A Physicist Experiments With Cultural Studies

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The displacement of the idea that facts and evidence matter by the idea that everything boils down to subjective interests and perspectives is — second only to American political campaigns — the most prominent and pernicious manifestation of anti-intellectualism in our time.

— Larry Laudan, Science and Relativism (1990)

For some years I've been troubled by an apparent decline in the standards of intellectual rigor in certain precincts of the American academic humanities. But I'm a mere physicist: if I find myself unable to make head or tail of jouissance and différance, perhaps that just reflects my own inadequacy.

So, to test the prevailing intellectual standards, I decided to try a modest (though admittedly uncontrolled) experiment: Would a leading North American journal of cultural studies — whose editorial collective includes such luminaries as Fredric Jameson and Andrew Ross — publish an article liberally salted with nonsense if (a) it sounded good and (b) it flattered the editors’ ideological preconceptions?

The answer, unfortunately, is yes. Interested readers can find my article, "Transgressing the Boundaries: Toward a Transformative Hermeneutics of Quantum Gravity," in the Spring/Summer 1996 issue of Social Text. It appears in a special number of the magazine devoted to the "Science Wars.

What's going on here? Could the editors really not have realized that my article was written as a parody?

In the first paragraph I deride "the dogma imposed by the long post-Enlightenment hegemony over the Western intellectual outlook":

that there exists an external world, whose properties are independent of any individual human being and indeed of humanity as a whole; that these properties are encoded in "eternal" physical laws; and that human beings can obtain reliable, albeit imperfect and tentative, knowledge of these laws by hewing to the "objective" procedures and epistemological strictures prescribed by the (so-called) scientific method.

Is it now dogma in Cultural Studies that there exists no external world? Or that there exists an external world but science obtains no knowledge of it?
In the second paragraph I declare, without the slightest evidence or argument, that "physical 'reality' [note the scare quotes] ... is at bottom a social and linguistic construct." Not our theories of physical reality, mind you, but the reality itself. Fair enough: anyone who believes that the laws of physics are mere social conventions is invited to try transgressing those conventions from the windows of my apartment. (I live on the twenty-first floor.)

Throughout the article, I employ scientific and mathematical concepts in ways that few scientists or mathematicians could possibly take seriously. For example, I suggest that the "morphogenetic field" — a bizarre New Age idea due to Rupert Sheldrake — constitutes a cutting-edge theory of quantum gravity. This connection is pure invention; even Sheldrake makes no such claim. I assert that Lacan's psychoanalytic speculations have been confirmed by recent work in quantum field theory. Even nonscientist readers might well wonder what in heavens' name quantum field theory has to do with psychoanalysis; certainly my article gives no reasoned argument to support such a link.

Later in the article I propose that the axiom of equality in mathematical set theory is somehow analogous to the homonymous concept in feminist politics. In reality, all the axiom of equality states is that two sets are identical if and only if they have the same elements. Even readers without mathematical training might well be suspicious of the claim that the axiom of equality reflects set theory's "nineteenth-century liberal origins."

In sum, I intentionally wrote the article so that any competent physicist or mathematician (or undergraduate physics or math major) would realize that it is a spoof. Evidently the editors of Social Text felt comfortable publishing an article on quantum physics without bothering to consult anyone knowledgeable in the subject.

The fundamental silliness of my article lies, however, not in its numerous solecisms but in the dubiousness of its central thesis and of the "reasoning" adduced to support it. Basically, I claim that quantum gravity — the still-speculative theory of space and time on scales of a millionth of a billionth of a billionth of a centimeter — has profound political implications (which, of course, are "progressive"). In support of this improbable proposition, I proceed as follows: First, I quote some controversial philosophical pronouncements of Heisenberg and Bohr, and assert (without argument) that quantum physics is profoundly consonant with "postmodernist epistemology." Next, I assemble a pastiche — Derrida and general relativity, Lacan and topology, Irigaray and quantum gravity — held together by vague rhetoric about "nonlinearity," "flux" and "interconnectedness." Finally, I jump (again without argument) to the assertion that "postmodern science" has abolished the concept of objective reality. Nowhere in all of this is there anything resembling a logical sequence of thought; one finds only citations of authority, plays on words, strained analogies, and bald assertions.

In its concluding passages, my article becomes especially egregious. Having abolished reality as a constraint on science, I go on to suggest (once again without argument) that science, in order to be "liberatory," must be subordinated to political strategies. I finish the article by observing that "a liberatory science cannot be complete without a profound revision of the canon of mathematics." We can see hints of an "emancipatory mathematics," I suggest, "in the multidimensional and nonlinear logic of fuzzy systems theory; but this approach is still heavily marked by its origins in the crisis of late-capitalist production relations." I add that "catastrophe theory, with its dialectical emphases on smoothness/discontinuity and metamorphosis/unfolding, will indubitably play a major role in the future mathematics; but much theoretical work remains to be done before this approach can become a concrete tool of progressive political praxis." It's understandable that the editors of Social Text were unable to evaluate critically the technical aspects of my article (which is exactly why they should have consulted a scientist). What's more surprising is how readily they accepted my implication that the search for truth in science must be subordinated to a political agenda, and how oblivious they were to the article's overall illogic.
Why did I do it? While my method was satirical, my motivation is utterly serious. What concerns me is the proliferation, not just of nonsense and sloppy thinking per se, but of a particular kind of nonsense and sloppy thinking: one that denies the existence of objective realities, or (when challenged) admits their existence but downplays their practical relevance. At its best, a journal like Social Text raises important questions that no scientist should ignore -- questions, for example, about how corporate and government funding influence scientific work. Unfortunately, epistemic relativism does little to further the discussion of these matters.

In short, my concern over the spread of subjectivist thinking is both intellectual and political. Intellectually, the problem with such doctrines is that they are false (when not simply meaningless). There is a real world; its properties are not merely social constructions; facts and evidence do matter. What sane person would contend otherwise? And yet, much contemporary academic theorizing consists precisely of attempts to blur these obvious truths -- the utter absurdity of it all being concealed through obscure and pretentious language.

Social Text's acceptance of my article exemplifies the intellectual arrogance of Theory -- meaning postmodernist literary theory -- carried to its logical extreme. No wonder they didn't bother to consult a physicist. If all is discourse and "text," then knowledge of the real world is superfluous; even physics becomes just another branch of Cultural Studies. If, moreover, all is rhetoric and "language games," then internal logical consistency is superfluous too: a patina of theoretical sophistication serves equally well. Incomprehensibility becomes a virtue; allusions, metaphors and puns substitute for evidence and logic. My own article is, if anything, an extremely modest example of this well-established genre.

Politically, I'm angered because most (though not all) of this silliness is emanating from the self-proclaimed Left. We're witnessing here a profound historical volte-face. For most of the past two centuries, the Left has been identified with science and against obscurantism; we have believed that rational thought and the fearless analysis of objective reality (both natural and social) are incisive tools for combating the mystifications promoted by the powerful -- not to mention being desirable human ends in their own right. The recent turn of many "progressive" or "leftist" academic humanists and social scientists toward one or another form of epistemic relativism betrays this worthy heritage and undermines the already fragile prospects for progressive social critique. Theorizing about "the social construction of reality" won't help us find an effective treatment for AIDS or devise strategies for preventing global warming. Nor can we combat false ideas in history, sociology, economics and politics if we reject the notions of truth and falsity.

The results of my little experiment demonstrate, at the very least, that some fashionable sectors of the American academic Left have been getting intellectually lazy. The editors of Social Text liked my article because they liked its conclusion: that "the content and methodology of postmodern science provide powerful intellectual support for the progressive political project." They apparently felt no need to analyze the quality of the evidence, the cogency of the arguments, or even the relevance of the arguments to the purported conclusion.

Of course, I'm not oblivious to the ethical issues involved in my rather unorthodox experiment. Professional communities operate largely on trust; deception undercuts that trust. But it is important to understand exactly what I did. My article is a theoretical essay based entirely on publicly available sources, all of which I have meticulously footnoted. All works cited are real, and all quotations are rigorously accurate; none are invented. Now, it's true that the author doesn't believe his own argument. But why should that matter? The editors' duty as scholars is to judge the validity and interest of ideas, without regard for their provenance. (That is why many scholarly journals practice blind refereeing.) If the Social Text editors find my arguments convincing, then why should they be disconcerted simply because I don't? Or are they more deferent to the so-called "cultural authority of technoscience" than they would care to admit?
In the end, I resorted to parody for a simple pragmatic reason. The targets of my critique have by now become a self-perpetuating academic subculture that typically ignores (or disdains) reasoned criticism from the outside. In such a situation, a more direct demonstration of the subculture's intellectual standards was required. But how can one show that the emperor has no clothes? Satire is by far the best weapon; and the blow that can't be brushed off is the one that's self-inflicted. I offered the *Social Text* editors an opportunity to demonstrate their intellectual rigor. Did they meet the test? I don't think so.

I say this not in glee but in sadness. After all, I'm a leftist too (under the Sandinista government I taught mathematics at the National University of Nicaragua). On nearly all practical political issues -- including many concerning science and technology -- I'm on the same side as the *Social Text* editors. But I'm a leftist (and feminist) *because* of evidence and logic, not in spite of it. Why should the right wing be allowed to monopolize the intellectual high ground?

And why should self-indulgent nonsense -- whatever its professed political orientation -- be lauded as the height of scholarly achievement?

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**SIDEBAR: EXCERPT FROM ARTICLE**

Thus, general relativity forces upon us radically new and counterintuitive notions of space, time and causality; so it is not surprising that it has had a profound impact not only on the natural sciences but also on philosophy, literary criticism, and the human sciences. For example, in a celebrated symposium three decades ago on *Les Langages Critiques et les Sciences de l'Homme*, Jean Hyppolite raised an incisive question about Jacques Derrida's theory of structure and sign in scientific discourse ... Derrida's perceptive reply went to the heart of classical general relativity:

> The Einsteinian constant is not a constant, is 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 something—of a center starting from which an observer could master the field—but the very concept of the game ...

In mathematical terms, Derrida's observation relates to the invariance of the Einstein field equation $G_{\mu\nu} = 8\pi G_{T\mu\nu}$ under nonlinear space-time diffeomorphisms (self-mappings of the space-time manifold which are infinitely differentiable but not necessarily analytic). The key point is that this invariance group "acts transitively": this means that any space-time point, if it exists at all, can be transformed into any other. In this way the infinite-dimensional invariance group erodes the distinction between observer and observed; the $\pi$ of Euclid and the $G$ of Newton, formerly thought to be constant and universal, are now perceived in their ineluctable historicity; and the putative observer becomes fatally de-centered, disconnected from any epistemic link to a space-time point that can no longer be defined by geometry alone.

* About this document ...
Daniel Sleator
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Transgressing the Boundaries: An Afterword

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I did not write this work merely with the aim of setting the exegetical record straight. My larger target is those contemporaries who -- in repeated acts of wish-fulfillment -- have appropriated conclusions from the philosophy of science and put them to work in aid of a variety of social cum political causes for which those conclusions are ill adapted. Feminists, religious apologists (including "creation scientists"), counterculturalists, neoconservatives, and a host of other curious fellow-travelers have claimed to find crucial grist for their mills in, for instance, the avowed incommensurability and underdetermination of scientific theories. The displacement of the idea that facts and evidence matter by the idea that everything boils down to subjective interests and perspectives is -- second only to American political campaigns -- the most prominent and pemicious manifestation of anti-intellectualism in our time.

-- Larry Laudan, Science and Relativism (1990, p. x)

Les grandes personnes sont décidément bien bizarres, se dit le petit prince.

-- Antoine de Saint Exupéry, Le Petit Prince

Alas, the editors of Social Text have discovered that my article, "Transgressing the Boundaries: Toward a Transformative Hermeneutics of Quantum Gravity", which appeared in Social Text #46/47, is a parody. In view of the important intellectual and political issues raised by this episode, they have generously agreed to publish this (non-parodic) Afteword, in which I explain my motives and my true views. One of my goals is to make a small contribution toward a dialogue on the Left between humanists and natural scientists -- "two cultures" which, contrary to some optimistic pronouncements (mostly by the former group), are probably farther apart in mentality than at any time in the past 50 years.

Like the genre it is meant to satirize -- myriad exemplars of which can be found in my reference list --
my article is a mélange of truths, half-truths, quarter-truths, falsehoods, non sequiturs, and syntactically correct sentences that have no meaning whatsoever. (Sadly, there are only a handful of the latter: I tried hard to produce them, but I found that, save for rare bursts of inspiration, I just didn't have the knack.) I also employed some other strategies that are well-established (albeit sometimes inadvertently) in the genre: appeals to authority in lieu of logic; speculative theories passed off as established science; strained and even absurd analogies; rhetoric that sounds good but whose meaning is ambiguous; and confusion between the technical and everyday senses of English words. (N.B. All works cited in my article are real, and all quotations are rigorously accurate; none are invented.)

But why did I do it? I confess that I'm an unabashed Old Leftist who never quite understood how deconstruction was supposed to help the working class. And I'm a stodgy old scientist who believes, naively, that there exists an external world, that there exist objective truths about that world, and that my job is to discover some of them. (If science were merely a negotiation of social conventions about what is agreed to be "true", why would I bother devoting a large fraction of my all-too-short life to it? I don't aspire to be the Emily Post of quantum field theory.)

But my main concern isn't to defend science from the barbarian hordes of lit crit (we'll survive just fine, thank you). Rather, my concern is explicitly political: to combat a currently fashionable postmodernist/poststructuralist/social-constructivist discourse -- and more generally a penchant for subjectivism -- which is, I believe, inimical to the values and future of the Left. Alan Ryan said it well:

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.

Likewise, Eric Hobsbawm has decried

the rise of "postmodernist" intellectual fashions in Western universities, particularly in departments of literature and anthropology, which imply that all "facts" claiming objective existence are simply intellectual constructions. In short, that there is no clear difference between fact and fiction. But there is, and for historians, even for the most militantly antipositivist ones among us, the ability to distinguish between the two is absolutely fundamental.

(Hobsbawm goes on to show how rigorous historical work can refute the fictions propounded by reactionary nationalists in India, Israel, the Balkans and elsewhere.) And finally Stanislav Andreski:

So long as authority inspires awe, confusion and absurdity enhance conservative tendencies in society. Firstly, because clear and logical thinking leads to a cumulation of knowledge (of which the progress of the natural sciences provides the best example) and the advance of knowledge sooner or later undermines the traditional order. Confused thinking, on the other hand, leads nowhere in particular and can be indulged indefinitely without producing any impact upon the world.

As an example of "confused thinking", I would like to consider a chapter from Harding (1991) entitled "Why 'Physics' Is a Bad Model for Physics". I select this example both because of Harding's prestige in certain (but by no means all) feminist circles, and because her essay is (unlike much of this genre) very clearly written. Harding wishes to answer the question, "Are feminist criticisms of Western thought relevant to the natural sciences?" She does so by raising, and then rebutting, six "false beliefs" about the nature of science. Some of her rebuttals are perfectly well-taken; but they don't
prove anything like what she claims they do. That is because she confutes five quite distinct issues:

1) **Ontology.** What objects **exist** in the world? What statements about these objects are **true**?
2) **Epistemology.** How can human beings obtain **knowledge** of truths about the world? How can they assess the **reliability** of that knowledge?
3) **Sociology of knowledge.** To what extent are the truths **known** (or **knowable**) by humans in any given society influenced (or determined) by social, economic, political, cultural and ideological factors? Same question for the false statements erroneously believed to be true.
4) **Individual ethics.** What types of research **ought** a scientist (or technologist) to undertake (or refuse to undertake)?
5) **Social ethics.** What types of research **ought** society to encourage, subsidize or publicly fund (or alternatively to discourage, tax or forbid)?

These questions are obviously related — e.g. if there are no objective truths about the world, then there isn’t much point in asking how one can know those (nonexistent) truths — but they are conceptually distinct.

