

# Postmodernism and its problems with science\*

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# 1 Introduction

The readers of *Lingua Franca*, an American journal reporting and discussing events of the academic life, found a surprising article by NYU Physics Professor Alan Sokal that started as follows:

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 an (admittedly uncontrolled) experiment: Would the leading North American journal of cultural studies — whose editorial collective includes such luminaries as Fredric Jameson and Andrew Ross — publish an article consisting of utter 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: Towards a Transformative Hermeneutics of Quantum Gravity" (!), in the spring 1996 issue of *Social Text*. It appears in a special number of the magazine devoted to "The Science Wars"<sup>1</sup>.

What's going on here? Could the editors *really* not have realized that my article was a parody? (Sokal, 1996b)

I shall quote below some parts of the paper, so that the reader will be able to answer by himself or herself this last question. Here is a typical example:

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*<sup>2</sup>, Jean Hyppolite raised an incisive question about Jacques Derrida's theory of structure and sign in scientific discourse:

When I take, for example, the structure of certain algebraic constructions [ensembles], where is the center? Is the center the knowledge of general rules which, after a fashion, allow us to understand the interplay of the elements? Or is the center certain elements which enjoy a particular privilege within the ensemble? ...With Einstein, for example, we see the end of a kind of privilege of empiric evidence. And in that connection we see a constant appear, a constant which is a combination of space-time, which does not belong to any of the experimenters who live the experience, but which, in a

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<sup>1</sup>This was intended to be a reply to critiques, by scientists, mostly by Gross and Levitt (1994), of postmodernism and cultural relativism in academia. See also Holton (1993), and Gross, Levitt and Lewis (1996).

<sup>2</sup>The Languages of Criticism and the Sciences of Man, see Derrida (1970) in the bibliography.

way, dominates the whole construct; and this notion of the constant – is this the center?

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 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. (Sokal, 1996a)

As pointed out by Steven Weinberg in his review of Sokal’s parody, “this is absurd — the meaning of a mathematically defined quantity like  $\pi$  cannot be affected by discoveries in physics, and in any case both  $\pi$  and  $G$  continue to appear as universal constants in the equations of general relativity.” (Weinberg, 1996a) The rest of the quote puts together good-sounding words like “de-centered”, “disconnected from any epistemic link”, but is basically meaningless. There are other glaring absurdities: how could general relativity possibly have a “profound impact” on literary criticism?

Why did they publish it? Here is, I think, the main “trick” used by Sokal: the “argument” given above is a comment on some (rather meaningless) quote from Derrida. And the entire paper is essentially a “cement” glueing together, without any logic, quotes from several famous French and American intellectuals<sup>3</sup> who make quite ignorant statements about physics or mathematics, with, however, great self-confidence. Independently of the parody, Sokal assembled several lengthier quotes from famous intellectuals who “abuse” physics and mathematics, which he started to circulate among his scientific colleagues. Most scientists found the quotes either amusing or shocking; however, non-scientist friends suggested that one explain what exactly is wrong with the quotes. Indeed, these quotes are sufficiently well made so that non-scientists may not notice their fraudulent character. The authors must have assumed that no scientist would ever read their prose, so that nobody would say openly that the emperor has no clothes (this shows indirectly how much contempt they have for

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<sup>3</sup>For the French: Deleuze, Derrida, Guattari, Irigaray, Lacan, Latour, Lyotard, Serres and Virilio.

their readers). From then on, we have collaborated to write a book<sup>4</sup> which would say just that. The purpose of this article is to give and discuss some examples of this “postmodern”<sup>5</sup> academic discourse. I shall also quote some other people who praise the works that we criticize. Indeed, it seems that the problem is not only that a few individuals go out of their way when they talk about science, but that their cultural environment (commentators and journalists) tolerates and even encourages this sloppy way of thinking. This is particularly true in the French (Parisian) subculture, but obviously, given the success of these authors in the United States, Finland and elsewhere, the problem is much broader.

We distinguish, roughly, two types of abuses:

1. One “imports” concepts from the exact sciences into psychoanalysis, semiotics, sociology, without giving any conceptual or empirical justification: this corresponds to the (post-)structuralist period, and will be illustrated by texts of Lacan and Kristeva.

2. Display of false erudition, name-dropping, play on words: this is more the post-modern attitude: all attempts to “do science” have been given up. I shall illustrate it through quotes of Virilio, Deleuze-Guattari and Baudrillard.

Another target of Sokal’s satire is the epistemic relativism which is rather prevalent nowadays among educated people: science is increasingly considered as a “narrative” or a “myth” among others, with no privileged claim to objectivity. Much sloppy thinking is also done along those lines, and I shall illustrate this by discussing some statements of Latour and of Irigaray.

## 2 Pseudoscience

### 2.1 Lacan

Lacan is one of the most famous and controversial psychoanalysts. I shall not discuss his work on psychoanalysis; but one finds many mathematical notions in his writings. Here are some examples: at a conference held in Baltimore (USA) in 1966, Lacan said:

This diagram [the Möbius strip]<sup>6</sup> can be considered the basis of a sort of essential inscription at the origin, in the knot which constitutes the subject. This goes much further than you may think at first, because you can search for the sort of surface able to receive such inscriptions. You can perhaps see

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<sup>4</sup>Whose provisional title is: *Les impostures scientifiques des philosophes (post)-modernes* (The scientific frauds of (post)-modern philosophers). An English translation will also appear.

