Andrew Ross

THE CHALLENGE OF SCIENCE

EDITOR'S INTRODUCTION

IN THIS ESSAY, Andrew Ross asks two questions. The first is very general: "Who is qualified to critique science?", and the second rather more specific: "What has cultural studies to say about science?" These questions derive their energy by breaking out from the usual hands-off-science mentality which, Ross suggests, has its origins in the sociologist Max Weber's positing of a value-free humanities in his famous 1918 address, "Science as a vocation," largely as a riposte to German antisemitism of the time. In fact a great deal of Ross's essay is devoted to explaining *why* science needs critique.

For Ross, working in the United States, technoscience is the ultimate horizon of most post-Second-World-War academic work, even in the humanities. That is where the money comes from. The implications of this have not sufficiently filtered through into cultural studies, which too often still assumes a hard culture/science division, and accepts scientific resistance to non-scientists' examining the social and cultural grounds and effects of their work. That resistance has only been increased by the various attacks on cultural studies' supposed incompetence in the field, of which the most influential have been by Gross and Levitt (1994) and Alan Sokal (Sokal and Bricmont 1997) – Sokal becoming notorious after the scandal which followed his hoodwinking the editors of *Social Text* by palming off a parodic essay on to their journal.

Ross's sensible and modest essay is a riposte to claims that cultural studies is a pseudo-discipline, lacking the conceptual rigor to deal with issues like the effect of science on society and culture. He argues that because science permeates and shapes modern culture so powerfully and divisively, it would be irresponsible not to analyze it and its effects from the outside, and ask of it: what are you doing to create a fairer, less risky society?

Further reading: Franklin 1995; Haraway 1991, 1997; Harding 1995; Ross 1991, 1994, 1996.

1

When future historians, as the cliché goes, survey the modern versions of the division of knowledge, what will seem most anachronistic? One of the likely contenders will be the strong pact by which the empirical pursuit of reason, at one end of the field, was guaranteed immunity from socio-political scrutiny at the same time as the ethical realm of values, at the other end, was relieved of any obligation to respond to advances in scientific knowledge. This entente proved to be the source of the dominant traditions of inquiry in the natural sciences and the humanities for most of the twentieth century. Science would undertake to provide neutral, public knowledge in a value-free setting so that humanists could grapple with the corrosive, contradictory life of social, cultural, and political issues in a milieu barred to technical experts; and vice versa.

For different reasons, this entente worked to the advantage of both traditions. reaffirming core elements of their respective professional ethics. Arguably, the greatest value has accrued to managerial elites, whether in the academy, in business, or in politics, who have benefited from the separation of the realm of facts from that of values: administrative control can be established with ease once employees or subjects have acknowledged the principle of 'that's not my department'. But the mutual pact also meant different things at different times. Robert Proctor has described, for example, how the social sciences initially sought the value-free imprimatur of science – Weber's *Wertfreiheit* – in order to build a protective neutrality zone against political coercion, primarily from the right, since sociology was perceived first as a socialist, and then, by the Nazis, as a Jewish discipline. The value-free neutrality of this paradigm had an especial appeal to the American academy in the 'end of ideology' period of the Cold War. For its critics, the ascendancy of the principle of *Wertfreiheit* over the course of the next two decades came to signify political quietism in the social sciences, and selling one's skills to the highest bidders in the natural sciences. In the humanities, a cognate set of 'self-evident' principles of taste – crystallized in the concept of the literary 'canon' – encouraged a formalist dogma whose death throes engendered the bitter spectacle of the Culture Wars in political life at the end of the 1980s. The powerful Cold War consensus that had ruled out of court any attention to the institutional arrangement or social conditions of knowledge did not end with a whimper.