For example, Harding (citing Forman 1987) points out that American research in the 1940s and 50s on quantum electronics was motivated in large part by potential military applications. True enough. Now, quantum mechanics made possible solid-state physics, which in turn made possible quantum electronics (e.g. the transistor), which made possible nearly all of modern technology (e.g. the computer). And the computer has had applications that are beneficial to society (e.g. in allowing the postmodern cultural critic to produce her articles more efficiently) as well as applications that are harmful (e.g. in allowing the U.S. military to kill human beings more efficiently). This raises a host of social and individual ethical questions: Ought society to forbid (or discourage) certain applications of computers? Forbid (or discourage) research on computers per se? Forbid (or discourage) research on quantum electronics? On solid-state physics? On quantum mechanics? And likewise for individual scientists and technologists. (Clearly, an affirmative answer to these questions becomes harder to justify as one goes down the list; but I do not want to declare any of these questions a **priori** illegitimate.) Likewise, sociological questions arise, for example: To what extent is our (true) knowledge of computer science, quantum electronics, solid-state physics and quantum mechanics — and our lack of knowledge about other scientific subjects, e.g. the global climate — a result of public-policy choices favoring militarism? To what extent have the erroneous theories (if any) in computer science, quantum electronics, solid-state physics and quantum mechanics been the result (in whole or in part) of social, economic, political, cultural and ideological factors, in particular the culture of militarism? These are all serious questions, which deserve careful investigation adhering to the highest standards of scientific and historical evidence. **But they have no effect whatsoever on the underlying scientific questions:** whether atoms (and silicon crystals, transistors and computers) really do behave according to the laws of quantum mechanics (and solid-state physics, quantum electronics and computer science). The militaristic orientation of American science has quite simply no bearing whatsoever on the ontological question, and only under a wildly implausible scenario could it have any bearing on the epistemological question. (E.g. if the worldwide community of solid-state physicists, following what they believe to be the conventional standards of scientific evidence, were to hastily accept an erroneous theory of semiconductor behavior because of their enthusiasm for the breakthrough in military technology that this theory would make possible.)

Andrew Ross has drawn an analogy between the hierarchical taste cultures (high, middlebrow and popular) familiar to cultural critics, and the demarcation between science and pseudoscience. At a sociological level this is an incisive observation; but at an ontological and epistemological level it is simply mad. Ross seems to recognize this, because he immediately says:

> I do not want to insist on a literal interpretation of this analogy ... A more exhaustive treatment would take account of the local, qualifying differences between the realm of cultural taste and that of science [1], but it would run up, finally, against the stand-off
between the empiricist's claim that non-context-dependent beliefs exist and that they can be true, and the culturalist's claim that beliefs are only socially accepted as true.

But such epistemological agnosticism simply won't suffice, at least not for people who aspire to make social change. Deny that non-context-dependent assertions can be true, and you don't just throw out quantum mechanics and molecular biology: you also throw out the Nazi gas chambers, the American enslavement of Africans, and the fact that today in New York it's raining. Hobsbawn is right: facts do matter, and some facts (like the first two cited here) matter a great deal.

Still, Ross is correct that, at a sociological level, maintaining the demarcation line between science and pseudoscience serves -- among other things -- to maintain the social power of those who, whether or not they have formal scientific credentials, stand on science's side of the line. (It has also served to increase the mean life expectancy in the United States from 47 years to 76 years in less than a century.) Ross notes that

Cultural critics have, for some time now, been faced with the task of exposing similar vested institutional interests in the debates about class, gender, race, and sexual preference that touch upon the demarcations between taste cultures, and I see no ultimate reason for us to abandon our hard-earned skepticism when we confront science.

Fair enough: scientists are in fact the first to advise skepticism in the face of other people's (and one's own) truth claims. But a sophomoric skepticism, a bland (or blind) agnosticism, won't get you anywhere. Cultural critics, like historians or scientists, need an informed skepticism: one that can evaluate evidence and logic, and come to reasoned (albeit tentative) judgments based on that evidence and logic.

At this point Ross may object that I am rigging the power game in my own favor: how is he, a professor of American Studies, to compete with me, a physicist, in a discussion of quantum mechanics? (Or even of nuclear power -- a subject on which I have no expertise whatsoever.) But it is equally true that I would be unlikely to win a debate with a professional historian on the causes of World War I. Nevertheless, as an intelligent lay person with a modest knowledge of history, I am capable of evaluating the evidence and logic offered by competing historians, and of coming to some sort of reasoned (albeit tentative) judgment. (Without that ability, how could any thoughtful person justify being politically active?)

The trouble is that few non-scientists in our society feel this self-confidence when dealing with scientific matters. As C.P. Snow observed in his famous "Two Cultures" lecture 35 years ago:

A good many times I have been present at gatherings of people who, by the standards of the traditional culture, are thought highly educated and who have with considerable gusto been expressing their incredulity at the illiteracy of scientists. Once or twice I have been provoked and have asked the company how many of them could describe the Second Law of Thermodynamics. The response was cold: it was also negative. Yet I was asking something which is about the scientific equivalent of: Have you read a work of Shakespeare's?

I now believe that if I had asked an even simpler question -- such as, What do you mean by mass, or acceleration, which is the scientific equivalent of saying, Can you read? -- not more than one in ten of the highly educated would have felt that I was speaking the same language. So the great edifice of modern physics goes up, and the majority of the cleverest people in the western world have about as much insight into it as their neolithic ancestors would have had.
A lot of the blame for this state of affairs rests, I think, with the scientists. The teaching of mathematics and science is often authoritarian; and this is antithetical not only to the principles of radical/democratic pedagogy but to the principles of science itself. No wonder most Americans can't distinguish between science and pseudoscience: their science teachers have never given them any rational grounds for doing so. (Ask an average undergraduate: Is matter composed of atoms? Yes. Why do you think so? The reader can fill in the response.) Is it then any surprise that 36% of Americans believe in telepathy, and that 47% believe in the creation account of Genesis?

As Ross has noted, many of the central political issues of the coming decades -- from health care to global warming to Third World development -- depend in part on subtle (and hotly debated) questions of scientific fact. But they don't depend only on scientific fact: they depend also on ethical values and -- in this journal it hardly needs to be added -- on naked economic interests. No Left can be effective unless it takes seriously questions of scientific fact and of ethical values and of economic interests. The issues at stake are too important to be left to the capitalists or to the scientists -- or to the postmodernists.

A quarter-century ago, at the height of the U.S. invasion of Vietnam, Noam Chomsky observed that:

> George Orwell once remarked that political thought, especially on the left, is a sort of masturbation fantasy in which the world of fact hardly matters. That's true, unfortunately, and it's part of the reason that our society lacks a genuine, responsible, serious left-wing movement.

Perhaps that's unduly harsh, but there's unfortunately a significant kernel of truth in it. Nowadays the erotic text tends to be written in (broken) French rather than Chinese, but the real-life consequences remain the same. Here's Alan Ryan in 1992, concluding his wry analysis of American intellectual fashions with a lament that

> the number of people who combine intellectual toughness with even a modest political radicalism is pitifully small. Which, in a country that has George Bush as President and Danforth Quayle lined up for 1996, is not very funny.

Four years later, with Bill Clinton installed as our supposedly "progressive" president and Newt Gingrich already preparing for the new millennium, it still isn't funny.

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• About this document ...

Daniel Sleator
Fri Jun 7 10:56:35 EDT 1996
The following is an editorial response to Alan Sokal's claim, in Lingua Franca, that his article, published in the current issue of Social Text, is a parody, and that he intended this hoax as a critique of science studies.

Sokal's articles and further commentary can be found at The Sokal Affair.

Science Wars can be ordered through Duke University Press.

What were some of the initial responses of the journal's editors when we first learned about Alan Sokal's prank upon Social Text? One suspected that Sokal's parody was nothing of the sort, and that his admission represented a change of heart, or a folding of his intellectual resolve. Another was less convinced that Sokal knew very much about what he was attempting to expose. A third was pleasantly astonished to learn that the journal is taken seriously enough to be considered a target of a hoax, especially a hoax by a physicist. Others were concerned that his hoax might spark off a new round of caricature and thereby perpetuate the climate in which science studies and cultural studies have been subject recently to so much derision from conservatives in science. All of us were distressed at the deceptive means by which Sokal chose to make his point. This breach of ethics is a serious matter in any scholarly community, and has damaging consequences when it occurs in science publishing. What is the likely result of Sokal's behavior for non-scientific journals? Less well-known authors who submit unsolicited articles to journals like ours may now come under needless suspicion, and the openness of intellectual inquiry that Social Text has played its role in fostering will be curtailed. However, varied our responses, we all believe that Sokal took too much for granted in his account of his prank. Indeed, his claim—that our publication of his article proves that something is rotten in the state of cultural studies—is as wobbly as the article itself.

Obviously, we now regret having published Sokal's article, and apologize to our readers, and to those in the science studies or cultural studies communities who might feel their work has been disparaged as a result of this affair. To give readers a clear sense of the circumstances underlying the publication of the article, we have taken the time to recount the relevant history of the editorial process. We regret that Lingua Franca did not provide us with such an opportunity when they decided to publish his statement.

>From the first, we considered Sokal's unsolicited article to be a little hokey. It is not every day we receive a dense philosophical tract from a professional physicist. Not knowing the author or his work, we engaged in some speculation about his intentions, and concluded that this article was the earnest attempt of a professional scientist to seek some kind of affirmation from postmodern philosophy for developments in his field. His adventures in PostmodernLand were not really our cup of tea. Like other journals of our vintage that try to keep abreast of cultural studies, it has been many years since Social Text published direct contributions to the debate about postmodern theory, and Sokal's article would have been regarded as somewhat outdated if it had come from a humanist or social scientist. As the work of a natural scientist it was unusual, and, we thought, plausibly symptomatic of how someone like Sokal might approach the field of postmodern epistemology i.e. awkwardly but assertively trying to capture the "feel" of the professional language of this field, while relying upon an armada of footnotes to ease his sense of vulnerability. In other words, we read it more as an act of good faith of the sort that might be worth encouraging than as a set of arguments with which we agreed. On those grounds, the editors considered it of interest to readers as a "document" of that
time-honored tradition in which modern physicists have discovered harmonic resonances with their own reasoning in the field of philosophy and metaphysics. Consequently, the article met one of the several criteria for publication which Social Text recognizes. As a non-refereed journal of political opinion and cultural analysis produced by an editorial collective (and entirely self-published until its adoption four years ago by Duke University Press), Social Text has always seen its lineage in the "little magazine" tradition of the independent left as much as in the academic domain, and so we often balance diverse editorial criteria when discussing the worth of submissions, whether they be works of fiction, interviews with sex workers, or essays about anti-colonialism. In other words, this is an editorial milieu with criteria and aims quite remote from that of a professional scientific journal. Whether Sokal's article would have been declared substandard by a physicist peer reviewer is debatable (it is not, after all, a scholarly contribution to the discipline of physics) but not finally relevant to us, at least not according to the criteria we employed.

Having established an interest in Sokal's article, we did ask him informally to revise the piece. We requested him a) to excise a good deal of the philosophical speculation and b) to excise most of his footnotes. Sokal seemed resistant to any revisions, and indeed insisted on retaining almost all of his footnotes and bibliographic apparatus on the grounds that his peers, in science, expected extensive documentation of this sort. Judging from his response, it was clear that his article would appear as is, or not at all. At this point, Sokal was designated as a "difficult, uncooperative author," a category well known to journal editors. We judged his article too much trouble to publish, not yet on the reject pile, perhaps of sufficient interest to readers if published in the company of related articles.

Some time after this impasse was reached, the editors did indeed decide to assemble a special issue on the topic of science studies. We wanted to gauge how science critics were responding to the attacks of Paul Gross and Norman Levitt, and other conservatives in science. Contributions were solicited from across the field of knowledge; from humanists, social scientists and natural scientists (the final lineup included many of the more significant names in the field—Sandra Harding, Steve Fuller, Emily Martin, Hilary Rose, Langdon Winner, Dorothy Nelkin, Richard Levins, George Levine, Sharon Traweek, Sarah Franklin, Ruth Hubbard, Joel Kovel, Stanley Aronowitz, and Les Levidow). Most responded directly to the evolving controversy that some were calling the "Science Wars," while others wrote their own accounts of work in their respective fields. Here, we thought, was an appropriate and heterogenous context in which Sokal's article might appear, providing a feasible solution to the editorial problem posed by his piece. He expressed some concern when asked if we could publish his work in this special issue (we assumed he wished to distance himself from the polemical company assembled for the issue), but he reiterated his eagerness to see it in print. Our final decision to include him presumed that readers would see his article in the particular context of the Science Wars issue, as a contribution from someone unknown to the field whose views, however offbeat, might still be thought relevant to the debate. Since his article was not written for that special issue, and bears little resemblance, in tone or substance, to the other commissioned articles, it was not slated to be included in the expanded book version of the issue (with additional articles by Katherine Hayles, Michael Lynch, Roger Hart, and Richard Lewontin) which will be published by Duke University Press in September.

In sum, Sokal's assumption that his parody caught the woozy editors of Social Text sleeping on the job is ill-conceived. Its status as parody does not alter substantially our interest in the piece itself as a symptomatic document. Indeed, Sokal's conduct has quickly become an object of study, for those who analyse the behavior of scientists. Our own role has also come under scrutiny, since, at the very least, the affair says something about our conception of how physicists read philosophy. As for the decision to publish his article, readers can judge for themselves whether we were right or wrong. But to construe this decision as proof of the bankruptcy of cultural studies is absurd.

What Sokal's confession most altered was our perception of his own good faith as a self-declared leftist. However we feel about his deception, we do hope that the ensuing discussion has been, and will continue to be, productive, and that interlocutors will resist the opportunity to exploit existing divisions and splits among committed people and seek instead to bridge and heal those differences.
There is nothing we regret more than watching the left eat the left, surely one of the sorriest spectacles of the twentieth century.

Having talked to the (real) Sokal subsequently, we believe that most of the issues he intended to air are, at this point, rather well-known to readers of Social Text and Lingua Franca. Indeed, they have been going the rounds in the academy since the first postmodern, social constructionist, or anti-foudational critiques of positivism appeared over thirty-five years ago. That many natural scientists have only recently felt the need to respond to these critiques says something about the restricted trade routes through which knowledge is still circulated in the academy, policed, as it is, at every departmental checkpoint by disciplinary passport controls. Nor are these critiques unfamiliar to folks who have long been involved in debates about the direction of the left, where positivism has had a long and healthy life. At this point in time, we have a vestigial stake in these critiques and debates, but much less of an interest than Sokal supposes. Like Gross and Levitt, he appears to have absorbed these critiques only at the level of caricatures, and has been re-issuing these caricatures in the form of otherworldly fanatics who deny the existence of facts, objective realities, and gravitational forces. We are sure Sokal knows that no such person exists, and have wondered why on earth he would promote this fiction. He must be aware that early proponents of quantum reality encountered similar parodies of themselves in the opposition to their ideas. Physics is not the only field where this occurred. Comparable caricatures have figured in many different scholarly controversies, from early twentieth century debates about legal realism to more recent ones about genetic reductionism. It is time to put them to rest.

On the other hand, we recognize that professional scientists like Sokal do feel that their beliefs and their intellectual integrity are threatened by the diverse work done in the field of science studies. Doubtless, there have been distorted and reductive descriptions of scientists in many aspects of that work. Over the years, many scholars in the field have responded sympathetically to this grievance, and a good deal of common ground has been established. We share Sokal's own concerns about obscurantism, for example. It is highly ironic that Social Text should now be associated with a kind of sectarian postmodernism that we have been at pains to discourage for many years. We would be all too happy if this episode cleared the air. Sokal has said that he agrees with many of the arguments put forth by other authors in the "Science Wars" issue of Social Text. Unfortunately, he declined to enter into a publishable dialogue with us for this issue of Lingua Franca. We are heartened, however, by the prospect of any levelheaded discussion about the politics of science that does not rest exclusively on claims of expertise, and is shaped by the public interest.