<sup>5</sup>The word is not important to us, and we include some older texts, from Lacan and Kristeva, which might be classified as structuralist or post-structuralist.

<sup>6</sup>A Möbius strip is obtained by turning a strip of paper by 180 degrees, and glueing the two opposite sides. The resulting object has only one face.

that the sphere, that old symbol for totality, is unsuitable. A torus, a Klein bottle, a cross-cut surface<sup>7</sup>, are able to receive such a cut. And this diversity is very important as it explains many things about the structure of mental disease. If one can symbolize the subject by this fundamental cut, in the same way one can show that a cut on a torus corresponds to the neurotic subject, and on a cross-cut surface to another sort of mental disease. [Lacan (1970), pp. 192–193]

Lacan does not give any reason to think that the rather abstract geometrical notions which he mentions explain “many things about the structure of mental disease.” Of course, one might think that this is just an analogy. Well, even so: what purpose would these analogies fill? But here is a dialogue following Lacan’s lecture:

HARRY WOOLF: May I ask if this fundamental arithmetic and this topology are not in themselves a myth or merely at best an analogy for an explanation of the life of the mind?

JACQUES LACAN: Analogy to what? “S” designates something which can be written exactly as this S. And I have said that the “S” which designates the subject is instrument, matter, to symbolize a loss. A loss that you experience as a subject (and myself also). In other words, this gap between one thing which has marked meanings and this other thing which is my actual discourse that I try to put in the place where you are, you as not another subject but as people that are able to understand me. Where is the analogon? Either this loss exists or it doesn’t exist. If it exists it is only possible to designate the loss by a system of symbols. In any case, the loss does not exist before this symbolization indicates its place. It is not an analogy. It is really in some part of the realities, this sort of torus. This torus really exists and it is exactly the structure of the neurotic. It is not an analogon; it is not even an abstraction, because an abstraction is some sort of diminution of reality, and I think it is reality itself. [Lacan (1970), pp. 195–196]

So, when he is asked explicitly whether it is an analogy, Lacan denies it. Of course, to say that the torus is “reality itself”, makes no sense, even if one were speaking about physics, where mathematics can be applied in a precise way.

Lacan used also notions of (point set) topology:

In this space of *jouissance*<sup>8</sup>, to take something bounded, closed, is a location, and to speak about it is a topology. . . . What does the most recent development of topology allow us to put forward concerning the location of the Other, of this sex as Other, as absolute Other? I will put forward the notion of compactness. Nothing is more compact than a fracture; clearly, the intersection of everything that closes being admitted as existing on an infinite number of sets, it follows

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<sup>7</sup>A Klein bottle is somewhat like a Möbius strip, but without boundary; it can be embedded in a space of higher dimension (at least four).

<sup>8</sup>enjoyment; the word appears in French in the translations.

that the intersection implies this infinite number. **It is the very definition of compactness.**<sup>9</sup>[Lacan (1975)]

Here Lacan uses several words that enter into the mathematical definition of compactness (intersection, closed etc. . . ) without paying any attention to their *meaning*. His “definition” makes no sense whatsoever. And, of course, no argument is given that could conceivably justify a relationship between compactness and “jouissance”.

In other texts, Lacan “develops” the role of imaginary numbers:

Thus, by calculating that signification according to the algebraic method used here, namely

$$\frac{S \text{ (signifier)}}{s \text{ (signified)}} = s \text{ (the statement),}$$

$$\text{with } S = (-1), \text{ produces: } s = \sqrt{-1}$$

. . . Thus the erectile organ comes to symbolize the place of *jouissance*, not in itself, or even in the form of an image, but as a part lacking in the desired image: that is why it is equivalent to the  $\sqrt{-1}$  of the signification produced above, of the *jouissance* that it restores by the coefficient of its statement to the function of the lack of signifier  $-1$ . [Lacan (1971); seminar held in 1960.]

Clearly, the square root of  $-1$  looks deep and mysterious to people who have not studied mathematics. But the relation between  $\sqrt{-1}$  and *jouissance* is even more mysterious, at least for us.

In the works of Lacan, one finds many other abuses, e.g. on mathematical logic, physics and knot theory. It seems reasonable to assume that, far from providing honest and useful analogies, these references allowed Lacan to impress his non-mathematical audience with a superficial erudition and to put a varnish of scientificity on his discourse.

## 2.2 Kristeva

Julia Kristeva wrote about many different subjects. The texts we quote are quite old, and we emphasize that she gave up this approach a long time ago. However, they illustrate perfectly the attitude which consists in trying or claiming to do science while merely introducing scientific words and formulas into one’s discourse.

In the book that we quote, *Semeiotike*, Kristeva tries to construct a “logic” of poetic language. She appeals to various notions of formal logic and of set theory. Here is an example:

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<sup>9</sup>Here and below, I add emphasis in boldface letters.

Having admitted that poetic language is a formal system whose theorization belongs to *set theory*, we may observe at the *same time* that the functioning of poetic meaning obeys to the principles designated by the axiom of choice. The latter specifies that there exists an single-valued correspondence, represented by a class, which associates to each non-empty set of the theory (of the system) one of its elements.

$$(\exists A) \{Un(A) \cdot (x)[\sim Em(x) \cdot \supset (\exists y)[y \in x \cdot \langle yx \rangle \in A]]\}$$

[ $Un(A)$  – “ $A$  is single-valued”;  $Em(x)$  – “the class  $x$  is empty”.]

