Higher Superstition

The Academic Left and Its Quarrels with Science

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ic and scientific detail (as in Atonowitz), or built on a minute, but overly restrictive, examination of the social and historical record (as in Shapin and Schaffer), is clearly designed to flatter a certain political perspective, and to assert the sovereignty of a certain kind of political alertness over the domain of history and philosophy of science. Even apart from "ideology," in the narrow sense, it functions politically (as universities understand these things) to redress the grievances of the social scientists, and to elevate their knowledge claims to the level historically enjoyed by physicists and chemists. Thus, the insights of the constructivists are ripe to be turned against them. One must scrutinize their precepts and their practices for signs that their theories are "value-laden" to a considerable, perhaps an unacceptable, degree. The evidence is there, we submit, and reveals far more about the nature of the constructivist program than that program has ever revealed about the nature of science.

CHAPTER FOUR

The Realm of Idle Phrases: Postmodernism, Literary Theory, and Cultural Criticism

If you're anxious for to shine in the high aesthetic line
As a man of culture rare,
You must get up all the germs of the transcendental terms
And plant them everywhere.
You must lie upon the daisies and discourse in novel phrases
Of your complicated state of mind.
The meaning doesn't matter if it's only idle chatter
Of a transcendental kind.

W. S. Gilbert, Bunthorne's Song from Patience

The Ascent of Postmodernism

Future historians, composing a chronicle of the life of the mind in the United States during the period 1975–95, may well feel obliged to pay close attention to the role of academic humanists and social scientists. Assuming that they do, they will have to contend with the curious phenomenon of postmodernism, a stance that has inflected the thinking of hosts of scholars in these areas. Postmodernism flourishes chiefly in departments of English, comparative literature, art history, and the like; but anyone familiar with contemporary American universities is well aware of how far it has spread into such unlikely areas as sociology, history, political science, anthropology, and philosophy.

To give a concise statement of postmodern doctrine would be an almost impossible task. It is too variegated and shifty to allow easy categorization, and too willfully intent on avoiding definitional precision. There is even a risk of misleading in calling it a body of ideas, for postmodernism is more a matter of attitude and emotional tonality than of rigorous axiomatics. Nonetheless, as critics of postmodernism in one of its currently most vigorous
forms—science criticism—we owe the reader some sense of how we understand the term.

Perhaps the easiest entry into this body of ideas (and prejudices) is to understand it as a negation—particularly as the negation of themes that have reigned in liberal intellectual life of the West since the Enlightenment. If we accept the notion that there is a generalized intellectual "project" of the Enlightenment, one that is intent upon building a sound body of knowledge about the world the human race confronts, then postmodernism defines itself, in large measure, as the antithetical doctrine: that such a project is inherently futile, self-deceptive, and worst of all, oppressive.

Contrasted to the Enlightenment ideal of a unified epistemology that discovers the foundational truths of physical and biological phenomena and unites them with an accurate understanding of humanity in its psychological, social, political, and aesthetic aspects, postmodern skepticism rejects the possibility of enduring universal knowledge in any area. It holds that all knowledge is local, or "situated," the product of interaction of a social class, rigidly circumscribed by its interests and prejudices, with the historical conditions of its existence. There is no knowledge, then; there are merely stories, "narratives," devised to satisfy the human need to make some sense of the world. In so doing, they track in unacknowledged ways the interests, prejudices, and conceits of their devisers. On this view, all knowledge projects are, like war, politics by other means.

It is fascinating that postmodernism, a point of view that must flirt continuously with nihilism, has become so conspicuously identified with radical scholarship and campus political activism on behalf of left-wing causes. As much as anything can be, postmodernism is the unifying doctrine of the academic left, having largely supplanted Marxism, except to the extent that the latter has been able to cover itself in postmodern dress. In a new and highly politicized area such as women's studies, for instance, virtually every scholar and student pays tribute to the supposed depth of postmodernist insight and the richness of postmodernist methodology.

The realm of cultural studies, only a few years old, and yet the virtual center of current left-wing theorizing, is to all intents the institutional embodiment of postmodernism. This is not to say that all feminists or all left-academic cultural critics are committed to the most caustic forms of postmodern skepticism. Some such scholars are at pains to make clear their doubts and reservations. Nevertheless, and however reluctantly, they almost inevitably find themselves aping the language and style of postmodernist prototypes, and drawing upon the manifestos of noted postmodernist thinkers, to lend authority to their own musings. As historian John Patrick Diggins

notes in his comprehensive chronicle of the American left, "Entering the academic world, New Leftists would find in various poststructuralist theories ready-made answers to their defeat and disillusionment." For "poststructuralist" here, read "postmodernist" (see Chap. 1, n. 2).

There is a paradox in all this. In scorning the Enlightenment, the postmodern left is clearly cutting away the roots, emotional as well as intellectual, that formed and sustained its most deeply held egalitarian ideals. In embracing the brittle skepticism of postmodern thought, would-be leftists are never more than an inch away from passivity, ineffectuality, and cynical despair. A criticism frequently advanced by opponents of postmodernism—justifiably, in our view—is that the doctrine, at its most virulent, is hardly distinguishable from the moral blankness, the Vieja la muerte!, upon which fascism was erected in the first half of this century.

Yet the seductions of the postmodern stance are also obvious. In an earlier day, Marxism, in the form of a disciplined Communist movement, lured intellectuals by offering them the illusion of membership in a priesthood, an inner circle of initiates privileged to understand, by means of esoteric doctrine, the secret inner workings of the world, a coven of hierophants signaling to each other in an arcane jargon impenetrable to outsiders. It was the promise of numinous power, inherent in arcane doctrine and obscure lexicon, that convinced instinctive radicals that Marxist communism alone had the potential to purge the world of its indwelling evils. The melancholy chronicle of Communism in America, and its horror-laden history in those parts of the world where it has at one time or another actually held power, have by now demolished its intellectual prestige beyond hope of resurrection.

Nevertheless, if we examine the popularity of postmodernism with a view to understanding its appeal to the politically discontented, we see that psychological factors are at work echoing those that lured previous generations to Marxism-Leninism. Again, what is offered is the possibility of becoming an initiate, part of an elect whose mastery of a certain style of discourse confers an insight unattainable elsewhere and authorizes a knowing (and often smug) attitude. The promise of power to mold the world in accordance with one's sense of justice is far more qualified and ambiguous than was the case with hard-line Marxism. All the same, that promise, however muted, is still there.

Resistance, subversion, and transgression are among the most popular postmodernist nouns, and the sense in which they are used clearly conveys the idea that bourgeois society, founded on racism, sexism, and the enforcement of rigid social roles, is under attack, its vulnerabilities being exposed. Moreover, the peculiarly quixotic view of the antagonism between "representa-
tion" and "reality" that is so thematic in postmodernist thought vouchsafes its practitioners an eerie absolution from having to measure their theories against the unyielding matrix of social fact. If one holds, as most postmodernists do, that "reality" is chimerical or at best inaccessible to human cognition, and that all human awareness is a creature and a prisoner of the language games that encode it, then it is a short step to the belief that mastery over words, over terminology and lexicon, is mastery over the world. As Higgins says, "to the extent that the Academic Left partook of various structuralist theories, reality eluded its vocabulary. Such terms as 'power and hegemony' and 'domination and discourse' marked a shift from labor to language in which text, speech, and other forms of communication came to be seen as more refined systems of control, with power ubiquitous and anonymous." In the cold light of day, such a creed seems pathetic as well as futile, a desperate amalgam of solipsism and magical thinking. But the world of postmodern thought is well provided with devices for keeping out the cold light of day.

The idea that close attention to the words, tropes, and rhetorical postures of a culture gives one transmutative power over that culture finds acceptance for a number of reasons. First of all, it shifts the game of politics to the home turf of those who by inclination and training are clever with words, disposed to read texts with minute attention and to attend to the higher-order resonances of language. At the same time, it allows scholars of a certain stamp to construe the pursuit of their most arcane interests as a defantly political act against the repressive strictures of society. This is exhilarating: it is radicalism without risk. It does not endanger careers but rather advances them. It is a radicalism that university administrators and even boards of governors have found easy to tolerate, since its calls to arms generally result in nothing more menacing than aphorisms lodged in obscure periodicals. It is, finally, a politics upon which the wear-and-tear of ordinary political life can have little effect. If something bad happens, one's doctrine is confirmed: if something good happens, it is vindicated.

One startling aspect of postmodernist thought is its belief in its own omnipotence. It pronounces with supreme confidence on all aspects of human history, politics, and culture. If there is a prototype of postmodernism, a previous thinker whose sweep and ambition are mirrored in its swagger and whose corrosiveness is echoed in its skepticism, it is probably Nietzsche. Whatever one thinks of Nietzsche as philosopher and cultural critic, he is obviously a talismanic figure. From his nominal base in an obscure and hermetic discipline (classical philology), he reaches out with searing criticism of society and its follies, strips away its pretenses, and flays its complacency. Contemporary postmodern critics, themselves situated, by virtue of the extreme specialization that prevails in the training of academics, in scholarly pigeonholes, consider themselves similarly called upon to be philosopher-kings. Postmodernism is, among other things, a device for amplifying the special insights of a narrow area of literary criticism or rhetorical analysis into a methodology for making judgments of the entire cultural spectrum.

Necessarily, this entails considerable intellectual coarseness. The confidence of the postmodern cultural critic is the confidence of a generalizer who excuses himself from many of the usual obligations of criticism. Under this dispensation, a wide variety of disciplines may be addressed and pronounced upon without requiring a detailed familiarity with the facts and logic around which they are organized. A recent article by Heather MacDonald vividly analyzes this phenomenon, which, in its most impudent form, generates scholarly essays that seem to have as their subject everything in general and nothing in particular, and which, under the postmodernist regime, are equally suitable for symposia in literature, history, sociology, or feminist theory. She writes specifically about a recent forum devoted nominally to the history and analysis of twentieth-century art, many of whose participants turned out to have no particular knowledge thereof. This is not an anomaly—it comes closer to being characteristic of scholarly life among contemporary humanists. Notes MacDonald:

Concurrently with its internal colonization of academic disciplines, [postmodern] Thoer-ese broke down the institutional barriers between them. The growth of "interdisciplinary studies" in the university and the fascination in the non-academic creative world with "crossover" work are manifestations of the universalizing drive of Thoer-ese. Its final triumph lies in the establishment of entire academic departments devoted solely to itself—"Departments of Critical Theory," "Units for Criticism and Interpretive Theory," and misleadingly-titled "Humanities Centers."

American postmodernism is often accused, with considerable justice, of being little more than mimicry of a few European thinkers, mostly French, who rose to prominence in the midst of the bewilderment afflicting intellectual life when the protorevolutionary struggles in the late sixties in France, Germany, and Italy fizzled out without having produced any real impact on bourgeois society. The most recurrent and inevitable names in postmodernist circles are those of two French philosophers, Jacques Derrida and Michel Foucault. Derrida, founder of the deconstructionist school of textual analysis, has by example fostered many of the stylistic affectations that bespangle
modern critical writing—puns, coinages, words made ambiguous by internal parentheses and other whimsical punctuation, facing columns of apparently unrelated text which, to the initiate, are supposed to comment on one another. This kind of writing, as much as anything else, has been responsible for the ambiguous reputation of deconstruction and related critical methods.

Derrida's deep epistemological pessimism has infected his disciples as much as have his stylistic eccentricities. Deconstructionism holds that truly meaningful utterance is impossible, that language is ultimately impotent, as are the mental operations conditioned by linguistic habit. The verbal means by which we seek to represent the world are incapable, it is said, of doing any such thing. Strings of words, whether on the page or in our heads, have at best a shadowy and unstable relation to reality. In fact "reality" is itself a mere construct, the persistent but illusory remnant of the Western metaphysical tradition. There is no reality outside the text, but texts themselves are turgidly unstable, inherently self-contradictory and self-canceling.

On the face of it, this position would seem to offer little cheer to the would-be revolutionary or radical reformer. In the peculiarly constricted world of leftist literary intellectuals, however, it has come to be read as a road map for the continuation of a political struggle that seemed, by the late seventies, to have run out of steam. "Yet deconstruction had enormous value to New Left literary academics," explains Diggins. "Having lost the confrontation on the streets in the sixties, they could later, as English professors in the eighties, continue it in the classroom. A new nemesis haunted the Left. Everything wrong with modern society would be explained no longer by the mode of production but by the mode of discourse."4

Derrida and deconstruction (in the strict sense) have seen their prestige erode somewhat in the past few years. This is not due, for the most part, to philosophical or political rebuttal of Derrida's ideas (although, in contrast to literary critics, few serious philosophers have had much use for them). Rather, the reason is the adventurous exposure of two figures closely associated with Derrida—one as disciple, the other as philosophical forebear—as having behaved abominably during the heyday of Nazism. Derrida's chief American follower, Paul de Man of Yale University, was posthumously disgraced by the revelation of his pro-Nazi writings as a literary journalist in occupied Belgium. This, moreover, turned out to be just one episode in a life filled with dissimulation, opportunism, and betrayal.5 At about the same time, new facts came to light concerning the enthusiasm of the influential philosopher Martin Heidegger for Nazi doctrine, enthusiasm that now appears to have been heartfelt, and that led Heidegger, as rector of his university during the thirties, to perpetrate unforgivable acts of repression.6 Since Derrida had always claimed derivation of his thought from Heidegger, his own credibility as a liberatory thinker came under challenge.

Derrida's declining prestige was not, however, merely a matter of guilt by association. In trying to defend de Man and Heidegger, Derrida and those closest to him sent forth a stream of polemics and vituperation that stupefied many of its readers by its unreason and its resort to special pleading. What is more, Derrida fell into the ironic position of insisting that texts, especially his own, have quit: determinate meanings which he, as author, was uniquely privileged to understand, and that history and facts were on his side. Thus, at a crucial point, the panic-stricken deconstructionists ran headlong from the implications of their own doctrine, which had loudly proclaimed the "death of the author" and had despised appeals to historical fact.7

If we turn to Michel Foucault, we find a more sympathetic, but still disturbing, figure. Foucault was, primarily, a philosopher of history, whose thinking led him to ever-deeper and more pessimistic considerations of the role of language and discourse in constructing the conditions of human existence. To Foucault, life is built around language, but language itself is not neutral. Rather, it is structured and influenced by the relations of power and domination in a society. In fact, language itself creates power and social authority. We are irredeemably trapped in a linguistic web that determines not only what we can say but what we can conceive. All systems of thought, then, are artifacts of the prison-house of language and thus stand in a questionable relation to the real world.

Like Derrida, Foucault is a thinker whose appeal has been mainly to social theorists and literary intellectuals, rather than to philosophers, who are less swayed by the emotive aspects of his writing, and who tend to regard it as a kind of poetry, rather than as philosophy proper or sound history. For one thing, Foucault's epistemological relativism arises from a study of the presumably exact facts of social history, which his best work examines minutely.8 Thus, despite himself, Foucault is ultimately tied to the postulate of a real world, definitely knowable in at least some of its aspects. Moreover, his reputation, too, has been attenuated of late, perhaps unfairly, by revelations of his deeply neurotic and self-despising personal life which, one cannot help feeling, dictated the tone of his speculations, as well as giving them their peculiar emotional force.