So when C. P. Snow issued his famous mid-century complaint about the increasing divergence of the 'two cultures', he was describing a condition that was not so much tendential as contractual. And since science had long since become the dominant civil authority in society, there was no real symmetry in this arrangement. While humanists preferred to think of the field of knowledge as an even spectrum, running from hard sciences to the fine arts, logical positivists of the Vienna circle reflected the much greater cultural power of abstract reason in their topographical choice of a hierarchy, with physics at the very top. Accordingly, for Snow, and those

who swallowed his story about the two cultures, the burden of education fell not upon scientists but upon humanists whose alleged technophobia had made them anachronistic legatees of a Romantic past, ill-equipped to face the challenge, technocratic or otherwise, of the future. For too long, Snow's fellow British intellectuals had followed William Blake's thunder, and paid too little heed to what Harold Wilson would shortly come to call the 'white heat of the technological revolution'. While Snow's polite thesis almost immediately became part of the folklore of intellectual life, there was little evidence that science was taken any more seriously as a cultural force. Speaking from the heart of the radical science movement in the early 1970s, Hilary Rose and Steven Rose lamented that there had been virtually no discussion of science's *cultural* role in central New Left history surveys like Raymond Williams's *The Long Revolution* or Perry Anderson's *The Components of the National Culture* (Rose and Rose 1976: 13). In the more pragmatic US, things were little better. Scan the writings of the New York Intellectuals, or the more academic tracts of postmodernism and multiculturalism in the 1970s and 1980s, and sustained engagement with the institutions of science is thin on the ground, despite feminism's sweeping indictment, during the same period, of the long history of biological and medical disciplining of women.

In recent years, however, it is not the education of humanists but the education of scientists that has been questioned. Fears about 'scientific illiteracy' are now more often applied, as Sandra Harding puts it, to the 'Eurocentrism and androcentrism of many scientists, policymakers and highly educated citizens' with an outcome that 'severely limits public understanding of science as a fully social process'. Such influential people, she argues, need 'a kind of scientific education' – rooted in social experience – 'that has not been available to them' (Harding 1995: 1). Indeed, the cloistered scientist, shielded from self-critical knowledge about the social origins and conditions of his or her instruments, empirical methods, and research applications, has emerged as a much greater danger to our social and environmental survival than the cloistered humanist. In view of the restructuring of our business civilization around the future of technoscience and biomedicine, the narrow, technical education of a small number of Western scientists has far-reaching consequences for everyone else. The long history of science serving as the handmaiden of militarism and capital accumulation may only be a prelude to the role being cast by today's corporations for their own technoscientific workforce and their subcontracted hands in the academy. Indeed, the social education of scientists is increasingly seen as one of the more important pedagogical tasks of the day.

Does cultural studies have some part to play in this education? The knowledge that science is not only socially determined but also culturally specific has modern scholarly lineage that dates back at least to the famous paper given by Soviet historian of science Boris Hessen at a London conference in 1931, in which he demonstrated how Newton's *Principia* responded to the emergent needs of British mercantile capitalism: particularly in the areas of transportation, communications and military production. This knowledge was subsequently drawn out in the work of J. D. Bernal, J. B. S. Haldane, and Joseph Needham. The externalism of these British Marxists was displaced and depoliticized in the Mertonian school of the sociology of science and in Kuhn's influential volume on scientific revolutions, and then revived in a more empirical form in the 1970s movement known as SSK

(sociology of scientific knowledge), with its many factional variants (Edinburgh, Bath, Paris, York, Tremont) and recent offshoots. The radical science movement that grew out of the anti-war movement in the late 1960s established 'science for the people' as a rallying cry, while the US academic field of STS came to maturity with its less radical, vocational agenda of democratizing technoscience. Today's burgeoning field of science studies is driven by assumptions and principles that are consonant with cultural studies, and includes prominent practitioners, mostly feminists, who are quite comfortable working under, or adjacent to, the rubric of cultural studies. Indeed, the watchword of 'science as culture' (also the name of the splendid journal that succeeded the *Radical Science Journal*) has come to be an eclectic rubric, including not only ethnographic attention to the minutiae of scientific culture, and the analyses of the role of science and scientific authority in the culture at large, but also interventions in matters of science policy and ideology. This is the point at which the broad tradition of cultural studies meets up with developments in science studies – when a continuum of power is established between the interests of the state and the expressive, daily realm of rituals.

