Is biology a political science?

If one were to ask casually about the future of biology, one might ponder its expected contributions to medicine and agriculture. Contemporary molecular biology and the biotechnology spawned from its advances are commonly held as offering potentially revolutionary prospects. But in this article, I take another perspective and discuss the place of biology in the culture at large. I attempt to summarize biology’s complex social setting, which might be schematized as a set of parallel vectors connecting two domains—science and culture—that are too often regarded as distinct. One of these vectors points from science to culture, and it describes how science has become a crucial constitutive component of culture, deeply influencing our world view. The ethical implications of that influence are profound, and perhaps no better articulated than in discussions concerning the extent to which human nature is biologically determined. The other vector describes how culture, to varying degrees, both frames scientific inquiry and practice and determines its social support and its development as a social activity.

This biology/culture discussion is just one chapter in a more general debate, begun after World War II, concerning the place of science in society. It is in this context that I discuss the politics of biology, but I do so with the overarching sense that “science” and “society” cannot be neatly divided because the two domains intimately influence each other. Therefore, perhaps a better title for these musings would have been, “The Demise of the Two Cultures,” which brings to mind C. P. Snow and another era (Snow 1959). When Snow published his essay, he was preoccupied with the disjunction of intellectual life. The growing autonomy of science, residing in its technological and esoterica, seemed to be unchecked and unchallengeable. Although he was arguing a different agenda, the contrast between then and now is striking because Snow wrote at a time when science was generally regarded as some distant colony, aloof if not markedly separate from the rest of culture. I, on the other hand, see science as fully contextualized, to the point that it is fighting to regain its “sense of self.”

The pendulum has swung wildly in the past four decades. Science cannot be given the status of some autonomous social activity, or even of a possession that enriches the mother country. Science—and, perhaps most directly, biology—has become constitutive to our very selves, interpreting through its own refractions issues previously left to religion, ethics, and philosophy. For instance, evolutionary explanations are now offered to elucidate complex social behavior, such as altruism or the economics of commerce (de Waal 1996, Ridley 1997); biologically based criteria are sought for what is “beautiful” (Rentschler et al. 1988); some innate (programmed) belief in the divine has been postulated (Wilson 1978); indeed, the very way humans think and the cognitive basis of language are now heatedly debated as biological phenomena, best understood in the context of evolutionary pressures (Deacon 1997, Pinker 1997). As the power of biological explanation grows, so does its defining influence. The cautionary caveat, to borrow from Marshall McLuhan, is that the medium—in this case, science—is becoming the message. Biological determinism has an extraordinary potential for framing our world view, and it is imperative that its claims be scrutinized carefully. In this article, I argue that, given the deep repercussions of biological thought on society, the life sciences have assumed a complex cultural politics, one that takes on a moral dimension that deserves scrupulous attention.

Science influences culture; culture influences science

Scientific consciousness dominates Western culture, not only in the practicalities of people’s everyday lives, but with respect to our most basic notions of reality and objectivity. Science also influences how Westerners regard themselves—that is, as animal creatures, rational thinkers, or elements of the entire cosmos. In short, science has shaped the West’s world view, and, increasingly, the rest of mankind’s. I am less concerned with the practical ways in which the biology of the future will influence our lives than I am with the manner in which humans use science to define themselves. This latter issue reflects our attempts to define human nature biologically. For instance, does I.Q. correlate with race, and is it therefore based on inherent biological differences? Does homosexuality arise as a result of a gene or a cluster of genes, and is it therefore biologically determined? To what degree is schizophrenia, or any other mental illness, genetically determined and, by extension, is behavior or personality neurally hard-wired—and thus genetic?

These questions are not restricted to the realm of science but have sur-reptitiously crossed over to the domain of human values, in which moral orientations and human prejudice heavily influence how these matters are framed and discussed. This transition from ostensibly “objective” scientific evaluation to social “opinion” has been made effortlessly in current polemics about the
Scientists have become willing actors in this social drama. They often find themselves choosing a line of inquiry that posits an ideological endpoint with profound social ramifications. Thus, for example, the Human Genome Project (HGP) may receive financial and political support, ostensibly to develop better technology for nucleotide sequencing and information processing, to construct genetic maps, and to serve as the foundation for advances in basic molecular biology. But it is also enlisted to identify genes for various “social diseases,” such as alcoholism or violent behavior. Thus, the HGP has been trumpeted as both a Holy Grail and a Rosetta Stone by many camps, not all of which share the same agenda.