Notwithstanding these reversals, the influence of Derrida and deconstructionism, of Foucault and his ideas of consciousness and domination, remains strong. One particular aspect of their style that continues to command imitators is their assurance that they are capable of profound insight into anything and everything. This style of philosophizing had been in eclipse during most
of the twentieth century, abandoned in favor of a technical mode of analysis that focuses with precise intensity on narrow questions and fine distinctions. But with Derrida and Foucault, among others, we see the rebirth of the philosopher as comprehensive sage.

The Conscription of Science as Metaphor

Science, arguably the dominant mode of thought in the contemporary world, has thus come under the scrutiny of Foucault, Derrida, and their followers. In the case of Foucault, skepticism is expressed in the form of doubts about the human importance of scientific truth, rather than on the possibility of achieving it. Nonetheless, his basic idea, that a mode of discourse is inevitably a code of power relations among the people who use it, has profoundly influenced other postmodern skeptics and has contributed importantly to the notion that science is simply a cultural construct which, in both form and content, and independently of any individual scientist's wish, is deeply inscribed with assumptions about domination, mastery, and authority.

For their part, Derrida and his epigones take a curiously ambivalent position toward science. On the one hand, scientific texts enjoy no special dispensation from the deconstructionist view of textuality. They are, it is asserted, just as indeterminate, as ultimately self-contradictory as any other text. The "privileged" status of scientific discourse is yet another illusion deriving from the conceits of Western metaphysics, and must therefore be rejected. Moreover, it has been put forth seriously that literary scholars trained in deconstruction or some related methodology are capable of a "deep reading" of scientific texts, a reading that reveals aspects of meaning and unconscious intent invisible to the scientists themselves. Later in this chapter we examine what some of these claims amount to.

On the other hand, deconstructionists, as well as other postmodern thinkers, have been eager to point out how modern science supposedly generates insights that confirm their own view of the universe. Kurt Gödel's celebrated incompleteness theorem is a constant point of reference. The argument is that this deep and startling result, which shows that no finite system of axioms can completely characterize even a seemingly "natural" mathematical object (that is, the set of whole numbers and its familiar arithmetic), can be taken to imply, in some sense, that "language is indeterminate." Mathematicians and logicians are dubious about such vague analogies, but many literary scholars are deeply impressed by them and recur to this particular example in paper after paper, even though it is doubtful that very many of them have any exact idea of what Gödel's result says, or any sense of how it is proved. They have fallen into the trap described by George Steiner, who understands, as few of the new "cultural critics" seem to do, that deep scientific ideas must be comprehended, first of all, on their own terms: "Having no mathematics, or very little, the common reader is excluded from science. If he tries to penetrate the meaning of a scientific argument, he will probably get it muddled, or misconstrue metaphor to signify the actual process."

A further sense of Derrida's eagerness to claim familiarity with deep scientific matters can be obtained from the following quotation, which also gives one some sense of how seriously to take such claims: "The Einsteinian constant is not a constant, not a center. It is the very concept of variability—it is, finally, the concept of the game. In other words, it is not the concept of some thing—of a center from which an observer could master the field—but the very concept of the game." The "Einsteinian constant" is, of course, c, the speed of light in vacuo, roughly 300 million meters per second. Physicists, we can say with confidence, are not likely to be impressed by such verbiage, and are hardly apt to revise their thinking about the constancy of c. Rather, it is probable that they will develop a certain disdain for scholars, however eminent, who talk this way, and a corresponding disdain for other scholars who propose to take such stuff seriously. Fortunately for Derrida, few scientists trouble to read him, while those academics who do are, for the most part, so poorly versed in science that they have a hard time telling the real thing from sheer bluff.

This is not, we assure the reader, an isolated case. In various other Derridean writings there are to be found, for example, portentous references to mathematical terms such as "differential topology," used without definition and without any contextual justification. Clearly, the intention is to assure readers who recognize vaguely that the language derives from contemporary science that Derrida is very much at home with its mysteries. An even more egregious and unambiguous example of the same sort of pretentiousness occurs in a piece by a young scholar writing in the important postmodern journal October: "The discourses of philosophy, linguistics, and sociology must be supplemented in a truly psychoanalytic account of AIDS by concepts drawn from the discourse of mathematics, principally post-Euclidean geometry, which provides for topological mappings based on a non-Euclidean concept of space." Scientists who are genuinely familiar with the terminology invoked by declarations of this sort have no choice but to regard the whole business as a species of con game.

This kind of pretentiousness is not limited to Derrida and his clones. It seems to have become a habit with many postmodern thinkers. Jean Baudrillard, for example, tells us that "there is no topology more beautiful than
Moebius’ to designate the contiguity of the close and the distant, of interior and exterior, of object and subject in the same spiral where the screen of our computers and the mental screen of our own brain become intertwined with each other as well.14 This is as pompous as it is meaningless; but it is well intended to impress readers whose knowledge of mathematics is superficial or nonexistent. Jean-Francois Lyotard is another celebrated postmodernist thinker—he is chiefly responsible for the popularity of the term—who pontificated about science at great length. Lyotard lets us know that “the games of scientific language become the games of the rich in which whoever is wealthiest has the best chance of being right.”15 Not all Lyotard’s readers, even among non-scientists, are eager to accept his scientific authority, however. In his book A Blessed Rage for Order: Deconstruction, Evolution, and Chaos, Alexander J. Argyros takes note of Lyotard’s propensity to play a similar game:

Lyotard’s postmodernism is not to be understood as ideological or theoretical fiat, but, we are led to believe, if only by implication, as the consequence of new developments in the natural and mathematical sciences. Therefore, Lyotard enlists such allies as Godel, Thom, and Mandelbrot in his campaign to reduce ethics to paralogy...I think Lyotard’s appropriation of mathematics and science is biased and tendentious in general.16

Even if we stick to mathematics alone, it is not hard to find other examples of postmodern thinkers whose urge to pontificate on science far outstrips their competence to do so. The recent compendium ZONE 6—Incontinentia is replete with examples. This is a volume of meditations on science, technology, and culture by a throng of well-known postmodernists. In perusing it, we find papers by Gilles Deleuze, Gilbert Simondon, Peter Eisenman, Aluísio Roseanne Stone, Frederick Turner, and Manuel de Luna, wherein they attempt to make references to deep mathematics—some of them at length, others just in passing.17 In each case, there are amateurish errors or efforts to pass off mere verbal tinsel as mathematical knowledge. Biology is similarly ill served.

We do not claim that all of the named writers are hostile to science: many of them, indeed, profess to admire it greatly. Moreover, a number of them are at best equivocally “postmodern,” under the meaning of the term as we have defined it. Nonetheless, whether deliberately or by inadvertence, they help to set the stage for a kind of hostile science-criticism which assumes that a grounding in the postmodern critical style, with its formulary, its litany, its rhetorical gimmicks, provides by itself sufficient intellectual leverage for insight into the workings of science, for criticism of it, and avoids the necessity of actually learning it.

How much has science itself been affected by these goings-on among the humanists? To this point, in the “hard” sciences—mathematics, physics, chemistry, and most of biology—the effects have been minimal or indiscernible. The same holds for applied science and engineering. Despite sweeping postmodernist claims of “paradigm shifts” and radical breaks in the reigning episteme, scientific practice in the more rigorous disciplines goes on as usual, driven for the most part by the internal logic of the subject and the unyielding contours of reality. The alarms and excursions that have shaken the halls of English and comparative literature departments have reached scientists, even those strictly within the academy, only as vague and amusing rumors.

In the social sciences, however, the effects have been drastic. The notion of “cultural critic,” in its postmodern form, embraces a certain kind of sociologist as well as a certain kind of literary scholar. They publish in the same journals and appear at the same symposia, speaking the same language and sharing the same attitudes. According to the eminent cultural anthropologist Robin Fox, his own discipline has been permeated by jargon, philosophical dogma, and political attitudes drawn from the world of postmodern literary criticism:

English literature departments are reconstituting themselves as cultural studies departments and are trying to take over the intellectual world. It’s a heady time for them and a scary time for science...My own interpretation is that lazy minds are happiest with the mere voicing of opinion, or with the easy task of dressing this up to make it look plausible. In modern literary criticism they have found the perfect model of this, along with a new doctrine of extreme relativism that says that everything is only opinion anyway, to justify it. Thus the otherwise odd vision of thousands of social science children cavorting after the Pied Piper of Lit. Crit. and discourse analysis.18

Cultural anthropologists, Fox reasons, were particularly susceptible to this invasion because “it makes a good excuse to dodge the rigors of science—the demand for verification and falsification—and promotes the relativism with which the social sciences have always sympathized.”19 Moreover, those whose politics inclined toward the left were all too happy to have a rationale for reconstituting their discipline as part of a social movement to champion the oppressed races, castes, genders, and sexual outcasts of the earth, freed of any need to analyze their situation “objectively.” In Fox’s view, however, many of the peoples whom this strategy is designed to help are, in the end,
poorly served: "Science, with its objectivity . . . remains the one international language capable of providing objective knowledge of the world. And it is a language that all can use and share and learn . . . The wretched of the earth want science and the benefits of science. To deny them this is another kind of racism." It is difficult to judge whether Fox overstates the extent of the damage—or understates it. The necessary census has not been taken. Therefore certainly has been damaged, and plenty of it. We hope that we shall not be obliged to compose a similar lament for polymer chemistry or biophysics in the near future.

The Political Temptations of "Theory"

Professors in the humanities are not, by and large, any more feeble-minded than the general run of humanity, nor are they particularly feckless in the affairs of day-to-day life. Moreover, despite the hopes of readers of the National Review or the American Spectator, left-wing political opinions are not especially inconsistent with high intelligence either, nor do they lead to a generalized susceptibility to muddled thinking. Why, then, has so large a proportion of the left-wing professoriate in literature and adjacent disciplines been so ripe for seduction by the potpourri of views—deconstructionist, Foucauldian, and otherwise—traveling under the catchall term postmodernism? Deconstructionism in its pure form would seem to be an unlikely candidate for such popularity. It is a uniquely disenchanted and crepuscular philosophy, carrying the reek of a decadent mandarinate that has seen everything once too often. To toy with ideas in such an idle and self-justifying fashion would seem to confess a lack of interest in bringing about salutary change in human affairs. For its part, Foucauldian analysis, despite the tender-heartedness of some of its instincts, seems equally to lead to resignation and quietism. If consciousness is such a prisoner of power—and Foucault seems much more gloomy than Marx in this respect—then hopes for a break with the oppressive past must be futile indeed. Notes Alan Ryan, Princeton professor of politics:

It is, for instance, pretty suicidal for embattled minorities to embrace Michel Foucault, let alone Jacques Derrida. The minority view was always that power could be undermined by truth . . . Once you read Foucault as saying that truth is simply an effect of power, you've had it . . . But American departments of literature, history, and sociology contain large numbers of self-described leftists who have confused radical doubts about objectivity with political radicalism, and are in a mess. The well-known Marxist literary critic Frank Lentricchia voiced similar doubts with respect to Paul de Man (this before the revelation of de Man's shabby political history): "De Man, unlike Schiller or Wordsworth, has no desire to employ the literary in the redemptive work of social change . . . his talk of 'critical crisis' is academic in the most debilitated sense of the word; it can only interest professors of literary theory." Though less disdainful of Foucault, Lentricchia is in the end disenchanted with that thinker's beatiﬁcation: "Foucault's theory of power, because it gives power to anyone, everywhere, provides for a means of resistance but no real goal for resistance . . . In this version, the economic version of exploitation seems insignificant." An even more sweeping unease is expressed by Bogdan Denitch, influential political scientist and co-chairman of the Democratic Socialists of America: "Politics of identity and mechanical imports of French intellectual fashions have trivialized and decentralized attempts to build genuinely broad coalitions that could provide an arena for a resurgent left." Even those among leftist intellectuals who have in part accepted the stance or methodology characteristic of postmodernism are left with a degree of unease. Alexander J. Argyros, in the statement of purpose that begins his book, flatterly asserts: "Since it is essentially a negative methodology, when deconstruction is called upon to address concrete issues, such as political ones, its penchant for eliding commitment and its resistance to postulating scales of value render it ineffectual at best and reactionary at worst." In the important theoretical journal New Left Review, Elizabeth Wilson, defending herself against a charge of abandoning the rationalistic legacy of the Enlightenment, writes: "As someone who still finds Marxism highly relevant in the present world I absolutely reject, however, any attempt to align me with, the likes of Rorty, et al." And, in a similar vein, the radical-feminist philosopher Kate Soper proposes exploiting postmodern skepticism without being overwhelmed by it, and advocates combining "alertness to the deficiencies and crudities of much traditional value-discourse with alertness to the self-defeating quality of the attempt to avoid all principled positions in theory." As will be evident from a day's skimming the unbound periodicals in any university library, such cautionary voices are in general not being heeded. The impulse to embrace postmodernism and to adopt the velleities of its chief figures in one's polemical language has run powerfully among left-wing intellectuals whose academic anchor is in the humanities.

A curious apology for this infatuation can be found in a paper of Kate Ellis, a radical-feminist literary scholar. Her argument for embracing deconstruction, or some partially non-Derridean variant of it, is, roughly, that in instructing (or rather, indoctrinating) her women's literature students in the
virtues of a radical feminist critique of society, she finds herself obstructed. Her problem is the tendency of those students to construe situations in fiction, and presumably in life, with reference to a narrative model emphasizing redemption (in the bourgeois-liberal mode), self-realization, and autonomy, by seeing these as the outcome of a sufficiently strong will and the ability to make the right choices. In Ellis's view, feminism requires a more strongly destabilizing view of things, which deconstruction fosters: "It means that no one person or group has the power of totally constitutive speech, and that no subject position can guarantee the truth of the speaker."\(^{29}\)

As is usual with rationales for deconstruction, the linear logic of Ellis's argument is an implicit rejection of the very position it argues for. Beneath that lurks a still more curious paradox, for upon analysis, Ellis's rhetoric reveals an underlying cast of mind flagrantly inconsistent with the cool pose of deconstruction. What is undeniable is her strict and unassailable moralism, as steadfast as that of any Sunday-school teacher. For Ellis, gender oppression and class oppression are absolute evils; all her theoretical moves are made with the intent of abolishing them. Whatever persuasive force can be found in her piece derives from her appeal to these values, whose epistemological standing for her is, of course, beyond question. They are so much a part of her that she is hardly conscious of them; she would scarcely allow them to be regarded as a mere casual consequence of her "position in the discursive field" or some such. The odor of unassailable rectitude that pervades what is supposed to be a case on behalf of untrammeled relativism is what makes this essay a little ridiculous—and just a bit admirable. Such emphatic ethical commitment, when all is said and done, puts to flight the formal skepticism being conscripted on its behalf.