The most consistent origin story for cultural studies describes it as the adulterated offspring of an insurgent sociology in revolt against Parsonian functionalism, and a 'left-Leavisite' cultural criticism (minus the high cultural elitism), pledged against what F. R. Leavis had called 'technologico-Benthamite civilization' and its rule of utilitarian reason. In this account, cultural studies has always been in flight from particular forms of instrumental reason, although not from rationality as such. None the less, the cause it has primarily pursued – that of cultural politics – has often been trivialized, on the hard left, as a displacement of 'real' politics, and, ultimately, as a dangerous immersion in the destructive element of unreason – the stuff of nationalism, fascism, imperialism, and capitalist commodification. According to this view, which has deep roots in the doctrine of 'scientific socialism', the path of progressive politics is an insuperably rational development, whose objective processes are contaminated by attention to the 'subjective' factors posed by cultural issues. In the wake of the Culture Wars, which have propelled cultural issues and values to the forefront of the New Right's political agenda, this position, often described as 'unreconstructed', seems especially untenable. Consequently, cultural politics has emerged as legitimate, unavoidable, and indispensable. At least one outcome of the face-off between mono- and multi-culturalists is the recognition that people feel their right to cultural respect and civility as strongly as they feel their right to the benefits of a social wage. Consequently, full citizenship has come to be seen as a cultural, as well as a socio-economic, achievement.

What does this account of citizenship have to learn from cultural studies of science? Adherence to scientific reason is a constituent element of cultural belief in advanced industrial societies, even in countries like the US where a vast portion of the population also believes that the world was created in six days. The authority of science is thus a central vehicle of consent in a technocratic democracy. This authority is exercised largely through appeal to expertise, from the dismal science of the economists at the commanding heights of the corporate state to the routines followed by technological dead labor in the workplace. Where scientific reason is the dominant cognitive authority, its cultural and economic role in maintaining a

social system of inequalities must be open to analysis and to reform in ways that go far beyond internalist adjustments and purifications. While the value-free neutrality of the scientific method is the legitimating basis for empowered forms of technical expertise, scientists themselves rarely feel personally or professionally responsible for any of the social or political uses of the name of science. The division of labor that accompanies value-free ideology – 'that's not my department' – means that scientists have been able to disavow knowledge about the social origins or applications of their research. The model for this division of labor, of course, was the archetypal example of the 'abuse' of science – the Manhattan Project, where the specialized allocation of research tasks pre-empted any knowledge on the part of individual participants about the overmanagers' mission.

The state's utilitarian endorsement of the ideology of 'value-free science' has long been a source of criticism and activism, and most egregiously in a period when so many of the world's scientists have been involved in military research or its spin-off industries. Yet many scientists charge that the criticism of scientific research and its results is often uninformed or non-specific. In the 1970s, this complaint met with an empirical response in the 'descriptive turn' of the SSK school, represented in the work of Barry Barnes, David Bloor, Steve Shapin, Michael Mulkay, and Harry Collins, and followed by Nigel Gilbert, Joan Fujimura, Ian Hacking, Eric Livingston, Trevor Pinch, Sal Restivo, Nancy Cartwright, David Gooding, and others. Rather than study the products of science, or scientists' own representations of science, the strong program of SSK endorsed the rigorously sociological study of science in practice, through first-hand observation. This empirical approach generated research in three main genres: studies of scientific controversies; historical studies; and ethnographic accounts of laboratory procedures, such as Bruno Latour and Steve Woolgar's *Laboratory Life* (1979), Karen Knorr Cetina's *The Manufacture of Knowledge* (1981), Michael Lynch's *Art and Artifact in Laboratory Science* (1985) and Sharon Traweek's *Beamtimes and Lifetimes* (1988). Such studies, identifying the role played by social interests in every aspect of research, demonstrated that scientific knowledge is not given by the natural world but is produced or constructed through social interactions between/among scientists and their instruments, and that these interactions are mediated by the conceptual apparatuses created in order to frame and interpret the results. The knowledge produced is often so local and context-specific that it makes sense only in relation to the laboratory instruments, modes of analysis, and specialized textual practices engineered within a specific field.