Those who doubt the efficacy and justification of a genetic answer to complex human behavior are arguing for another kind of biology, one oriented altogether differently. I will not discuss that argument here; it is sufficient to note that there are in fact different ways of probing the same problem, and a phenomenon may appear different from each perspective. So, whether molecular genetic research is intrinsically “better” than other kinds of biological approaches for describing complex human behaviors—or, for that matter, complex physiological systems, such as the immune or nervous systems—is disputed (Tauber and Sarkar 1992). The scientific facts and theories that result from different approaches will obviously reflect differing strategies and assumptions, which only demonstrates the obvious: Nature may be described in varying ways.

The issue in the case of the HGP is the extent to which a molecular approach is applicable to describing human behavior. The answer to that question in large measure reflects strong extracurricular influences. Science has an undeniable authority when it remains within a narrow domain of inquiry, but extending the results of the HGP to social policy provides a vivid illustration of science's profound influence on culture. The nagging question remains: To what extent should we allow science such authority, when its findings are projected or applied in domains so widely outside its purview? Perhaps the basic question concerning the future of biology pertains to where the boundary between the laboratory and its surrounding culture is drawn. While guarding its own integrity and independence, science seeks to inform and influence the political agenda of social policy. But science’s effect on social policy is only one of the two vectors governing science’s place in culture. Society has a reciprocal influence on science.

Science studies emphasize that science can no longer be regarded as a circumscribed, self-contained intellectual or social activity. Biology, like the other natural sciences, resides firmly and intimately within its supporting culture. Science not only penetrates society but also is molded by culture. As Bruno Latour describes the phenomenon, science is “blended,” by which he means to emphasize the artificiality of attempting to separate “science”—as insulated and circumscribed—from the myriad other social activities (e.g., political, economic, and educational) that support and guide its practice (Latour 1993). Perhaps the most important point is that the study of nature and the study of society are inextricably linked; not only are they interwoven in a trivial social sense, but their belief systems are interdependent as well. Science studies scholars debate the extent of this interdependence, the so-called boundary problem (Gieryn 1995, Tauber 1997). Some critics maintain that there is a strong degree of autonomy for science, whereas others argue that it makes no sense to speak of nature (as science examines it) and culture (as historians, philosophers, or sociologists practice their studies) as independent domains.

The question of boundaries

The question of science’s boundaries and the legitimacy of its authority rests on its claims to objectivity. On one hand, the “internalist” approach argues that science grows from its local, immanent concerns; that it is subject to and governed by rational discourse; and that the world it examines may be discerned objectively by the scientific hypothetico-deductive method. The project of compro-
hending nature is thus viewed as essentially logical. This view of scientific activity is what Michel Callon calls the model of “Science as Rational Knowledge” (Callon 1995). This model relies implicitly on the realist view of nature, in which science enunciates a sophisticated and formalized dialogue between humans and nature. In this view, science is fundamentally a normative exercise in which extrinsic social influences—be they political, ideological, or economic—are minimized in the pursuit of truth.

This approach has been challenged both historically and philosophically. From these critical perspectives, science emerges as a vast, intricate network of social practices. It is thus erroneous (or perhaps just superficial) to regard science as having its own domain, or as cautiously venturing forth from its insularity against a potentially intrusive public. For those who regard science as intimately contextualized in society, science continuously sells itself, promoting the benefits of its progress for technology and medicine. For example, virtually every high school biology textbook now states that the improved health and longevity of Western citizens is due largely to scientific insights regarding nutrition, sanitation, and infectious diseases. But the march of science hardly rests on its laurels. Daily, dramatic television and photojournalistic accounts present “biology at work” at the frontiers of knowledge. Whether through photos of a developing fetus, the pinpoint accuracy of laser surgery, or the in vitro fertilization of a postmenopausal woman, Francis Bacon’s espousal of science’s promise to improve society is constantly reiterated. To propel that message to the public, the boundaries of biology currently extend well beyond the laboratory, into the copy rooms of news agencies and the studios of television networks. No longer solely the business of scientists, scientific findings and disputes find their way into lay culture to become integrated within society as a whole (Gieryn 1995). Beyond publicizing scientific progress, these public relations forays are designed to stake out a social role for science that translates into power, resources, and authority.