Our main concern is that readers new to the debates engendered by science studies are not persuaded by the Sokal stunt that this is simply an academic turf war between scientists and humanists/social scientists, with each side trying to outsmart the other. Sadly, this outcome would simply reinforce the premise that only professional scientists have the credentialled right to speak their minds on scientific matters that affect all of us. What's important to us is not so much the gulf of comprehension between "the two cultures," but rather the gulf of power between experts and lay voices, and the currently shifting relationship between science and the corporate-military state. Nor are these concerns extrinsic to the practice of science itself. Prior to deciding whether science intrinsically tells the truth, we must ask, again and again, whether it is possible, or prudent, to isolate facts from values. This is a crucial question to ask, because it bears upon the kind of progressive society we want to promote.

Why does science matter so much to us? Because its power, as a civil religion, as a social and political authority, affects our daily lives and the parlous condition of the natural world more than does any other domain of knowledge. Does it follow that non-scientists should have some say in the decision-making processes that define and shape the work of the professional scientific community? Some scientists (including Sokal presumably) would say yes, and in some countries, non-expert citizens do indeed participate in these processes. All hell breaks loose, however, when the following question is asked. Should non-experts have anything to say about scientific methodology and epistemology? After centuries of scientific racism, scientific sexism, and scientific domination of nature
one might have thought this was a pertinent question to ask.

Bruce Robbins and Andrew Ross
Co-Editors, for Social Text
Sokal's Reply to Social Text Editorial

I confess to amusement that one Social Text editor still doesn't believe my piece was a parody. Oh, well.

As for Social Text's editorial process, readers can judge for themselves the plausibility of the editors' post facto explanations, which if true may be more damning than the incident itself. Some of their chronology is at variance with the documentary record (e-mail and regular mail between Ross and myself, which I've saved), but let me not beat a dead horse.

More interesting than the scandal provoked by the article's acceptance is, I think, the scandal that ought to be provoked by its content. My essay, aside from being (if I may quote Katha Pollitt's flattery) "a hilarious compilation of pomo gibberish," is also an annotated bibliography of charlatanism and nonsense by dozens of prominent French and American intellectuals. This goes well beyond the narrow category of "postmodernism," and includes some of the most fashionable thinkers in "science studies," literary criticism, and cultural studies.

In short, there is a lot of sloppy thinking going around about "social construction," often abetted by a vocabulary that intentionally elides the distinction between facts and our knowledge of them. I'm no expert in epistemology, but some of this work is so illogical that it doesn't take an expert to deconstruct it. I've analyzed one representative example in an Afterword submitted for publication in Social Text; I hope the editors will print it, perhaps along with replies. I'd suggest they also invite contributions from philosophers far sharper than myself, such as Susan Haack and Janet Radcliffe Richards.

Robbins and Ross say that I "declined to enter into a publishable dialogue" with them. Quite the contrary: we're having that dialogue right now. What I declined was an oral dialogue, which in my opinion usually yields a low ratio of content to words.

Robbins and Ross guess wrong when they say I feel "threatened" by science-studies scholars. My goal isn't to defend science from the barbarian hordes of lit crit (we'll survive just fine, thank you), but to defend the Left from a trendy segment of itself. Like innumerable others from diverse backgrounds and disciplines, I call for the Left to reclaim its Enlightenment roots. We're worried above all for the social sciences and the humanities, not the natural sciences.

In their last two paragraphs, Robbins and Ross bring up a plethora of real issues, but it would take quite a bit of space to disentangle the substance from the rhetoric. They conflate science as an intellectual system with the social and economic role of science and technology. They conflate epistemic and ethical issues.

These confusions lead Robbins and Ross into a serious error: setting up an opposition between science and progressive politics. They describe science as a "civil religion" that supports existing social and political structures. It is of course true that scientific research is skewed by the influence of those with power and money. But a scientific worldview, based on a commitment to logic and standards of evidence and to the incessant confrontation of theories with reality, is an essential component of any progressive politics.

Despite these differences, there is a potentially vast common ground between Robbins—Ross and myself. When scientific research is increasingly funded by private corporations that have a financial interest in particular outcomes of that research — is the drug effective or not? — scientific objectivity is undermined. (But to make this argument, one must first have a conception of objectivity: not as a state that human beings can ever attain, but as an ideal standard of comparison.) When universities are more interested in patent royalties than in the open sharing of scientific information, the public suffers.
There are hundreds of important political and economic issues surrounding science and technology. Sociology of science, at its best, has done much to clarify these issues. But sloppy sociology, like sloppy science, is useless or even counterproductive.
"Scientist takes academia for a ride with parody"

by Linda Seebach

The Valley Times (Pleasanton, California), May 12, 1996

Physicist Alan Sokal of New York University meticulously observed all the rules of the academic game when he constructed his article on postmodern physics and submitted it to a prestigious journal of cultural studies called Social Text.

The people he cites as authorities in cultural studies are the superluminaries of the field, the quotations he uses to illustrate his argument are strictly accurate and the text is bristling with footnotes.

All the rules but one, that is: Sokal's article is a parody. Under the grandiloquent title "Transgressing the Boundaries: Toward a Transformative Hermeneutics of Quantum Gravity," it appeared in the Spring/Summer 1996 special issue of the magazine, one entirely devoted to "the science wars," as the editors term the tension between people who actually do science and the critics who merely theorize about it.

Many scientists believe that the emperors of cultural studies have no clothes. But Sokal captured the whole royal court parading around in naked ignorance and persuaded the palace chroniclers to publish the portrait as a centerfold.

Once the article was safely in print, Sokal revealed his modest experiment. "Would a leading journal of cultural studies," he wrote in the May/June issue of Lingua Franca, "publish an article liberally salted with nonsense if (a) it sounded good and (b) it flattered the editors' ideological preconceptions?"

Unfortunately yes, and Sokal's deliberate nonsense is anything but subtle. Translated into plain English from the high-flown language he borrowed for the occasion, his first paragraph says that scientists "cling to the dogma" that the external world exists and its properties are independent of what human beings think.

But nobody believes that old stuff any more, right? Now we all know that physical reality is "at bottom a social and linguistic construct."

Is there a sound when a tree falls in the forest and no one hears it? Under the theory of social construction, there's not even a tree.

There are so many red flags planted throughout the paper that even non-scientists should have spotted at least one and started laughing, Sokal said Thursday (May 9). "Either this is a parody or the author is off his rocker."

Sokal was prompted into parody by a 1994 book, Higher Superstition: The Academic Left and Its Quarrels with Science, by Paul Gross and Norman Levitt, which ruffled a lot of postmodernist feathers.

"I'm an academic leftist and I have no quarrel with science," Sokal said, "so the first thing I did was go
to the library and check their references, to see whether (Gross and Levitt) were being fair" and they were. In fact, he found even more examples of scientific illiteracy, some of them even worse.

It would be so boring to refute them, Sokal said. "I picked the silliest quotes from the most prominent people, and I made up an argument for how they were linked together."

Was Sokal's experiment ethical? "It's true the author doesn't believe his own arguments," he wrote in Lingua Franca. "But why should that matter? If the Social Text editors find my arguments convincing, then why should they be disconcerted simply because I don't?"

They are disconcerted, of course, and for reasons that transcend their private embarrassment at being taken in. Sokal's successful spoof calls into question the intellectual standards of the whole field.

If you're chuckling, but inclined to think it's just professors doing their usual angels-on-a-pinhead thing, please do think again. Tuition and fees at the priciest private universities run nearly $1,000 for each week of class. Taxpayers pick up a big chunk of the bill for public universities. Many of those classes are being taught, it appears, by professors who deny the distinction between truth and falsity and consequently can't distinguish double-talk from rational argument.

Maybe some of the junior professors and the graduate students do know what they're hearing is nonsense, but think it would be harmful to their careers to speak out. Living with such deception, possibly for a lifetime, is profoundly corrupting. Honest people just get out, leaving the field to those who don't mind deception or don't recognize it. It's hard to say which is worse.

It's easy to see why Sokal's spoof was enticing to editors desperate for the imprimatur of a working scientist on their critical enterprise, and he even inserted the evidence by quoting Andrew Ross, who edited the special issue.

The kind of science that's needed, Ross said, is one "that will be publicly answerable and of some service to progressive interests."

So that's the kind of science Sokal claimed to be writing about.

"A liberatory science cannot be complete without a profound revision of the canon of mathematics," he concludes. "We can see hints of (such emancipatory mathematics) in the multidimensional and nonlinear logic of fuzzy systems theory but this approach is still heavily marked by its origins in the crisis of late-capitalist production relations." He drags in catastrophe theory and chaos theory, too.

There is a political point to Sokal's demonstration, but it's not the right-wing one he's sure will be attributed to him. He's proud to call himself a leftist, and his resume includes a stint teaching mathematics at the National University of Nicaragua under the Sandinistas. "If you take up crazy philosophies you undermine your ability to tackle questions of public policy, like ecology," he said. "It really matters whether the world is warming up."

I don't remotely share Sokal's political views, but I agree with him that the corruption of clear thought and clear language is dangerous. And corruption has to be exposed before it can be cleaned up.

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A Mathematician Reads Social Text

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New York University mathematical physicist Alan Sokal published in the postmodern humanities journal Social Text a parody entitled Transgressing the Boundaries: Toward a Transformative Hermeneutics of Quantum Gravity [1]. His point in doing so was to test whether the field of "cultural studies of science" was seriously lacking in "intellectual standards." His article is nonsense from start to finish, but was still published. He revealed the hoax in another article in Lingua Franca [2]. The incident, and reactions to it, now being called the Sokal Affair, have received wide coverage in The New York Times [3].

Of course, Sokal's experiment does not settle the issue, but rather points to the need for further study. Did he merely pull a fast one on the editors of Social Text, or is the field, known as the social or cultural studies of science, itself truly bunk? In an attempt to answer this question I have read the other articles in the issue of Social Text in which Sokal's article appeared. It was a special issue devoted to what the editor calls "Science Wars," (capital S, capital W). The call for a special issue on this topic was motivated as a response to the book, Higher Superstition; the academic left and its quarrels with science, by Paul Gross and Norman Levitt, Johns Hopkins University Press, 1994.

What follows are a few observations on some of the other articles in the Science Wars issue of Social Text.

Andrew Ross: Introduction

Andrew Ross edited the issue of Social Text in question and wrote an introduction for it. Ross makes clear that his sympathies lie with those who seek to "uncover the gender-laden and racist assumptions built into the Euro-American scientific method," and "to create new scientific methods rooted in the social needs of communities and accountable to social interests other than those of managerial elites in business, government, and the military." If he substituted "scientific establishment" for "scientific method" he would be articulating a legitimate political program with which I myself would have at least some sympathy.

Perhaps he has merely gotten his terms confused. Is he really criticizing the scientific method itself? How would he change it? We read on.

The unjustified conferral of expertise on the scientist's knowledge of, say, chemical materials, and not on the worker's or the farmer's experience with such materials, is an abuse of power that will not be opposed or altered simply by demonstrating the socially constructed nature of the scientist's knowledge. That may help to demystify, but it must be joined by insistence on methodological reform -- to involve the local experience of users in the research process from the outset and to ensure that the process is shaped less by a
the research process from the outset and to ensure that the process is shaped less by a manufacturer's interests than by the needs of communities affected by the product.

One does not have to look far to find potential for serious negative outcomes for working people arising from Ross' position. The New York Times (6/14/1996, p. A4) reports that pottery makers, including children, in Mexico are being exposed to high levels of lead from the glazes they use. People who use the pots are also at risk. The workers however don't believe this. But the lead doesn't care who believes what. Lead is real and so are its effects. The Mexican government has only recently developed lead free glazes. The potters will likely switch, but only because U.S. import restrictions are hurting their business. "The potters remain convinced that the lead scare is simply a foreign conspiracy," the Times reports. Here we have a difficult problem were science, economics and cultural pride all meet. This is the type of problem natural and social scientists should be working on together. But Ross' approach confuses the issue, and hence weakens progress towards a goal that I share.

Still skeptical? Don't think someone as educated as Ross could fall into such a trap? Think again: "... we begin to talk about different ways of doing science, ways that downgrade methodology, experiment, and manufacturing in favor of local environments, cultural values, and principles of social justice." Ross is unwilling, on principle, to separate his political views from his analysis. There is nothing wrong with having a political agenda, or using it as a basis from which to formulate questions for study. But you can't answer questions about science, or even politics, with your politics. Ross asserts that that which he does like should be downgraded, while politically good things should be elevated to the status of science. It doesn't matter that "manufacturing" has nothing to do with "doing science"; capitalists like manufacturing and science was created under capitalism. It reminds one of an ideologue who evaluates art based on the politics of the artist.

In a response to Sokal's revelation that his article was a hoax, Ross wrote: "Prior to deciding whether science intrinsically tells the truth, we must ask, again and again, whether it is possible, or prudent, to isolate facts from values." [4] In the analysis of complex social questions the separation of facts from values may be a difficult and problematic task. And it is precisely here that scholars in the humanities can of service to the common good. For while I cannot prove that the separation of facts and values is a necessary step in solving problems, Ross, and as we will see, others, provide us with ample empirical evidence that this is so.

Sandra Harding: Science is "Good to Think With"

From the title of this article I thought I might be in for a pleasant relief. No such luck. Criticisms of social studies of science are made by the "antidemocratic right" who "virtually never" contest the accuracy of social studies of science but merely engage in "ridicule". The desire to ridicule is indeed a difficult beast to tame.

The conceptual frameworks of modern physics, chemistry and biology on the one hand and environmental sciences on the other hand do not fit together perfectly. The latter require learning [my emphasis] to negotiate between the principles of those modern sciences and of both local and social knowledge of environments, neither of which has a place in the conceptual frameworks of those modern sciences (...). Indeed, the conceptual frameworks of those three modern sciences no longer appear unifiable (...).

I can agree with Harding that the interdisciplinary work needed to do environmental studies is hard and involves transgressing both intellectual and administrative barriers. But she is not simply advocating better management of science. She believes that since different cultures intersect nature in non-identical ways that they should or will produce different sciences. (Likewise, men and women would produce masculine and feminine sciences.) And, these sciences are not integratable. "Different questions produce different answers containing distinctive, sometimes conflicting, representations of nature and, indeed of science, and the representations that conflict do not fit together like pieces of a jigsaw puzzle," Harding writes.
jigsaw puzzle," Harding writes.

Postmodernists tend to view the world as a collage of images, and believe that the use of reason as a means to gain a unified picture of nature or society is a project that is running out of steam in this, the postmodern age. My view is that the engine is sound but the hill is steep. Politically and culturally, Western countries are looking more like collages. Leftist programs to challenge the power of capital have been set back. While it is true that reason and objectivity are not all powerful, it seems to me that in the confusion and frustration of the moment Harding is retreating, rather than finding new paths up.

**Emily Martin: Meeting Polemics with Irenics**

An irenic, Martin tells us, is like a polemic, only friendlier, and indeed she is. Her article is a search for "common ground," between the social and natural sciences, and among the social scientists themselves, who, it seems don't always see eye to eye on questions about the nature of science.

As an example of some of her very interesting work she recounts an experience she had while giving a talk to medical students on how our perceptions of the body are influenced by our culture. Several female students told of how, in their gross anatomy class they were instructed to remove the breasts if their cadaver was female, and dispose of them. Martin encouraged them to pursue the matter.

"At stake," Martin writes, "is what counts as knowledge and who gets to determine this." If she had said, "what knowledge counts" I would have no qualms. If it were not for the context in which her essay appears, I would pass this over as merely poor wording. But it is at just this point that some of Martin's colleagues go so far astray. Later in the article Martin too falls into the same trap, but is not snared as badly.