The result of this kind of attention has been a more systematic description of 'science in action', better equipped to demystify scientists' perception that their research laboratories and working communities are value-free zones. Each zone, in turn, came to be seen as an intersection of various belief systems, patched together to form a seemingly coherent whole. But the relativism inherent in the descriptive turn was much criticized as a theory that ultimately declared the sociological equivalence of all beliefs, whether true or false according to internal or external criteria. It did little, as Steve Fuller has argued, to dislodge the elitist perception that only scientists can do science, and it shied away from all normative or evaluative analysis that might produce change in scientific institutions (Fuller 1992: 390–

428). In opting for a program of social realism that eschewed value-laden or moralistic critique, SSK's passive 'explanation' of science's social and cultural construction was open to charges of quietism. Contrary to the positivist view of science which stressed the universality of scientific knowledge, SSK demonstrated that there was little distinctive to differentiate science from other social activities. But this evidence could not in itself lead to alternative ways of doing science. Nor would it suggest alternative criteria (i.e. other than those framed by the needs of the military, capital, or the state) to judge the successes and failures of science. Only normative critiques could change the status quo.

It could be argued that a similar set of concerns accompanied the ethnographic turn in cultural studies, coming, as it did, at a point where excessively abstract theorizing about 'spectators' and 'readers' had devolved attention away from the contexts in which people actually utilized culture. Turning its back on the long history, within cultural theory, of moralizing assumptions about the behavior and beliefs of 'the masses', cultural studies tried to relinquish patronizing value-judgements, sought to renounce recruitism, and vowed to find out instead what real people said, thought and did in their lived environments. The powerless and disenfranchised turned out to be creative, diverse, and, yes, resistant in response to the media flow in which they had been immersed. Intellectuals found a way to salve their separation from the popular classes, and in doing so, found a refuge from the pressures of bourgeois taste. And a much greater understanding of the processes of cultural consumption emerged. As in the case of SSK, criticism of this ethnographic turn appeals to the need to recommend and exhort alternatives to the status quo. Eschewing value-judgements (suspending opinions about whether cultural texts were good or bad) meant that critics also gave up the authority to demand change, a dereliction, in some respects, of the tradition of the 'responsibility of intellectuals' (see Brunsdon 1990). Since normative judgements of taste were hardly absent from the realm of popular opinion itself, the cultural studies classroom, as Simon Frith recently pointed out, became virtually the only place where the act of passing value-judgements was more or less prohibited (Frith 1996). By contrast, conservative intellectuals picked up the baton, and have been running away with the 'values' contest. Accordingly, this critique of the ethnographic phase of cultural studies has been largely responsible for the emergence of the new cadre of 'public intellectuals', pursuing the limited access available in the public, non-academic media to left-wing intellectuals.

In accord with similar developments in science studies, that part of cultural studies that has concerned itself with state policy (primarily in Australia, and, to a much lesser extent, in the UK) finds itself inevitably compromised not only by bureaucratic calculation but also by accommodation to the 'direction' of the corporate state. Attempts to redirect science policy or cultural policy towards the public interest or the service of social relevance have been obliged to abandon or dumb down their critiques and oppositional strategies. On the other hand, the route of institutional empowerment provides opportunities for reform of policies and structures rarely open to the fiercely independent dissident.

Clearly, the mutually exclusive attractions of administrative influence and prophetic opposition pull both ways for both fields. In addition, cultural studies and

science studies share the position of bridge disciplines, the former crossing humanities and the social sciences, the latter crossing social sciences and the natural sciences. So much is shared between the two fields that conservatives active in the recent Science Wars have been able to group together, in a spurious 'anti-science movement', as their common antagonists, social constructionists and postmodernists in both cultural studies and science studies. (The eclectic mix of arraigned 'irrationalists' also includes astrologers, eco-feminists, Afrocentrists, New Agers, and Christian fundamentalists.) Of course, there are many significant distinctions between these intellectual tendencies, but the immediate outcome of the Science Wars, as I shall discuss below, has been not only to encourage unity and alliances among these tendencies but to highlight more clearly the ideas, assumptions, and principles that lie at the core of scientific conservatism.