Biology as politics has two rules: a proactive agenda in policymaking, and a self-aggrandizing program in promoting its own interests to garner resources. In its first role, various political groups use biology to advance their own agenda. Because science is regarded as a form of knowledge that has special claims to legitimacy, those who advocate policies on the basis of scientific “facts” have more authority than those who do not. And if both sides of a social debate embrace scientific “facts,” then the political jury must decide which position embraces the better science or is supported by the better scientist. In short, the Nobel laureate as politician is a potent figure. An adjudicatory role of science is hardly a new issue. Beneath the current sociological dissection of the local fights for dominance in the evolution of scientific knowledge reside the observations of the first architects of science. Four hundred years ago, Bacon astutely recognized that scientific knowledge confers social power. As purveyors of this power, scientists may be regarded as political instruments, be they in monarchial, totalitarian, or democratic societies.

The other aspect of science’s politics is the promotion of its own self-interest as a social institution. As the scientific community has grown in the twentieth century, scientists and their support industries have increasingly been characterized as an interest group advocating their method and product for their own economic purposes. Thus, a delicate political balance is constantly being struck between science being used by society and the institution of science seeking its own enrichment. Given the tugs and pushes on science, it is perhaps not surprising that questions concerning the process and nature of scientific knowledge are often raised.

The production of scientific knowledge

The analysis of the boundaries of science raises a fundamental sociological question: How is truth found, or, as some would say, invented? This issue has been approached in two ways—one assuming a normative attitude, the other embracing relativism. These two perspectives, essentialism and constructivism, form the axis of the sociology of knowledge and distinguish the forces battling over the political standing of science and its role in adjudicating social questions. Essentialists maintain the possibility and analytic advantage of identifying the unique and invariant qualities that set science apart from other occupations and thus explain its singular achievements. Constructivists deny any such demarcation, maintaining instead that science, like other intellectual disciplines, is contextually contingent, driven by the pragmatic interests of its supporting political culture. Some constructivists extend the argument by contending that science uses a rationality designed for its hegemonic ends as part of a far-reaching ideological battle over the very nature of knowledge itself (e.g., Woolgar 1988a, 1988b). The struggles of the science wars then extend from the more mundane issues of how much money Congress should budget for research to highly iconoclastic attacks on the foundations of knowledge (for review of these issues, see Hollis and Lukes 1982, Cole 1992, Holton 1993, Barnes et al. 1996, Gross et al. 1996, Ross 1996).

Few people would dispute the constructivist’s claims regarding the contextualization of science into its supporting culture. But the constructivists have generated heated debate because their arguments seem finally to reduce science to politics. Those scientists who regard science as a normative enterprise reject the assertions that theoretical scientific formulations are heavily determined by ideological orientations and that science is no more than a rhetorical enterprise in which persuasion is used to overwhelm the opposition. What is at stake in this debate is not only the definition of “truth” but also the definition of science itself.

The implications of this debate go well beyond characterizing science as a form of knowledge. When science is applied to the social domain, it shifts from its epistemological function (i.e., knowing nature) to a role in a different arena, one that is heavily laden with value judgments, cultural history, and political forces. In this context, science becomes in-
vested in the moral domain. In other words, the boundary between what is and what ought to be—that is, between ontology and ethics—is continually blurred as science assumes a greater and greater dominance in discussions of how human biological character might determine social behavior. Perhaps the intellectual basis of the science wars resides in this shift.

Contemporary historians and sociologists of science have shown in their investigations of scientific practice that “what is” (i.e., the reality as described by biologists) cannot be understood independently from how that reality was examined or produced in the laboratory. So, shifting the focus from ontology (“what is”) to epistemology (“how we know what we know”) conflates these two questions such that “what is” becomes an epistemological matter. The constructivists’ reading undermines the authority of science to make ontological truth claims by exposing the contingency of those claims. Consequently, the next step, of applying such claims—in which moral choices might rationally be made—is also undermined. That is, if science is only one of a broad range of systems of rational endeavor—if it is, like other such systems, fraught with human frailties—then the scientist loses not only epistemological authority but, more pointedly, moral authority. The social consequences would be revolutionary if radical constructivism were to succeed in fatally undermining the epistemological standing of science.