Said otherwise, one may choose simultaneously an element in each of the non-empty sets which we consider. So stated, the axiom is applicable in our universe  $\mathcal{E}$  of the  $pl^{10}$ . It specifies how every sequence contains the message of the book. ... [Kristeva (1969).]

To put it mildly, it is bizarre to introduce the axiom of choice, which is used in mathematics to establish the existence of infinite sets, into a theory of poetic language. And of course, the relevance of this axiom is merely asserted, not argued. Reading further, one starts to wonder whether Kristeva knows the mathematics that she invokes:

The notion of constructibility implied by the axiom of choice, associated to what we have just postulated for the poetic language, explains the impossibility to establish a contradiction in the space of poetic language. This observation is close to Gödel’s observation concerning **the impossibility of proving the contradiction of a system by means formalized within the system**. [Kristeva (1969)]

First of all, the axiom of choice allows to prove the existence of sets that one cannot “construct”. But, what is more striking is that Kristeva does not seem to understand “Gödel’s observation”: in fact Gödel showed exactly the contrary, namely the impossibility of proving the *absence* of contradiction of a system by means formalized within the system. It is trivial to construct a contradictory system of axioms and to prove that it is contradictory.

*Semeiotike* was Kristeva’s first book, and made her famous. It is interesting to see how it was acclaimed:

Julia Kristeva changes the order of things: she always destroys the latest preconception, the one we thought we could be comforted by, the one of which we could be proud: what she displaces is the *already said*, that is to say, the insistence of the signified; what she subverts is the authority of monologic science and of filiation. [Roland Barthes (1970).]

In another work, Kristeva “applies” technical concepts of mathematical analysis:

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<sup>10</sup>poetic language

In the syntactic operations following the mirror stage, the subject is already sure of his uniqueness: his flight towards the “point  $\infty$ ” in the signifying is stopped. One thinks for example of a set  $C_0$  on the usual space  $\mathbf{R}^3$  where for each continuous function  $F$  in  $\mathbf{R}^3$  and each integer  $n > 0$ , the set of points  $X$  where  $F(X)$  exceeds  $n$  is *bounded*, the functions of  $C_0$  going to zero when the variable  $X$  tends towards the “other scene”. In this topos, the subject placed in  $C_0$  does not reach this “center exterior to language” about which Lacan speaks and where the subject loses himself as subject, situation that would translate the relational group that topology calls a *ring*. [Kristeva (1977)]

The definition that she gives of the space  $C_0(\mathbf{R}^3)$  of continuous function vanishing at infinity is not correct<sup>11</sup>, but the main problem is: what does this have to do with psychology? How could a subject be “placed in  $C_0$ ”?

Despite such obvious abuses and name-dropping, an American commentator writes:

What is most striking about Kristeva’s work . . . is the **competence** with which it is presented, the intense singlemindedness with which it is pursued, and finally, its **intricate rigour**. No resources are spared: existing theories of logic are invoked and, at one point, quantum mechanics . . . [John Lechte (1990).]

### 3 Postmodernism

Here, I shall review various authors who use scientific terminology without any concern for its meaning but who, unlike the previous ones, do not try, it seems, to hold a coherent discourse on anything.

#### 3.1 Virilio

Virilio used to be director of a school of architecture. He became relatively well-known as a philosopher of “dromocracy”: he frequently refers to velocity and related notions. But one sincerely wonders how much he understand his own words. Let us start with a typical example, which, however, is not the worst:

How can we account for this situation? It is necessary to introduce the specter of a new kind of interval, the *interval of light* (or zero-sign). In fact, in relativity the revolution of this third “interval” is in itself a sort of imperceptible cultural revolution. If the interval of *Time* (a positive sign) and the interval of *Space* (a negative sign) have given impetus to the geography and the history of the world through geometrical measurement of agrarian space (allotment into parcels of land) and urban areas (cadastral surveys), the organization of the calendar and measurement of time (clocks and watches) have also presided over a vast political and chronological regulation of human societies. The sudden emergence of an interval of the third type thus signals that we

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<sup>11</sup>She should have written: “ $|F(X)|$  exceeds  $1/n$ ”.

are undergoing an abrupt qualitative shift, a profound mutation of the relations that as humans we are keeping with our living environment. *Time* (duration) and *Space* (extension) are now inconceivable without *Light* (absolute speed), the cosmological constant of the speed of light. [Virilio (1993)]

Here Virilio refers to the space-time intervals used in the Special Theory of Relativity, which are neither intervals in space nor intervals in time, without explaining what they conceivably have to do with “the geography and the history of the world”. But the rest of the text is more surprising:

Since the beginning of this century, the absolute limit of the speed of light has, as it were, *enlightened* space and time together. We are therefore no longer dealing so much with light that illuminates things (the object, the subject, and travel) as with the constant character of its absolute speed, which conditions the phenomenal apperception of the world’s duration and extension. We do well to heed the physicist who speaks of the logic of particles: “A representation is defined by a sum of observables that are flickering back and forth.” [*A representation is defined by a complete set of commuting observables.*] The macroscopic logic of the techniques of *real time* could not better describe the macroscopic logic of this sudden “teletopical commutation” that perfects what until now had been the fundamentally “topical” quality of the old human city. [Virilio (1993), pp. 5–6]