As is exemplified by Ellis's work, the postmodern stance and its attendant philosophical buzzwords have become obligatory on the academic left, save for unrepentant die-hard Marxists. There is no one, overriding reason for this; a number of mutually reinforcing factors seem to have come into play. First of all, postmodern philosophy, in its guise as literary theory, flatteringly conceives a high degree of power to the skills and habits of mind of literary critics. The practice of close, exegetical reading, of hermeneutics, is elevated and greatly ennobled by Derrida and his followers. No longer is it seen as a quaint academic hobby-horse for insular specialists, intent on picking the last bit of meat from the bones of Jane Austen or Herman Melville. Rather, it has now become the key to a full comprehension of the profoundest matters of truth and meaning, the mantic art of understanding humanity and the universe at their very foundations. At a stroke, the status of literary studies as a genteel backwater of the world of affairs is reversed; and the image of the sophisticated critic as a new Dr. Faustus, conjuring secrets from the remotest circles of heaven and hell, is set in its place. Like all great men, the high priests of deconstruction and the like are flatterers.

Secondly, postmodernism, whether chiefly derived from one philosophical source or drawing eclectically on a flock of them—Lyotard, Baudrillard in addition to Derrida and Foucault—is, in its skepticism about everything save itself, an incarnation of the anti-Philosopher's Stone. Everything it touches is drained of value, authority, validity, and even the right to stand for what it has always stood for and to be understood as it has always been understood. Thus, in the game of intellectual subversion, which is always important to the academic left (though the wider world goes on much as usual), it is felt to be the instrument for dethroning the proudest symbols and most sublime achievements of Western—that is to say, white, patriarchal, violent, imperialistic, capitalistic, greed-ridden—civilization. Notes Vincent Pecora, a literary critic of emphatic left-wing sympathies but scornful of deconstruction and its political consequences: "To many of Derrida's critics, the deconstructive rejection of humanism and the Enlightenment seems mere nihilism. But it is precisely this anti-'Western' stance that has been the key, I think, to the influence Derrida's work has had on a broad spectrum of the academic left."

Everything by which that civilization contrives to hold itself in high regard—Shakespeare and Dante, Descartes and Kant, Locke and Jefferson, Newton and Einstein, Mozart and Beethoven—wills under the deconstructive gaze (at least in the minds of those doing the gazing). It is a heaven-sent device for avoiding close argument and the analysis of particulars. Once a postmodern critic has at hand a license to read every proposition as its opposite when it suits his convenience, analytic skills of the more traditional sort are expendable and logic is effaced in the swirling tide of rhetoric. Once it has been decided that determinate meaning is chimerical and not worthy of slightest deference from the well-honed poststructuralist postmodernist, the entire edifice of hard-won truth becomes a house of cards. Once it has been affirmed that one discursive community is as good as another, that the narrative of science holds no privileges over the narratives of superstition, the newly minted cultural critic can actually revel in his ignorance of deep scientific ideas. That this is a canny political act is accepted as an article of faith, no matter how much it seems to elevate wishful thinking over hard social fact.

The feeling that the postmodern critique is inherently political in a fashion helpful to the left is made evident in the recent rise of what has come to be called "cultural studies" on the campus. This term covers a multitude of freeform speculations about social institutions current and past. It is a recombina-
tion of social history and sociology, practiced largely by scholars whose background is in literary studies, when it is not in women's studies or something of the sort. It combines a pugnacious vindication of the demonic and popular cultures with a truculent interrogation of anything that issues from the high culture of the elite or from the dominant attitudes of the bourgeoisie. In that sense, it is a Foucauldian project on its face. The role of the skepticism and relativism of the deconstructionists is also clear: if no text is "privileged," no narrative tradition closer to ethical, aesthetic, or historical truth than any other, then there are no grounds for regarding the traditional venues of humanist scholars—high literature and high art—as sacred ground. Thus, it becomes permissible for professors of English to inquire solemnly into what are by tradition (and in fact) trivial matters, and to festoon those inquiries with the abundant neologisms of the postmodern lexicon, giving thereby further assurance that the subject at hand, be it rap music or professional wrestling, has deep implications for theory.

**Philosophical Revenge**

While many scientists in and out of the academic community hold progressive and leftist—sometimes emphatically leftist—views on a variety of questions, the postmodern stance has made little headway among them and seems, when they become aware of it, to evoke indifference or amused contempt. To the extent that contemporary theory, as it is understood by the humanists, is likely to influence scientists at all, the effect will probably be to drive them further from active political engagement along the lines hoped for by the left. This fact rarely deters the postmodern left from pursuing its favorite will-o'-the-wisps; if anything, the humanist radical is persuaded by the opposition or indifference of scientists that he must be on the right track. We suspect that this phenomenon is partly rooted in intellectual trends that were manifest in university life three or four decades ago.

At that time, the no-nonsense logical positivism adumbrated in such influential books as A. J. Ayer’s *Language, Truth, and Logic* was widely discussed and supported. It is safe to say that some version of this viewpoint—with Popperian addenda—is still embraced, at least tentatively, by most working scientists who have reflected at all (as most have) on the issues of knowing and truth. As it was made known to the academic community, however, positivism, while flattering to physical and biological scientists, was devastatingly hurtful to the amour propre of traditional humanists, and hardly more comforting to social theorists. This philosophical doctrine imposes severe tests of meaningfulness on all sorts of propositions. Statements in the language of academic, as well as everyday, discourse that seem, on their face, to be making some kind of factual assertion about the world are, in the harsh glare of positivism, often dispossessed of such pretensions.

The propositions of science, by and large, escape humiliation, while those of the humanities, including such venerable philosophic areas as ethics and aesthetics, emphatically do not. Thus, while statements about the emission spectra of planetary nebulae are perfectly meaningful for the positivist, the assertion that Racine is superior to Corneille (or Schubert to Mendelssohn, or that the Napoleonic Code is ethically inferior to Anglo-Saxon common law) collapses into meaninglessness. The latter is understood as an example of "emotive" utterance, to which truth-value cannot properly be ascribed.

Given that humanists—and, in particular, literary scholars of the traditional sort—have always labored just as hard, examined the relevant data just as minutely, and argued as exhaustively in reaching their judgments as physicists and mathematicians do in reaching theirs, the news that their conclusions cannot, in principle, even be wrong (in the sense that the contrary proposition is right) was a sour revelation indeed. The fact that scientists tended to accept it more or less complacently cannot have been much comfort to professors of English and art history.

A further source of unhappiness was the reaction of a good part of the social-science community, which responded to the logical-positivist critique (or its vulgarization) with various attempts to introduce quantitative methods, mathematical models, "replicability," and " falsifiability" into sociological work. Many of these attempts were brutally reductionistic and flew in the face of common sense, obtaining results that were either painful elaborations of the obvious or, even worse, procrustean absurdities. As the acerbic Stanislav Andreski puts it:

The recipe for authorship in this line of business is as simple as it is rewarding: just get hold of a textbook of mathematics, copy the less complicated parts, put in some references to the literature in one or two branches of the social studies without worrying unduly about whether the formulae which you wrote down have any bearing on the real human actions, and give your product a good-sounding title, which suggests that you have found a key to an exact science of collective behavior.  

This sort of thing, while for the most part unimpressive to the scientists, tended to convince many humanists—and a good part of the social-science community as well—that a craving for methodological respectability—"scientism" or "physics envy" as it was sometimes called—must lead to a
sterile (and politically reactionary) view of human affairs, denying ineluctable truths about the human situation. 32

Thus it probably came to pass that when the brutally skeptical views of the postmodernists began to gain currency some years later, many humanists, and many social scientists as well, were quick to lay hold of them as instruments of revenge. 33 If the carefully crafted opinions of literary experts were to be consigned to epistemological limbo by analytic philosophy, those experts and their academic progeny now had in hand—or so they thought—an instrument that could drag down the scientists and other pursuers of "objective" knowledge with all the rest. This view accounts at least in part for the paradox that on embracing postmodernism, humanist scholars have in many instances cruelly repudiated the accomplishments of their own disciplines, even to the point of denouncing their own earlier work.

However varied the reasons for the embrace of postmodernism in the universities, it is clear that the phenomenon is almost wholly associated with the self-described political left. As far as the ideological right is concerned, the situation presents it with welcome opportunities for polemical sallies, counterblows that avoid the necessity for justifying the illogical or evil practices of their own heroes and of whatever world (usually of the recent past) they like to think of as the best of all possible worlds. With postmodernism the target, conservatives easily move the discussion onto the loftier plane on which the relativistic caprices of Derrida, Lyotard, and the rest are the principal focus. Roger Kimball's Tenured Radicals adopts this strategy in part, but its underlying politics are relatively transparent, compared to arguments that seem never to stray in the slightest from disinterested philosophical inquiry. 34 It is often hard to read the writer's political position from such critiques, and some of them, in fact, issue from impeccably left-wing thinkers.

For the first time in modern American history, right-wing theorists seem on the point of establishing themselves upon the ethical and philosophical high ground, thanks to the postmodern contortions of the left. This fact, however, has little penetrated left-academic discourse; the entanglement of would-be progressive intellectuals with the conceptual freak show of postmodernism continues to isolate and neutralize them, at least outside the hothouses (i.e., academic departments and conferences) in which they flourish. One will cheer or deplore this fact as one's political tendencies dictate.

Cultural Studies: Playing Intellectual Hooky

We can now come to the question of the relation between the postmodern styles pervading so much of current humanist thinking and the traditional scientific disciplines—mathematics, physics, chemistry, biology, engineering. It would have been idle to hope that the ambitions of postmodernism would be satisfied by a revision of the standard modes of analyzing literature and the arts, and by a new methodology for thinking about sociology and social history. The mentality of postmodernism has an emphatically totalizing component, even as it pretends to denounce the totalizing propensities of whatever it wishes to attack. The centrality of science to the contemporary world, its crucial role in shaping the material conditions under which we live as well as many of the assumptions we bring into our discussions of the world, guaranteed that sooner or later postmodern dialecticians would feel bound to turn their guns on it.

It may be argued that in revolutionizing literary criticism, postmodernism will have created a valuable legacy, although many people (including students) who simply love literature and look to academic criticism for relevant inspiration and deeper insight about it have been cruelly disappointed. Still, the analysis of social questions may have benefited from postmodern intellectual strategies, however susceptible to subjectivism and jolly pontifications they may be. In the area of the hard sciences however (and we hold to the usage, anticipating the jeers of Derridean or Foucauldian skeptics), it has by now become clear, after a few short years, that criticism and analysis informed by postmodern attitudes has been, by and large, an irrelevant botch.

We could not wish for a more straightforward example than the following paragraph, appearing in the recent volume Cultural Studies, a massive tome clearly intended to be a sourcebook and text for the hordes of anticipated students in this newly delivered academic hybrid. The quotation is taken from the essay “New Age Technicure” by Andrew Ross, professor of English at Princeton, editor (with Stanley Aronowitz) of the fashionably postmodern-leftist journal Social Text, and glamorous cult-figure in the movement. 35 Despite its length, it is worth quoting in full:

In this respect [i.e., the distinction between authentic science and pseudoscience] it is worth drawing an analogy between the demarcation lines in science and the borders between hierarchical taste cultures—high, middlebrow, popular—that cultural critics and other experts involved in the business of culture have long had the vocation of supervising. In both cases, we find the same need for experts to police the borders with their criteria of inclusion and exclusion. In the wake of Karl Popper's influential work, for example, falsifiability is often put forward as a criterion for distinguishing between the truly scientific and the pseudo-scientific. But such a yardstick is no more objectively adequate and no
less mythical a criterion than appeals to, say, aesthetic complexity have
been in the history of cultural criticism. Falsifiability is a self-referential
concept in science inasmuch as it appeals to those normative codes of
science that favor objective authentication of evidence by a supposedly
objective observer. In the same way "aesthetic complexity" only makes
sense as a criterion of demarcation inasmuch as it refers to assumptions
about the supposed objectivity of categories like the "aesthetic" revered
by institutionally accredited judges of taste. 16

So much, then, for three thousand years of struggle to develop a systematic
method for getting reliable information about the world! So much for the
notion that refutation by experience is good grounds for abandoning a theory,
or at least taking it in for major repairs! To see whether this petulant para-
graph says anything, we have to strip away the irrelevancies concerning the
relative nature of aesthetic judgments and resolutely ignore the dreaded
Culture and Science Border Patrol in order to get at it. Doing so, we seem to
be left with something like: "Science backs up its claims, whereas pseudo-
science doesn't, but I don't care about the difference." Perhaps, however, we
are being uncharitable. If we work on it for a while, it is just possible to
construe Ross as meaning to say, "The empiricist philosophy by which science
proceeds cannot be justified by an appeal to empiricism. We can't solve the
Problem of Induction by appealing to inductive inference."

Welcome to freshman philosophy! True, there is a serious point here, one
with which most scientists are quite familiar. But it does nothing to elevate
pseudoscientific nonsense to the epistemic dignity of genuine science. In our mind's
eye we envision this paragraph leaping from the occult—New Age section of
the bookstore, where, no doubt, it graced some puffery about channelers or
healing crystals, to the spanking-new cultural studies section where, thanks
to Professor Ross and the editors of Cultural Studies, it takes on a new life as a
contribution to learned discourse.

Ross’s piece in Cultural Studies is largely incorporated into his Strange
Weather: Culture, Science and Technology in the Age of Limits. This work studies
contemporary popular subcultures that vulgarize standard science while, to
some degree, challenging its authority. Ross is for the most part in sympathy
with these enthusiasms, which include the New Age movement, "alternative"
health care regimens, science fiction (especially of the cyberpunk,
feminist, or gay variety), computer hacking, and visionary radical ecologism.
He celebrates them as possible nuclei of resistance to a monolithic, global,
capitalist technoculture—a monster, as Ross would have it, sustained by
modern science and sanctified by its canons of validity. Strange Weather is
Ross's magnum opus, and it enlarges his claim to be expert on matters of
science and technology. It does so, however, on the basis of an argument that
is thin and irresolute, unwilling even to try to formulate a clear and consistent
case against the putative scientific world view, but reflecting a desperate
unhappiness that science is such a powerful force, materially and intellec-
tually, in contemporary life.

Predictably, the sociologist Bruno Latour is one of Ross's gurus, and the
ideas of Stanley Aronowitz are called upon as well. Equally predictably, Ross
parrots all the New Age mystifications of quantum mechanics—without,
however, displaying any but the vaguest understanding of physics in general
or quantum mechanics in particular. This is a book that is content, in the
main, to posture, rather than to argue. It is driven by resentment, rather than
by the logic of its ideas. Ross doesn't know what he wants to do about science.
He doesn't like it, but—he wistfully allows—he might be persuaded to like it
if it were to change into something "that will be publicly answerable and of
some service to progressive interests." 17 "Of some service to progressive interests"
seems reasonably clear, if frighteningly Stalinist in tone and at root. One
infers, however, that a "publicly answerable" science is the sort of thing that
the common man or woman can do pretty much at will, the sort of thing that
involves not too much by way of hard work or thought, of deep analysis or
difficult concepts. Above all, that old demon, rationalism, must be banished.
"How," asks Ross, "can metaphysical life [i.e., New Age] theories and explana-
tions taken seriously by millions be ignored or excluded by a small group of
powerful people called 'scientists'?" 18

Strange it is that a well-known scholar at one of the world's most distin-
guished universities should write a lengthy book upon a subject about which
he knows, evidently, virtually nothing. It is stranger still that he can boast of
his ignorance in the very first words. "This book is dedicated to all of the
science teachers I never had. It could only have been written without them."
Such hubris, such eagerness to put on an antic disposition and yet be taken
seriously, speaks volumes on the canons of acceptable scholarship under the
postmodern dispensation. In the end, however, it is less appalling than Ross's
confident assumption that he and his coterie know what's best for the human
race politically and socially, an assumption that presumably licenses this silly
attempt to declare Western science ripe for overthrow.