How radical constructivism would undermine science’s standing arouses the most hostility among defenders of science, who argue that perverse uses of science represent a political usurpation of what should (and can) be an autonomous, if not value-neutral, endeavor. Some constructivist critics counter that, as often as not, a particular research strategy has, within its very foundations, an ideological basis that, although usually left unstated (or unrecognized) by the scientist, has broad social ramifications beyond its narrow research agenda. A case in point is the support that genetic reductionism gives to a particular kind of biological determinism. Therefore, when critics rail against the HGP they do so not only because of misgivings about its scientific strategy but also because they perceive that it consists of more than the stated direct purpose of mapping and sequencing human genes. The detractors’ general concern is that biology, under the guise of genetic reductionism—the view that holds that all biological (and social) behavior is ultimately determined by our genetic constitution—prescribes a particularly noxious deterministic orientation toward human nature (Tauber and Sarkar 1992, 1993).

Reductionism has deep roots in biology. It grew most visibly in the 1840s to eventually expunge vitalistic forces and show that life processes were but manifestations of physics and chemistry (Galaty 1974). Genetic reductionism, the latest chapter of Cartesian reductionist philosophy, exhibits the same methodology as used in the physical sciences, namely to seek and define the basic elements constituting complex systems. Reductionists believe that such strategy will establish a theoretical biology that would emulate the theory structure of the physical sciences. Therefore, this approach promises to reduce complex phenomena to some function of simple components. Thus, in addition to showing that certain traits are clearly genetic, genetic reductionism claims the hereditary basis of complex behavior, including mental functions: “With remarkable ease a transition is made from the biological to the inherited...and, then, from the inherited to the genetic...In this view, the environment is passive, though necessary background, as genes act alone” (Tauber and Sarkar 1993).

Genetic reductionism settles the unresolved nature–nurture debate in favor of heredity alone; human behavior and social problems are thus univocally reduced to genetics. Advocacy or opposition to the HGP reveals deep-seated opinions regarding the character of biological organization and function, a matter that I will not discuss further here, other than to note that, at a minimum, a new form of determinism has been declared and opposed.

The debate over genetic reductionism is an ideological argument, resting on a complex array of philosophical orientations. To advocate resolution of contingent and complicated interactions of environment and heredity—when determining the details of such interactions is impossible—reveals only opinion, not scientific knowledge. The stakes are high because the vision adopted seeks to define the way humans regard themselves, both individually and collectively. So, for example, the polemics swirling around the HGP—those ethical and philosophical issues that eclipse the technical questions of how to effectively map genes or process the enormous quantity of data—may be fairly regarded as an example of science’s political persona.

The HGP illustrates that science is not simply prescribed by laboratory-based activity seeking what William James called “stubborn facts” but also includes two clearly declared political activities: The HGP is both a lobby to accrue government support for molecular biology and genetics and a forum that focuses a philosophical debate about the merits of genetic reductionism. These two activities collaborate to frame public social policy in two venues: political and financial support for a particular branch of science, and the application of a particular philosophical orientation to social issues. This bivel discussion seems to be an exemplar of science stretching its domain. Those who seek to understand the social construction of knowledge may well reap a rich harvest in such analyses.

Science under siege

Beyond determining the technology of our time and the pervasive formulation of our world view, science has strong ethical consequences and wide-ranging effects on how Westerners organize society and define human nature. Despite the intimate historical links between scientific and moral discourse, science was born during the sixteenth century in the ostensible effort to free objective knowledge from religion-enforced connotations of fact and value, of natural and supernatural, of body and spirit. Even at the dawn of modern science, its founders and patrons recognized that the issue of mapping the independent do-
main of knowledge proper was crucial, given the rise of political agendas concerned with how science could be used to serve particular social and economic interests. And it was in the recognition of science’s power that its early institutionalization was structured to guarantee its independence from meddling politicians, who in turn extracted the promise that scientists would remain uninvolved in political interests. As patient spectators, the “common” people would reap the material harvest.