Note first that I have inserted in italics the correct translation from the French of Virilio’s text<sup>12</sup>. This is a standard technical sentence copied from a quantum-mechanics textbook (he refers to a book by G. Cohen Tannoudji and M. Spiro, *La matière espace-temps*, Paris, Fayard, 1986). But this sentence is not easy to understand, unless one studies mathematics and physics for a while, and it has nothing to do with “real time”, “macroscopic logic” (it is about microphysics) and even less with “the old human city”. Obviously here, Virilio knows that he does not know what he is talking about. Yet he is taken seriously by commentators (see below), editors and readers.

Other hilarious quotes include:

... it now seems appropriate to reconsider the notions of acceleration and deceleration (what physicists call positive and negative speeds). [Virilio (1993)]

Confusing acceleration and velocity is not bad, especially for an expert on “dromocracy”! Finally:

...but instead of elemental particles (**electrons** and photons) that are transmitted at the speed of light. [Virilio (1989)]

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<sup>12</sup>Another amusing characteristic of this field is, as we shall illustrate again below the extreme sloppyness of the translations. But if the meaning of the sentences does not matter, who cares about the translation?

But electrons never go at the speed of light! If they did, it would violate the theory of relativity that Virilio likes so much.

Here is an evaluation of Virilio’s work in the main intellectual French newspaper:

With an **astonishing erudition**, which combines space-distances and time-distances, this researcher opens up an important field of philosophical questions that he calls “dromocracy” (from the Greek *dromos*: speed). [Le Monde (1984)]

And in a review of a collective book where the quote on the “flickering observables” appeared, one reads:

*Re-thinking Technologies* constitutes a significant contribution to the analysis of techno-cultures today. It will definitely contradict those who still think that postmodernity is merely a fashionable term or an empty fad. The nagging opinion that cultural and critical theory is “too abstract,” hopelessly removed from reality, devoid of ethical values and above all incompatible with **erudition, systematic thinking, intellectual rigor** and creative criticism, will simply be pulverized. . . . This collection assembles some of the most recent and fresh work by leading culture critics and theoreticians of the arts and sciences, such as Paul Virilio, Félix Guattari, . . . [Gabon (1994), pp. 119–120]

Frankly, more striking arguments will be needed in order to “pulverize” our nagging opinions.

### 3.2 Deleuze and Guattari

Deleuze, who died last year, is one of the best known contemporary French philosophers. He wrote several books with his friend, the psychoanalyst Guattari. Here I will simply quote from Sokal’s article; in an ironical footnote, he writes:

A very recent but important contribution to the philosophy of mathematics can be found in the work of Deleuze and Guattari (1994, chap. 5). Here they introduce the philosophically fruitful notion of a “functive” [Fr. *fonctif*], which is neither a function [Fr. *fonction*] nor a functional [Fr. *fonctionnelle*]<sup>13</sup> but rather a more basic conceptual entity:

The object of science is not concepts but rather functions that are presented as propositions in discursive systems. The elements of functions are called *functives*. [p. 117]<sup>14</sup>

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<sup>13</sup>Note the pedantic use of French: the words are almost the same as in English, yet the original words are inserted, as if the concepts were so subtle that it mattered. Of course, as the quotes below show, the notion of functive makes little sense.

<sup>14</sup>Functions and propositions are quite different objects. A function has arguments and values, but I do not know what they mean by an “element” of a function.

This apparently simple idea has surprisingly subtle and far-reaching consequences; its elucidation requires a detour into chaos theory:

... the first difference between science and philosophy is their respective attitudes toward chaos. Chaos is defined not so much by its disorder as by the infinite speed with which every form taking shape in it vanishes. It is a void that is not a nothingness but a *virtual*, containing all possible particles and drawing out all possible forms, which spring up only to disappear immediately, without consistency or reference, without consequence. Chaos is an infinite speed of birth and disappearance. [pp. 117–118]<sup>15</sup>

But science, unlike philosophy, cannot cope with infinite speeds:

... it is by slowing down that matter, as well as the scientific thought able to penetrate it [*sic*] with propositions, is actualized. A function is a Slow-motion. Of course, science constantly advances accelerations, not only in catalysis but in particle accelerators and expansions that move galaxies apart. However, the primordial slowing down is not for these phenomena a zero-instant with which they break but rather a condition coextensive with their whole development. To slow down is to set a limit in chaos to which all speeds are subject, so that they form a variable determined as abscissa, at the same time as the limit forms a universal constant that cannot be gone beyond (for example, a maximum degree of contraction). *The first functionives are therefore the limit and the variable*, and reference is a relationship between values of the variable or, more profoundly, the relationship of the variable, as abscissa of speeds, with the limit. [pp. 118–119, emphasis mine]

A rather intricate further analysis (too lengthy to quote here) leads to a conclusion of profound methodological importance for those sciences based on mathematical modelling:

The respective independence of variables appears in mathematics when one of them is at a higher power than the first. That is why Hegel shows that variability in the function is not confined to values that can be changed ( $\frac{2}{3}$  and  $\frac{4}{6}$ ) or are left undetermined ( $a = 2b$ ) but requires one of the variables to be at a higher power ( $y^2/x = P$ ).<sup>16</sup> [p. 122]

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<sup>15</sup>In their book, Deleuze and Guattari quote Prigogine and Stengers (1988). These authors discuss an analogy between the origin of the universe and a phase transition. Neither of these two issues is directly connected to the theory of chaos, as usually understood in the modern theory of dynamical systems.