Note well that the nonsense Andrew Ross propounds is a predictable, in
fact a near-inevitable, consequence of applying to questions of scientific
validity the sophomoric skepticism—and the visceral urge to champion the
demotic whenever it comes in conflict with "official" culture—that charac-
terizes the postmodern stance as absorbed and refracted by left-wing aca-
demies. Note also the way in which Ross’s manifesto serves the impulse to inflict retribution on those recent modes of philosophy that are flattering to the claims of science and dismissive of literary criticism and the like as mere opinion-mongering. Clearly, resentment is in the saddle here, and it is a disastrous methodology, one that propounds ostensibly deep thoughts on shallow aspects of science and culture, while generating shallow thoughts on their deep aspects.

Chaos Theory: A Brief Guide

We are obviously not able to consider here each and every intellectual curio that arises from the now widespread effort of postmodern theorists to bring science under their scrutiny. A few of the more redolent examples must suffice to illustrate the general tendency. For the sake of unity, and to reserve discussion of other sciences for later chapters, those we consider here have to do with a certain recent development in the mathematical sciences—so-called “chaos theory”—that has drawn an unusual (for a mathematical subject) amount of public interest. Quite naturally, it has been a proving ground for postmodern critics eager to try their apparatus in the venue of modern scientific thought, and eager to justify their philosophic maxims by appeal to ostensibly “paradigm shifts” in science. This tactic is not so rudely dismissive of science and scientists as Andrew Ross’s frontal assault. Nonetheless, in positing the emergence of a “postmodern” science which, it is claimed, illustrates the validity of the postmodern weltanschaung, these “analyses” in effect derogate the reliability and accuracy of standard science, and snidely disparage those scientists—that is to say, the vast majority of all scientists—who have been oblivious to this ostensible revolution in thought.

Any but the briefest description of chaos theory would be out of place here. The term refers to developments in pure and applied mathematics, particularly to a branch named dynamical systems theory: the study of systems that change with time. Typically, these are deterministic; that is, the state of the system at one instant completely determines its state at all subsequent moments. The locus classicus of dynamical systems theory is the great work of Isaac Newton on celestial mechanics, that is, the theory of how stars, planets, moons, asteroids, comets, and so forth move under the influence of gravity.

Chaos theory essentially addresses this conundrum: knowing that a system is in theory deterministic is by no means equivalent to having an effective means for predicting its behavior as a function of an initial condition, namely, the state of the system at one particular time. The optimism of late eighteenth- and early nineteenth-century mathematicians, astronomers, and physicists that practicable methods of computation would become available for making such predictions in all reasonably simple cases turns out to have been premature, although it inspired brilliant work sufficient to handle many such problems, including most that have to be dealt with in engineering and day-to-day science. As it happens, however, there are very simple systems, in the sense that they involve a small number of parameters and a very straightforward “law of evolution,” where prediction becomes essentially impossible beyond a short period of time. What’s more, there are significant “qualitative” as well as “quantitative” aspects to this inability. For instance, the trajectories of evolution of two systems that start out “microscopically” close, as far as their respective initial conditions are concerned, can diverge wildly, not only in a numerical sense but in their geometric aspects. Thus, to make matters more concrete, an astronomer may find that it is impossible to make a good prediction about the qualitative behavior of a planetary system because, first of all, the methods at hand for solving the relevant differential equations are far too inaccurate, and furthermore, even if the first difficulty could be got around, a tiny error in determining the initial condition (which is of course inevitable) can result in a gross qualitative error in characterizing the long-term behavior of the system.

Dynamical systems theory is a very geometric subject, as modern mathematicians understand the term, and, in consequence, many of these bizarre phenomena can be illustrated, with the aid of computer-generated graphics, by weird and beautiful pictures. This alone accounts for much of the public interest in these developments. (It accounts as well, we must admit, for much of the popularity of the subject among mathematicians themselves, not to mention legions of computer-users with skill at graphics.) Nonetheless, despite their didactic value, the accessibility of such pictures may have the effect of deceiving the intelligent layman into believing that he grasps the subject better than he really does. To be undiplomatic, a solid understanding of what is really involved requires a considerable amount of formal mathematical knowledge.

The foundations of the subject were laid at the end of the nineteenth century by the great mathematician Henri Poincaré, and in a sense modern chaos theory represents a resumption of this work after a long hiatus. The reasons for this slumber are as follows:

1. The attention that Poincaré’s work should have attracted from physicists and mathematicians was understandably diverted by the stunning developments in theoretical physics that took place at the beginning of the twentieth century (special and general relativity and quantum mechanics). These quite naturally absorbed the lion’s share of intellectual energy of those best placed
to follow up Poincaré’s implications. (It is worth noting in passing that, even had Einstein never been born, Poincaré would almost certainly have come up with relativity on his own at about the same time.)

2. The possibility of developing chaos theory as a mathematically consistent subject depends on a huge body of foundational mathematical work in such areas as topology, differential geometry, and the theory of computational complexity, most of which was done long after Poincaré’s day.

3. Mathematical theories cannot grow without a host of specific examples on which the mathematician must rely to sharpen and modify his intuition before setting out to erect a systematic mathematical structure incorporating them. So far as chaos theory is concerned, most of the paradigmatic examples cannot be worked out by ordinary pencil and paper computations; nor can geometric pictures easily be drawn by relying solely on naive intuition. These examples were forthcoming only after the development of high-speed electronic computers in the 1950s and 60s and the subsequent refinement of computer graphics techniques.

The best-known book on the subject is James Gleick’s *Chaos—the Birth of a New Science*. While commendably accurate on the underlying mathematical principles and their relevance for a host of scientific questions, Gleick’s book, perhaps inevitably, overemphasizes the history of the subject in trying to make its protagonists fascinating. In point of fact, there is nothing, on the level of personal idiosyncrasy, that can be said to distinguish specialists in chaos theory from other mathematicians and theoretical physicists. They are not pointedly more heretical in temperament. They just happen to work on dynamical systems theory, as opposed to low-dimensional topology or geometric measure theory or Hopf algebras. Moreover, chaos theory, for all its beauty and scientific relevance, is not the dominant theme in contemporary mathematics, for the simple reason that nothing is. Mathematics is stupendously vast and varied, and every year results appear in one specialty or another that are just as delightfully surprising and involve just as great intuitive leaps as those of chaos theory. So far as physics and the other mathematical sciences are concerned, chaos theory is certainly a helpful source of new techniques and insights, but it cannot by any means be said to put everything else in the shade. If one insists on calling the development of chaos theory a “paradigm shift” in the Kuhnian sense of the term, it probably does no harm, as long as it is kept in mind that within the scientific community there is not much sense of foundations being overturned. A more apt metaphor is that a bright light has been turned on, better illuminating what we already knew, making visible some fascinating fine detail, and revealing promising paths for further investigation. There has been very little in the way of culture shock.

We point out that some contemporary popular myths about chaos theory are corrected in the book by David Ruelle, one of the founders and accomplished masters of the subject. For those who want a brief and clear exposition of the basic notions, we recommend also Harmke Kamminga’s essay in, of all places, *New Left Review.* (This may reassure some on the left who misunderstand the polemical intentions of this book. On the other hand, even the most conservative reader will be able to get through Kamminga’s piece without elevation of blood pressure.) Kamminga wisely chose to write his exposition “in consultation with a number of experts,” and he observes prudently that “chaos and nonlinearity may be in danger of being seen as the solution to everything. Uncritical use of the notion of the ‘butterfly effect’ and glib assertions that ‘life is a strange attractor’ threaten to turn chaos theory into a new mysticism.” Ruelle would certainly agree, as would most mathematicians and physicists. This has not forestalled the emergence of a fad among historians, social theorists, and literary intellectuals, a number of whom are given to studding their essays with knowing references to chaos theory as a way of dressing up truisms about the complexity of life, art, and human experience.

**Chaos as Nonsense I: Steven Best**

Kamminga’s piece and the publication of it in a staunchly ideological journal are ample evidence that left-wing political commitment is not, of itself, inconsistent with a healthy and productive interest in various aspects of modern life, science included. However, there are in contrast examples of attempts to deal with the same subject that rely for their doctrine and methodology on the arcana of full-blown postmodern theory. The results are grotesque. They illustrate both the megalomaniac pretentiousness and the utter impotence of postmodernism under full sail as it attempts to engage itself with the world of honest science.

Steven Best is a fledgling philosopher and co-author of *Postmodern Theory: Critical Interrogations,* a well-received and approving account of the trends in current intellectual life grouped under this term. He has also written a curious and turgid essay, “Chaos and Entropy: Metaphors in Postmodern Science and Social Theory,” for *Science and Culture,* a journal that focuses on the relation between science and society from a left-wing, often quite explicitly Marxist, point of view. However, Marx is very much in the background so far as Best is concerned; his heroes are the usual suspects—Foucault, Derrida, Lyotard, Baudrillard, and so on. His version of postmodernism is in the standard mold: “Postmodern social theory vigorously rejects every key axiom of mod-
ern philosophy and sociology: it renounces foundationalism and representational epistemologies. Postmodernism stresses the relativity, instability and indeterminacy of meaning; it abandons all attempts to grasp totalities or construct Grand Theory.42

In his paper, Best attempts to describe and (more or less) to serve as advocate for something he refers to as "postmodern science." This, one is given to understand, has as its mission the overthrow, rather than the fulfillment of "modern" science: "Like postmodern social theory, postmodern science sees modernity and modern reason as inherently repressive." In other words, hidden beneath the relativistic pose, there lurks a still-necked moralism. Postmodernism in general and postmodern science in particular have come to liberate us from repression. This mission is especially crucial since only postmodern science can save us from the ecological catastrophe into which modern science is driving us: "Postmodern science draws the conclusion that a new, postmodern paradigm is necessary, one which is philosophically sophisticated, scientifically complex, ethically sensitive, spiritually aware, and ecologically sane."41

The reader may be inclined to characterize these dicta as a Very Grand Theory indeed, which would seem to subvert ab initio their self-proclaimed postmodernity, within which there is supposed to be no Grand Theory. Letting this pass, however, we ask what is thought to constitute "postmodern" science. Best gives us this categorical description of it: "Within its own discipline, postmodern science has three main branches of influence: thermodynamics . . . quantum mechanics . . . and chaos theory." That, now, is a very curious amalgam for something forthrightly claiming to be postmodern: it covers a period in the history of physics from the 1820s to the present day, but mysteriously omits both special and general relativity. Perhaps, not having Jacques Derrida's credentials in these latter subjects. Best thinks it best to steer clear of them.

One would think that the much-trumpeted emergence of self-conscious postmodernism in the two decades past would have produced a generation of explicitly postmodern scientists proud to identify themselves as such. Strangely enough, the examples Best comes up with are unimpressive. Noted chemist Ilya Prigogine is among them, of course (his name keeps coming up in postmodern discourses with depressing frequency); but a realistic view of Prigogine's science would have to come to terms with the fact that serious contributions have not been forthcoming for a couple of decades, and that he has slipped into habits of speculation that involve him in very shaky science and even shaker mathematics. Best's other paragon of contemporary postmodern scientific thought is Jeremy Rifkin, author of Entropy, Alceny, and Beyond Beef, among a series of books and pamphlets devoted to imminent environmental catastrophes. While it is possible that Rifkin's high-pitched rhetoric performs some service in alerting a sluggish public to the existence of ecological problems, it is widely felt, even by those scientists most passionately committed to environmentalism, that Rifkin's unrelieved alarmism rests on ill-founded and unscientific theorizing, and that his distortions and fantasies damage the political cause he seeks to inspire.44

In contrast to such dubious champions, undisputed masters of the most startling ideas in current scientific theory—Hawking, Witten, and Guth for instance—are very much out of Best's picture. This is hardly surprising, given Best's evident incompetence at understanding the scientific and mathematical ideas he tries to cite in his favor. His understanding of chaos theory in particular is shallow and confused, and apparently arises from a botched reading of popularizations like those of Gleick and Kamminga. Certainly, he fails to take heed of Kamminga's warning (cited above); and in his account, chaos theory does indeed become a new mysticism.45 This is a grave charge; but here are some examples to substantiate it.

Best asserts, for instance, that in the systems studied by chaos theorists, the inability to determine initial conditions exactly frustrates prediction because "errors made at that level will be exponentially magnified in subsequent calculations." Certainly, this is often true for these so-called nonlinear systems; but then again it is equally true for the most classical of nonchaotic linear systems as well. For instance, the differential equation of exponential growth, \( y' = ky \), \( k > 0 \), which is usually studied in elementary calculus courses, exhibits the behavior prototypically, and it has no hint of chaos. As any competent freshman can see, if the initial condition is approximated erroneously by even the smallest amount, the subsequent error will grow exponentially with time. On the other hand, for a nonlinear equation like \( y' = ky^2 \) this will not happen; over time, initial errors are amplified at a less than exponential rate.

Best's physics is similarly shaky. He solemnly intones: "The dialectic between order and disorder also suggests a reevaluation of the Law of Entropy, no longer viewed simply as system decay and breakdown but as creations of new forms of order."46 Unfortunately for the gravamen of his argument, this realization represents no breakthrough inspired by chaos theory. The formation of the orderly arrangement of a snowflake, for instance, from an unordered collection of water molecules is, in fact, an entropy-increasing process, a fact that is quite well understood in classical thermodynamics and is, again, taught in elementary courses.47

This error, absurd as it is, is merely symptomatic of an even deeper igno-
Chaos as Nonsense II: N. Katherine Hayles

Among these is the literary scholar N. Katherine Hayles, whose specialty is the relations among science, literature, and contemporary literary theory. She too is committed to the idea that chaos theory is somehow paradigmatic of the postmodern condition, but unlike Best she tries to illustrate this, not in reference to some presumed political ideal, but rather by arguing for deep parallels and resonances between the mathematics of chaos and the theoretical practices of textual critics loyal to the tenets of postmodernism. (Best, for his part, advances a similar claim in passing.49) Her recent book, Chaos Bound, is devoted to promulgating this odd hypothesis.