But as biology continues to amass further sophistication and complexity, and its products continue to dramatically change human lives, the public is increasingly concerned that science is too significant to be left to scientists alone. Furthermore, as an important corollary, its purported benefits will be increasingly scrutinized. Government’s growing presence in regulating the laboratory, protecting human subjects, examining research budgets, and monitoring investigators all reflect a demand by society to control the course of research. Science studies have fueled the opinion that science is like any other social activity and that it is governed by the same general cultural rules that direct other complex cultural institutions (e.g., Pickering 1992).

Science does have legitimate claims to rationality and objectivity in pursuit of its narrowly articulated objectives, and these objectives hold important promise for human welfare. But when scientists engage in public debate on social questions that will decide public policy, their authority is subject to different roles of inquiry. On virtually any controversial social question, from abortion to waste control, scientific testimony is often aligned on both sides of the issue. Citizens watch the spectacle of opposing experts contesting whose data is more valid or on what basis such evidence might be enlisted. Skepticism about scientific certainty, or, at the very least, about bona fide knowledge opens the door to the possibility of decisions being determined by criteria other than what are normally construed as “scientific.” These decisions may ultimately be determined by moral, legal, or frankly political rationales, and in such cases the scientist becomes a bit player in a larger social drama.

The scientist’s adjudicating role is also undermined by mistrust about science in regard to how well scientific answers might offer solutions to complex social problems. Although I suspect that this apprehension is growing increasingly dominant, its precise value is not easy to assign. Most readers will recognize a common image of the practicing scientist locked in the laboratory, isolated from social trials and tribulations and divorced from the concerns of a turbulent outside world. After all, in the search for “truth” and “reality,” scientists are ostensibly isolated from the messy decisions about how the fruits of their labor are to be applied (whether in warfare, medicine, or technology at large) or from the possible dire consequences of their discoveries for individuals or the environment. In this view, science’s lofty laboratories only unperturbed truth seekers explore nature’s secrets, oblivious to the political, social, and economic needs of the supporting culture.

Some critics, such as Theodore Roszak, have deplored the moral consequences of this posture; although Roszak’s description is widely held, it should be regarded as caricature:

Bacon went in search of a philosophy of alienation. They [the scientists] broke faith with their environment by establishing between it and themselves the alienative dichotomy called “objectivity.” By that means they sought to increase their power, with nothing—no sensitivity to others or the environment—to bar their access to “the delicate mysteries of man and nature.” The cult of objectivity has led scientists and the general public to think of everything around us—people and biosphere—as “mere things on which we exercise power.” Objectivity is in practice a cloak for callousness. (Roszak 1972, p. 169)

This vision sees the political overtures of scientists as no more than an undisguised effort to impose their own ideology on their fellow citizens. In other words, scientists have a dual persona: As scientists, they are divorced from the social world, but the product of their labor is expected to percolate through its technological application to benefit society. Objectivity then assumes a particular social value. So from this alienating perspective, scientists emerge out of the laboratory to engage in public debate on public matters, where they are viewed as trespassers who would impose their own Faustian vision on their fellow citizens. This Dr. Strangelove image—and the disparity it represents between how some nonscientists see scientists and how scientists see themselves—is disturbing, to say the least.

There are, to be sure, such diabolical characters among scientists, but by and large they are straw men constructed by various lobbies for their own purposes. Once the polarization of scientist versus citizen is abandoned, all of us, scientists and laypersons alike, turn out to be aligned on the political spectrum, advocating various positions with varying commitments to scientific arguments for support. In these debates, however, the uses of science in the social context cannot be neutral. The neutrality of science depends on regarding nature as holding no value. Values are rooted in human needs and desires, whereas nature, stripped of qualities, teleology, and meaning, is left secularized, value neutral, disenchanted. But when the findings of science are used in social debate, its neutrality is lost because human values are then imposed on what, left isolated, might otherwise claim objectivity.