<sup>16</sup>This is either difficult to understand or difficult to believe: it seems to say that functions like  $a = 2b$ , or  $y = 2x$  are not functions. Indeed, after that, they explain that only functions where one of the variables is at a higher power can be differentiated! Of course, the reference to Hegel itself is amusing. Throughout his “Greater Logic”, one finds quite nonsensical remarks about limits, derivatives, and mathematics in general (see Section 6 below for further remarks on Hegel). But, it is one thing to exhibit one’s ignorance, as Hegel did, at the beginning of the 19<sup>th</sup> century, when

(Note that the English translation inadvertently writes  $y^{2/x} = P$ , an amusing error that thoroughly mangles the logic of the argument.)<sup>17</sup> Surprisingly for a technical philosophical work, this book (*Qu'est-ce que la philosophie?*) was a best-seller in France in 1991.

On the back cover of the English edition of this book, one reads:

A very great book . . . One of the rare ones which compel us to see things differently. . . it will soon become a classic. [Eribon, *Le Nouvel Observateur*]

And, in a comment on two previous books by Deleuze alone, where similar confusions about mathematics can be found, Michel Foucault wrote:

I must speak about two books that are great among the great ones: *Différence et répétition* and *Logique du sens* . . . But, maybe, some day, the century will be Deleuzian. [Foucault (1970)]

### 3.3 Baudrillard, Guattari.

The sociologist Jean Baudrillard uses metaphors about chaos or non-Euclidean geometries in his discussions of history or society. But these metaphors are rather arbitrary, and do not at all clarify what he means, as the following example shows:

One must, perhaps, consider history itself as a chaotic formation where acceleration puts an end to linearity, and where the turbulence created by acceleration definitively separates history from its end, as it separates effects from their causes. The destination, even if it is the Last Judgment, we shall not reach it, we are henceforth separated from it by a hyperspace with variable refraction. [Baudrillard (1992)]

And, for another example, quoted by Gross and Levitt (1994):

There is no topology more beautiful than Möbius' to designate the contiguity of the close and the distant, of interior and exterior, of object and subject in the same spiral where the screen of our computers and the mental screen of our brain become intertwined with each other as well. [Baudrillard (1987)]

As Gross and Levitt say: "This is as pompous as it is meaningless; but it is well contrived to impress readers whose knowledge of mathematics is superficial or nonexistent." (Gross and Levitt, 1994).

Finally, some works of Guattari alone combine an almost random sequence of scientific and philosophical words:

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mathematical analysis had not yet been put on a firm foundation, and quite another to repeat the same confusions 170 years later, as Deleuze and Guattari do.

<sup>17</sup>This is one of my favorite jokes: as in many of the quotes, the translator does not seem to worry very much about accuracy. But since there is, in Sokal's view, no logic of the argument, the error here does not matter in the least.

We can clearly see that there is no bi-univocal correspondence between linear signifying links or archi-writing, depending on the author, and this multi-referential, multidimensional machinic catalysis. The symmetry of scale, the transversality, the pathic non-discursive character of their expansion: all these dimensions remove us from the logic of the excluded middle and reinforce our dismissal of the ontological binarism we criticised previously. A machinic assemblage, through its diverse components, extracts its consistency by crossing ontological thresholds, non-linear thresholds of irreversibility, ontological and phylogenetic thresholds, creative thresholds of heterogenesis and autopoiesis. The notion of scale needs to be expanded to consider fractal symmetries in ontological terms. [Guattari (1992)]

and it goes on and on like that, for pages after pages.

## 4 Objections

Let me answer briefly some objections that are sometimes raised against our critique.

### 4.1 It is irrelevant, marginal.

Of course, here and in Sokal's article, the quotes are rather brief. But in our book, we collect longer quotes, which show that these are not just isolated mistakes. Moreover, we quote secondary sources which amplify and analyze e.g. Lacan's mathematics (see, e.g. Granon-Lafont (1987,1990), Leupin (1991), Loparic (1991), Nasio (1987,1992), Vapereau (1985)). It is true that these people are not mainly concerned with mathematics and physics. But we believe that our criticism should be an "eye opener". For example, Bertrand Russell says that he was raised in a Hegelian tradition. When he read what Hegel says about differential and integral calculus, and which he thought was "muddle-headed nonsense", this helped him to become more critical of Hegel (Bertrand Russell, 1951). If the authors that we quote are really serious and deep thinkers, how come that they are so sloppy when they write about the sciences? Moreover, what they say here can be compared with precise statements and rigorously evaluated, which is not always the case with typical statements of Lacan, Deleuze or Hegel.

### 4.2 You miss the point.

The argument would be that human affairs are much more complicated than what natural scientists are used to deal with. And our authors reveal profound truths which are not easy to express in simple words. When they use scientific terminology, they give to the words another meaning than their usual one, and we fail to understand them.

