

REFERENCE FRAME

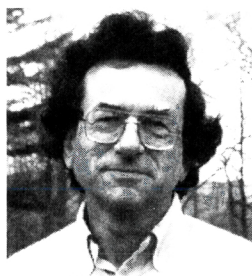
What's Wrong with This Reading

N. David Mermin

Many scientists pride themselves on their ability to read difficult texts in areas of their discipline conceptually or historically remote from their own. It has become evident in the recent "science wars" between scientists and science critics that this ability can diminish rapidly with interdisciplinary distance. (I use the word "critics" in the neutral sense—cf. "theater critics." I can think of no other term encompassing the full array of practitioners from sociology, anthropology, history, literature and cultural studies, who have turned their attention to the activity of scientists.) Fronts are opening in the science wars on which some scientists are misrepresenting and oversimplifying as egregiously as those at whom they direct their fire.

I shall illustrate this with one of the strangest and most notorious texts on the battlefield, Bruno Latour's "A Relativistic Account of Einstein's Relativity."¹ This essay has been criticized by physicists for misconstruing the content of relativity and being filled with elementary technical mistakes. It is on display in Alan Sokal's famous spoof,² one of its "mistakes" showed up in Steven Weinberg's much-cited article in the *New York Review*,³ and I know of two articles on the "Relativistic Account" scheduled to appear in anthologies devoted to the new and gloomy art of extracting technical errors from the writings of science critics.

I believe such attacks miss the point of Latour's essay. While I have not myself succeeded in making complete sense of it, there are texts by Nietzsche, Hegel and Kant in which there is virtually nothing I can make sense of. Nevertheless, I have not concluded that they are charlatans. Critics of the science critics ought to exercise similar caution. The straightforward explicit style toward which scientists strive (and pick up any issue of *Science* to remind yourself how successful *we* are in achieving it) is inappropriate in disciplines where the objects and aims of



inquiry have themselves an ambiguous and uncertain character.

Latour takes an anthropological slant on things. Physicists recently discovering his "relativistic account" are not the only ones he puzzles. Many distinguished British critics of science find him a far-from-easy read, and they have fired more accurate salvos in his direction than some of the interdisciplinary ballistic missiles I have seen launched from the science side.

His text focuses on a little book, *Relativity: The Special and General Theory*, written by Einstein in 1916 for the general reader. If I had been Latour's referee, I would have insisted (among other things) that he change his title to something like "What Can We Learn from a Popular Text by Einstein about the Study of Society?" I imagine Latour would have refused to make the change, because his title is much more fun.

Which brings us to the matter of fun. Bruno Latour is clearly a man who enjoys having fun. His article is always playful: "Although [Einstein] takes the reader, at the beginning, to Trafalgar Square, he is not interested in sending him to tail Hercule Poirot on to the train at Paddington. . . ." This sets the tone and establishes the almost jocular but not necessarily inaccurate idiom in which somewhat more technical matters are put:

"Playing the idiot, the author-in-the-text redefines what an event is. . . ."

"The only thing required of them is to watch the hands of their clocks closely and obstinately. . . ."

"[Einstein's] panic at the idea that observers sent away might betray, might retain privileges. . . ."

"[The] hard and lowly work of build-

ing a rigid scaffolding to frame an event. . . ."

What is a funny article doing in *Social Studies of Science*? I have tried from time to time to publish funny articles in *Physical Review Letters*. Only minuscule bits of the fun have escaped the editorial mangle. But different fields have different conventions. *Social Studies of Science* allows authors to be entertaining. When physicist critics of Latour fail to notice when he is being funny, they put at risk our proud reputation for having a finely tuned sense of humor.

Now on to the hard and lowly work of suggesting what Latour may actually be writing about. I defer here to my uniquely qualified daughter Liz, who has been in cultural studies for some years, is now in anthropology, and once taught a class at Harvard on relativity for nonscientists in which Einstein's essay served as a text. I am taking the outrageous paternal liberty of displaying below my edited version of her instant reading of Latour:

The big point from the social science perspective is the role of the observer—the guy who is needed to know that the man on the tracks and the man on the train don't say the same thing, and who is in a position to compare their readings without saying that one or the other is wrong. This is analogous to the social scientist looking at society. What's interesting for the social scientists is that it doesn't really matter how this observer is positioned, just that he is able to observe in this way—so there is no "privileged" position of observation, but it is necessary to be able to observe a certain amount more than just the guy on the train or the guy on the tracks.

If you add that there are some absolute statements that can be derived from these observations, you get a more complex statement of "relativism"—whereby you understand that although things appear differently from different perspectives, certain things do remain

N. DAVID MERMIN is a professor of physics at Cornell University. He has had strong disagreements with sociologists of science in and outside of these pages.

the same, and the task of social science is to find out what those things are. This is what cultural relativism in the old-fashioned anthropological sense meant—that there are certain codes of rationality and internal consistency that hold in all cultures, regardless of how odd or irrational their views might appear from the outside.