As part of her work on the impact of AIDS on local communities, Martin interviews John Marcellino of Baltimore, Maryland. Marcellino relates his and his community's fears of the epidemic. In doing so, and she quotes him at length, he gives an analysis of the different social groups in his neighborhood and describes how his people fit in to the larger society and its power structures.

However compelling the problems Marcellino raises (and the fact that he is able to articulate them), by itself his story would not count as doing "social science". What counts as "science" is in part an effect of institutions (giving credentials, granting authenticity, and so on). By himself Marcellino has none of these things. This is where the institutionalization of feminism in the academy plays a small but crucial role. In this particular example, it is my position in a university, itself made possible by the activities of earlier generations of feminists, that gives me the time and resources to talk to people like Marcellino and to publish books and articles (and give lectures) in which I argue that what he says should begin to participate in what counts as social science.

It is a common view, I suspect, among social critics of science that scientists only count as science that which is produced by people with "credentials". To cite but two counter examples, Yuji Hyakutake's discovery of a comet now bearing his name [5], an event not at all uncommon in astronomy, and of course the Indian mathematician Ramanujan (see for example [6]).

The deeper question though is, is Marcellino "doing science"? I believe the answer is no. He is not systematically collecting data or presenting it in verifiable ways. He is engaging in a social analysis that is important. Writing a poem about AIDS might have political, educational and artistic value, but it is not science. If Martin really believes Marcellino is doing science, I would hope that she is giving him a share of her honorariums and royalties. If not, shouldn't he start talking to a lawyer?

I believe that it is very likely that Marcellino is capable of doing science. If Martin where to work with him and his neighbors, showing them how to conduct and document surveys and focus groups and how to dig through medical records and transcripts of city council meetings and helping them to write reports and papers, then Marcellino would be doing science. Then the mumblings and whinings of the
reports and papers, then Marcellino would be doing science. Then the mumblings and whinings of the people could become articulate voices for change resonating through the halls of power. But, to say Marcellino is doing science now, is to lock him into his place now. It seems to me that what Martin is saying, is that what Marcellino needs in order to be counted as doing science are someone else's credentials to piggyback on, rather than training in scientific methodology. If this is her meaning, I cannot disagree more, though I do so respectfully.

Langdon Winner: The Gloves Come Off

Despite his title, I found Winner's essay quite enlightening. Like Martin's it is well written and free of jargon. It starts by outlining four broad areas into which science and technology studies tend to fall: (1) the history of science and technology, (2) sociological and political analysis of scientific communities, (3) analyses and critiques of specific technologies (e.g. nuclear power), and (4) philosophical criticisms of how the scientific lookout and technology have effected modern lifestyles and values. He is up front about his own background and political framework:

My own work, for example, flows primarily from two of these: expressing a desire to confront what I perceive to be a systematic disorder in modern life, a disorder manifest in technology-centered ways of living that I regard as unfriendly to any sane aspiration for human being; and applying concepts and approaches of a particular discipline, political theory, to questions about the significance of technology for political life.

Notice here that there is a clear division between the political agenda and the program of research. They are separated by a semicolon. I find myself wishing to dialog with Winner already. I'd like to know more about his critique of technology-centered modern life. But I also want to tell him that I have strong reservations about his political analysis of the scientific community.

As David Dickson has noted, the late 1970s and early 1980s ... were years that witnessed a shift in the relationships between science and society. During the previous decade, scientists found themselves subject to pressures to orient research toward national priorities in health care, environmental clean-up, and energy research. Many scientists came to believe that the public's influence on R & D had grown too large, that the direction of science by political policymakers had gotten out of hand. Dickson argues that scientists, galled by what they regarded as excessive democratic control of research agendas, were more than willing to form alliances with other sources of social control. Hence, during the Reagan era scientists supported a turn away from research agendas shaped by a sense of social need toward R & D geared to the ongoing military buildup and the quest for "national competitiveness" expressed in priorities of business firms.

The reference to Dickson is his book The New Politics of Science, Pantheon Books, New York, 1984. Winner's characterization appears to be more one sided than what Dickson claims. Still I find myself in a similar position to the social critics of science. Dickson's claims do not jibe with my own experience, yet I lack the time and background to present a detailed alternative. The issue of the political role of the scientific communities is clearly very important, and characterizations similar to the one above are repeated by other authors in this issue of Social Text. I don't trust the objectivity of their analysis, yet a knee-jerk defense of scientists' roles would only make matters worse. An objective analysis of the political functioning of scientists and their organizations would be important to the improvement of democracy and may indeed cause us to develop new ethical norms and more democratic organizational strategies. This it seems to me is an area where serious dialog and debate could be of great use.

Sarah Franklin: Seeing Through the Science Wars

In the movie Monty Python and the Holy Grail, there is a scene in which the village people are about to burn a woman for witchcraft. But one of the knights to be intervenes and insist that they must
prove that the woman is indeed a witch or let her go. How to do so? Well, what else burns? Why wood burns. And what else does wood do? Why it floats on water. And what else floats? Why a duck floats. Thus, if the woman is a witch she must weigh the same as a duck. Of course! A duck is brought out and it and the woman are placed on opposite sides of a scale. Sure enough, they weigh the same!

By a similar concatenation of fact and fallacy, Franklin shows that the book, *Higher Superstitions*, is linked to the anti-abortion movement. I kid you not. Her article makes Sokal's parody look reasonable. Here is a sentence from her concluding paragraph. "Like Randall Terry and the Operation Rescue campaigners, Gross and Levitt espouse a paternalistic Right-to-Life discourse concerning the vital essence of the scientific ethos, and the importance of its salvation on behalf of our children's futures."

Conclusions

Having only read a single issue of this one journal, *Social Text*, it would be premature of me to pass judgement on the entire field of social studies of science. I can say that my initial impressions are as follows. The field seems very uneven. There are serious scholars doing interesting if controversial work and with whom dialogue and debate with the scientific community might well be fruitful. There are also many, including some who are prominent in the field, for whom ideology is paramount over objective scholarship. They seem to view intellectual standards as political barricades. The situation is perhaps analogous to the field of psychometrics (IQ testing) which in my view is dominated by persons with right wing and elitist political agendas. This is not reflective of psychology as a whole or of conservative politics as a whole. Likewise, the unfortunate prominence of some dubious scholarship in the field of social science studies should not be held against the field as whole or be seen as typical of the political left. It is up to rigorous researchers and scholars, of whatever political persuasion, to up hold high standards and expose those whose work does not measure up. It is also important that this be done through normal academic mechanisms and not be used by outside political forces to promote anti-intellectual hysteria. This is tricky as it is equally important in a democratic society for the public to observe and participate in such a process.

What to do?

In the conclusion of their book Gross and Levitt recommend that science and math faculty play a more active role in tenure and curriculum issues in departments of those who attempt to use or evaluate the natural sciences but lack training in them. I would like to suggest some additional avenues. Might not it be possible to develop an "Introduction to the Natural Sciences" course, for graduate credit, aimed at interested humanities students? I admit that it is not easy to see how such a course would be structured. But I think the idea is worth exploring. Another possibility is to have science and math researchers give regular expository guest lectures on their work to humanities and social studies departments. Perhaps inter-departmental "exchange" programs could be negotiated. While I doubt "hard core" postmodernists would be won over, such effects could open lines of communication and narrow the cultural gaps in the academe.

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On Being Hoaxed

Draft of article for Tikkun

Bruce Robbins

That afternoon in May I was sitting in front of the computer, half-working, half-listening to "All Things Considered." The kids were in the living room doing a similar combination of homework and TV. Then, all of a sudden, I heard the words "Social Text," followed by laughter. It was the name of the journal I've worked on for over ten years, the last five of them as coeditor. I was thunderstruck. We were on National Public Radio. "Kids! I yelled. "Social Text!"

I had learned a few days earlier that Alan Sokal's essay in our last issue, which argued that there is a convergence between postmodern philosophy and quantum physics, was a hoax intended to demonstrate how ignorant people like the editors of Social Text are about science. But it had never occurred to me, and perhaps it had never occurred to Sokal, that a hoax aimed at a small journal of left-wing cultural politics would be worthy of attention from the mainstream media. Now I quickly found myself succumbing to a perverse sense of self-importance. Frustrating as it was to hear the NPR interviewer chuckle as Sokal scoffed at difficult philosophical passages (would anybody expect them to make sense, quoted out of context?), the main feeling was titillation. We were worth attacking! But why?

My kids, who have spent endless childhood hours suffering through Social Text meetings, knew enough to appear sympathetically excited as I tried not to hop up and down. "But you know, daddy," my 14-year-old daughter said afterwards, "that guy wasn't any easier to understand than the people he was making fun of." It was a useful hint. When I wrote back to NPR I admitted that we should have known Sokal was putting us on. Could anybody be serious who wrote papers with titles like "The Absence of Phase Transition for Antiferromagnetic Potts Models Via the Dobrushin Uniqueness Theorem" and "New Lower Bounds on the Self-Avoiding-Walk Connective Constant"?

There's no doubt that esoteric language sometimes hides absence of thought. But jargon isn't really the issue here. Nor is the issue how dumb we were. Yes, Social Text should have shown the article to a physicist—even though it wasn't, after all, a scholarly contribution to physics. And, pleased as we might be to publish a credentialed scientist who was critical of the science establishment (they aren't exactly beating down our doors), we should not have decided to let it pass as one physicist's opinion, philosophically and stylistically awkward but politically convenient. Still, the fact that we missed the telltale jokes hidden in the footnotes doesn't mean the essay in fact had no argument, as most of the press rushed to assume on nothing more than Sokal's say-so. Smarter or braver than the crowd of smart-aleck reporters who were so anxious to show that they themselves never, never could have been fooled, Sharon Begley and Adam Rogers of Newsweek reminded readers of how respectable a pedigree arguments like Sokal's have within science itself: "Ever since the quantum mechanics revolution of the early 20th century, scientists have accepted, for instance, that an electron in an atom does not have a definite position until an observer measures it. Even more bizarre, experiments prove that merely knowing one property of a particle can change its other ones. Physicists and philosophers argue passionately about what this means. Is it so egregious for social scientists to riff on the idea of an observer-created world?" (June 3).

Sure, there is plenty of legitimate disagreement about the extent to which observers and their socially-conditioned assumptions shape the accounts of the physical universe that scientists produce. But it's the height of bad faith to pretend that only French theory or scientific incompetence could possibly lead anyone even to pose such questions. Liz McMillen of the Chronicle of Higher Education gives a classic example of how social and sexual prejudices have worked their way into scientific results. "For years scientists believed that the sperm actively sought out the female egg, which was thought to play a passive role. But in recent years, scientists have said the egg actually sends out
thought to play a passive role. But in recent years, scientists have said the egg actually sends out signals to guide the sperm" (June 28). Sokal claims that the sort of work Social Text publishes "won't help us find an effective treatment for AIDS or devise strategies for preventing global warming." But does anyone actually believe thatomophobia, say, has nothing to do with the history of AIDS research or that exposing its influence is politically irrelevant? Or that the profit motive has had no effect on the agenda for research into global warming?

The charge that non-scientists like us are incompetent to judge what scientists do is of course a claim that only scientists can be allowed to judge it. It's a claim, in other words, that science ought to be free from any public accountability, or any accountability other than to those funders (increasingly, private corporations) who pay the piper. Pretending that criticisms of science are invalidated by postmodernism or poststructuralism is a convenient way for Sokal and his backers to pretend that what they are defending is not their own exclusive rights to a turf that the public has good reason to monitor as closely as possible.

But this is not to say that the hoax offered no grounds for amusement other than gloating along with Sokal's barely concealed belligerence. Points were raised in the ensuing debate that can certainly divide people of intelligence and good will. The example that hits closest to home is the question of culture, or of a politics that is specifically cultural. Left-wing commentators in particular have accused this cultural politics, which they associate correctly with Social Text, of arrogantly overreaching itself—if not in asserting its authority to render judgment on science, then more broadly in claiming to be a political activity of more than academic significance. The Sokal affair, many feel, administered to cultural politics a well-deserved comeuppance.

Culture is important only if the scientific worldview leaves a lot out. This is one reason why literary critics and other humanists have been inclined toward skepticism about science ever since the modern concept of culture was first defined by the Romantics and Matthew Arnold. In other words, today's anti-science skepticism in the academy is not an innovation, nor does it stem directly from French theory or multiculturalism. But it is indeed a problem. Eager to return to their own disciplinary reason for being, students of culture have trouble controlling their propensity to generate mindlessly repetitive attacks on culture's supposed others, whether they are called science or reason or truth. Bewitched by epistemological questions (what is real knowledge?), cultural critics sometimes act as if the questioning of reality were of self-evident and even paramount ethical and political value, as if truth and reason were always and everywhere weapons of the right. (In fact it's almost impossible to belong to the left or to an academic discipline without some functional sense of truth and reason, and academic critics tend to have one whether they admit it or not.) A primary concern with culture has sometimes meant a certain hesitation in talking about economic inequality or in doing something about legislation. It has also entailed a willingness to to find things to appreciate in ordinary culture, even a highly commercialized, commodified culture like ours. Hence the easy parodies of a cultural studies industry whose analyses mechanically uncover "resistance" and "subversion" in whatever artifact happens to be under discussion. With so much resistance and subversion all over the place, you'd think the force of change in American society would be doing a lot better than they are.

All of these points have been raised in the wake of Sokal's hoax. Abut it's worth noting that they had all been raised before as well, and within the same fields and journals that have since been widely ridiculed. In other words, the debate about them is part of cultural politics.

Cultural politics is not, then, a simple distraction from the harder realities of economic injustice or efforts to organize or to pass legislation. As Ellen Willis suggested with eloquent irony in The Village Voice (June 25), the know-nothings of the left are as deluded as the know-its of the right: "Capitalism is screwing people! What goes up must come down! What more do we need to know?" We need to know a lot, and a lot of what we need to know is cultural. The struggle for economic redistribution, Nancy Fraser argues, necessarily passes through struggles for recognition. Race concerns access to housing and employment as well as cultural disparagement. Gender is not merely a question of identity but a structuring principle of the division between "productive" and unpaid, domestic labor.
domestic labor.

Consider the Jewish question. Various people have wondered why so many Jews (myself included) have been involved on both sides of the Sokal affair. It's only a speculation, but perhaps the reason is that the "objective reality" that's really at stake here is not that troublingly complex problem faced by scientists and philosophers; here, objective reality is a figure for meritocracy. You don't know what merit is unless you have a standard, and for many people objectivity has seemed to be that standard. Without it, they fear that the whole edifice of merit will collapse— a fear that many already associate with multiculturalism and academic reform. This fear has been especially acute for Jews, whose possibilities of upward mobility since World War II have depended disproportionately on the (new) policy of identity-blindness in education. But for some of us, being Jewish has been just as peremptory a reason to try to see beyond the artificial limits and subtle injustices of meritocracy, a reason to develop a larger and more generous sense of fairness.

Along with a threat to universal standards of fairness, culture has also seemed too eager to be hip. It is ironic that the mainstream media should lavish their satire on the hip-academic-as-interpreter-of-culture, for if there are any true slaves to the up-to-the-minute urgency of fashion out there, it's of course the media people themselves, not slower-paced academics who listen to NPR while they muse and ponder. For the media, academics are usefully unlikely suspects. Writing man-bites-dog stories that accuse nutty professors (of all people!) of being led astray by fashion offers reporters a chance to get out from under their own servitude to the latest versions of the cool and the chic. To which I add, for what it's worth, a quiet warning against cheap fashion bashing. Any teenager will tell you that it can be cool to have a conscience. The high moral ground doesn't belong to the nerds.