Our answer is that this is highly unlikely. How could it help our authors to communicate profound truths to their (usual) readers if they use a scientific terminology

that most readers do not understand (and that, very often, as we saw, the authors themselves do not understand either)?

As for the profound truths, we fail to perceive them. This is then supposed to be due to our intellectual limitations. After all, the natural sciences are expressed in a highly technical language; so why should philosophy or the human sciences be accessible to lay-readers like us? Our answer is that for the natural sciences, most results can be roughly explained to lay-people in ways that one can more or less understand; for example, although we have no training in biology, we can follow, at some level, developments in that field by reading good popular books. Moreover, if we want to learn more, there is a well-defined path to follow. But we have never seen the analogue for the ununderstandable statements in, say, Lacan or Deleuze. Besides, many statements that are understandable are either confused or banal. So, we feel free to remain skeptical about the existence of these deep thoughts.

Kant already expressed the same idea, in a different context:

One doesn't know whether to laugh harder at the charlatan who spreads all this fog... or at the audience which naively imagines the reason it cannot clearly recognize and grasp [his] masterpiece of insight is that new masses of truth are being hurled at it. [Kant, Critique of Judgment, Section 47]

### **4.3 These are only metaphors or analogies.**

This is certainly true for some of the texts (interestingly, however, when Lacan is asked about whether the torus is an analogy, he denies it). But what is the point of making such analogies? Analogies may certainly be fruitful between two different domains of knowledge. But they have to serve some purpose, e.g. transfer information: one explains a new concept by analogy with a older and more familiar one. But here, the analogies are made with concepts (in physics or mathematics) which are neither familiar to the (non-scientific) readers nor to the writers. And, since the analogies are made between vague theories (e.g. Lacanian psychoanalysis) and well-established ones, we can only suspect that their real role is to legitimize the weaker theories.

### **4.4 It is all poetry.**

Obviously, we have no objection to the use of a scientific terminology by artists, even if the meaning of the words is slightly distorted. But here, we deal with people who obviously want to make a theoretical work. Moreover, these texts lead to thousands of commentaries, seminars, doctoral theses etc... They cannot be excused by appealing to some poetic freedom. Besides, for a native French speaker, the "poetry" sounds very bad indeed.

## 5 Epistemic Relativism

### 5.1 Sokal's Hoax

Another target of Sokal's hoax is cultural and epistemic relativism. For large segments of the American intelligentsia, science has become a "narrative" among many others that does not provide us with a more objective knowledge of the world than traditional belief systems<sup>18</sup>. Sokal started his article by stating an extreme version of this sort of ideas, in order to see whether the editors would have any objections (they didn't):

There are many natural scientists, and especially physicists, who continue to reject the notion that the disciplines concerned with social and cultural criticism can have anything to contribute, except perhaps peripherally, to their research. Still less are they receptive to the idea that the very foundations of their worldview must be revised or rebuilt in the light of such criticism. Rather, they cling to the dogma imposed by the long post-Enlightenment hegemony over the Western intellectual outlook, which can be summarized briefly as follows: 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.

But deep conceptual shifts within twentieth-century science have undermined this Cartesian-Newtonian metaphysics<sup>19</sup>; revisionist studies in the history and philosophy of science have cast further doubt on its credibility<sup>20</sup>; and, most recently, feminist and poststructuralist critiques have demystified the substantive content of mainstream Western scientific practice, revealing the ideology of domination concealed behind the façade of "objectivity".<sup>21</sup> It has thus become increasingly apparent that physical "reality", no less than social "reality", is at bottom a social and linguistic construct; that scientific "knowledge", far from being objective, reflects and encodes the dominant ideologies and power relations of the culture that produced it; that the truth claims of science are inherently theory-laden and self-referential; and consequently, that the discourse of the scientific community, for all its undeniable value, cannot assert a privileged epistemological status with respect to counter-hegemonic narratives emanating from dissident or marginalized communities. [Sokal (1996a)]

These statements would be rather long to discuss in detail. Let me simply say that we both reject entirely the idea that "physical 'reality', no less than social 'reality', is at bottom a social and linguistic construct". Reality existed long before us and will

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<sup>18</sup>For further discussion, see Gross and Levitt (1994).

<sup>19</sup>Heisenberg (1958), Bohr (1963).

<sup>20</sup>Kuhn (1970), Feyerabend (1975), Latour (1987), Aronowitz (1988), Bloor (1991).

<sup>21</sup>Merchant (1980), Keller (1985), Harding (1986,1991), Haraway (1989,1991), Best (1991).

still exist long after us. As the “true” Sokal says elsewhere, this way of talking, as well as the rest of the text above, confuses 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<sup>22</sup> (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

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<sup>22</sup>She wrote an essay entitled “Why ‘Physics’ Is a Bad Model for Physics” Harding (1991). According to Sokal, she has a “prestige in certain (but by no means all) feminist circles, and her essay is (unlike much of this genre) very clearly written.” (Sokal, 1996c)

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.) [Sokal (1996c)]

Anyway, I shall not pursue further the discussion of these philosophical issues. They require a careful examination. Unfortunately, a lot of sloppy thinking is also done around these problems. Let me give some examples.