2

Every time I fly these days, I remind myself that I am sitting in a slightly modified bomber. After all, that is what civilian aircraft are. Sometimes, I even imagine that I am on a combat mission, in cynical sympathy perhaps, with my fellow flyers, many of whom (on weekdays, when I mostly travel to give lectures) are invariably business people, psyching themselves up for some hardball meeting with their regional peers. Most recently, I've had to think about the following, infamous statement made by Richard Dawkins in a September 1994 issue of the *Times Higher Education Supplement*: 'If it gives you satisfaction to say that the theory of aerodynamics is a social construct that is your privilege, but why do you entrust your air travel plans to a Boeing rather than a magic carpet . . . Show me a cultural relativist at 20,000 feet and I will show you a hypocrite.' As Sarah Franklin has retorted, 'Show me a person who denies that airplane design is a highly organized human social activity, and I'll show you an unreconstructed objectivist' (Franklin 1995). Philosophers like Wittgenstein used the desk or table as the favoured example of their ontological proofs and refutations. Currently, the airplane is a likely candidate as the object of choice in disputes within science studies. On the one hand, objectivists can invoke the irrefutability of the law of gravity, on the other, their antagonists can show how the history of entire sciences like the 'pure' mathematics of aerodynamics have been determined by military needs in ballistics research and technologies. We needn't even get into the history of how Newton came to apply the metaphor of *gravitas*, originally a human attribute, to the principle of mutual attraction between bodies. The metaphor eventually died off into literalness.

But the choice of the airplane would also be emotionally magnified, I suspect, by the complex set of fears and anxieties associated with the experience of civilian air flight, including a response to the rituals and institutions pioneered by military usage and preserved to this day in the culture of air transport. The massive surveillance at airports, the inflight physical experience of involuntary confinement and submission to centralized commands, and the rituals of national identification that accompany border crossing, are more evocative of military service than most routine civilian events. That terrorism is associated with air travel

has as much to do with its continuity with the militarized cultural environment as with the fact that passengers are particularly vulnerable in mid-air.

The risks and fears associated with airplanes could be characterized as technophobia in the fullest sense of the term; no longer a knee-jerk reaction to the unknown world of machines but a complex and informed response to objects and ideas within a daily environment pervaded by the sway of technoscience. This kind of technophobia has become part of our routine response to modernity, perhaps even an intrinsic feature of modernity itself. No less complex, these days, is its manifestation in the field of knowledge. If I had to say what it is that terrorizes my students most today it would be the task of engaging with technoscientific rationality and all of its imposing institutional fortifications, a task that they none the less feel more responsive to than have previous generations of cultural critics. Why do they feel more responsive to meeting the critical challenges of science?

Some cynical commentators might say that it is all part of the colonizing will of cultural studies to penetrate every corner of the field of knowledge in an expansionist movement that masquerades as postdisciplinarity. Whatever truth there might be to this ambition, it would still pale beside the reductionist aspirations of science's Holy Grail of a unified theory of the natural world. When Francis Bacon announced, 'I have taken all knowledge to be my province', Eurocentric science was acquiring a colonizing voice that sought universality for its particular views. Conservatives in science get nearer the mark when they see the knowledge claims of cultural studies – local, specific, and social – as contaminants, and likely to weaken and infect the core, universalist beliefs of the natural sciences in the same way as its contagion has swept through the humanities and social sciences. The viral metaphors are not mine; I cite them because they are typical of the epidemiological rhetoric utilized by science purists.

My own impression is that these students are probably not acquiescent agents of either intellectual contagion or disciplinary colonialism. To my mind, they are responding, in a much more informed way, to conditions largely created in the last two decades in which technoscience has played a conclusive role in reshaping the economic and cultural composition of most people's productive lives, especially those involving intellectual and knowledge workers. Most of these students are Internet-savvy, and are therefore proficient in the cyberculture that is emerging as the international language of the professional-managerial class, and arguably, the first *lingua franca* of business, government, and academic elites to be inaccessible to most of the population since preliterate, preindustrial times. They also know that the utopian trappings of that cybermedium may very soon be remembered only as a brief golden age before Disney, Murdoch, Microsoft, AT&T, and Time Warner monopolized the real estate, in accord with the privatizing rage of capital-intensive technoscience. Whatever opportunities remain for the academy and the Internet's spectrum of independents to develop a halfway-decent public sphere are more compromised by the day, and in the scarcity climate favoured by national and global managers, resources will only dwindle. Our students, acutely aware of their tenuous future in the shrinking educational sector, are highly conscious of the factors driving the scarcity revolution.

