding schemes, we have conducted content analyses by hand of approximately 170 newspaper articles on results of DNA ancestry testing, and about 4000 responses (for each item) in the GKAP survey to open-ended questions about why the respondent would or would not be willing to contribute a DNA sample to a forensic biobank or a medical biobank. We are in the process of hand-coding roughly 600 academic articles addressing DNA or genomics. We have designed this coding scheme so that representative articles from various disciplines (for example, law, anthropology, economics, bioethics, and history of science) are coded. We also conducted computerized coding of almost 6000 newspaper articles about race and genomics. Each coding project was designed for a particular paper, but the coding schemes were extensive enough in several cases that we can use the material for this book.

**Book Outline**

This outline, and the relative weights of its components, will change as we write the draft manuscript, but the following is our vision of the book as of now:

*SECTION I: Introduction*

*Chap 1: Framework*

Overview of the project, introduce 2 x 2 table, explicate the vertical and horizontal dimensions, draw attention to distinctive quality of genomics. Include brief methodological overview, with more details in appendix to book.

*Chap. 2:* *Context*

Brief history, philosophy, ideology around the 2 dimensions, brief summary of development of genomic science.

*SECTION II: Explicating the 2 x 2 Framework*

*Chaps. 3-6:* *Examining the Cells*

Explicate each cell of Figure 1, with enough illustration and explanation of each aspect of genomics within a given cell to show how the overall logic of that cell operates in political and policy terms. Focus on 4 (+ or -) arenas within genomics, that appear in each cell – e.g. forensic biobanks, DTC testing, DNA ancestry testing, medical biobanks, personalized diagnosis and treatment, issues of privacy and family’s right to knowledge…

*SECTION III: Correlates of the Cells*

*Chaps. 7-9: Ideology, Race, and Diffusion*

Explore characteristics of residents of each cell, with chap. 7 focusing on partisanship and ideology, chap. 8 on race and ethnicity, and chap. 9 on experts versus mass public

*SECTION IV: Consequences*

*Chap. 10-11: Electoral Politics, the Courts, and Public Policy*

Implications of the diffusion of genomic science into the public arena, in terms of electoral politics (chap. 10) and judicial and policy developments (chap. 11). Will probably conclude with policy recommendations, including suggestions for school curricula and training of public officials such as judges or appointed officials of various kinds. Also our own normative or philosophical stance…

1. What we portray here as dichotomies are actually continua, and probably most people hold positions somewhere closer to the centers than to either extreme. For clarity of exposition, however, we portray them here in dichotomous terms. We will need to decide whether to maintain this expository stance in the book, or shift to the more accurate but less clear framework of two intersecting continua. [↑](#footnote-ref-1)
2. Note that being risk averse or risk seeking in general is not the same as having a given level of technological risk aversion. For example, a person who is highly risk averse with regard to foreign policy might want a strong system of national self-defense and heavy investment in the country’s armed forces. That person might well be a technology optimist about a missile shield or other military technologies. [↑](#footnote-ref-2)
3. Here and over the next few paragraphs, our formulation so far conflates two non-biologically deterministic positions: free will or individual choice, and environmental influences or socialization. We would appreciate advice on whether we should frame the vertical dimension as three equally important positions (biological determinism, environmental determinism, and no determinism) or whether the significant difference is between the first and the latter two. [↑](#footnote-ref-3)
4. Genomics is not the only exception to the association of liberalism with technology optimism. Liberals tend to be more skeptical than conservatives about use of nuclear power for energy generation, fracking, factory farming, or use of drones in warfare, for example. Part of this project will entail sorting out the underlying conditions that accord with or contradict the typical association between liberalism and technology optimism. That will include identification of the distinctive characteristics of genomics. [↑](#footnote-ref-4)
5. Whether liberals or conservatives are stronger believers in human agency or free will depends a lot of how one defines conservatism (e.g. libertarianism or Burkean social conservatism) and how one defines liberalism (individual autonomy or social context); that is another question to be sorted out. [↑](#footnote-ref-5)
6. Nonetheless, a majority endorse them. [↑](#footnote-ref-6)
7. We will also refer to the results of a more limited survey conducted in 2009 by Jennifer through the Time-sharing Experiments in the Social Sciences (TESS). It focused on vignettes about racial ancestry testing. We have the option of applying to TES S for another limited survey, so long as it embeds a survey experiment and passes muster with external reviewers. Finally, the GSS includes other items on genomics or genetics in 2010 and in other years, so we will analyze those items as needed. [↑](#footnote-ref-7)