## 5.2 Latour

Bruno Latour is one of the most famous contemporary sociologists of science. In his book “Science in Action”, he describes several “rules of method” which the sociologist of science should follow. Here is the third one:

Since the settlement of a controversy is the *cause* of **Nature’s representation**, not the consequence, we can **never** use the outcome — **Nature** — to explain how and why a controversy has been settled” (Latour (1987), Third Rule of Method, *Science in Action*, pp. 99 and 258).

Note, first, that Latour uses two completely different expressions, “Nature” and “Nature’s representation”, as if they were equivalent. Of course, he could claim that they are equivalent; he would then hold some rather radical form of idealism. That would at least be interesting, and debatable, but there is no indication that Latour espouses such views. So the sentence is profoundly ambiguous: we can understand it either by putting twice “Nature’s representation” or twice “Nature”. To see how they differ, consider, for example, the controversy, in the 19th century, between creationism and Darwinism. Under the first interpretation, the sentence is innocuous: obviously if a controversy is settled, e.g. in favour of Darwinism, our representation of nature changes. Under the second interpretation, the sentence is radical but obviously false: how can one reasonably explain the transition between belief in a literal reading of the Bible and the modern theory of evolution without **ever** invoking the fossil record and other aspects of “Nature”?

Latour presents himself often as a philosopher and this is one of his six rules of method. It is difficult to believe that this is just a very careless way to write. Rather, such ambiguous sentences offer a great advantage in debates. The radical interpretation can be used to attract the attention of inexperienced readers. And the innocuous one can be used as a position of retreat if the patent falsehood of the radical interpretation is exposed (“but I never said that ...”).

There are other problems in Latour's writings. Let me quote Sokal's remarks on Latour's analysis of relativity:

take a look at Bruno Latour's semiotic analysis of the theory of relativity, published in *Social Studies in Science*, in which "Einstein's text is read as a contribution to the sociology of delegation" (Latour, 1988). Why's that? Because Latour finds Einstein's popular books on relativity full of situations in which the author delegates one observer to stand on the platform and make certain measurements, and another observer to stand on the train and make certain measurements; and of course the results won't obey Lorentz transformations unless the two observers do what they are told! You think I exaggerate? Latour emphasizes Einstein's

obsession with transporting *information* through *transformation* without *deformation*; his passion for the precise superimposition of readings; his panic at the idea that observers sent away might betray, might retain privileges, and send reports that could not be used to expand our knowledge; his desire to discipline the delegated observers and to turn them into dependent pieces of apparatus that do nothing but watch the coincidence of hands and notches ... [Latour, 1988]

Furthermore, because Latour doesn't understand what the term "frame of reference" means in physics — he confuses it with "actor" in semiotics — he claims that relativity cannot deal with the transformation laws between two frames of reference, but needs at least *three*:

If there are only one, or even *two* frames of reference, no solution can be found ... Einstein's solution is to consider *three* actors: one in the train, one on the embankment and a third one, the author [enunciator] or one of his representants, who tries to superimpose the coded observations sent back by the two others. [Latour, 1988]

Finally, Latour somehow got the idea that relativity concerns the problems raised by the relative *location* (rather than the relative *motion*) of different observers. (Of course, even the word "observer" here is potentially misleading; it belongs to the pedagogy of relativity, not to the theory itself.) Here is Latour's summary of the meaning of relativity:

provided the two relativities [special and general] are accepted, more frames of reference with less privilege can be accessed, reduced, accumulated and combined, observers can be delegated to a few more places in the infinitely large (the cosmos) and the infinitely small (electrons), and the readings they send will be understandable. His [Einstein's] book could well be titled: "New Instructions for Bringing Back Long-Distance Scientific Travellers". [Latour, 1988]

Latour has thus produced 40 pages of comical misunderstandings of a theory that is nowadays routinely taught to intelligent college freshmen; and *Social Studies in Science* found it a worthy scholarly contribution.[Sokal, 1996d]

### 5.3 Irigaray

Irigaray is well-known as a psychoanalyst and feminist thinker. In the texts below, she tries to find “sexist” bias in the discourse of modern science. She starts by saying that:

Every knowledge is produced by subjects in a given historical context. Even if it tries to be objective, even if its techniques want to be means of controlling it, science makes some choices, some exclusions, due, among other things, to the sex of the scientists. [Irigaray (1987)]

This is a very plausible statement. The problem comes when we look at her examples:

...As for Einstein, the main question that he raises, in my opinion, is that he does not leave us any other chance than his God, given his interest for **accelerations without electromagnetic rebalancing** ...But, for us, what does this general relativity represent, the one that is the law outside of the nuclear power plants and that questions our bodily inertia, vital necessary condition? [Irigaray (1987)]

This is quite remarkable: “accelerations without electromagnetic rebalancing” is a pure invention of Irigaray. It simply does not make sense in physics and Einstein could not possibly have been interested in this nonexistent subject. Besides, general relativity has nothing to do with the nuclear power plants (she must confuse it with special relativity). How can one do a useful intellectual work on serious issues (like sexism in science) while being so ignorant?