As little as twenty-five years ago, it was naive, but still tenable, to ignore the pivotal contribution of universities to emergent forms of post-industrialism – in

retrospect, a socio-economic revolution driven by the commercial potential of scientific R&D, managed by technocratic cadres churned out by higher education, maintained by Third World labor pools and resources, and facilitated by global economic restructuring. Indeed, the student movements of the 1960s were, in part, prompted by a generational aversion to the prospect of being apprenticed en masse to occupy semi-professional niches in the technostructure of the corporate state and the burgeoning transnational metastate. The anti-war movements on campuses were directed at the widespread use of university facilities and resources for military research and applications – a public relations debacle for the vaunted ideology of science's disinterested ethos.

Today, your head has to be buried very deep in the sand to ignore the pervasive presence of technoscience in all of the institutional environments that house our intellectual work. I am referring not simply to the computerization of the workplace and of the professional culture of intellectual work in general. The demand for productivity at reduced wages, the erosion of benefits and job stability, the geographical dislocation of economic life, the maintenance of a swollen, reserve army of highly educated labor, widespread technological disemployment and downsizing, the privatization of public work environments and the routinization of concessions and other sacrifices at the budgetary altar of pro-scarcity politics – all of these conditions characteristic of the postindustrial economy as a whole have taken a sizeable toll upon the workplaces of higher education. While the evereccentric rituals and traditions of academic life serve to distribute the full impact of technological change unevenly across our campuses, most of our research universities resemble commercial laboratories more than they do ivory towers these days.

This state of affairs is a consequence of the contractual agreements forged during the 1980s that bound academic science to the industrial marketplace, and redefined universities as public institutions doing private business, patenting genetic material today, for example, like any pharmaceutical company, or else handing the patents over to the corporate sponsors of academic research as contractually required. In the Reagan–Bush years, at the height of the Pentagon's cashflow volume, basic science was forced onto the international marketplace in the name of competitiveness in war and in trade. Economic restructuring around science and technology has meant that industrial sponsorship of the academic scientific community is now a primary basis for corporate competitiveness where access to basic science is the driving force (Dickson 1988). Under these circumstances, it is all the more necessary for boosters to prop up the old distinction between science and technology – the idea that science is the disinterested pursuit of public knowledge made internationally available at no cost and that technology alone applies to the sector of commercial product development. But in today's marketplace, it is the corporate bottom line, expressed, for example, in the golden rule of patent protection, that decides when public sharing of scientific information ends and when product development and monopoly control over profits takes over – very quickly, in most instances. The Human Genome Project has been the exemplary modern instance of this rule; even as it proceeds under the benign rubric of public enlightenment, only a dunce would bet that, in the current economic climate, it will not lead to the private ownership of life processes. Universities and

corporations already hold private patents on all sorts of genetic material. The section on Trade-related Intellectual Property Rights in the GATT agreement has, most recently, guaranteed a future of biopiracy for the gene hunters of the North unmatched since the heyday of botanical imperialism.

To cut a long story short, we live and work now in conditions and environments that demand a critique of technoscience as a matter of course, as part of a commonplace response to daily life. Our students have absorbed this critical temper, not because of their proximity to campus research environments but because it has become a normalized feature of life in an advanced industrial society. Scepticism about the artifactual power harbored within the laboratories and hitech factories is a minimal exercise of citizenship. It forms the basis for massive public anxiety about the safety of everything from the processed food we consume to a biologically engineered future often described, in popular shorthand, as 'tampering with nature'. Knowledge about the risks surrounding us is unevenly shared, as a result of class and education, but it is a part of everyone's daily experience of modernity.