Hayles's underlying assumptions seem curiously Hegelian. The cultural moment, she reasons, has brought forth chaos theory simultaneously with Derrida's Of Grammatology and de Man's Allegories of Reading, and hence, some unspecified mechanism of the zeitgeist must be responsible for both developments. This is a bizarre thesis. Why should the theory of dynamical systems be more closely related to the gyrations of literary exegetes than it is to major league baseball or Jane Fonda's workout tapes? Aside from the irrelevant fact that both kinds of theorizing take place, for the most part, on university campuses, there is no ground for positing any kind of conceptual relationship. Hayles's arguments, such as they are, are based on subjective and shoddy analogies, leaky metaphors, and (not unusual for work immersed in postmodern theory) flat and unsupported assertions. She is one of those who are eager to tell you, earnestly and at length, precisely why a raven is like a writing desk—especially if a publication can be got out of it. Her comparisons—like that of Derrida to the mathematician Mitchell Feigenbaum,50 to take but one example—are strained and arbitrary and informed by a logic that would make everything a metaphor for everything else. Why not compare Derrida to Charles Manson, or the Feigenbaum number to Roger Clemens's earned-run average? Why not compare the "unexpectedness" of chaotic phenomena to the surprising twists and turns in Haydn's string quartets, icons of the Enlightenment though they be? It would make easily as much sense. What Hayles does is not analysis. It is name-dropping.

Even philosophers who see some parallels between deconstructive literary theory and the mathematics and physics of chaos theory are loath to push the comparison as far as does Hayles. Alexander Argyros, commenting on Hayles's work, notes: "I suspect that this apparent compatibility may be implying to literary theorists that chaos is a validation of deconstruction. My own view is that such a claim is, for the most part, wrong . . . While it is certainly true that deconstruction and chaos are both interested in highlighting non-linearity, to claim that they are fellow travellers is, I believe, to make an unwarranted assumption."52 (Of course, there is the further question of what "non-linearity" means to a mathematician, as contrasted to what it might signify to a postmodern literary theorist. We address this point below.)

In trying to grasp what chaos theory is and how it relates to other aspects of mathematics and the physical sciences, Hayles falls into the same kinds of amateurish errors that plague Best's paper. It is clear, over and over again,
that she really doesn't know what "linearity" means in a mathematical context. In that her book is so much longer, her mistakes are correspondingly more numerous. They are all the more embarrassing as well because she genuinely attempts to give an expository description of some deep mathematics and physics—fractal geometry, nonlinear dynamics, G"odelian incompleteness, information theory, and so forth. Naturally, the usual doodles are present—fractals, Cantor sets, the Lorenz attractor, bits and pieces of the Mandelbrot set (no diagram of the Peano space-filling curve, more's the pity)—but in this context, they are no more than intellectual tinsel, since they are unilluminated by genuine understanding or exposition. Hayles repeatedly if unwittingly illustrates the everlasting soundness of Pope's axiom—a little learning is a dangerous thing.

Unlike most of the works we have examined, Chaos Bound is not primarily concerned with leftist political agenda. Nonetheless, Hayles can't resist dropping portentous hints about the transformative political significance of both postmodern literary theory and nonlinear topological dynamics, especially when they are viewed as manifestations of the same putative retraction of the guts of the culture. As well, there are the predictable genuflections to the feminist-critique-of-science mafia, especially to Donna Haraway. Mercifully, however, the explicit political claims are muted. Or perhaps it would be better to say that they are diluted by a sea of muddy abstractions. Hayles provides a chapter entitled "The Politics of Chaos," filled with ruminations on such themes as tensions between local and global, contingent versus universal, laden with the sense that these are vibrant with political significance. Of course there is the tendency to conflate the mathematical terms local, global, and universal with the same words as they occur in poststructuralist discourse—an impermissible tendency in our opinion, and one that rests on Hayles's shallow understanding of how mathematics really uses such terms. The deeper trouble, however, is that the word politics itself is used so abstractly that one has no sense of what all this introspection is supposed to signify for those aspects of human existence usually covered by the term.

One might argue that Hayles's analysis, in contradistinction to most of the critiques of science emanating from the academic left, has at least the virtue of regarding science as, on the whole, liberatory and politically progressive. But this approbation comes at the cost of such a distended misreading of science, in equal measure grotesque and condescending, that it is hardly distinguishable from hostility. In any event, Hayles's subsequent work reverts to the tone of orthodox radical feminism and rails at physics (fluid dynamics in particular) as deriving from a worldview deeply tainted by sexist imagery. We shall not comment on this latest exercise in self-righteous hermeneutics, except to observe that it is tendentious and strained to the point of absurdity.

It would be an endless task to compile a detailed list of Hayles's solecisms. A very few examples will have to suffice. On one page, for instance, we find that "The special theory of relativity lost its epistemological clarity when it was combined with quantum mechanics to form quantum field theory. By midcentury all three had been played out or had undergone substantial modification." This will come as a terrible shock to physicists! Special relativity and quantum mechanics are as solidly confirmed as it is possible for physical theories to be. While there may be some lingering doubts whether general relativity is quite the right model on the cosmological scale, the special theory has always triumphantly passed every empirical test. However physics develops in the future, any modification must subsume rather than displace special relativity, just as special relativity subsumed Newtonian mechanics. The story is much the same for quantum mechanics, with the additional element that theorists (John Bell for instance) are in the habit of deriving wildly counterintuitive conclusions from the quantum mechanical formalism, only to have these confirmed in the laboratory as soon as the experimentalists can think of a way to test them! As for quantum field theory, one mathematical aspect of the great project to provide a truly unified framework for both relativity and quantum mechanics, this is an ongoing project that engages the deepest and liveliest intellects in physics and mathematics. "Played out?" The best that can be said for Hayles is that she confuses the fact that physics is very much a continuing discipline, and, therefore, has fascinating foundational problems left to solve, with some kind of philosophical and spiritual exhaustion. If anything is played out, it is the postmodernist's pretension to have something interesting to say about physics.

Hayles is similarly at sea when it comes to philosophy. On the same page a few lines further on we find that "logical positivism had its heyday in the closing decades of the nineteenth century," which is rather like saying that Babe Ruth's career was at its height in the closing decades of the nineteenth century. Logical positivism was, of course, the philosophical school devised in the late twenties and early thirties of this century by the so-called Vienna Circle, a group of philosophers, mathematicians, and physicists who sought to accommodate the mind-stretching, and then still-recent, developments of relativity and quantum mechanics. In the English-speaking countries, it gained great influence through the work of A. J. Ayer, and the fifties and sixties were, as previously noted, its real heyday. Nor is it a dead letter, even
of glorious patriotism sounded very empty, it would have been much
more difficult to think language could have an absolute ground of mean-
ing.57

Her point seems to be that the Principia and the special theory are products of the
halycon times of pre–World War I Europe (a conceit that leads to the
gaffe on logical positivism). This ignores the fact that both efforts are the
result of extreme intellectual crises, albeit crises of which the general culture,
and even the r ante cultures of philosophers and the literary intelligentsia,
were entirely unaware. The Principia sprang from Russell’s discovery of the
set-theory paradox that bears his name, which rendered unsatisfactory the
prior work of Cantor and Frege on the foundations of mathematics. Relativity
derived from Einstein’s realization that the mathematics of Maxwell’s equa-
tions raised serious questions about classical notions of absolute time and
space. These “crises” were known only to a handful of mathematical sci-
ents. The idea that something in the ambient culture—whether under
Hayles’s interpretation or some competing version stressing the subterranean
tensions that led to World War I—generated these magnificent works is thus
wildly implausible.

Correspondingly, Hayles’s idea that such intellectual projects as the Prin-
cipia, relativity, and logical positivism would have been far more difficult after
the war (ignoring even the fact that logical positivism was one of the most
cr atic postwar projects) is a febrile delusion of doctrinaire reading.
The silliness of the cited paragraph is perhaps most apparent when one
considers that both Einstein and Russell were highly conscious of the empti-
ess of patriotic rhetoric long before the war, even as they were in the midst
of their great work on the foundations of physics and mathematics respectively.
The lesson to be learned, then, is that cultural constructivist theories of
science deserve to be treated with the gravest suspicion, whether they derive
from sociology, Foucauldian historicism, or deconstructive literary theory.

All the strange pronouncements upon which we have focused occur, as we
note, on one page. There is nothing particularly special about that page. This
book is stuffed with similar solecisms, which makes reading it a painful
experience. Yet the work is published by a distinguished university press and
has garnered Hayles a substantial degree of recognition, including an en-
dowed chair at a major university, a Guggenheim Fellowship, the presidency
of the Association for Science and Literature, and the chairmanship of the
literature and science committee of the Modern Language Association; so we
ought not to conclude that this is some kind of crackpot tract of the New Age
movement (although the word crackpot unkindly leaps to mind when one has
to read it). This is very much in the academic mainstream, as commandeered by the votaries of postmodernism.

The point, finally, is not to berate Hayles—or Best, for that matter—for mathematical illiteracy. That, in itself, is nothing like a disgrace. Hundreds of millions of bright, able, and accomplished people share this minor affliction (and quite a few mathematicians are weak, to say the least, on post-modernist thought). But when such solecisms as we find in these writings are confidently put forth as scholarly discoveries, with every assurance that something profound is being uttered, one must wonder about the system—and the ideology—that nurtures and rewards them. Whence, we must ask, does such grossly misplaced intellectual self-confidence come? The smug, hermetic, self-referential atmosphere of politicized academic postmodernism obviously has a great deal to do with it. In this milieu, there is not much thought given to simple scientific accuracy. The caution and scrupulousness that working scientists are conditioned to expect are swept aside, because, in the final analysis, postmodernist work is in great measure prophetic and hortatory, rather than analytic: it announces and cheers on a sweeping "paradigm shift" within our civilization, a change that is supposed to liberate us all.

We suspect that the reader who has followed this brief survey will be left with a few questions. First of all, why is the technical question of mathematical "linearity" versus "nonlinearity" so intriguing to supposed experts in culture and literature? Of course, as we have noted, the success of Gleick's book on the emergence of mathematical chaos theory and its scientific applications has left much of the literate but scientifically inexpert public with a somewhat distorted sense of the overall configuration of the mathematical sciences, of the enormous compass of contemporary mathematics, both pure and applied, and of the relative importance of various ideas within that field. The very accessibility of Gleick's work, and subsequent efforts in the same line, have thus had the unintended consequence of calling forth portentous pronouncements from "cultural critics," whose knowledge of the relevant science is largely limited to these necessarily oversimplified accounts.

Beyond this, however, there is a deep confusion of categories, and a surprisingly naïve sense that the use of the same English word in widely separated contexts assures that there are deep thematic similarities. To a paid-up member of the postmodern academic left, the word linear, for example, carries negative connotations. It suggests relentless sequentiality, unbending purposefulness, singlemindedness, the triumph of the instrumental—in other words, the mentality that is held to underlie the predicated Western ethos of conquest, domination, objectification, and rigid delineation of oppressive categories via "binary oppositions." Inevitably, nonlinearity is seen by contrast to have liberatory implications. It suggests many-sidedness, multiculture, diversity, polymorphism, the effacement of boundaries. Thus the revolution for which the postmodernist yearns, realistically or otherwise, is one in which the "linear" regime of late capitalist society will be supplanted by a "nonlinear" ethos, in which multiplicity reigns in the cultural and sexual realms, and in which all sorts of boundaries may freely be crossed.

It should—but obviously does not—go without saying that the mathematical notion of linearity, or its absence, in regard to functions, differential operators, dynamical systems, or whatever, while technically indispensable, has nothing whatsoever to do with such sociocultural questions. Of course, anyone is free to read pictures of fractal geometry and the like subjectively as emblems for a revolution in sensibility—or in politics, for that matter. The point is, however, that this is utterly subjective: it is poetry of the most idiosyncratic sort. Postmodern cultural transformation is no more inscribed in the mathematical peculiarities of nonlinear dynamical systems than Nazi doctrine is to be read in the geometric configuration of the swastika. To hold otherwise is to revert to the magical, emblematic thinking of premodern (rather than postmodern) times. It certainly doesn't deserve the name of scholarship.

It is also useful to consider the sense in which these theoretical extravagances of would-be philosophers of culture are hostile to science and to scientists. Obviously, there is some subtlety here. Some of these critics seem, after all, on the face of things, to be celebrating science, or at least some of its recent achievements. They see certain new themes in the sciences as harbinger of a desirable cultural change. Hostility is there, however, and its presence becomes clearer when we take note of the moralizing undertone. What is really being asserted is that there is a "modern" science, linked to "phallogocentric" thought and the mechanisms of capitalist-racist-patriarchal domination—in other words, the science that William Blake, in an earlier era, decried as "single vision and Newton's sleep." By contrast, there is supposed to be an embryonic "postmodern" science that points to the overthrow of the old order. This theme can be traced in the continued insistence that the "chaos theory" postmodernists think they are talking about is "post-Newtonian" (even though it is perfectly clear to the mathematically literate that Newtonian themes are central to these new developments, whether they address Newtonian celestial mechanics or the fractal geometry of the basins of attraction of the roots of a polynomial that appear when Newton's method is applied in the complex plane). The "Newton" that postmodern cultural critics are trying to escape is Blake's figment, not the preeminent mathematician and physicist of the same name.
We conclude that hostility to science is, after all, an inextricable element of these postmodern philosophical excursions. It takes the form of the "good guys (persons?) versus bad guys" scenario that the critics impose relentlessly on the history and sociology of science. It is mirrored in the remarkable arrogance with which postmodernists address these issues. Virtually all of them claim to discern important intellectual themes and political motifs in past and current science, themes and motifs that are quite invisible to the scientists themselves. These supposed insights rest, as we have seen, on a technical competence so shallow and incomplete as to be analytically worthless. Their arrogance, then, is comparable to that of "creation scientists" in addressing evolutionary biology, or to that of Galileo's persecutors within the Inquisition in their response to his cosmology. We probably don't need to fear for the safety or intellectual freedom of the sciences on the basis of these bizarre lucubrations: but that is not the issue. What does concern us is that these intellectual adventures are so well received in nonscientific academic circles, especially on the left, and that they provide the route to publication, tenure, reputation, and academic authority for a growing body of would-be scholars.

We must hope that the painful boulus of postmodernism will pass through the costive bowels of academic life sooner rather than later. Pass, of course, it will eventually. Keeping the hard sciences from contamination should not be impossible, provided that the scientists' resistance to jargonistic snow jobs is as high as it ought to be. We do worry about that, however. In the meantime, unfortunately, the postmodernists will be out there trying to dominate every intellectual conversation. Have they not imbibed the wisdom of the sage?

And everyone will say
As you walk your mystic way
"If this young man expresses himself in terms too deep for me,
Why, what a very singularly deep young man
This deep young man must be!"

CHAPTER FIVE

Auspicing Gender

Would not physics benefit from asking why a scientific world view with physics as its paradigm excludes the history of physics from its recommendation that we seek causal explanations of everything in the world around us? Only if we insist that science is analytically separate from social life can we maintain the fiction that explanations of irrational social belief and behavior could not ever, even in principle, increase our understanding of the world physics explains.

SANDRA HARDING, THE SCIENCE QUESTION IN FEMINISM

Feminist Success

American universities have adopted feminism. History, literature, art criticism, psychology—all have had to come to terms with a militant, sometimes angry challenge to their settled ways of doing business. In its obvious form, feminism has concentrated on educational opportunity and careers, demanding an end to practices that have excluded women, and strong remediation, which includes not only affirmative action but also the establishment of women's studies programs and women's centers. On the conceptual level, it has forced a reevaluation of scholarly practices and opened neglected questions of the history, status, and particular interests of women. It has resurrected the work and built the reputations of some women artists and thinkers whom history and male indifference had discounted.