Who is the real target of spluttering tirades against hip and/or cultural politics which suggest, like Tom Frank's, that the only real politics is economics? Since nobody believes that ponytails and body piercing infallibly signify how someone is going to come down on plant closures or universal health care, it seems likely that what such outbursts really express is a longing for the days when women were back in the kitchen and it was respectable to joke about faggots and other natural objects of humor. These are not the family values I want my children to learn. Nor are they the values of the country at large. As Garry Wills observed recently, "Women are not going back to their status of three decades ago. Neither are blacks. Gays are not going back into the closet to shut up. White Western culture is not going to regain its monopoly in schools, museums, journals." Wills' larger point is that even for the purposes of the current election, it's not just the economy, stupid. "The new permissiveness," Wills says, is not "just a matter of elite hedonism, adversarial to 'real' Americans, 'the people.' Ask at the video rental stores if the only people renting porno films are pinko professors (or Supreme Court Justices)."

In an effort to enlarge socialism's appeal to ordinary, decent people, George Orwell, that voice of decency and clear jargon-free English, once listed the sorts of enthusiasts (he called them cranks) who currently give socialism a bad name. Unfortunately, he declares, socialism draws "every fruit-juice drinker, nudist, sandal wearer, sex maniac, Quaker, 'Nature Cure' quack, pacifist, and feminist in England." To state one's desire for vegetarian food, he went on, "is by itself to alienate plenty of decent people." Much of the support for Sokal's hoax and the hostility to cultural politics that has accompanied it seems to me an echo of Orwell's bid to reclaim the center. Decency, it is now repeated, is on the side of ordinary folks, those who believe that science can be trusted to report on objective reality and that people compete on a level playing field and who are easily alienated by anyone who believes anything different. If you are a vegetarian, a pacifist, a feminist, a member of a minority church, someone who prefers fruit juice to alcohol—today's list would be longer, of course, with more categories for race, sex, religion, and styles of life— you needn't apply. Cultural politics has perhaps erred on occasion by seeming to speak up ONLY for those who are excluded from such a list. But I would argue that any list like this makes a huge and potentially costly mistake about who ordinary people really are. One job of journals like Social Text is to keep that mistake from happening. The media who took our story so seriously were perhaps acknowledging in their indirect fashion that there is a real public stake in the outcome.
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Science Fiction: Postmodernism Exposed

By Peter Berkowitz

Physicist Alan Sokal’s article in the journal Social Text, submitted as a hoax and unwittingly published, has left its editors huffing with indignation. But beyond the bruised academic egos the episode raises an extraordinary question: What does it say about the state of academic life that leading scholars were unable to distinguish serious argument from utter nonsense?

It was in the pages of the May/June issue of Lingua Franca that Professor Sokal explained that his essay, "Transgressing the Boundaries: Toward a Transformative Hermeneutics of Quantum Gravity," was exactly as it appeared: a random assortment of arcane, jargon-infested abstractions. Filled with trendy pronouncements about the need to establish an "emancipatory mathematics," and a "liberatory science," it was, by its author’s own account, devoid of both evidence and reasoned argument.

In the scandal’s wake, Social Text’s editors have solemnly reproached Professor Sokal for violating the norms of the academic community, and it is certainly ironic that Social Text’s self-styled academic rebels, who pride themselves on putting playful mockery to good scholarly use, have suddenly become earnest defenders of gravity. But the serious questions, as Professor Sokal himself has pointed out, concern the habits of mind that permitted Social Text to publish a bold reinterpretation of an abstruse dimension of theoretical physics without soliciting the evaluation of anyone trained in the field. From whence did this arrogance derive?

No doubt many sources, but chief among them is the presumption inscribed in the very tenets of postmodern thought. Jean-François Lyotard famously defined the spirit of postmodernism as "incredulity toward meta-narratives." Postmodern incredulity should not be confused with the healthy skepticism that proclaims that human beings lack certain knowledge about what is good and just and true. Nor should it be mistaken for the intellectual virtue Mill called "many-sidedness"—the ability to discern the partial truth in rival perspectives—and which Mill saw as essential to the liberal spirit. Nor again should postmodern incredulity be taken for the quality that Keats called "negative capability," a quality "of being in uncertainties, Mysteries, doubts, without any irritable reaching after fact & reason."

For what the skeptical, liberal and romantic spirits share is philosophical modesty. Postmodern incredulity, by contrast, is boastful, haughty and dismissive. It combines a certainty that older views—views about nature, social and political organization, the moral life and religious faith—are wrong, with a disdain for the ignorant multitudes who have in the past or continue in the present to embrace them. Unlike the skeptic who insists, especially in connection to first things and ultimate questions, on the limits of our
knowledge, the incredulous postmodernist knows that what was once believed to be true is absurd. In contrast to Millian many-sidedness, which takes pains to preserve what is true and worthy of admiration in traditional beliefs and institutions, postmodern incredulity focuses narrowly on what is supposedly false and pernicious. And, in contrast to the light touch and discriminating sensibility John Keats sought to capture in the notion of negative capability, postmodern incredulity heavy-handedly seeks to put uncertainties, mysteries and doubts to rest.

This conceit is beautifully captured in Sokal's opening summary of the perspective from which he proposes to develop a transformative hermeneutics of quantum gravity (whatever that means). Postmodernism knows the ultimate building blocks of reality: "it has become increasingly apparent," Sokal writes in Social Text, "that physical 'reality,' no less than social 'reality,' is at bottom a social and linguistic construct." And postmodernism knows that scientific knowledge is not really knowledge at all but culturally relative and an expression of class interest: "scientific 'knowledge,' far from being objective, reflects and encodes the dominant ideologies and power relations of the culture that produced it." As these assertions—in support of which Sokal adduces little more than the authority of the writings of Social Text editors and contributors—indicate, the postmodern study of science is grounded in, and derives much of its critical power from, metaphysical first principles. But the issue is less the validity of postmodernism's metaphysical first principles than the unquestioning credulity with which they are embraced by the faithful.

To hear, in the wake of the Sokal affair, such distinguished voices in the field of cultural studies as professors Andrew Ross, Social Text's co-editor, and Stanley Fish, executive director of Duke University Press (which publishes the journal), one would think that postmodernism, or the social construction of knowledge school, argues simply that human beings bring meanings into the world and that these meanings, which grow out of and reflect human passions and prejudices, sometimes obscure reality and often serve the interests of the powerful. But this is disingenuous. What distinguishes postmodernism is the extreme and dogmatic belief that the principles of morality as well as reason itself are socially constructed—that is, created by human beings for pleasure and profit—and nothing more. Time and again postmodern critics have used this eminently debatable opinion to dispose of, with a single blow, the literary, scientific and philosophical achievements of the West. Moreover, they have drawn comforting democratic and egalitarian inferences from the principle that morality and reason are human constructs or creations, a principle that actually fits far more comfortably with the anti-democratic and inequitarian conclusions that nothing is true, everything is permitted and justice is the advantage of the stronger.

Writing in his Introduction to the "Science Wars" issue of Social Text, Ross declares that the critique of the "cultural" or "critical" study of science has been led by "fresh conservative recruits" who have been "bankrolled and coordinated by the same right-wing groups" that have been fighting the Culture Wars. In the same issue his fellow editor, Professor Stanley Aronowitz, speaks ominously of "scientific conservatives and their publicists" who wish to silence "critical investigations of science and technology." This effort by Ross and Aronowitz to reduce the criticism of their ideas to cranky political motivations is a smokescreen. Indeed, the insight they claim is so daring of them to publicly defend—that science threatens the environment and can be placed in the service of evil—is actually a staple of nineteenth-century Romanticism as well as twentieth-century conservative thought.

What is truly troubling about the "cultural" or "critical" study of science as it tends to be carried out in universities today is what is troubling about postmodernism in general. By teaching that the distinction between true and false is one more repressive human fiction, postmodernism promotes contempt for the truth and undermines the virtue of intellectual integrity. Those who have never performed an experiment or mastered an equation can,
therefore, enjoy a sneering superiority based on the alleged insight that science is a form of literary invention distinguished primarily by its outsized social cachet.

It is postmodernism's ethics of intellectual inquiry that allowed Ross and his colleagues to believe they could adequately judge Sokal's paper despite their evident ignorance of its subject matter: physics. If only their blunder were an isolated example in the academy.

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THE SCIENCE WARS

Scholars Who Study the Lab Say Their Work Has Been Distorted

By Liz McMillen

By tricking the journal Social Text into publishing a nonsensical essay applying postmodern thought to quantum physics, Alan Sokal showed that the cultural study of science was intellectually suspect and ignorant of the science it purports to study.

Or did he?

Many who work under the broad rubric of "science studies" maintain that Mr. Sokal got it wrong: He misunderstood and unjustifiably caricatured a diverse and intellectually rigorous field with a generation of work behind it. His hoax, they say, has polarized scholars into two camps in a way that has little to do with reality: scientists in favor of truth and rationality, and humanists who are anti-science.

Viewing Mr. Sokal's parody as a valid critique of science studies, says Anne Fausto-Sterling, a professor of medical science at Brown University, "is like judging all of physics by cold fusion."

"What upsets me the most is the sheer degree of misinformation," says Emily Martin, a professor of anthropology at Princeton University, who is on leave this year with the Humanities Research Institute at the University of California at Irvine. "None of us recognize ourselves in these diatribes. What did we ever write that gave Alan Sokal the impression that you could jump out of the 21st story and not have anything happen?" (Mr. Sokal had gleefully invited anyone who believed that the laws of physics were mere social conventions to jump out of his apartment window on the 21st floor.)

Sharon Traweek, an associate professor of history at the University of California at Los Angeles, says the affair has prompted a sort of loyalty test. "I've been asked things like, 'Do you believe in gravity?' 'Do you believe in Maxwell's equations?' It's almost as if we're back to the Inquisition." "Mr. Sokal's hoax has thrown a discomfiting spotlight on the field of science studies, raising questions about the need for scientific expertise in such work and about the nature of scholarly language. Mr. Sokal, a physicist at New York University, says much of cultural theory is a dangerous attack on rationality, an argument that has won him many sympathizers. Scientists and others who are disenchanted with the theoretical drift of the humanities have taken up his parody with gusto.

Because it struck a nerve, his effort is likely to prompt a wave of publishing and conference activity. Social Text plans to publish three pieces on the topic in its next issue, and editors are deciding whether to devote another issue to science studies. Lingua Franca, which ran a piece by Mr. Sokal about the prank, will run replies in a forthcoming issue. Stanley Aronowitz, a sociologist who has written several books on scientific knowledge, plans a conference this fall at the City University of New York on the "science wars."

At Irvine's humanities institute, a group met this month to talk about putting together an anthology of writings in response. "The last thing we want to do is fan the flames of this wildly overblown exercise in testosterone," says Ms. Martin. "But we do want to make it known that there is work going on that doesn't fit Sokal's description."
Mr. Sokal is not the first to criticize science studies, but he has complicated and, in some cases, deepened the mistrust between scientists and scholars in the humanities. A few years ago, Bruno Latour, a prominent figure in the sociology of science, seemed to be on the verge of a professorship at the Institute for Advanced Study, a position that must be approved by all of the faculty members. But after scientists and mathematicians there learned more about his work — he has studied laboratories by approaching scientists as if they were a primitive tribe — they became outraged. He withdrew before a vote could be taken.

Higher Superstition: The Academic Left and Its Quarrels With Science (Johns Hopkins University Press, 1994), by Paul Gross and Norman Levitt, made many of the same points Mr. Sokal did, in a polemic that is intensely disliked by some scholars. "To put it bluntly, the academic left dislikes science," the two authors wrote, proceeding to skewer the work of Mr. Latour, Katherine Hayles, Sandra Harding, and Steven Shapin for their alleged attacks on objectivity and rationality.

Mr. Gross and Mr. Levitt also helped organize a conference last year, sponsored by the New York Academy of Science, that aired scientists' complaints. It was called "The Flight From Science and Reason."

Many scholars believe that recent conflicts such as these have grown out of a turf war, one with money and authority at stake. Lately, scientists have taken some hits: the death of the Superconducting Supercollider, criticism of other "big science" projects, and a decline in the job market rivaling that of the humanities. "A big defunding process is going on in the sciences, and, with a few exceptions, they have lost cachet," says Mr. Aronowitz. "On top of that, upstarts began to comment on science. That's a transgression that is seen as hurting the community."

Mr. Sokal's hoax "also gives aid and comfort to those who think cultural studies is a form of barbarism," Mr. Aronowitz says. "I think this is a marriage of convenience, with people uniting on the epistemological questions."

As for Mr. Sokal's complaint about the humanities, there is also the local context at New York University to consider, where both Mr. Sokal and Andrew Ross, the editor of Social Text's "Science Wars" issue, teach. They are part of two very different worlds, however.

Mr. Ross, who directs a new, high-profile program in American studies, has been covered by glossy magazines. Mr. Sokal is a member of a department that, is by contrast, less visible. It is ranked 53rd among 147 doctoral programs in physics, according to the National Research Council.

Mr. Sokal insists that his article was not aimed specifically at Mr. Ross. And he concedes that not all of science studies is "nonsense."

For example, he says he "rather liked" Ms. Traweek's book, Beantimes and Lifetimes (Harvard University Press, 1988). But the studies cited in his parody — by scholars such as Mr. Latour, Mr. Aronowitz, Ms. Haraway, and Ms. Harding — are severely flawed, he says, by "bad philosophy, sloppy thinking, utter misunderstanding of the science they're purporting to study, or all of the above."

While there are some radical threads in science studies, many scholars feel that critics such as Mr. Gross, Mr. Levitt, and now Mr. Sokal have misinterpreted most of the work in the field.

A starting point for science studies is the premise that scientific ideas are socially and culturally shaped — that is, they are developed by particular people in particular places in particular times. Rather than viewing science as a pure kind of knowledge, they view science as a human activity affected by values and preferences.

One often-cited example of how science can be affected by cultural notions — in this case, ideas
about male and female behavior — is the model of human conception. For years, scientists believed
that the sperm actively sought out the female egg, which was thought to play a passive role. But in
recent years, scientists have said the egg actually sends out signals to guide the sperm.

Thomas Kuhn's 1962 book, The Structure of Scientific Revolutions, was an important challenge to the
idea of a neutral science. Mr. Kuhn, who died last week, examined how scientific knowledge is
produced through changes in world views, or "paradigm shifts." Work done in the 1970s at the
University of Edinburgh on the sociology of knowledge also was an early influence.

Besides sociology, scholars who work in this field come out of anthropology, history of science,
philosophy, feminist studies, and, more recently, cultural studies. They are interested not only in the
impact of science and technology on society, but also in how the scientific enterprise is conducted:
how facts are arrived at, the relationships between funding agencies and scientific communities, the
"culture" of a laboratory.

Anthropology has been a particularly rich source of work, spawning ethnographies and laboratory
studies. U.C.L.A.'s Ms. Traweek has applied the participant-observer approach to high-energy
physics, comparing the development of the field in the United States with that in Japan.

In Making PCR (University of Chicago Press, 1995), Paul Rabinow, of the University of California at
Berkeley, analyzed the development of the polymerase-chain reaction in the 1980s and how it
emerged from the Cetus Corporation, a setting distinct from university research in its values and
operation.

"No matter what opinions they hold, scholars in science studies agree that questions about what
counts as knowledge need to be examined in terms of practice, institutions, people, funding, and
language," says Donna Haraway, a professor in the history-of-consciousness program at the
University of California at Santa Cruz and author of several books, including Primate Visions and the
forthcoming Modest_Wit@Second_Millennium.FemaleMan.(c)Meets_OncoMouse(tm ) (both
Routledge).

Much of what many scholars in the humanities take for granted, such as the analysis of discourse,
causes alarm among scientists. To many people, science studies seems to fall in the category of
postmodernism, where, as George Levine noted in Social Text, "a lot of kooky, anti-intellectual,
politically correct, and subversive types have been thought to hang out."

In interviews, Mr. Sokal has declared that some scholars do not believe in the laws of nature. But
important differences exist between saying that scientific knowledge is socially constructed and saying
that there are no scientific facts, Ms. Haraway and others point out.

"What Sokal doesn't know is that there is a whole literature on metaphors and how nature took on
legal language and property metaphors," she says. "No one doesn't believe in laws of nature."