One of the touchstones of cultural studies is Raymond Williams's maxim that 'culture is ordinary' – an everyday creative activity that everyone does. So, too, we might say that the critique of science is ordinary, exercised in a hundred little ways on a daily basis; from suspicion of the latest nutritionist advice to distrust of the first and second medical opinions; from doubts about the safety of the nearest chemical storage facility to apprehension about the latest biogenetic laboratory animal. These are routine responses, often made without prolonged reflection, but that does not make them mindless. They are invariably based upon a complex process of risk perception and risk assessment. In his influential book, *Risk Society,* Ulrich Beck has described a society increasingly characterized by the overproduction of risks, and socially organized around the power that comes from achieving and possessing a risk-free environment (Beck 1992). In such a society, popular technoscepticism has come to replace the older semi-rational fears once associated with the term technophobia. Demonizing technology is by now a campy part of retro culture, reminiscent of a B-Grade science-fiction movie. By contrast, today's anxieties are thoroughly domestic, and so much under the skin they can no more easily be projected onto discrete objects than can boundaries be strictly maintained between the ecosphere and the technosphere. They have become part of the birthright of modernity, an offshoot of the Enlightenment rationality that fostered modern science itself.

If the critique of technoscience has come to be normalized, the same cannot be said of science itself. Science is not recognized as an ordinary activity because it is practiced by highly specialized and highly credentialed experts. So too, a consideration of who is qualified to critique science leads to no ordinary conclusion. At the very least, it requires some recognition of the priestly order that obtains within scientific institutions (wielding a power that is further concentrated and sanctified as scientific and technical knowledge attains more and more importance in society), and, on the other hand, the lay status automatically accorded to all non-professionals who are not involved directly in the networks of prestige that determine decision-making within science communities. This is a status as readily accepted by most of us, through science envy as much as anything, as it is exploited

by those seeking the name of science for their political purposes. Let me give you a succinct example of how both of these outcomes reinforce each other. In Stephen Jay Gould's review of *The Bell Curve* in the *New Yorker*, he noted that reviewer after reviewer in the public media confessed that he or she was not a scientist or an expert in any of the empirical fields represented in Murray and Herrnstein's book, and that they therefore did not feel qualified to judge fully the worth of the book's arguments. Gould concludes that *The Bell Curve*, though only 'a rhetorical masterpiece of scientism', succeeds largely because 'it benefits from the particular kind of fear that numbers impose on nonprofessional commentators'. He then proceeds to tear apart the numbers in his own incisive way. Bestowing the status of a masterpiece, even of scientism, is a little overgenerous, but Gould's observation allows us to see how a smelly piece of racist welfare-bashing can succeed in cowing ordinarily feisty opinion-makers into silence simply by wheeling in some heavy statistical artillery and festooning its pages with references to science scholarship that has been fully discredited for decades. Of course, *The Bell Curve* was not written to generate debate among experts. It was designed to feed intravenously into public policy, and so few people were prepared to take a stand over its scientific validity. In the current climate, however, when the social institutions targeted by Murray are being undermined daily, it is only a matter of time before we see more concerted efforts at scientific racism, at which point critics of these ideas will be tarred with the science-bashing brush that has been so broadly applied by conservatives in the Science Wars.

3

While science boosters have seldom missed an opportunity to scare up anti-science folk devils in order to reinforce access to resources, funding, and other privileges, the origin of the current backlash can be traced to the publication of Paul Gross and Norman Levitt's book *Higher Superstition: The Academic Left and its Quarrels with Science* in the spring of 1994. Drawing directly upon the lessons of the Culture Wars, Gross and Levitt cut a swathe through the usual PC suspects, caricaturing multiculturalists, postmodernists, and constructionists alike. The book escalated the low-level friction between conservative scientists and the science studies community. Soon after, the National Association of Scholars took up the cause, launching and coordinating a well-funded campaign to promote the backlash. In October 1994, the NAS convened its second annual conference, 'Objectivity and Truth in the Natural Sciences, the Social Sciences, and the Humanities', in order to combat what it presented as the growing 'denigration of science'. In the words of the advertisement for the conference, this denigration, hitherto confined to 'quarters outside the academy', increasingly now 'comes from within' and has to be stopped because it 'undermines public confidence . . . alters directions of research . . . affects funding [and] subverts the standards of reason and truth.' Another large conference, 'The Flight from Reason and Truth', was convened at the New York Academy of Sciences in June 1995, and by July the press campaign had worked its way up the media food chain from the glossy weeklies to the op-ed pages of the quality dailies. By this time, proponents of critical science studies were being

grouped alongside astrologists, New Age cultists, Creationists, Lysenkoists, and Nazi Aryan scientists. In the meantime, Gross and Levitt (nicknamed Love-it or Leave-it by the science studies community) and their colleagues had begun what amounted to a holy war at the risk of exhibiting all the symptoms associated with the popular stereotype of the bad scientist: arrogant, insular, self-interested, and aggressively resistant to external inquiry and public accountability.