The crucial philosophical distinction for this discussion is between “what ought to be” and “what is.” The attempt to free facts from value originated in the effort to liberate science from its medieval theological roots, and it remains the linchpin for scientists pleading autonomy under the guise of “objectivity,” as well as for critics who decry the violation of neutrality of science, which obviously serves particular social agendas. But as Robert Proctor, a contemporary historian of science, has cogently observed:

Neutrality and objectivity are not the same thing. Neutrality refers to whether science takes a stand; objectivity, to whether science merits claims to reliability. The two need not have anything to do
with each other. Certain sciences may be completely "objective"—that is, valid—and yet designed to serve certain political interests. Geologists know more about oil-bearing shales than about many other rocks, but the knowledge is thereby no less reliable. Counter-insurgency theorists know how to manipulate populations in revolt, but the fact that their knowledge is goal-directed does not mean it doesn't work.

The appropriate critique of these sciences is not that they are not "objective" but that they are partial, or narrow, or directed towards ends which one opposes. In general, knowledge is no less objective (that is true, or reliable) being in the service of interests. (Proctor 1991, p. 10)

Since World War II, an increasingly critical political chorus has heightened awareness of this objectivity-neutrality problem. Despite the reiterated disavowals of a value-laden science, critics have exposed this innocent view for what it is. Citizens are maintaining a vigilant watch over science's aspirations and successes, and they no longer accept as gospel the claims and promises of a growing scientific lobby. Recently, critics successfully halted the construction of the superconducting supercollider (SSC), the exemplar of Big Science, in what might be regarded as anti-scientific conservatism (which has cost the United States leadership in elementary particle physics) or as appropriate constraint of a ravenously imperialistic Science. The SSC episode seems to have resulted from a different kind of activism than, for instance, attacks on what have been perceived as unbridled technology (e.g., nuclear power or environmental pollutants).

The distinction between science and its product, technology, is traditionally offered to provide scientists the "space" to pursue their research in the interests of advancing knowledge, leaving its application to another public forum. But science no longer enjoys such latitude. Recent controversies surrounding the public policy issues about investment in major scientific projects that have been touted as the climax of scientific development are largely connected to a general recent re-assessment of science policy. First, similar Big Science programs of the past, such as President Nixon's "War on Cancer" and other overly optimistic projects, promised to deliver solutions that were unrealistic. The political response to such disappointments has been a growing concern that resources should be more carefully allocated to ambitious scientific goals. Second, because science and its uses are not easily separated, society must be careful in controlling the very genesis of new industries. This potential limit on the growth of science has led some critics to propose that there are indeed forms of "forbidden knowledge" (Shattuck 1996). And finally, and perhaps unfairly, there is the widespread sentiment that the positivist ideals of the scientific method have been weakened, and the progress and application of science must therefore be viewed with more circumspection (Kitcher 1993). In aggregate, these reservations require Science to aggressively sell itself to the public.

Daily we witness how science functions as a political force. Consider, for instance, how scientists must vie with other interest groups to garner public support. Detractors have attempted to depict the proponents of such projects as the HGP and the SSC as self-aggrandizing competitors for scarce economic resources. Science then becomes another project for debate, just like subsidies for milk, pork-barrel patronage for public works, or special tax breaks for struggling industries. In this context, scientists occupy no sacrosanct position and must pit their lobbyists against those of other interest groups similarly seeking government support. The same rules apply, and the same utilitarian factors determine the outcome. On these playing fields, science is just another participant in contemporary power politics. Biology, because of its immediate relevance, is the field of science that is closest to this interface—its autonomy therefore diminishes even as its technology and conceptual apparatus becomes increasingly esoteric to the average citizen. That tension is the price of science's successes and the controversy of some of its applications.

But there are other ramifications of the politics of science. The biologist's authority will be continually attacked, not solely for his or her scientific claims but, more often than not, for his or her presumed ideological stance. As scientific questions and answers become central to the public debate about human and social character, the biologist will increasingly be placed in the interesting role of social activist under the cloak of his or her professional credentials. Of course, any advocacy role will also expose the vulnerability of scientific knowledge, that is, its provisional and tentative character. And those who see biology as a normative activity may find it painful to see biology dragged into the trenches of current political warfare and thus bloodied by contests within its own ranks as one group of scientific experts is pitted against another. As scientists, we expect debate among ourselves about data and theory; in the public forum, we are often exposed as less certain (and thus less authoritative) than we might wish.