"Many people think that those of us who say that language mediates our experience of the world are
denying the existence of the world," says Mr. Aronowitz.

For the record, he adds, "I do believe the world exists. But you can't separate what the world means
from the language used to describe it. To use a simple phrase, reality does not yield its secrets. It has
to be interpreted."

Others have raised questions about how much expertise is necessary for science studies. Mr. Gross,
a professor of life sciences at the University of Virginia, and Mr. Levitt, a professor of mathematics at
Rutgers University, maintain that to think critically about science requires years of labor. Mr. Sokal
says the fact that he can pass off nonsense as the real thing shows just how little the editors of Social
Text really understand science.
Yet scholars in the field point out that some know the science involved very well; some are also trained in the discipline they are studying. "If you don't learn the science or enough science, then I don't think you're a serious scholar," says Berkeley's Mr. Rabinow. In working on Making PCR, he learned enough molecular biology to follow lab meetings and read journal articles.

He regularly shows his writings to the subjects of his studies. "That doesn't mean they can censor it, but it's a productive and ethical stance," he says. "I almost always learn something."

"You have to have a careful understanding of scientific methodology," agrees Dorothy Nelkin, a professor at N.Y.U. who teaches in the sociology department and the law school. "I could not go into a lab and do a scientific experiment, but I can listen to scientists. One has to be not scared of science."

Until recently, scientists have ignored much of the work in science studies, she says. "The interesting question is, Why has a small number of humanists with no real influence provoked a response? There is no corporate backup, like there is in science. It's not about postmodern obfuscation; that's not a reason to mobilize. My feeling is that scientists used to have great autonomy and no accountability. That contract has broken down."

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Post MORTEM

Probing, puncturing, and dissecting the conventional wisdom of the Washington Post

Post vs. Postmodern
by Steve Fuller

In the May 1996 issue of *Lingua Franca*, a gossip magazine for academic humanists, physicist Alan Sokal revealed that he had just perpetrated an elaborate hoax on *Social Text*, perhaps the foremost cultural studies journal in North America. He managed to publish an impeccably documented article that purported to derive postmodern cultural implications from contemporary work in physics. The story quickly circulated throughout the world’s media after it made the front page of *The New York Times* on 18 May. While *The Times* made a point of airing both sides of Sokal’s story by speaking to the editors of *Social Text*, most other coverage has typically presented only Sokal’s side — the only side aired in the original *Lingua Franca* piece — and sometimes even endorsed Sokal’s side, as *The Washington Post* has done in its indignant editorial of 29 May.

A natural question to ask at the outset is whether Sokal’s hoax is really worthy of *The Post’s* pontifications, especially during a period of pivotal elections in India, Israel, and Northern Ireland. The fact that both Sokal and *Social Text* hail from New York City (indeed, New York University) obviously played a role in *The Times’s* front page coverage. It was local news. Had the hoax been perpetrated in just about any other part of the US, it would have been lucky to receive any coverage at all in *The Times*. *The Post’s* eagerness to get in on the dispute shows, in the first instance, that it is still a provincial paper that takes its cultural marching orders from New York.

In its editorial, *The Post makes two assertions*. On the one hand, it does not quite buy the reasons given by *Social Text’s* editors for originally publishing Sokal’s piece; yet, on the other hand, the editors should not have even bothered to offer reasons because they do not profess to have any standards in the first place (being postmodernists and all that...).

The first assertion is especially disturbing coming from a major newspaper that presumably supports the protection of free speech. One point repeatedly driven home by the *Social Text* editors is that their periodical functions more as a political magazine than a traditional academic journal, and as such its primary aim is publishing not what it thinks ought to be believed but what it thinks ought to be heard. For
example, nothing in the writings of Social Text's two editors, Andrew Ross and Bruce Robbins, would suggest that they are personally sympathetic to the style of reasoning that is parodied in Sokal's piece. In fact, in his introduction to the relevant issue of Social Text, Ross does not even mention Sokal in the course of tying the other pieces together in terms of some common themes. His article is presented in a take-it-or-leave-it fashion without editorial endorsement.

On to The Post's second assertion: As a piece of reasoning it is simply shoddy. If we grant that Social Text is a 'postmodernist' journal, and that postmodernists generally believe that there are no universally valid intellectual standards, it does not follow that they believe that there are no standards whatsoever. Rather, the standards are relative to a particular culture, time, etc. Even Sokal seemed to recognize this, since there are some marked divergences between his article in Social Text and his gloss on it in Lingua Franca. In the Lingua Franca interview, Sokal suggests that if one truly believes that reality is socially constructed, then they should be able to walk out of windows unharmed. Had he said this in his Social Text piece, no doubt the editors would have refused publication, since no such absurdity is implied by the social construction of reality. Moreover, Sokal now erroneously uses the word "subjectivist" to describe the position staked out in the original article, even though this contradicts everything he said there about postmodernism's "decentering" of the subject. It seemed that Sokal knew when to 'shut up', to echo The Post's elegant expression, which implies that he recognized that there were some standards he had to meet which went beyond flattering the editors and their cronies.

The question then arises as to why Sokal chose to suspend those standards when he went public. Part of the answer seems to be that the standards, such as they are, are not high enough, especially when cultural studies people start to pronounce on the social significance of this or that physical theory, equation, etc. Although Sokal may believe that science is under siege at the moment, he should be pleased by the ease with which The Post and other journalists took what he said here at face value. Thus, the reader was regaled with quotes from the bogus article that were alleged to be gibberish. But were they gibberish? A lot depends on whether one thinks it makes sense to understand the cultural significance of physics by focusing on the structure of particular physical theories and equations in the first place. The actual errors in physics committed in the article are, for the most part, rather subtle, and certainly not enough to warrant the charge that Social Text's editors are scientific illiterates.

Nevertheless, it may be reasonable to expect scholars in the cultural studies of science to have mastered enough of a given science to pass one of E.D. Hirsch’s 'cultural literacy' tests. At the same time, however, it might not be such a bad idea for scientists to master some basics in the history and sociology of science before they attempt to mobilize it in a public forum to legitimate a pet project. For example, when Leon Lederman and Steven Weinberg were opining wildly about how the Supercollider would answer the question set 2500 years ago by Thales, 'What is matter?', the liberties they took with the socio-historical record
did not merit front page coverage, even though their argument for public funding rested largely on the Supercollider's (allegedly) momentous cultural significance, since its practical payoffs would likely be indirect at best. If Sokal's hoax leads to some reciprocal interdisciplinary accountability of the kind suggested here, it may not have been entirely diversionary.

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Professor Sokal's Bad Joke [Op-Ed]


By Stanley Fish

Durham, N.C. When the editors of Social Text accepted an essay purporting to link developments in quantum mechanics with the formulations of postmodern thought, they could not have anticipated that on the day of its publication the author, Alan Sokal, a physicist at New York University, would be announcing in the pages of another journal, Lingua Franca, that the whole thing had been an elaborate hoax.

He had made it all up, he said, and gloated that his "prank" proved that sociologists and humanists who spoke of science as a "social construction" didn't know what they were talking about. Acknowledging the ethical issues raised by his deception, Professor Sokal declared it justified by the importance of the truths he was defending from postmodernist attack: "There is a world; its properties are not merely social constructions; facts and evidence do matter. What sane person would contend otherwise?"

Exactly! Professor Sokal's question should alert us to the improbability of the scenario he conjures up: Scholars with impeccable credentials making statements no sane person could credit. The truth is that none of his targets would ever make such statements.

What sociologists of science say is that of course the world is real and independent of our observations but that accounts of the world are produced by observers and are therefore relative to their capacities, education, training, etc. It is not the world or its properties but the vocabularies in whose terms we know them that are socially constructed -- fashioned by human beings -- which is why our understanding of those properties is continually changing.

Distinguishing fact from fiction is surely the business of science, but the means of doing so are not perspicacious in nature -- for if they were, there would be no work to be done. Consequently, the history of science is a record of controversies about what counts as evidence and how facts are to be established.

Those who concern themselves with this history neither dispute the accomplishments of science nor deny the existence or power of scientific procedure. They just maintain and demonstrate that the nature of scientific procedure is a question continually debated in its own precints. What results is an incredibly complex and rich story, full of honor for scientists, and this is the story sociologists of science are trying to tell and get right.

Why then does Professor Sokal attack them? The answer lies in two misunderstandings. First, Professor Sokal takes "socially constructed" to mean "not real," whereas for workers in the field "socially constructed" is a compliment paid to a fact or a procedure that has emerged from the welter of disciplinary competition into a real and productive life where it can be cited, invoked and perhaps challenged. It is no contradiction to say that something is socially constructed and also real.

Perhaps a humble example from the world of baseball will help make the point. Consider the following little catechism:

Are there balls and strikes in the world? Yes.

Are there balls and strikes in nature (if by nature you understand physical reality independent of human actors)?
No.

Are balls and strikes socially constructed? Yes.

Are balls and strikes real? Yes.

Do some people get .5 million either for producing balls and strikes or for preventing their production? Yes.

So balls and strikes are both socially constructed and real, socially constructed and consequential. The facts about ball and strikes are also real but they can change, as they would, for example, if baseball's rule makers were to vote tomorrow that from now on it's four strikes and you're out.

But that's just the point, someone might object. "Sure the facts of baseball, a human institution that didn't exist until the 19th century, are socially constructed. But scientists are concerned with facts that were there before anyone looked through a microscope. And besides, even if scientific accounts of facts can change, they don't change by majority vote."

This appears to make sense, but the distinction between baseball and science is not finally so firm: On the baseball side, the social construction of the game assumes and depends on a set of established scientific facts. That is why the pitcher's mound is not 400 feet from the plate. Both the shape in which we have the game and the shapes in which we couldn't have it are strongly related to the world's properties.

On the science side, although scientists don't take formal votes to decide what facts will be considered credible, neither do they present their competing accounts to nature and receive from her an immediate and legible verdict. Rather they hazard hypotheses that are then tested by other workers in the field in the context of evidentiary rules, which may themselves be altered in the process. Verdicts are then given by publications and research centers whose judgments and monies will determine the way the game goes for a while.

Both science and baseball then are mixtures of adventurous inventiveness and reliance on established norms and mechanisms of validation, and the facts yielded by both will be social constructions and be real.

Baseball and science may be both social constructions, but not all social constructions are the same. First, there is the difference in purpose -- to refine physical skills and entertain, on the one hand, and to solve problems of a theoretical and practical kind, on the other. From this difference flow all the other differences, in the nature of the skills involved, the quality of the attention required, the measurements of accomplishment, the system of reward, and on and on.

Even if two activities are alike social constructions, if you want to take the measure of either it is the differences you must keep in mind.

This is what Professor Sokal does not do, and this is his second mistake. He thinks that the sociology of science is in competition with mainstream science -- wants either to replace it or debunk it -- and he doesn't understand that it is a distinct enterprise, with objects of study, criteria, procedures and goals all of its own.

Sociologists of science aren't trying to do science; they are trying to come up with a rich and powerful explanation of what it means to do it. Their question is, "What are the conditions that make scientific accomplishments possible?" and answers to that question are not intended to be either substitutes for scientific work or arguments against it.

When Professor Sokal declares that "theorizing about 'the social construction of reality' won't help us
find an effective treatment for AIDS," he is at once right and wrong. He is right that sociologists will
never do the job assigned properly to scientists. He is wrong to imply that the failure of the sociology
of science to do something it never set out to do is a mark against it.

My point is finally a simple one: A research project that takes the practice of science as an object of
study is not a threat to that practice because, committed as it is to its own goals and protocols, it
doesn't reach into, and therefore doesn't pose a danger to, the goals and protocols it studies. Just as
the criteria of an enterprise will be internal to its own history, so will the threat to its integrity be
internal, posed not by presumptuous outsiders but by insiders who decide not to play by the rules or to
put the rules in the service of a devious purpose.

This means that it is Alan Sokal, not his targets, who threatens to undermine the intellectual standards
he vows to protect. Remember, science is above all a communal effort. No scientist (and for that
matter, no sociologist or literary critic) begins his task by inventing anew the facts he will assume, the
models he will regard as exemplary and the standards he tries to be faithful to.

They are all given by the tradition of inquiry he has joined, and for the most part he must take them on
faith. And he must take on faith, too, the reports offered to him by colleagues, all of whom are in the
same position, unable to start from scratch and therefore dependent on the information they receive
from fellow researchers. (Indeed, some professional physicists who take Professor Sokal on faith
report finding his arguments plausible.)

The large word for all this is "trust," and in his "A Social History of Truth," Steven Shapin poses the
relevant (rhetorical) question: "How could coordinated activity of any kind be possible if people could
not rely upon others' undertakings?"

Alan Sokal put forward his own undertakings as reliable, and he took care, as he boasts, to surround
his deception with all the marks of authenticity, including dozens of "real" footnotes and an
introductory section that enlists a roster of the century's greatest scientists in support of a line of
argument he says he never believed in. He carefully packaged his deception so as not to be detected
except by someone who began with a deep and corrosive attitude of suspicion that may now be in full
flower in the offices of learned journals because of what he has done.

In a 1989 report published in The Proceedings of the National Academy of Science, fraud is said to go
"beyond error to erode the foundation of trust on which science is built." That is Professor Sokal's
legacy, one likely to be longer lasting than the brief fame he now enjoys for having successfully
pretended to be himself.

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the Duke University Press, which publishes the journal Social Text. His most recent book
is "Professional Correctness."

pc-bcom1.nmsu.edu visited at 09:48:36 Monday, November 04, 1996
using Mozilla/3.0Gold (Win16; I) from http://weber.u.washington.edu/~jwalsh/sokal/.
Sokal's Reply to Fish

This article is taken from the deleeze-guattari list: deleeze-guattari@jefferson.village.virginia.EDU. It was sent by mdufs@faraday.cls.virginia.edu on Sunday May 26 1996.

Here's the latest news from the NY Times: After giving Stanley Fish 38 column inches (not including graphics) to misrepresent my views, and giving Bruce Robbins and Andrew Ross an additional 4 column inches to restate their own views and mildly misrepresent mine, the NYT letters editor (Kris Wells, 212-556-1873) has refused to print my 12-column-inch reply. She said I could have only 7.3 column inches. Since such drastic compression would make a travesty of my letter, I refused.

Here, for your interest, is the letter the NYT refused to print. Feel free to distribute it.

Best, Alan Sokal

To the editor:

It's not every day that a mere theoretical physicist such as myself has the honor of being subjected to a half-page personal attack by the august Stanley Fish ("Professor Sokal's Bad Joke", May 21). Fortunately, his allegations can be refuted in far fewer words.

Fish implies that I am opposed to all sociology of science, and that I fail to understand the elementary distinction between sociology of science and science. Give me a break! I have no objection whatsoever to sociology of science, which at its best can clarify the important political and economic issues surrounding science and technology. My only objection is to _bad_ sociology of science — numerous examples of which are praised (!) in my parody article in the spring/summer 1996 issue of _Social Text_.

Fish's discourse on the "social construction" of science and baseball is amusing, but the situation can be stated much more simply. The laws of nature are not social constructions; the universe existed long before we did. Our theories about the laws of nature are social constructions. The goal of science is for the latter to approximate as closely as possible the former. Fish seems to agree.

Unfortunately, not everyone in the trendy field of "cultural studies of science" agrees. In a lecture at the New York Academy of Sciences (February 7, 1996), _Social Text_ co-editor Andrew Ross said: "I won't deny that there is a law of gravity. I would nevertheless argue that there are no laws in nature, there are only laws in society. Laws are things that men and women make, and that they can change." [verbatim quote in my notes]

What could Ross possibly mean? That the law of gravity is a social law that men and women can change? Anyone who believes _that_ is invited to try changing the laws of gravity from the windows of my apartment:

I live on the twenty-first floor.

Now, perhaps all Ross means is that our _understanding_ of the laws of physics changes over time; but if that's what he meant, why didn't he say so, and what's the big deal?