It's really a very formalist argument as I read it. Latour wants to suggest translating the formal properties of Einstein's argument into social science, in order to see both what social scientists can learn about "society" and how they use the term, and what hard scientists can learn about their own assumptions. He is trying to explain relativity only insofar as he wants to come up with a formal ("semiotic") reading of it that can be transferred to society. He's looking for a model for understanding social reality that will help social scientists deal with their debates—which have to do with the position and significance of the observer, with the relation between "content" of a social activity and "context" (to use his terms), and with the kinds of conclusions and rules that can be extracted through observation.

Since the questions in the field are often rather fuzzy, the argument is a bit vague and suggestive. However, I read it as a corrective aimed much more at sociologists than at scientists—not as an attempt to explain relativity to anyone, but as an attempt to pull out of the explanation of relativity offered in Einstein's essay certain useful ideas.

To this I add only that although Latour is not primarily interested in relativity as physics, there are passages in which he gets this aspect not only right, but eloquently so:

Instead of considering instruments (rulers and clocks) as ways of representing abstract notions like space and time, Einstein takes the instruments to be what *generates* space and time. Instead of space and time being represented through the mediation of the instruments, it is space and time which have always been representing the humble and hidden practice of superimposing notches, hands and coordinates. It must be said that the character por-

trayed by Einstein does a very similar job to that of an anthropologist of science who refuses to understand what "space" and "time" mean, and who focuses instead on work, practices, and instruments. Like any constructivist in sociology of science, Einstein's first move in this text is to bring the abstractions back to the inscriptions and to the hard work of producing them.

Latour's first two sentences provide an exemplary encapsulation of the essential core of relativity. He then draws a parallel between Einstein's deconstruction of the notions of space and time, and the approach of social scientists to the content of science. It was indeed a convention among scientists, buried so deep in their culture to be unrecognizable as such, that space and time were real objective entities measured by clocks and meter sticks. Einstein's profound insight was that, on the contrary, space and time are abstractions, serving to coordinate the results of such measurements. This is what sociologists of scientific knowledge have been saying for over two decades about all kinds of entities that scientists view as objectively real. We may not like it when the analogous thing is said about "the electron," but looking at such claims from this perspective transforms them from absurdities into serious suggestions, deserving not Olympian mockery, but reasoned debate.

Did I cheat by picking out the one coherent paragraph in the essay? I don't think so. Read it yourself. There are, to be sure, many obscure statements that appear to be about the physics of relativity, which may well be misconstruals of elementary technical points. But they are peripheral to the central issues, and some current diatribes are superficial in their identifications of "error." Latour, for example, appears to use "frame of reference" indifferently to whether he has in mind the position or state of motion of an observer. But this is irrelevant to his analogy between the Einstein character and anthropologists, and as Liz's comments reveal, the word "position" is used in cultural studies to mean conceptual location or ideological stance.

Latour has also been taken to task for maintaining that you need three frames of reference, rather than merely two, to make sense of the whole business. If you publicly condemn a fellow scholar for error, however, you ought to make sure you've got it right yourself. The fact, not widely appreciated, is that if you want to extract the

Lorentz transformations without using Einstein's second postulate, then although you cannot do it using only two frames of reference, you can if you introduce a third.⁴ Putting it formally, you must not only require that the inverse of a Lorentz transformation is a Lorentz transformation, for which the familiar two frames suffice, but also that they form a group: the product of two is a third. This requires a less familiar consideration of three frames to establish. While Latour clearly has something quite different in mind—two cultures and an anthropologist—if you're going to read him as getting the physics wrong, you should take care to get it right yourself.

I recommend two principles to guide what we scientists say and write in our exchanges with science critics. First, assume, at least as a preliminary working hypothesis, that you are reading intelligent people trying to make serious points, writing within a literary tradition that is as technical and unfamiliar to you as the professional idiom of your science may be to them. Second, technical criticisms should be based on reasoned argument. *Ex cathedra* sneering at selected sound bites demeans scholarly debate and is unlikely to persuade the sneered-at of one's serious intent. Try to think imaginatively about the rather subtle constellation of issues that may becloud superficially obvious "refutations" of "error."

Some of the attacks on science critics suggest a Germanic philologist scrutinizing Mark Twain's hilarious essay "The Awful German Language," where appear the immortal words, "he would rather decline two drinks than one German adjective."

"Ah," says the scholar, "here Mr. Twain, by the ludicrous error of using 'decline' in its colloquial sense of 'turn down,' reveals his abysmal ignorance of elementary grammatical theory." Some of the shots the science side has been firing in the science wars are hardly more accurate. The science critics get many things wrong, but we have to take more care explaining why, or we will only lend further credence to some of their worst misreadings of what we are up to.

References

1. B. Latour, *Social Studies of Science* **18**, 3 (1988).
2. A. Sokal, *Social Text* **46/47**, 217 (1996).
3. S. Weinberg, *New York Review of Books*, 8 August 1996, page 11.
4. See, for example, Y. P. Terletskii, *Paradoxes in the Theory of Relativity*, Plenum, New York (1968), sec. 7. ■