Many factors have been cited for the sudden advent of this backlash, but most commentators agreed that the decline in funding of science, and the erosion of its popular authority combined to service the need for public scapegoats (Ross 1996). On the other hand, it was clearly triggered by, and targeted at, the influence of cultural studies within science studies. SSK, STS, History of Science, Sociology of Science, Anthropology of Science and other disciplinary undertakings had ruffled feathers over the years. But it was the offending combination of attention to gender, race, ethnocentrism and elite culturalism – the same potent mixture that had fuelled the Culture Wars – that raised the temperature to the boiling point. Critiques of defense funding and corporate sponsorship could always be answered by the 'abuse of science' argument, i.e., humans kill, not guns. So, too, SSK critiques drew the kind of response that promised to reconstruct science from within by rendering it more objective yet in its pursuit of better knowledge through less impure procedures. At bottom, it could still be maintained in both instances that the 'scientific method' was sound. This was less the case with the 'science as culture' critiques, directed, as they were, at more fundamental flaws, and suggesting changes in the very epistemology of the scientific method. If everything from the socialization of scientists to the corporate structuring of research institutions has a recognizable effect upon the shaping of science, how can the purified method of experimental objectivity be declared off-limits to social inquiry and reformation? When there are so many different versions of doing science, even within the domains of Western science (the world's dominant paradigm of rational inquiry), who would dream of reserving an uncontested status for the truth claims of a unitary, abstract method? Consequently, there has been a wholesale challenge to the assumption that objectivity in science is best served by methods pursued at a distance from the social contexts in which science is applied and from the communities most affected by science. In a society so organized hierarchically by class, race, and sexuality, there is no prospect of real objectivity.

Thus Harding argues that objectivity in science would be better ensured if anti-sexist, anti-racist, and pro-democratic principles were adopted as the governing assumptions of research. Only if such moral and political programs were embraced could the prevailing anti-democratic prejudices in science be expunged (Harding 1991). Against science's God's-eye view of nature, comprehensive and yet located nowhere in particular, Donna Haraway argues for 'situated knowledge' on behalf of 'embodied' perspectives of the natural world (Haraway 1988).

Other than reiterating the bromide that science serves truth and not society, interpretations of objectivity that challenge the exclusivity of the empirical method have mostly been answered in the Science Wars by caricature and red-baiting. The more academic response – based on the charge of technical ignorance – has been selected by Gross and Levitt as the ultimate Science Wars put-down: if you haven't solved a 'first order linear differential equation', then you have no business

recording your opinion on any of the pressing business that science does in society. Given the arcane authority of credentialism in a technocracy, such an argument will suffice to silence many. On the contrary, it should be seen as the kind of argument that exposes the way in which technical elites protect their privileges in a society where the most valued forms of knowledge are well nigh inaccessible to most of the population. Indeed, the use of technical expertise as a criterion to intimidate, exclude and disenfranchise is a primary exercise of power in the knowledge society we now inhabit. If you are a non-professional, of course you will never know enough to satisfy your scientist interlocutors. (To do so, you have to be head of a lab, with a fistful of funding, and with a good deal of clout in other places.) But how much do you need to know about nuclear fission to know that nuclear reactors are an insane idea?

On the other hand, we live in times when corporations have their eyes fixed on the patent prize. Consequently, much more is at stake in these Science Wars than the self-interested status of scientists. Given the potential rewards, critique from the non-professional public or from non-credentialed professionals is a costly risk. And so the principle of the disinterested autonomy of scientific inquiry, voiced in the past as a protection against state interference, is more often a serviceable smoke screen today, at a time when scientific knowledge is systematically whisked out of the orbit of education and converted into private capital. The question raised earlier here – Who is qualified to critique science? – already carries set answers in a culture of expertise. One of our jobs is to turn this question around. How can science qualify *us* to sustain a critical view of society?