The natural sciences take their share of the heat. In point of opportunities for women, the traditional recruitment and apprenticeship system has been unfair and exclusionary. Strenuous pressure for change has been the predictable result, as women claim their right of equal access to any vocation, no matter how long tradition has regarded it as a province of the male intellect. Until recently, however, the substance and the cognitive style of science per se had not been the target of much feminist complaint. The main demand was
CHAPTER NINE

Does It Matter?

There is today a broad, generational, postmodernist current of irrationalism with its roots deep in the seductively brilliant thought of Nietzsche and Heidegger, which is at its core elitist and antidemocratic, even though that thought is often absorbed only in the flattened, simplified version popular among today's students and intellectuals. This is the cloven hoof of earth mother communitarianism, the need for the organic, the authentic feeling and for passion as against the cool "patriarchal" logic of the broad Left. This trend includes the rejection of science as well as scientific fetishism. And, of course, it is permeated by utter contempt for the wimp and wool of genuine democracy, for discussion, give and take, compromise, and elected representative bodies.

BEGGAR DENITCH, AFTER THE FLOOD

Discounting the Critics

Science is, above all else, a reality-driven enterprise. Every active investigator is inescapably aware of this. It creates the pain as well as much of the delight of research. Reality is the overseer at one's shoulder, ready to rap one's knuckles or to spring the trap into which one has been led by overconfidence, or by a too-complacent reliance on mere surmise. Science succeeds precisely because it has accepted a bargain in which even the boldest imagination stands hostage to reality. Reality is the unrelenting angel with whom scientists have agreed to wrestle.

Yet those who insist that science is driven by culture and by politics, by economics, by aesthetics, even by a species of understated mysticism, are not for that reason alone to be dismissed as wrongheaded. On the contrary, these assertions, if "driven" is replaced by "influenced," come near to being truism. Great difficulties arise, however, when such insights are wielded as ideological blunt instruments in the name of "demystification," or to nourish the political vanity of factions and the academic vanity of scholarship more notable for its novelty than for profundity. A serious investigation of the interplay of cultural and social factors with the workings of scientific research in a given field is an enterprise that requires patience, subtlety, erudition, and a knowledge of human nature. Above all, however, it requires an intimate appreciation of the science in question, of its inner logic and of the store of data on which it relies, of its intellectual and experimental tools. In saying this, we are plainly aware that we are setting very high standards for the successful pursuit of such work. We are saying, in effect, that a scholar devoted to a project of this kind must be, inter alia, a scientist of professional competence, or nearly so.

This is not a dictum that sits at all happily in the minds of those thinkers whom this book has criticized. They read it as an ideological demand, emanating from the arrogance of a priesthood that denies the intellectual fitness of anyone who is not an initiate. Such resentment is quite understandable on an emotional level. But as logic, it is of little avail. The critiques of science and the political misuses of it that we have evaluated vary greatly in perspective and argumentative strategy. Yet common to almost all of them is a failure to grapple seriously with the detailed content of the scientific ideas they propose to contest, and with the scientific practices they wish to impeach.

This alone, aside from other defects of reasoning and evidence, aside from the routine intrusion of special pleading, almost invariably guarantees that the results, however aggressively proclaimed, will lack accuracy and specificity. Such work founders because it treats science as a token of the illegitimacy of the current social order, rather than as a coherent body of ideas requiring the most exacting attentiveness. Scientists—aside from a small cadre of ideologically motivated sympathizers—generally ignore these critiques, not out of blind defensiveness of their own turf, not out of snobbery, but because the critics simply sail too wide of the mark, and have so little to say about the actual ideas with which scientists contend every day of their working lives.

Science, from the most cloistered and abstract to the most directly applicable, has taken little notice of recent critiques of its underlying conceptual basis. Instead, it has tended to be vaguely receptive to the political right-thinking to which the critics lay claim, but without examining the details. There has been no rethinking of fundamental ideas, or of how these are to be articulated to experimental and observational reality, in response to recent criticism by feminists, sociologists, and postmodern philosophers. Occasionally, the opinions of such thinkers are voiced in scientific journals of the more general, informal sort (as opposed to specialized research publications). This illustrates an admirable intellectual hospitality; or—sometimes—a lazy and weak-minded one. But it should not be misread as general acceptance or
influence on actual scientific practice. Science as such—molecular biology, solid-state physics, polymer chemistry, nonlinear differential equations, and the thousands of other specialties—would have taken the same course over the last couple of decades had no feminist philosopher or postmodern social critic ever addressed a line to scientific matters. To put it bluntly, the probability that science will sooner or later take these critiques sufficiently to heart to change its fundamental way of knowing is vanishingly small.

This is not to say that criticism of the social implications of scientific practice has been without effect. In a few areas of applied science, medicine, and technology, practices have been rethought and modified on the basis of specific critiques (for example, of workplace safety monitoring), a good many of them having a left-wing provenance. Some of the modifications have been useful; some, as we have seen, are less than justifiable on logical grounds. In any event this must be distinguished very clearly from revisions at the level of concepts and fundamental methodology. There, despite the hyperbole and the earnest attempts of ideologically charged enthusiasts, the effect is imperceptible.

Thus we come round once more to the question of why the critiques of science generated by the academic left should be taken seriously enough to require an honest rejoinder from science. If, as we believe, science will not, in any serious way, be influenced, deflected, restricted, or even inconvenienced by these critics and those they influence, why should their work draw more than passing comment from anyone outside that mutual admiration society? Why, in fact, have we troubled to worry about it? From the broadest point of view, we worry, and believe that scientists as well as laypersons well disposed toward intellectual progress should worry, because unanswered criticism must in due course have effects. We worry for the reason articulated by Arthur Potynen, for example, among many others who have begun to ask this question:

Those attempting to ignore post-modernism are many: for example, the natural sciences and business departments often hope that the affected, yet essentially harmless, humanities will remain isolated and irrelevant. But if power is the essence of all human endeavors, then can science escape being labeled willful and coercive? Can business be anything other than rapacious? Can either science or business continue to function in a political culture that assumes them to be oppressive? (Emphasis added.)

Those who choose to do so may dismiss this remark as the carping of one to whom "business as usual" may be the most sacred of values. The epigraph of this chapter, a *cri de coeur* from Bogdan Denitch, a life-long socialist of

unswerving faith, fully demonstrates that such misgivings do not necessarily go hand-in-hand with a benign attitude toward "business." A similar complaint is heard from the left-wing social theorist Alan Chalmers:

I am by no means alone in viewing social trends in the contemporary world with dismay and alarm. The gulf between rich and poor and between developed and undeveloped countries widens, the environment is destroyed, and the threat of annihilation looms. The social and political problems facing us are urgent and vital. I do not think this cause is helped by construals of science as a capitalist male conspiracy or as indistinguishable from black magic or voodoo.

Plainly, one needn't be in any sense a conservative to view the antiscientism of the academic left with deepest apprehension. One needs only to have paid some attention to it, to have understood its meanings, deep as well as superficial, to be concerned.

**Academic Recognition and Fairness**

The issue of academic recognition derives, we admit, from what some will descry as academic priggishness. Much of the work we have cited has been received with enthusiasm in certain academic quarters, where trendiness in the humanities and social sciences combines with "identity politics" and with the residue of Marxist intellectual totalism that persists among leftist thinkers. Paradoxically enough, in the United States—this bastion of free-market capitalism and reflexive hostility to socialist ideas—such enthusiasm is usually enough to guarantee success and even celebrity in the narrow world of the academy. The critics whose work so disturbs us will, in one sense, have the last laugh. For the most part, they have made it to the upper rungs of the academic ladder, from which no rejoinder, however well founded, will dislodge them in any likely future. Nor will the richest charitable foundations cease to support and honor them.

Most of the science-critics with whom we have dealt in this book, for instance, have high positions in such notable universities as Princeton, Berkeley, Brown, MIT, Rutgers, and the CUNY Graduate Center—and, if we allow some British examples, Oxford and the University of Edinburgh. They do not struggle in outer darkness: many of them are influential, politically as well as intellectually. We shall not illustrate this point with a list of the chairs, fellowships, and academic titles to which they lay claim at those institutions, but the facts are a matter of public record, and readers so inclined can easily satisfy themselves that most of our subjects, far from struggling as
certain aspects of, shall we say, theoretical physics or evolutionary biology to which the scientists themselves were heretofore blind! They are correspondingly uneasy to subject such claims to skeptical scrutiny, especially in light of the painful fact that to exercise it, they would have to acquire expertise in a field they have studiously avoided.

More than once we have been told by Y, the eminent professor of English and cultural critic, that X's critique of science shows her to be intimately familiar with some specific technical subject. On looking into X's work, however, we seem to find a great deal of psycho-talk, a good deal of literary language, and a glaring absence of knowledge of the supposed subject. In this case Y's wish has clearly been father to the thought. Likewise, we have been told over and over again that the keen methodologies of contemporary literary analysis leave up-to-date literary critics uniquely placed to analyze the rhetorical strategies and semiotic underpinnings of scientific treatises. This claim—it amounts to an unquestioned truth in some circles—has, however, remained entirely unsupported. We have never seen it illustrated with reference, for example, to a paper on the instability of induced magnetic fields in high-temperature superconductors. We doubt we ever shall. Nonetheless, it remains an effective sop to the vanity of contemporary literati.

At the same time, we find that scholars who are eager to praise cultural and political critiques of science are reluctant to take into account the (admittedly rare) actual responses of scientists to this work. Having, as they see it, reduced the scientific community to an object of study, they are quite unwilling (despite their repertory-theater "feeling for the organism") to allow the specimen to wriggle free of its new restraints. Their logic is that any objections on the part of scientists are tainted, prima facie, by self-interest and special pleading. It is never taken into account that the same defects might afflict the critiques themselves. In any event, this kind of exclusion serves the further purpose of acquitting the humanist and social-scientist enthusiasts of recent science criticism of the tiresome chore of learning the specifics of the biology, chemistry, physics, or mathematics being criticized.

In sum, we are accusing a powerful faction in modern academic life of intellectual dereliction. This accusation has nothing to do with political correctness or "subversion": it has to do, rather, with the craft of scholarship—a craft that has always had consequences, independently of the behaviors of individual scholars. We allege that eagerness to praise a certain spectrum of work has disarmed skepticism and careful critical attention. Political sympathy has combined with professional vanity to give undue weight, prestige, and influence to a decidedly slender body of work.

As we have observed, substantial careers have been made and salvaged on
view as honestly as possible, but also as forcefully, to the attention of the academic and scientific community.

A Schism in the Academy?

Emeritus professor of sociology Lewis S. Feuer has recently written:

If multiculturalists succeed in acquiring control of the curriculum and if they then institute a kind of force-conditioning of students with the "literatures" and ideological apologia for backward peoples, the consequence for the universities will be quite other than they foresee. Science students, with their essential preparatory studies growing all the time, will finally rebel against the "humanities" requirements, and for all practical purposes, the colleges of science will secede from their traditional association with the liberal arts college... The free marketplace of students and professors will, unless politically intimidated, decide for those institutions loyal to scientific values.

Even if one judges Feuer's vision to be unduly pessimistic, it must be admitted that he has his finger on something. The mood he detects is real, if unfocused. The National Association of Scholars, antiradical if not in any simple way "conservative," may intend to exploit it. One of its principles seems to be that in campus disputes over "political correctness" and the like, among the things to be done is "get the scientists on your side."

The immediate subjects of Feuer's ire—"multiculturalists"—have not, under that description, received much attention from us, aside from our remarks concerning "Afrocentric" science. But it would be disingenuous to pretend that our subjects and his don't have a large overlap. Left-wing critics of science such as Stanley Aronowitz, Sandra Harding, and Helen Longino salt their analyses heavily with appeals to the presumed superiority of "multicultural" epistemologies. If their views become part of the general intellectual baggage of the academic left, a process we believe is well advanced, then Feuer's scenario, or something resembling it, becomes very much more likely. Departments of chemistry or electrical engineering, other things being equal, have little to say, and will continue to have little to say, about the kind of "multiculturalism" that infuses the reading lists of courses on the modern novel with works by Third World women. If, however, the same academic factions are seen to be agitating for a similarly politicized view of science, one that draws heavily on the critiques we have analyzed above, academic life, already fractious, is likely to become considerably more belligerent. The chemists and engineers are quite likely to insist on a say about such agitation,
once it is their own courses, rather than the vague metaphors of a discipline, that are being proposed for purification or diversification.

On the whole, it is regrettable that serious students of the exact sciences rarely encounter, in their training, courses in the history of their disciplines that pay close attention to social, cultural, and political factors. Such knowledge is usually acquired ad hoc by those scientists who take a particular interest in it. But, as Feuer points out, the burden of essential preparatory studies is enormous, and is continually growing. Time is precious to a young scientist, and the optimal career path leads to the frontier of the subject as quickly as possible, leaving little opportunity for historical rumination. Nevertheless, much as one might lament the rarity of historically oriented science courses (and we join in that lament), in our judgment their absence is, on the whole, preferable to a hypothetical curriculum that requires such courses but hands responsibility for them over to historians and sociologists whose views derive from the science critiques of the academic left. We should be very surprised if our opinion is not shared by the vast majority of our colleagues, including some whose political outlook is unequivocally egalitarian and feminist.

The humanities, as traditionally understood, are indispensable to our civilization and to the prospects of living a fulfilling life within it. The indispensability of professional academic humanists, on the other hand, is a less certain proposition. Academic scientists have acceded to it, and properly so, out of respect for their colleagues as well as a deep concern that the great traditions of Western humanism should not be buried under the shabby detritus of popular culture and philistinism. The current stir over the postmodern style of humanist scholarship invokes the possibility that this body of sentiment may erode. Scientists are not the only skeptics, or even the most important ones; nor is such skepticism, we insist, necessarily a badge of right-wing leanings. Many of our wholeheartedly left-liberal, humanist colleagues are increasingly embarrassed by the spectacle of flamboyant celebrities in their respective fields playing "such fantastic tricks before high heaven as make the angels weep." How far things would have to go before the disenchantment becomes severe enough to provoke a genuine crisis in university life is anyone's guess. It is, however, obvious that to the extent that the various misconceptions about science we have examined become part of the general stew of postmodern assertions, the irritation of scientists will grow increasingly acute.

This tendency will be amplified because of the activism inspired, to a great degree, by left-wing antiscientism. In this regard, we might mention the raids on laboratories by animal-rights extremists, the successful attempts to inhibit funding of innocuous studies on the relation between heredity and sociopathic behavior and to close down scientific meetings on the subject, the assaults on evolutionary biologists for their advocacy of a not particularly doctrinaire sociobiological perspective, and the endless string of nuisance lawsuits brought by Jeremy Rifkin and his allies. All these actions have had the support, or at least the sympathy, of a substantial faction of the academic left. To most, if not all, scientists, however, they smack of the deepest anti-intellectualism. It would not be going too far to label them as superstitious outright. Yet they dovetail rather neatly with the emerging dogmas of the left concerning the innate fallibility of Western science.