Granted, not even the _Social Text_ editors would deny the existence of an external world, or claim that 'physical 'reality' dots is at bottom a social and linguistic construct.'
The fact remains that they published an article saying exactly this in its first two paragraphs. And despite my repeated requests during the editorial process for substantive comments, suggestions and criticisms, none were ever received, just an acceptance letter.

Concerning my ethics, this issue is treated in detail in my article in the May/June issue of _Lingua Franca_, so I won't repeat it here. Suffice it to say that there is a long and honorable tradition, going back at least to Jonathan Swift, of truth-telling through satire.

Doesn't Fish have a sense of humor?

My goals, however, are utterly serious. I'm a leftist and a feminist and proud of it; I'm angered by a shoddy "scholarship" that claims to be left-wing but in fact, through its sophistry and obscurantism, undermines the prospects for progressive social critique. Like innumerable others from diverse backgrounds and disciplines, I call for the left to reclaim its Enlightenment roots.

But let me now shut up: far better to give voice to the humanists and social scientists who have been flooding my e-mail for the past two weeks, expressing relief that the nakedness of their local emperors has finally been exposed. Let's hear their stories about the debate that is now opening up.

Sincerely,

Alan Sokal
THE "SCIENCE WARS"
WHAT IS AT STAKE?

Chronicle of Higher Education, July 26, 1996

Dorothy Nelkin

A surprising number of scientists have mobilized to attack those humanists and social scientists who study science as an activity influenced by social, cultural, and political forces. Battles against the so-called "flight from science and reason" are taking place on many fronts; in angry books (Higher Superstition) and public meetings, science studies scholars have been called "science bashers," "ignorant alarmists," or "self-deluded ideologues," bent on destroying science and undermining the scientific world view. A Smithsonian Institution show called "Science in American Life," intended to portray the role of science in society and the costs as well as benefits of progress, became a target of scientists' wrath. And when physicist Alan Sokal used deception to promulgate his outrage at social constructivist theories of science, he was lauded by his colleagues. Are these critics suggesting that science must not be critically examined by "outsiders"—only celebrated, promoted, and praised?

The very success of science has given the once private domain of the scientific laboratory a public profile. Studies of science extend beyond examination of its social impact to question the choice of research priorities, the methods of research, and the biases that shape interpretations of nature. Such investigations treat science as a product not of disembodied minds but of actual people in social interaction. To many scientists this is a hostile attack on their status in society, and they are responding with vehemence and indignation.

The scientific community has, in the past, been notoriously reluctant to mobilize against creationists, animal rightists, and other influential anti-science groups. Why now are scientists so eager to attack social constructivist theories? Why is it so problematic to explore the gap between truth and knowledge, to ask "how do we know?" What is this science war really about? Some scientists have accused their humanist critics of postmodernist obfuscation. But the foibles of other disciplines are unlikely catalysts for war. Nor is the science war about the power of humanists who are hardly about to topple the scientific enterprise. There is no evidence that science studies scholars are responsible for Congressional cutbacks in science funding. A Congress that is wiping out the National Endowment for the Humanities could not really place so much value on cultural studies that it would be influenced by humanists. Nor is there evidence that humanists, even those with popular appeal, have ever had much influence on public policy. One is hard put to find a correlation between cultural analyses of science and changes in science policy.

The moral outrage of scientists may be best understood in the context of critical changes within science itself and in the relationship of science to the state. The social contract between science and the state that formed after World War II included agreements about the terms of scientific autonomy. The government would provide research support unfettered by requirements for accountability if scientists would work in the interests of progress and effectively regulate themselves. The unusual degree of autonomy granted to science reflected the public image of scientists as apolitical, unbiased, and therefore reliable as sources of truth. It also reflected public trust in the ability of the scientific community to control its internal affairs. Under these conditions science flourished and scientists took autonomy for granted as their due. In the 1990s, however, the terms of contract appear increasingly obsolete, and the harmony that had long marked the partnership between science and the state has deteriorated. Both sides have failed to meet their side of the bargain. Government is cutting back on funding and scientists, often working in the interest of private profit, are facing the problems of
self-regulation.

The strains on science funding are, in large part, a consequence of world events—the end of the Cold War, the cutback in defense related research, and the national deficit. But also, the extraordinary optimism about the future of science that maintained the social contract has dissipated, and scientists like other institutions and most people these days must cope with fewer resources and greater accountability.

The scientists' side of the contract, their promise of self regulation, has also deteriorated. It has become increasingly difficult to maintain control over the large number of scientists working in specialized fields in a climate of intense competition. The widely reported incidents of fraud have become a major concern for journal editors and scientific associations. Some scientists regard fraud as an aberration: others as revealing basic structural flaws in the organization of science. But fraud strikes at the moral roots of the scientific enterprise, and presents a serious challenge to the ability of the community to regulate itself.

Scientists are also struggling to come to terms with revelations about ethical abuses. The US Department of Energy investigation into the history of unethical research involving human subjects revealed widespread scientific complicity in dubious experiments using inadequate safety precautions. It also found that many scientists gave only limited attention to informed consent.

Finally, changes in science also reflect growing corporate influence on research. As economic competition overshadows military goals, many scientists are shifting their priorities to commercially relevant research devoted to the solution of short term problems. Predictably, corporate sponsors demand research in the interest of profit. Thus, the vision of science as driven by scientific curiosity has been clouded leaving the impression that scientific information is less a public resource—the basis after all of the original contract— than a private commodity.

In all, science, has become a different enterprise than it was when its contract was forged with the state. It is larger, more costly, more controversial, and more difficult to control. It is faced with budget projections below the rate of inflation so that some established projects have been blocked and some well-trained scientists are without jobs. Scientists view their situation as grim—but who is to blame?

Institutions under siege, in the words of Mary Douglas, seek to "block personal curiosity [and] organize public memory." They protect their boundaries, by "channel[ing] perceptions into forms compatible with the relations they authorize." This is what the science war is about. In defending their disciplines, scientists are arguing with extraordinary passion to convey their dispassionate objectivity. They want once again to be perceived as pure, unsullied seekers after truth, and to define their own history and contemporary practice in just such terms. History is important in shaping public perceptions; yet the defensive war against those who study science as a social institution is very strange.

Despite budget cutbacks, the scientific culture is not about to disappear. While certain areas of science, especially "big science" projects such as NASA and fusion research are threatened, surveys consistently show that despite a general lack of science literacy, the public is convinced of the value of science. And the role of science as a model of rationality in human affairs is not really in question. Indeed, most historians and sociologists who study science validate the credibility of their work in terms of scientific standards. Moreover, American society has by no means abandoned science. Unlike welfare mothers, the chronically ill, artists, and other needy groups, many scientists can fall back on industry and private foundations when government funds are reduced. And the budget plans for the National Science Foundation call for increasing support of basic research while wiping out most support for the social sciences. On this front the scientists have won their war.

In sum, the science war seems misplaced. There are, these days, many threats to scientific rationality— from religious fundamentalists, right wing politicians, and other anti-science forces. Attacking fellow academics is much easier, but misdirected. It is strategically misguided as well.
the importance of science in society, what is wrong with a sociologically-informed account of the workings of science? Is science only to be popularized and praised? After all, demystifying science, and assessing it as a social institution could contribute to public understanding.

By engaging in polemics against all who question science, scientists are fostering polarization and discouraging reasoned discussion. By defending themselves so bitterly against outside critiques, scientists can only encourage a public image of their profession as arrogant and answerable to no-one. By closing ranks, they appear as simply another self-protective institution looking out for interests and careers. And by making vociferous claims to absolute authority over the definition of truth, they are behaving much like fundamentalists. Thoughtful scholars— even those outside the debate — are forced to take sides as the science war challenges assumptions about their mode of research and their freedom to articulate ideas. At a time when academic institutions are generally under siege, dividing the academy into warring factions is not a productive strategy.
The attached is a Web version of an article written for the October, 1996, issue of the Notices of the American Mathematical Society. The article has been modified only to insert hypertext links and additional information like this. The endnotes and any other pages reached through links are not part of the article in the Notices.

It has come to my attention that despite electronic submission in the form of a TeX file (but one which needed reformatting), the Notices inserted a few errors, especially in my name and e-mail address. Take heed if you think that electronic submissions make page proofs unnecessary!

A report from the front of the ``Science Wars''

The controversy over the book
Higher Superstition, by Gross and Levitt
and the recent articles by Sokal

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The OAMSRPDAAS (Official AMS Representative to the Physics Division of the American Association for the Advancement of Science) was trying to look wise at a meeting in Baltimore last February, while silently wondering whether his was the absolutely most obscure bureaucratic position in North American Academia. He was diverted from this relatively engrossing problem of optimization by the appearance of one Bernard Ortiz de Montellano, bearing tidings of the sorry state of precollege science education, with particulars about how and why the school boards of Portland, Oregon, and some other localities have adopted curricula full of nonsense. Ordinarily, your representative discounts tales of ``political correctness,'' because he has always found it difficult to believe in the existence of things for which he has little direct evidence, and Georgia Tech is not hotbed of PC. On the other hand, he has had some not altogether positive experiences with school boards, so his interest was aroused.

Among other things he learned that this and other attacks on science have been thoroughly discussed in Higher Superstition: The Academic Left and its Quarrels with Science, by Virginia biologist Paul R. Gross and Rutgers mathematician Norman Levitt [GL]. The assembled scientists in Baltimore were avidly reading the book and reporting that it was ``a real eye-opener'' and ``not just the usual anti-PC screed.'' Best of all, it was on sale! At that time, before a recent prank by Alan Sokal, a mathematical physicist at NYU, focused the mass media on tensions between scientists and the ``academic left,'' most scientists were astonished to be told that there are social scientists and humanities scholars who believe not only that they have produced incisive and significant criticism of the role of science in society, but that they have also revolutionized its methods, its content, and its claim to truthfulness. Can a revolution have occurred in science without scientists being aware of it? Just what are these critics saying, and are the attacks on science something scientists need to worry about?

Gross and Levitt have dealt with these questions and written a call to arms for the community. The ``left'' as seen by Gross and Levitt is quite diverse, including those labeling themselves feminists, ecological activists, afrocentrists, and others, but the greatest concern is with a movement in the tradition of postmodern literary theory, called ``cultural studies.'' (The somewhat fluid terminology includes ``science studies'' and some other variants.) Attacks from the other side - creation science
and so on - are not discussed, mostly because they are virtually unrepresented on our own soil, the universities.

At the beginning this book feels academic and formal, because the authors show off their vocabulary and because they protest painstakingly that their targets are limited to specific fools and foolishness and not to sociologists of science or the politically engaged at large, with whom they express sympathy. (Later events confirm their decision to be careful in this regard.) It soon gets lively, however, as the case relentlessly builds against the postmodern critics and others, damning them with their own words. These critics are depicted as ideologues with an intense envy of science, born of adolescent fixations on power and authority. Their analysis consists of "turgid and opaque" jargon and servile quotations from their intellectual idols, in defense of politically foreordained conclusions. With these shabby intellectual weapons they are furiously tilting at the windmills of science. An example is Stanley Aronowitz, whose *Science as Power*, is described as follows [GL, pp. 50-51]:

Its chief method seems to be to invoke from the philosophy of science as many names as possible ... names and phrases are simply run in and out of the text as props for Aronowitz's views.

The view promoted in this influential book is described (by an admirer [R1]) as:

Critics like Stanley Aronowitz see science not as the realization of universal reason but simply as an ideology with a power that extends well beyond its own institutions...

Most ridiculous are many critics who sling scientific terminology about with an air of authority, while revealing to anyone with technical training that they have not the slightest idea what it means. In examples drawn from mathematics, they have picked up some vogue words like chaos and nonlinearity, and have eagerly misunderstood them as showing that mathematics has been fundamentally rethought and has retreated from its claim to objective truth. (The cultural critics have little to say about logic or the foundations of mathematics, where there are some long-standing and quite vexatious issues. They are instead drawing words and phrases selectively from the popular press.) Similar silliness is babbled about quantum and relativistic physics and about other branches of science. Indeed, scientific objectivity is flatly rejected as a bogus and dangerous notion associated with the evils of capitalism, colonialism, militarism, patriarchy, etc. Some advocate repression [H]:

The "innocence" of science communities ... is extremely dangerous to us all. Perhaps people who have exhibited tendencies toward such innocence should not be permitted to practice science or construct metatheories of science; they are a danger to the already disadvantaged and perhaps even to the species!

Innocence in this context refers to doing pure research, carried on without political oversight.

Finally, cultural critics declare victory over science: "We are witnessing the slow, discontinuous breakup of the old world-view according to which physical science offers context-free knowledge of the external world " [A] ..... "Science is no longer accepted as a given without the mediation of cultural codes, social and economic forces, and professional interests" [N] ..... "It is safe to say that many of the founding certitudes of modern science have been demolished" [R1]. The opinions of scientists on this point are not actively sought.

The indictment made in *Higher Superstition*, buttressed as it is with so many direct quotes and meticulous documentation, is forceful and persuasive. This reviewer took the next step and examined the works of many of Gross and Levitt's targets for himself, and found it rather easy to locate additional dismaying examples. Not all of the crimes occur simultaneously, of course. Sometimes turgid and opaque prose shrouds a true statement, and sometimes ignorance is quite nicely expressed. And there is even some good sense here and there - when they are not shouting slogans or pretending to know things they don't.
Oh, for a Tom Wolfe to write a satirical novel about these folk! Or for an Alan Sokal to write a parody article and actually get it published in Social Text, a prominent journal of the cultural studies movement [S1]. If cultural critics are free to use their (dim) lights to examine science, then it is fair to use the scientific method to verify whether Gross and Levitt’s description of them is accurate. In a companion article to his parody, published simultaneously in another journal [S2], Sokal explains:

...to test the prevailing intellectual standards, I decided to try a modest (though admittedly uncontrolled) experiment: Would a leading North American journal of cultural studies - whose editorial collective includes such luminaries as Fredric Jameson and Andrew Ross - publish an article liberally salted with nonsense if (a) it sounded good and (b) it flattered the editors’ ideological preconceptions?

The parody was a pastiche of left-wing cant, fawning references, grandiose quotations, and outright nonsense, centered on the claim that physical reality is merely a social construct. In defense of their decision to accept Sokal’s article, the “editorial collective” has revealed that it makes decisions according to postmodern standards unhampered by such quaint traditions as peer review [RR].

But wait... aren’t the portraits painted by Gross and Levitt and illuminated by Sokal a bit too familiar? Could we have glimpsed something not so different when we last peered into our collective mirror? Mathematics and science certainly have idols and personality cults. How often does a seminar speaker explain that a problem is important because such and such a famous mathematician said it was? Believe it or not, we have jargon. As for puffery and pretension, have you never read an article in “applied” mathematics which starts by grandly stating that the equation about to be given a wonderful analysis is of utmost importance for a long list of branches of physics? Details about these applications may be in shorter supply than future citations in The Physical Review.

Most but not all readers of stories about the Sokal affair in the mass media are on the side of scientific rationality in the dispute. Others view it as a turf war between two similar communities of self-important pedants, one of which happens to have scored off the other. Objectively, the enemies of science cannot simply be dismissed as fools (not all of them all of the time), and indeed they are disturbingly like ourselves in many ways.

This suggests another modest experiment: Could a parody be published in a serious mathematical physics journal, for example, if it used authentic sounding jargon and made references to fashionable trends in the field? Spoof posters are not uncommon at meetings, but they are recognized for what they are (by most onlookers most of the time). This experiment, too, has been carried out at least twice to my knowledge, in July, 1988, and in October, 1993, by investigators who prefer to remain anonymous. The result? Alas, the counterrevolutionary cads who edit our publications, with their retrograde allegiance to objectivity and peer review, wouldn’t even let such an article into a conference proceeding or mp-arc, the electronic archive. Strangely, there seems to be a correlation between belief in objectivity and quality control.