Conclusion

The autonomy of science is being eroded as a result of a growing public awareness that the laboratory is not a free-standing enterprise but is socially based and subject to the needs and values of its supporting culture. This public domain of science refers not only to the renewal and support that Western society gives to scientific institutions but also to the recognition that science takes place in a political culture, supporting diverse economic and social interests. In other words, science is highly politicalized. From this perspective, the relevant issue for science studies, beyond defining the social origins of knowledge, is the requirement for a philosophy that focuses on the forms of power in and around the sciences: "Why do we know what we know and why don't we know what we don't know? What should we know and what shouldn't we know? How might we know differently?" (Proctor 1991).

In short, a political philosophy of science is emerging (e.g., see Rouse 1987, Longino 1990) that must, in some fashion, attempt to resolve three differing views of science and society...
that, while competing with one another, also resonate in offering differing perspectives of a complex association. As developmental biologist Scott Gilbert has elaborated, these three views are, first, that science (or at least its truth claims) is independent of society; second, that science is politics by other means; and third, that science plays a critical role in defining our culture and world view (Gilbert 1997). I have already argued the case for the second and third views; let me reiterate my opposition to the first.

It is, after all, naive to regard biology as somehow isolated from its supporting culture, and one aspect of the complex social character of biology is its political activity. Biology cannot be confined to its investigative concerns, because its boundaries cannot be firmly drawn. While guarding its own domain, biology seeks to inform and influence the political agenda of social policy as a reasonable extension of its knowledge. The epistemological and moral domains are not easily separated because we integrate them as informed opinion on a complex continuum between the search for "what is" and our aspirations for "what ought to be." On the social playing field, these two philosophical goals meet somewhere beyond their theoretical origins and thereafter cannot be divided again. Biology is inextricably drawn between these two poles, a situation that should make us pause and consider anew how a politics of science might emerge. The character of science in this broadened view remains a critical question for the future of biology, which, from this perspective of science deeply embedded in culture, is no longer just a laboratory effort to study nature but becomes a social institution that plays in a complex cultural drama. On this view, biology has a particularly important role within that social agenda.

For instance, the debates concerning sociobiology or bioethics pertain to this issue of the cultural role of biology, as evolutionary explanations for altruism, sexuality, religion, hierarchical social structures—to name only a few contemporary debates—grow increasingly important (e.g., Wilson 1978, de Waal 1996, Diamond 1997, Ridley 1997). Although the character of these biologically oriented notions is distinctly post-Darwinian, developing from nineteenth-century social Darwinism to novel or even radical forms of evolutionary epistemology, these kinds of applied inferences are of course not new. From Plato to Freud, humanist thinkers have extrapolated biological descriptions and models to human behavior in their attempts to define and explain human nature. But one need only recall the fate of such theories, and especially such perverse cases as Nazi racial dogma or Stalinist genetics, to be aware that any extrapolation from biology to the human sciences requires vigilant examination and commands only tentative authority, if for no other reason than science's own provisionalism.

Despite these cautionary provisos, Westerners still seek authority, if not certainty, in public debates. So in the very act of defining ourselves—both in terms of delineating human nature and searching for the biological basis of culture—the scientific view, with its strong claims to objectivity, is used to displace and outweigh other modes of discourse. The dialectic is, of course, bidirectional because social and ethical ideologies may also color scientific interpretations of the nature of human psychology and social behavior. But of the two vectors, the influence of biology on culture is more clear, and as the authority of biology has grown, its influence on the epistemology of the human sciences has increased in parallel. And this trajectory continues into the moral domain. For example, if homosexuality is regarded as biologically determined (a scientific judgment), and if biological determinism translates into psychological and social determinism (the conclusion of a human science), then how might we regard such behavior as susceptible to moral judgment? To make homosexuality deviant, one must either use criteria other than science's (e.g., religious or ethical) or attempt to undermine and refute the science used to reach this unwanted conclusion. Increasingly, the course of employing other kinds of knowledge or rationalities to assess such issues becomes less tenable, and social debate is contested on scientific grounds, where the objectivity-neutrality distinction must be carefully scrutinized.

This complex dialectic of science effecting our moral stance, and our moral views subtly directing science, is, at its heart, the problem of placing science within its cultural context. The basic question concerning the future of biology is where to draw the boundary between science and other social activities and applied moral judgments. This question is perhaps less epistemological than ethical because that decision is based on choice, and choice is grounded on value, and value is a moral category.

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