Our speculations on the growing antipathy toward academic radicalism on the part of scientists are influenced by a certain sense of how the humanities and the arts enter into the actual lives of our scientific colleagues. On the whole, scientists are deeply cultured people, in the best and most honorable sense. The image of the scientific monomaniac, of science departments devoted to a "naive scientism," is, to say the least, highly misleading. The range of knowledge of music, art, history, philosophy, and literature to be found in a random sample of scientists is, we know from long experience, extensive, and in some fortunate venues enormous. Most of this learning has been acquired, of necessity, at odd moments here and there—not through formal or systematic study. As humanists, therefore, scientists are autodidacts. One obvious consequence of this fact is to undercut the argument that traditional humanities departments, in their role as educators, are indispensable bearers of the great treasures of our cultural heritage. There are other, albeit less efficient, routes to erudition.

Let us be blunt: having come so far, we have little left to lose. If, taking a fanciful hypothesis, the humanities department of MIT (a bastion, by the way, of left-wing rectitude) were to walk out in a huff, the scientific faculty could, at need and with enough released time, patch together a humanities curriculum, to be taught by the scientists themselves. It would have obvious gaps and rough spots, to be sure, and it might with some regularity prove irane; but on the whole it would be, we imagine, no worse than operative. What the opposite situation—a walkout by the scientists—would produce, as the humanities department tried to cope with the demand for science education, we leave to the reader's imagination. This little exercise in one-upmanship is, of course, utter fantasy. But it does point to something real. The notion that scientists and engineers will always accept as axiomatic the competence and indispensability for higher education of humanists and social scientists is altogether too smug. Other sentiments are clearly aslant. How these matters play out in American intellectual life will depend, to some
degree, on the ability of the non-scientists to retain in the most grotesque
tendencies in their respective fields.

We are not averse to propose that some, at least, of the "critiques of science"
we have addressed must be counted among such grotesqueries. If they retain
their current ascendancy among humanist radicals, it seems likely that the
gap between C. P. Snow's "two cultures" will become a rigid barrier, main-
tained by mutual disesteem between scientists and their would-be critics. The
sense of unity, of sharing in a common, though diverse, enterprise, will
certainly diminish. The country, the sense of mutual respect, that has been
one of the graces of university life, compensating for its difficulties and
penuries, will atrophy. At the same time, the tendency of the university to
develop into a cluster of rival satrapies, each eager to serve exclusively its own
clientele, will be amplified. The thinning of the curriculum into a list of
narrow, mutually incomprehensible specialties will be accelerated. Feuer's
suggestion of a formal secession of the sciences from the radicalized world of
no-longer-liberal arts may seem overblown. It would be premature, however,
to rule it out.

The Debasement of Science Education

It is self-evident that active and interested citizenship in this country, the
frame of mind that follows public affairs and stands ready to participate to
some degree in ongoing debates, requires a usable knowledge of science and
technology—at the very least, a seat-of-the-pants ability to track disputes
concerning science and public policy. In a republic that counts Franklin and
Jefferson among its founders, and whose culture heroes prominently include
the participants in the Manhattan Project and the entrepreneurs who have
endowed every desktop with its own computer, one might hope that such
intellectual endowments would be commonplace, if not ubiquitous. All too
obviously, this is not the case. Outside the community of professional sci-
entists and engineers, understanding of even the most elementary science is
thin and vague. Indeed, most of the population, including its iconic voices—
the television entertainers who comment on and not infrequently distort the
news—seems to take a perverse pride in the self-abnegation "I'm no rocket
scientist." The mass media have acquired a habit, deriving equally from fear
and laziness, of presenting scientific matters in the most stripped-down terms;
and they haul out in terror when any kind of nuance or subtlety threatens to
intrude on the story. If scientists have acquired a quasi-sacerdotal status in the
popular imagination, it is not because they have pressed strongly for such
recognition, but because so much of the population finds it more comfortable
to declare itself awestruck than to acquire the knowledge that might dissipate
the awe.

Like it or not, the responsibility for a remedy to this palpable and increasingly
dangerous defect in the foundations of republican existence lies principally with the
university. For all its failings, and despite its supposed economic decline
relative to the other Western industrial powers, the United States remains
unique in its ability to provide a large proportion of its young people with
some kind of higher education. In the face of all just criticism of the race and
gender biases of this society, the fact remains that a bright and energetic
young person who is determined to get a college education can probably get
one, no matter how "marginalized" or "disempowered" his or her social back-
ground. The campus culture not only shapes the maturation of most middle
and upper class youth; it functions in a similar way for a large proportion of the
"underclass"—at least those of its young people who manage to get through
adolescence without major damage and with some hope left intact.

There is, however, an inevitable corollary to the praiseworthy demographics
of American undergraduate education. The majority of students entering
college are inadequately prepared for it across the board. In science and
mathematics they are as a rule wretchedly prepared, so that undergraduate
teaching responsibilities in the sciences involve a great deal of remedial work.
Even worse, many students in lower-level science courses are not only igno-
rant of science but are ignorant as well of the fundamental frame of mind, the
attitudes, the intellectual rhythms needed if one is to acquire useful knowl-
edge. Thus, for better or worse, university scientists, as a body, have, in
addition to their research goals and their duty to train new generations of
scientific professionals, the responsibility of inculcating basic scientific liter-
acy in an enormous number of students who are unprepared, recalcitrant, and
skeptical about the whole business. Superb teaching may overcome these
obstacles; but excellence of that kind, like excellence of any kind, is rare and
appears only fitfully in the population of college teachers.

In the face thereof we now confront the emergence of a new body of
criticism of science, one that holds, when we get down to cases, that Western
science is in fundamental ways blind or blinkered, that it is corrupted by its
subtle bigotry and by its servile accommodation of power, that it is the artifact
of a worldview liable, any day now, to be overthrown. The critics, by their
stance, their language, and the terms on which they engage the scientific
views they criticize, offer another dispensation as well. They declare, in
effect, that parallel, even superior ways of knowing—those of feminism or
postmodernism or deep racial wisdom—are available for the evaluation of
scientific questions, and that from the heights of such alternative epis-
temologies the newly enlightened can discern the fundamental errors and weaknesses of traditional science—without troubling to become well informed about the substance and the inner logic of the scientific enterprise. Thus, with the aid of an unrelenting moralism that cloaks itself in political and social virtue, a moralism seconded with reigning platitudes of activists and cowed, beleaguered college presidents alike, the critics enthone a doctrine and a methodology for thinking about science that is at once scornful and ignorant.

We have been at pains to say why we think most of this is sheer piffery, and why the residue of genuine insights is negligibly small. Nevertheless, the odor of rectitude, as it is now defined in many areas of university life, can insulate a swarm of silly errors from criticism—indeed, it can silence the critics. Remarking on Robin Fox’s critique of the extreme relativism prevalent among ethnographers and cultural anthropologists, Bernard Ortiz de Montellano has this to say:

I think that Fox is understating the amount of political correctness in certain fields. For example, the American Anthropological Association’s last meeting had multiculturalism as a theme and ran a number of inane PC sessions on the topic. However, it rejected a session I proposed on “Multiculturalism and Pseudoanthropology.” This session included the dean of Olmec and Maya studies and the only African-American Meso-American archaeologist, critiquing Ivan Van Sertima’s idea that Nubians/Egyptians were here at the time of the Olmec, which is received wisdom among African American circles. The foremost authority on Nubia was going to talk on “The Afrocentric Misuse of Nubia”; . . . Eugene Scott . . . was going to give a case study of how multiculturalism is being used in the Berkeley schools; and I was going to give my talk on melanin. This problem is not just in anthropology. I have found extreme reluctance and avoidance of the topic of the Portland Baseline Essay and Afrocentric pseudoscience generally at the AAAS Education directorate, . . . National Science Foundation Science Education, and even at the National Academy of Sciences Committee on National Science Standards.

As we have noted, the criticism of science that we find so thin and unconvincing has been the making of a number of academic careers. To some degree at least, the attitudes it reflects and encourages have radiated into the general atmosphere of academic life. We encounter increasing numbers of students, graduate as well as undergraduate, whose primary contact with science has been through the work of feminist or cultural constructivist critics, and who are convinced, moreover, that they have imbibed doctrines that are wise (as well as stylish). Even more sadly, we have run into bright and ambitious black students who have become emotionally committed to some of the most risible Afrocentric myths—those of the black Egyptian superscientists, for instance, or of white, government scientists having created HIV secretly, in the laboratory, as a tool for genocide. We know of mathematics departments where the most straightforward pedagogic housekeeping task—that of giving placement exams to insure that students are assigned courses commensurate with their background and ability—is complicated by the insufferable intervention of ideologues, who insist that such tests are inherently “culturally biased” or “gender biased,” an intervention whose probable consequence is to make life miserable for the poor undergraduates who are shoehorned, courtesy of their would-be benefactors, into courses they aren’t ready to handle.

At the level of primary or secondary education, where even in more halcyon times science education was often a stepchild, matters stand even worse. The inanities of Afrocentric science now have free rein in a number of urban, predominantly black school districts. Of course, simple charity urges us to see this as a desperate, if horribly ill-considered, response to a desperate educational and social situation; but that situation is not to be ameliorated by the teaching of nonsense. As Ortiz de Montellano points out, however, many professionals in science education, who should, presumably, see the danger of this situation and take action to defuse it, sit on their hands and even devise relativistic excuses for letting it continue and worsen. It is never easy to estimate how much of this nonresponse is due to ignorance of what is really going on and how much to simple cowardice.

Even more startling, however, is the attitude of school authorities in some upscale, politically “progressive” districts. Eugenie Scott, executive director of the National Center for Science Education, reports (despite the apparent disapproval of the American Anthropological Association) that multicultural antisecuirsm fulminates in the progressive mecca of Berkeley, California. According to Scott, some Berkeley textbook committees are now trying to bar history and social science books that assert (innocuously, one would think) that Native American populations arrived in this hemisphere from Asia toward the end of the last ice age. Native American myths, they point out, contain no such assertions; why, therefore, should the confabulations of scientists be privileged over the “narratives” that the indigenes tell about themselves? It is ironic that Scott, an anthropologist who has devoted her recent career to fighting the influence of presumably right-wing “scientific creationists,” should now find herself trying to ward off similarly appalling nonsense that is backed by a large faction of what now passes for the left. In
some ways, it is even more frightening nonsense. For, whereas the well-educated folk of the Berkeley community were eager to take up arms against the intrusion of "creation science" into the schools, and insisted that the facts of evolution be taught without apology, a certain hesitancy gripped many of them when scientific nonsense intruded under the banner of multiculturalism, conveyed by the new relativism of the postmodernist thinkers.\textsuperscript{14}

The Inanition of Public Discourse

If, as seems obvious, scientific and technical issues will become increasingly and urgently relevant to public policy in the decades ahead, how well will such matters be debated in this country? Obviously, we cannot hold high hopes. The historic record of American education in making the general public conversant with basic science has always been poor, except for a brief flurry of serious effort in the post-Sputnik era. Superstition, whether about astrology, ancient astronauts, or alien abductions, has always had easy and profitable going. Fringe medicine and outright quackery, long endemic in American culture, have taken on new and ominous vigor, thanks in part to the dizzyly rising costs and increasing impersonality of ordinary health care. The contrast between the incomparable virtuosity of professional American science and the general, public disregard of scientific substance, whether from complacency or hostility, grows ever more pronounced. It is one of the great social paradoxes of history.

Those on the left of the political spectrum are concerned, and rightly so, about the abridgment of democratic procedure and debate inherent in a system that delegates all responsibility for important policy matters to a technocratic elite. These misgivings are manifestations of a significant dilemma. How are such decisions to be made in a manner that takes serious and accurate account of technical and scientific matters without abrogating popular rule or reducing it to a mere symbol? Dozens of pressing issues, from AIDS to alternative energy sources, are complicated by this question. How do we permit a wide public to have a serious voice in such deliberations without inviting in gullibility, ignorance, and mere faddishness—without inviting in the PR operators? The easy answer, of course, is to educate the great mass of citizens in such a way that thinking accurately about science is possible, if not quite second nature. The countervailing obstacle, however, is that widespread ignorance of science in and of itself prevents the development of an educational system that could dispel it.

It is clear that many of the left-wing thinkers whose ideas we find so unsatisfactory are, at bottom, obsessed by the same essential concern as the one we are now trying to address. How do we democratize scientific and technological decision making? How do we give the heretofore powerless some measure of control over the decisions, technological and otherwise, that so profoundly shape their lives? The unfortunate trajectory of academic radicalism has carried it to a position where this question is not so much answered as dispelled by a fog of philosophical conceits. Andrew Ross, Sandra Harding, Simon Schaffer, Stanley Aronowitz, Carolyn Merchant—even Jeremy Rifkin—are all, in their various ways, insisting that the mountain come to Mohammed. In this they are seconded by a squad of educational bureaucrats. Since science seems so difficult, so inaccessible and intimidating, when viewed on its own terms, the radical critics take the daring step of insisting that science can't be what it claims to be, no matter how well it backs up its claims with experiment and applied technology. Outwardly or covertly, they insist on supplanting standard science with other "ways of knowing" that, by their very nature, will be inclusive and welcoming. This is the true agenda of Harding's "strong objectivity," of Ross's insistence that New Agers and others on the far fringes of science will rally us against the omnivorous monster of technoculture.

The generosity of the democratic impulse when conjoined to this mode of thinking is instantly perverted to a kind of inverse intellectual snobbery, a form of coarse populism that is willing to exile the most stringent kinds of analytical thought and jettison the reliable devices of empiricism in the name of opening the doors of knowledge and driving the hauty priests of science from the temple. The theorizing done on behalf of this project is thus a species of incantation, a ritual rather than an argument. It does not conceive the need to examine science closely on the terms set by the logic of science because, in itself, that kind of examination would concede too much to the temperament and mind-set of the scientist. It would require precisely the kind of education, or self-education, that the critics, in the name of some kind of popular participation and empowerment, want desperately to prove superfluous.

A recent address by Carolyn Merchant gives voice to this sentiment in a fashion that reveals clearly the characteristic combination of earnest concern, wistfulness, and outright superficiality that marks recent leftist criticism of science.\textsuperscript{14} Drawing upon the misleading characterizations of "chaos theory" that have controlled public consciousness of this topic, she further distorts those second-hand characterizations in order to view it as a license to abandon the predictive strategies of science, to ignore "computers," in favor of a warm, cozy, inclusive discussion in which all voices—especially those of the formerly disempowered—will now have weight. Chaos theory, she rea-
sons, tells us that the predictive claims of science have been ill founded; so why not abandon, or at least denounce them, in the name of communitarian solidarity and radical egalitarianism? Of course, Merchant's daydream ignores the simple reality that, popular images to the contrary, chaos theory as an actual science does not diminish the claims of science to provide accurate predictions, but rather enhances and extends them substantially. One would have guessed that a Berkeley professor, motivated to take an interest in such matters and having had scientific training, could easily have discovered the facts of the case—they are certainly readily available. But this would not have sorted well with the egalitarian and ultimately pastoral vision Merchant wants to vindicate. She seems to prefer a science that is unsure and a little bit helpless—it would be far more amenable to her ideology.