The correlation is not perfect — scientific error and even fraud get published from time to time, and clever parodies might have a decent chance of appearing in some journals devoted to the softer sciences. Systematic experiments quantifying the susceptibility to parody of various academic disciplines, in units called the sokal, the millisokal, etc., could be quite revealing. Even more revealing would be the response to the parody, judging from the recent affair. In the case of Social Text, Sokal’s experiment not only bought out its lack of scholarly review, but also found the editors so far out to sea that they had trouble understanding the point of the parody. Perhaps, one said, Sokal just had a "change of heart" when he revealed the hoax [RR].

The sanctimonious tone of the critics upon being criticized can be pretty funny when set beside their other writings. For instance, Andrew Ross, the editor of Social Text, usually writes aggressively (he's
not one of the turgid and opaque ones): ``Be prepared for another season of asinine anecdotes about feminist algebra, [etc.]'' [R2] and "This book is dedicated to all of the science teachers I never had. It could only have been written without them." [R3] are typical. After his own nose was tweaked, the aging enfant terrible and his coeditor wrote [RR]:

This breach of ethics is a serious matter in any scholarly community, and has damaging consequences......[Sokal's] adventures in PostmodernLand were not really our cup of tea......Why does science matter so much to us? Because its power, as a civil religion, as a social and political authority, affects our daily lives and the parlous condition of the natural world more than does any other domain of knowledge.

Notice that the power of science has apparently nothing to do with its content. The passage ends with:

Should non-experts have anything to say about scientific methodology and epistemology? After centuries of scientific racism, scientific sexism, and scientific domination of nature one might have thought this was a pertinent question to ask.

Here and elsewhere ([R2], [F1]), Gross, Levitt, Sokal and other scientists are charged with arrogantly opposing any examination of science by outsiders, but this is squarely contradicted by the evidence of their words. Of course science is an appropriate object of study by anthropologists, sociologists, historians, and philosophers, and of course it exists in a political context. But the examination should be intelligent and honest. Humbug, on the other hand, cries out to be exposed, and it has been. Obviously, defensiveness is a motivation, but Sokal was feeling more defensive about left-wing politics, of which he is an adherent, than about science. He feels that left-wing politics has been damaged by its association with nonsense, whereas science has been unscathed [S2]. Sokal is far from alone on the left in his dismay at sharing the company of the cultural critics [P]. Or perhaps this is a naive view: Despite contrary evidence, Ross has cleverly deconstructed Gross, Levitt, and even Sokal into the far right wing:

The erosion of the Cold War funding contract with the state, combined with the decrease in public respect for scientific authority, has created a demand for scapegoats in the demonic form of politically motivated scholars in science studies. Accordingly, Gross, Levitt, Sokal and others are simply recycling all of the usual suspect ideas from the Culture Wars in order to persuade scientists ... to get involved in the academic P.C. wars.

[R4] (see also [R2], [P]). How could anyone imagine that the motivation for cultural studies is political? Since it is inconceivable that anyone would allow his honest judgment to override political partisanship, Gross, Levitt, and Sokal must have sinister designs!

Thoughtful scientists do pay attention to philosophical issues about science, though usually without getting distracted from their work. Few see the cultural studies movement as serious in this regard, revealing as it so often does a dearth of scientific knowledge or even communication with scientists. (In contrast, Feyerabend [Fe1][Fe2], whom some cultural critics revere, was both scholarly and eager to discuss science with scientists.) Moreover, if the prevailing intellectual standards in cultural studies are as low as Gross and Levitt make them out, most of the damage will be localized at the source, as was the case in the Soviet Union, where the more politicized academic disciplines settled into mediocrity. This was ultimately to the benefit of Soviet mathematics, in which the talented often sought refuge.

The threat is not to the epistemology of science, but to its social context, and this is the true battleground. Science is terribly important, but not as an accidentally powerful example among many equally valid forms of discourse, or as a state religion. It is paramount because it constantly transforms the human condition, and its power to do so arises from a unique relation to objectivity, which some cultural critics fail, or refuse, to grasp. Any political system or ideology has to deal with the phenomenon of science, but only damage can result from ignorance and dishonest motives. This can
be seen every day in education, the workplace, and the courts - the legal avatar of the movement, known as critical legal studies, is far more influential than cultural studies, and the other groups described by Gross and Levitt are all at work in the legal system as well. We suffer much more as citizens than as professionals, but as professionals we are both able and responsible to improve the uses of science in society. In this it would be foolish arrogance not to work together with outside critics, who not only potentially have much to offer, but have a substantial track record of doing so. For example, the Tuskegee experiment, in which uninformed people were intentionally not treated for syphilis as part of a controlled experiment, is only one of the most notorious of many ethical abuses which have occurred in science, in this country and not so long ago. The scientific community was not alone or even in a unique position of leadership in establishing better principles of beneficence and disclosure in human experimentation. None of the sciences, including mathematics, has a monopoly on wisdom as to its uses.

Gross, Levitt, and Sokal have done us all a great favor. Thanks to them the scientific community is now aware of this breed of critics and is ready to respond with its own indispensable perspectives. Even those who have been embarrassed may now curb their excesses, and ultimately benefit. Let us now be equally vigilant about our own shortcomings, and, most importantly, let us not neglect the serious issues surrounding science in our amusement over the latest skirmish.

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References and Further Reading


[Fe2] Paul Feyerabend, Science in a Free Society. Manchester: NLB, 1978. Feyerabend pioneered the modern philosophical critique of the objectivity of science. His comparisons of science to pseudoscience and even his language - abusing his own critics as illiterate, putting the word "fact" in quotes (p. 158) - are echoed by the cultural critics.


Many materials related to the Sokal affair are obtainable at
http://weber.u.washington.edu/%7Ejwalsh/sokal/.

http://www.nyu.edu/gsas/dept/physics/faculty/sokal/index.html

and http://www.feedmag.com/96.06chapman/96.06chapman.html

(URLs verified 28 June 1996)

Additional endnotes (not in the article in the Notices) and links.

* Perhaps the same author's description of Aronowitz provides a clue for this question.
  various disclosures about the author

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OPINION

Was Sokal’s Hoax Justified?

Kurt Gottfried

Physicists rarely make the front page of the New York Times, but Alan Sokal of New York University did last 18 May. The Times reported the hoax he published in Social Text, and immediately revealed, in which he lampooned certain sociologists and humanists engaged in science studies. The story reverberated in the popular press, and was then taken to a loftier level by the New York Review of Books.

Some believe that such a prank in an academic journal is unacceptable, but I claim that Sokal was justified.

As this debate has an irreducible ideological dimension, I must first state where I come from. Because science has an enormous impact on society, decisions about the exploitation and support of science must be made by society as a whole. This imposes serious obligations on us as scientists—obligations rarely discharged with commensurate urgency and devotion. The natural sciences also provoke questions few scientists are qualified to tackle—such as the influence of the cultural and political context on the creation of scientific knowledge. Here, there are serious obligations on scholars in science studies, and in my view they too are often not met. Finally, I know that “an oral tradition [employing] intuitive modes of thought, inference by analogy and other stratagems plays an essential role in the creation of physics.” Nevertheless, I believe that physics ultimately produces knowledge that is not contingent on culture or personalities, in contrast to more difficult pursuits in which reproducible phenomena under carefully controllable conditions either do not exist or are of little interest.

When Sokal’s hoax surfaced, I heard arguments that the editors of Social Text should be excused for not catching on—that respected physics journals sometimes publish articles that editors and referees know they do not understand and suspect to be wrong. I found these arguments rather compelling. Afterward, however, evidence from the ultimate source, Social Text itself, changed my mind.

The editors of Social Text, Bruce Robbins and Andrew Ross, with commendable candor, stated publicly that their journal has a political agenda, which is overlooked by those who charge Sokal with defiling academic ethical standards. This perspective is evident in Robbins and Ross’s letters to the New York Times on 23 May 1996, and to In These Times on 8 July, the latter stating that Social Text was hoaxed not because we liked Sokal’s jargon-filled references to postmodern authorities . . . but because we thought he was a progressive scientist, a physicist who was willing to publicly criticize scientific orthodoxies . . . Anyone who thinks this stuff is characteristic of Social Text is invited to read the rest of the ‘Science Wars’ issue from which Sokal’s prank has unfortunately diverted attention.

I then read an article from which Sokal diverted attention: “The Politics of the Science Wars” by Stanley Aronowitz. To put it succinctly, had I been shown both Sokal’s and Aronowitz’s articles, and asked which might be a hoax, I would have said that both are either hoaxes or nonsense! Why? Because Aronowitz, like Sokal, (1) makes statements about physics that are factually wrong, (2) displays deep misconceptions about physics and (3) seems ignorant about what physicists did in the past and try to do now. And to boot, Aronowitz, like Sokal, speaks with a self-confidence that would assure lay readers that they are in the hands of an erudite expert.

What’s wrong with the Aronowitz piece?

Exhibit 1: “Most theoretical physicists, for example, sincerely believe that however partial our collective knowledge may be . . . of physical reality, one day scientists shall find the necessary correlation between wave and particle; the unified field theory of matter and energy will transcend Heisenberg’s uncertainty principle.”

Readers of Physics Today don’t need me to explain how absurd that is.

Exhibit 2: “At the end of the day, the many questions of science and its influence cannot be settled by means of a fail-safe method of inquiry . . . passionate partisans of wave and matrix mechanics explanations for the behavior of electrons were unable to reach agreement for decades.”

The facts: Heisenberg discovered matrix mechanics in July 1925, and his theory was developed that fall by him, Born and Jordan, and independently by Dirac. Schrödinger announced his discovery of wave mechanics in January 1926. Everyone was puzzled that two such different formulations gave identical results. Six weeks later, Schrödinger submitted the paper that proved that the two theories were mathematically equivalent. End of passionate debate.

Now you may say this is a quibble. It is not. For it goes beyond not knowing the simplest facts about an important development in the science one is supposedly analyzing. This incorrect statement is used to argue that scientists cannot settle their disputes with better experiments or theories, a claim also made by some other sociologists, though not on the basis of such a flagrant error.

Exhibit 3 is far more complicated. Aronowitz’s article rests, in part, on a study by Paul Forman, which, according to Aronowitz, “shows” that the “shift from the Old Quantum Theory, which retained large elements of classical physics, to [quantum mechanics]” was linked to the “pessimism that afflicted the rest of the academic elite” in Weimar Germany.

This claim that the Weimar Zeitgeist led to the triumph of indeterministic quantum mechanics floored me. I have, for some 45 years, indulged myself in an amateurish infatuation with the original literature of modern physics, and was unaware of this thesis. That atomic physics was in crisis was known before Weimar was a gleam in France’s eye. In 1912, Einstein in Prague, looking out on a mental hos-
pital below, told a visitor that the people pacing the yard were the lunatics who did not have to worry about the quantum theory. Long before 1925, practitioners of the old quantum theory knew it was not a theory, but a hodgepodge of ingenious and often contradictory recipes grafted onto classical physics.

The intellectual leader of the whole quantum enterprise in the Weimar period was a Dane, Niels Bohr. In 1924, Bohr published the most radical pre-Heisenberg proposal for a new theory with a Dutchman, Kramers, and an American, Slater. They were not humiliated Teutons obsessed by Nietzsche and Spengler, pining for a Wagnerian crisis.

I looked up Forman. His is an erudite paper with 246 footnotes, many very long. Forman makes a convincing case that Hermann Weyl and other important German-speaking mathematicians and physicists (in contrast to Anglo-Saxon ones) did ponder the philosophical implications raised by their attempts to solve the atomic enigma. But Forman’s paper has no explicit discussion of the famous puzzles that the old quantum theory could not solve, such as the helium spectrum, or of the phenomena it could not even address, such as collisions. Nor does it relate that once the matrix mechanics and wave mechanics papers appeared, those Germans stopped philosophizing and used the new theory like pragmatic Anglo-Saxons because it obviously worked, even if its interpretation was then a mystery.

Other publications by Forman show that he knows all this and much more. Furthermore, he could assume that his readers, professional historians of science, do too, and could make an informed judgment about the plausibility of his astonishing thesis, as some did with sharp critiques that go beyond my curbside remarks. But most readers (and authors) of Social Text do not have such knowledge, and would be unable to assess the extent to which cultural factors influenced the development of quantum mechanics. So, in this setting, Aronowitz’s presentation becomes an unadorned contention that the triumph of one scientific theory over another is due to factors exterior to science and not to what we physicists claim produces the final decision—experimentally established facts and mathematical coherence.

Indeed, Aronowitz implies that Forman showed that the shift from the old theory was due to the Zeitgeist, whereas Forman’s thesis is more subtle: “And while it is undoubtedly true that the internal developments in atomic physics were important in precipitating this widespread sense of crisis among German-speaking Central European physicists. . . . [t]he possibility of the crisis of the old quantum theory was, I think, dependent upon the physicists’ own craving for crisis. Arising from participation in, and adaptation to, the Weimar intellectual milieu.” Here, developments within physics are considered, though with far less weight than I find plausible.

Now a few words about Sokal’s paper. I claim that any reasonably well-informed layman should have recognized it as a hoax, because Sokal was reckless. Consider, for example, his histrionic note 3, citing the literary scholar David Porosh who, according to Sokal, claims that computer scientists “subverted the most revolutionary implications of quantum physics.” Sokal then admonishes Porosh for not taking his case further—for not pointing out that “Claude Shannon worked for the then telephone monopoly AT&T, and not analyzing carefully whether the ‘victory of cybernetics over quantum physics in the 1940s and 1950s can be explained in large part by the centrality of cybernetics to the ongoing capitalist drive for automation of industrial production, compared to the marginal industrial relevance of quantum mechanics.’” Where did the editors of Social Text hear of the victory of cybernetics over quantum physics? And are they, while putting out an issue on science and society, unaware that the transistor, the Rosetta stone of modern electronics, was invented at AT&T at that very time, and depends on quantum processes in solids?

To summarize, I hope that Sokal’s hoax will play a beneficial role—not just in the debate at this interface between the natural sciences and other fields, but for the academic enterprise as a whole. People who allow others to call them university professors do not only have academic freedom and—if they’re lucky—tenure to protect that freedom. They also have responsibilities. Surely they must—not should—have a modicum of knowledge about the topics they pass judgments on. That does not mean that they must follow a narrow path, or refrain from voicing outrageous opinions—but not opinions based on junk thought and junk knowledge.

Physicists should not, however, jump to the conclusion that Social Text is representative of science studies. Sociologists with knowledge of physics voice opinions that I find outrageous and perplexing. Consider, in particular, Andrew Pickering’s Creating Quarks: A Sociological History of Particle Physics. It gives a superb account of the birth of the Standard Model of particle physics, and is better suited for most of the readers Weisskopf and I had in mind when we wrote our 1984 book. However, here is the lesson Pickering draws from his well-told tale: “The [Standard Model] should be seen as a culturally specific product . . . a communally congenial representation of reality. . . . [O]nly singular incompetence could have prevented [the] high energy physics community [from] producing an understandable version of reality at any point in [its] history. . . . [T]he preponderance of mathematics . . . is no more difficult to understand than the fondness of ethnic groups for their native language. . . . [T]here is no obligation upon anyone framing a view of the world to take account of what twentieth century science has to say.”

Pickering’s later work offers a more nuanced and complex viewpoint, though he appears to adhere to the same bottom line. Some other sociologists who study physics also assert that scientific knowledge is a cultural artifact (as discussed in David Mermin’s column. The Golemization of Relativity, PHYSICS TODAY, April 1996, page 11), and this view is taking hold in audiences in no position to evaluate the assertion. Scientists must respond in a thoughtful and persuasive manner, and learn how to reach those audiences effectively. Mere polemics will not do.

I thank Gerald Holton, David Mermin and Sam Schaefer for criticism and advice.

References
5. S. Aronowitz, Social Text (Spring-Summer 1996), p. 177.
9. Ref. 6, p. 62, emphasis in original.
11. Ref. 10, p. 413.