Back-door utopianism, so characteristic of academic-leftist critics of science, is a sad and, ultimately, a woefully impotent business. Behind it stands a Romantic discontent that echoes perilously certain sentiments that were once recognized as reactionary. How much it will add, in the end, to the burden of outright superstition and ignorance that has always plagued the American democratic experiment is difficult to say. It is plain, however, that the underlying disaffection is hostile to enlightenment as such, and not just to the Enlightenment. What is chiefly discouraging about its new ascendancy in academic life is the evidence it provides of a tradition of egalitarianism falling under the sway of obscurantism and muddle. We do not need to convict the paladins of the postmodern left of any particular superstitious foolishness, in the ordinary sense, to notice that they have an appalling tendency to condone such foolishness with a relativist nod and a deconstructionist wink.

Above all, the net effect of all this is to debase still further the already corrupt coinage of public debate. The damage wrought by denatured language is all too apparent. Public health officials struggle to gain the credibility that should rightfully be theirs, and have to fight continually to be heard over a hubbub of voices stridently denouncing the arrogance of Western scientific and materialist paradigms, and offering to replace them with "alternative modes of healing" that promise to make us better faster and cheaper than stodgy old M.D.'s. At the root of it all is an ancient amalgam of quackery and self-delusion, but now, the fashionable shibboleths of postmodern academic discourse have become available to array the old foolishness in up-to-date scholarly language. Discussion of environmental questions is now, at least to some degree, hostage to a rhetorical style and a technique of public relations in which unrelenting eocabble plays an increasingly peremptory role. The locutions "environment friendly" and "environmentally sane" cover a broad range of styles and practices that, as we have seen, can be neither of those. This, too, is a language fostered in large measure by the peculiar intellectual gamesmanship of the academic left, and it is as often as not employed for purely political purposes.

As we have seen, practical measures for making discussion of scientific issues effectively more democratic by what should be the straightforward process of extending scientific literacy are continually subverted by the intrusion of "identity politics" into the pedagogy of science. In the case of "Afro-centric" science education, the phenomenon is nothing less than garish, although it remains strangely immune to criticism. It is clear that black youngsters who aspire to scientific careers will be in deep trouble if their early education is dominated by the Afrocentrism espoused by Ivan Van Sertima, Hunter Havelin Adams, and their co-workers.

The feminist critique of science is subtler and, superficially, less provocative in style; but it may, ultimately, have even more widely exclusionary results. Young women—or men, for that matter—who try to embark on scientific vocations with the explicit aim of reconstituting science along the lines advocated by Harding, Haraway, or Keller, or Longino, are on a course leading, we submit, to frustration and disillusion. We are not imagining such young people: we encounter them regularly in our classes!

Science does not work the way the critics say it works, and the program of reforms mooted by the critics will turn it into something other, and less than, science. Enthusiastic recruits to the cause of "feminist" science will have to face this contradiction sooner or later—most likely sooner. They may then come to take the view, shared by most women scientists of our acquaintance, that feminism, whatever its strengths as a moral stance and a social program, is not a methodology for doing science: it does not offer any privileged insights into scientific questions. That will be their victory. But if they attempt to hold fast to the most emphatic tenets of feminist dogma—for instance, Sandra Harding's assertion that "women" can't be "scientists" under the present order, because society constructs these as mutually exclusive categories, and therefore that scientific practice must be reconstituted along radical-feminist lines before women can participate15—they will quickly find themselves effectively excluded from serious scientific work.

On the other hand, many women with scientific talent may not get even that far. They will be discouraged from the outset by the litany of the most prominent critics to the effect that science, as it is practiced, is imputedly antagonistic to women, that it reflects and embodies a system of "patriarchal" domination and "violent" subordination of nature. Thus, to the degree that this sort of thing actually happens, feminism will find itself in the position of
frustrating an original, legitimate, and honorable feminist goal: that of augmenting the proportion, as well as the absolute number, of women in science.

We must also note that the left itself—not only the peculiar ideological tribe we have dubbed the “academic left,” but the far broader and deeper tradition of egalitarian social criticism that properly deserves such a designation—is, potentially, one of the ironic victims of the doctrinaire science-criticism that has emerged, just as it has long been the victim of the worst kinds of Marxist, Leninist, and Stalinist cant. It is quite legitimate, for instance, to assert that socialist views, as such, have a place in the important debates about environmental questions. Without here endorsing—or rejecting—a socialist point of view, we appreciate that it exists, that it is distinguishable from alternative political visions, and that it has a certain force. The underlying argument is that free-market capitalism, with its entrenchment of profit and its tendency to insulate crucial economic decisions from democratic oversight, is, in itself, an obstacle to changes we should make in our uses of technology if we are to develop sound environmental practices. In itself, this is a view that can be argued intelligently and that cannot simply be dismissed without specific, and historically informed, criticism. If, however, “eco-socialists” are forced to carry the ideological baggage of the academic left—the relativism of the social constructivists, the sophomoric skepticism of the postmodernists, the incipient Lysenkovism of feminist critics, the millenialism of the radical environmentalists, the racial chauvinism of the Afrocentrists—then they will, in effect, greatly accommodate their opponents, and facilitate the rapid dismissal of their own soundest points, since those will be embedded in a tissue of unsound and pseudoscientific nonsense. Scientists, and the scientifically well-informed, will simply not accept any form of “socialism” whose agenda include the subversion of legitimate science.

The Role of Scientists

If a jeremiad is to be more than a prolonged lament, it should, by custom, conclude with a call to arms, with a list of actions to be taken by people of goodwill. Thus are the diagnosed evils to be remedied and the disasters foreseen somehow avoided. Our list comes up, however, disconcertingly sparse; and the actions we can recommend are, on the whole, unheroic. We address ourselves chiefly to scientists, engineers, physicians, and other scientifically well-informed people who are members, by actual affiliation or by inclination, of the academic community. What ought they to do, as formal or informal educators, about the bizarre war against scientific thought and practice being waged by the various ideological strands of the academic left?

Obviously—at least we hope that by now it’s obvious—we are not calling for a purge of the institutions of higher learning in this country. We don’t advocate supplanting one regime of “political correctness” by another, even more odiously high-handed one. Having made that disclaimer, however, we can in good conscience urge that certain forms of vigilance are appropriate, troublesome as they may be to preoccupied teachers and scholars. First and most important is the necessity of seeing to it that whatever is labeled as “science education” in our colleges and universities deserves that designation. Science courses must teach science. It’s as simple as that. They should have substantive scientific content, validated by perfectly well-known and legitimate modes of scientific inference. As educators, scarred in battle and wearing a few tarnished medals, we have experience of the attempts to label shaky theorizing and tendentious quibbling as “science” for the sake of introducing it into the curriculum.

“Creation science” is an example that most of us are familiar with, although institutions of higher education (outside of sectarian colleges of dubious legitimacy) were rarely the targets of that campaign. We have also the example of various New Age confections peddled at some community colleges and in extension programs, under the pretext that they represent “science” of some kind. But the influence of the academic left is of a different kind, since it is seconded by the support, often enthusiastic, of many established senior members of the academic community. To date, it has merely nibbled at the fringes of the “hard” sciences, although, as we have seen, such heretofore honorable fields as anthropology and psychology have been gravely contaminated. We cannot help feeling, however, that there will be many more calls for “feminist” courses in biology and “Afrocentric” courses in mathematics. How much force such campaigns will have is hard to predict. In any event scientists and science educators must, on their professional honor, be prepared to resist the insertion into the science curriculum of courses whose content is tailored to the demands of any ideological faction. It will be alleged, of course, that conventional science, like all knowledge, is inevitably “ideological,” and that the proposed “reforms” are therefore just as legitimate and considerably more self-aware than the traditional kinds of scientific education. This contention is, however, simply wrong, as we hope we have at least suggested: in fact, we think it comes very near to being nonsense. Scientists ought to reject it out of hand. This is not really a matter that demands intellectual acuity—the theories of the left-academic critics are not, on the intellectual plane, particularly intimidating. Rather, it is a question of not letting one’s social ideals, which may well find much to admire in
feminism and in the quest for racial justice, overrule one's professional judgment and simple common sense. Unthinking sentimentality, be it remembered, is the great enemy of genuine compassion.

Beyond this, there is the matter of courses, seminars, symposia and the like, that claim to address scientific matters while falling outside the official boundaries of science departments. We urge scientific professionals to scrutinize these offerings, whether or not invited to do so, to participate in them if possible, and with appropriate skepticism. We urge them not to fear making judgments, not to hesitate, for the sake of someone else's imagined good intentions, to make their misgivings public. The academic left, after all, is fiercely judgmental and highly vociferous, though all the while it is eager to denounce judgmental behavior in its opponents. Moreover, some of the instinctively deferential habits of academics will simply have to be put aside. One can't assume, in these matters, that possession of an advanced degree or a professorship equates to intellectual legitimacy. Most of this book has been devoted to a critique of work done by academics whose nominal credentials are quite impressive. That has not prevented them from propounding wrongheaded, evenpatulous, theories about matters in which their knowledge ranges from shallow to nonexistent. This is a disconcerting fact of contemporary academic life. It should stimulate energetic action and argument, not resignation or quietism. It should be as strong a push to attending faculty meetings, and paying attention to curricular proposals, as the threat of state-mandated program cuts or of new parking regulations.

In our experience, scientists who try to engage the radical critics of science in direct debate are in for a frustrating time of it. This is not because their foes are expert rhetoricians. In fact the critics of science are relatively reluctant to contend with actual scientists in the flesh. They prefer a hermetic, self-referential atmosphere for the promulgation of their ideas; often they appear to regard the presence of well-informed scientists, unless invited for specific "technical" contributions, as intrusive. This is a characteristic of the sectarian mentality: it usually implies a skittishness on the part of the critics, one that may derive from inward knowledge that their theories rest as much on wishful thinking as on learning. In any case scientists oughtn't to be reluctant to stick their two cents in. They should insist—always within the bounds of courtesy, of course—on being included in debates and presentations that center on science and the relations between science and culture. If they are nevertheless excluded, as will sometimes happen, they should be prepared to make a bit of noise about it. They will be on very firm ground in today's academy, where few proceedings are allowed to proceed without proper repre-

servation of the affected class, and where noise is no longer taken, as it used to be, as evidence of an unfortunate class origin.

We realize, of course, that the greatest disincentive to participation in such controversies is the time and effort it takes, costs that will add greatly to the burden of sustaining a serious research program and meeting one's instructional and professional responsibilities. Intellectually, these quarrels tend to be tiresome. Nature is the scientist's worthy adversary (we use the figure in defiance of the fact that science critics will sniff it out as evidence that we are slaves to the Western-patriarchal paradigm of dominance and control). Academic leftists, on the other hand, tend to be unfocused bores, and a certain deliberate, cheerful simple-mindedness is needed to hear them out sufficiently to catch the drift of the arguments and to formulate an apposite response. It is an unlikely chore, but one that a good many of us ought to be doing, out of loyalty to our own disciplines and to—for the pretentiousness of the word—civilization.

Finally, there is the unpleasant, but serious, question of careerism, which, conjoined to ideological enthusiasm, has been responsible for much of the misbegotten scholarship we have considered. It has been traditional, in the academy, for the humanists to let the scientists do their own hiring, firing, and promotion, and for the scientists to reciprocate. If representatives from one camp are obliged by local custom to rule on the other's actions in such matters (as in the case of tenure committees), they usually assert pro forma, without making any inquiries beyond the superficial ones, for example, to ascertain that the letters of recommendation and so forth are adequately fulsome or lack, at least, the hint of bones rattling in closets. The proliferation of would-be science critics and epistemologists among left-wing humanists raises serious questions about this cozy arrangement. If an aspiring scholar is to be judged on work affecting to make deep pronouncements on questions of science, scientific methodology, history of science, or the very legitimacy of science, it strikes us that scientists should have some say in evaluating it. This holds even if the candidate resides academically in the English department or the art department or the sociology department. It will be objected that scientists, as a hermetic, self-protective guild, ought not to sit in judgment of those who are studying them. But academic leftists, postmodernists, deconstructionists, and the like have their own self-protective guilds, and experience shows that they are not at all reluctant to rally round their own. Elementary fairness requires that a broader spectrum of opinion should be brought into the process. If an assistant professor of English is to stake his bid for tenure on work that, for example, purports to analyze quantum mechanics
as an ideological construct, then he has no right to complain if a professor of physics is brought into the evaluation to say whether he evidences any real understanding of quantum mechanics. More broadly, if scientists perceive that a spate of nonsense concerning science has been coming out of the mouths of their young humanist colleagues, then they have the right to raise questions about the mechanisms that give a fair wind to such shaky scholarship.

It will be argued immediately that this is an asymmetric, and therefore inequitable, proposition. If physicists are to judge scholars of English, why shouldn't English professors judge physicists? The fallacy here is that the asymmetry originates from the pretensions, legitimate or otherwise, of members of the English (or sociology or cultural studies or women's studies or African-American studies) department to qualification on scientific questions. If, say, a member of the mathematics department were to engage in the (most unlikely) scholarly project of analyzing the rhetorical and stylistic elements of certain mathematics papers, it would be entirely legitimate for literary scholars to pronounce judgment on the work, and for the promotion process to take that judgment fully into account. To put it bluntly, it is humanists of the academic left who have transgressed the boundaries—as they are eager in most circumstances to proclaim. That's their privilege; but they are not (or should not be) exempt from customs duties!

Finally, there is the question of reconquering lost territory for the scientific approach. As we have noted, some fields, long recognized as scientific in principle, have fallen victim to antiscientific relativism. Anthropology is one example; other, partial examples could be found within psychology and sociology. Plainly, there is no direct way to enjoin our counterparts in these fields to abandon the pleasures of subjective narrativity for the fuddy-duddy rigors of empirical and statistical research. Still, “hard” scientists should find some way of supporting those of their colleagues in these areas who are willing to honor the principle that the right to make knowledge claims, in a university, has to be earned by the methodologically sound sweat of one's brow. It's fine to argue about competing methodologies; it is not fine to congratulate oneself on having abandoned method.

We must conclude on a note of melancholy. At this point in history, for anyone who has read it honestly, the status of science as a reliable, profound, and productive source of knowledge ought to be beyond serious question. That vague but grandiloquent challenges nevertheless recur incessantly remains, after all our attempts to understand, a source of sad perplexity. That many of these challenges now issue from a community that consists, regardless of ideology, of people who have presumably enjoyed a first-class education and who have, all their adult lives, played a central role in the larger intellectual world deepens our misgivings. We would have been much happier if this book had been unnecessary. We may be misguided; we may have made mistakes; our erudition may be more deficient than we already know; but we are not dishonest. Honestly, then, we care deeply about our students, and honestly we treasure that collegial life of the mind which no external insult—not of age nor loss nor straitened circumstances—has in our time been able to diminish. For us to believe that a book of this kind is needed means at very least that, in making our inquiries and absorbing a large and distressing literature, we have had to abandon the complacent feeling that the republic of intellectual inquiry is secure from internal decay.

Finally, and with an ironic nod to Andrew Ross, we would like to acknowledge with deepest gratitude the gifts of all the science teachers we have had throughout our lives. That includes colleagues, senior and junior, and, most important, some of our students. This book could not have been conceived, let alone written, without them.