Another work of Irigaray deals with sexism in fluid mechanics (Irigaray, 1985). An American feminist, Katherine Hayles, who is, in general, rather favorable to Irigaray summarizes her argument<sup>23</sup> as follows:

The privileging of solid over fluid mechanics, and indeed the inability of science to deal with turbulent flow at all, she attributes to the association of fluidity with femininity. Whereas men have sex organs that protrude and become rigid, women have openings that leak menstrual blood and vaginal fluids. Although men, too, flow on occasion — when semen is emitted, for example — this aspect of their sexuality is not emphasized. It is the rigidity of the male organ that counts, not its complicity in fluid flow. These idealizations are reinscribed in mathematics, which conceives of fluids as laminated planes and other modified

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<sup>23</sup>Hayles’ paper is much more clearly written than the one of Irigaray, so I quote the former.

solid forms. In the same way that women are erased within masculinist theories and language, existing only as not-men, so fluids have been erased from science, existing only as not-solids. From this perspective it is no wonder that science has not been able to arrive at a successful model for turbulence. The problem of turbulent flow cannot be solved because the conceptions of fluids (and of women) have been formulated so as necessarily to leave unarticulated remainders. [Hayles (1992), p. 17]

But Hayles remarks that:

From talking with several applied mathematicians and fluid mechanicians about Irigaray's claim, I can testify that they unanimously conclude she does not know the first thing about their disciplines. In their view, her argument is not to be taken seriously. There is evidence to support this view. In a footnote to the chapter's first page, Irigaray airily advises the reader "to consult some texts on solid and fluid mechanics" without bothering to mention any. The lack of mathematical detail in her argument forces one to wonder whether she has followed this advice herself. Nowhere does she mention a name or date that would enable one to connect her argument with a specific theory of fluids, much less to trace debates between opposing theories. [Hayles (1992), p. 17]

Then, Hayles goes on to give her own arguments about sexism in fluid mechanics, which are also based on a rather deep misunderstanding of that science. But I shall leave that aside. I shall go back to Irigaray, and see what she writes about mathematics:

The mathematical sciences, in the theory of wholes [*set theory*], concern themselves with closed and open spaces . . . They concern themselves very little with the question of the partially open, with wholes that are not clearly delineated [*fuzzy sets*], with any analysis of the problem of borders [*boundaries*]. [Irigaray (1982)]

Note again the sloppiness of the official translation (the correct translation from the French is in italics). But of course, the problem of "borders", i.e. of boundaries (e.g. for manifolds) is a big field of mathematics (except that it does not really make sense to speak of boundaries in pure set theory).

This would be an amusing confusion, but Sokal found, to his surprise, this sentence of Irigaray quoted by Suzanne Damarin, an American educator who writes high-school textbooks of mathematics, and who adds:

In the context provided by Irigaray we can see an opposition between the linear time of mathematics problems of related rates, distance formulas, and linear acceleration versus the dominant experiential cyclical time of the menstrual body. Is it obvious to the female mind-body that **intervals have endpoints, that parabolas neatly divide the plane**, and, indeed, that the linear mathematics of schooling describes the world of experience in intuitively obvious ways? [Damarin (1995).]

This is extraordinary: does anybody seriously think that women are unable to see that “intervals have endpoints”? If this were true, it would be a very good argument *against* the access of women to the study of mathematics<sup>24</sup>. Luckily, some of the best mathematics students nowadays are women and they would be very surprised indeed to learn that their “menstrual body” prevents them from understanding such trivial facts. With friends such as Irigaray and Damarin, the feminist cause does not need enemies.

## 6 Conclusion: Why Bother?

Most scientists will think that our effort is a waste of time. And it certainly is, from the point of view of the natural sciences. We also agree that “our” authors would not be worth discussing if they were not so famous. But we feel that there are several issues involved in our work, whose relevance will be appreciated differently by different people.

### 6.1 Scientific issues.

First of all, there are canons of “systematic thinking” and “intellectual rigor” both in the human sciences and in the natural sciences. It is true that our understanding of “nature” is much more developed than our understanding of “humans”, but this does not mean that, in the latter subject, “anything goes”. By exposing fraudulent work, we hope, at least, to encourage people who do serious work in these fields but who do not necessarily get the publicity that our authors receive. Some scientists have to get involved in this endeavour, because, although the level of physics or mathematics that we use here is basically that of a good undergraduate student, some specialized knowledge is needed.

To put these questions in historical perspective, it is worthwhile to see what Bertrand Russell wrote 50 years ago:

One of the bad effects of an anti-intellectual philosophy such as that of Bergson, is that it thrives upon the errors and confusions of the intellect. Hence it is led to prefer bad thinking to good, to declare every momentary difficulty insoluble, and to regard every foolish mistake as revealing the bankruptcy of intellect and the triumph of intuition. There are in Bergson’s work many allusions to mathematics and science, and to a careless reader these allusions may seem to strengthen his philosophy greatly. As regards science, especially

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<sup>24</sup>Irigaray sometimes suggests that science is not good for women: she recommends

“not to subscribe nor to adhere to the existence of a neutral and universal science, to which women should painfully arrive, and through which they oppress themselves and other women, transforming science in a new superego.”  
[Irigaray (1987)]

biology and physiology, I am not competent to criticize his interpretations. But as regards mathematics, he has deliberately preferred traditional errors in interpretation to the more modern views which have prevailed among mathematicians for the last eighty years. In this matter, he has followed the example of most philosophers. In the eighteenth and the early nineteenth centuries, the infinitesimal calculus, though well developed as a method, was supported, as regards his foundations, by many fallacies and much confused thinking. Hegel and his followers seized upon these fallacies and confusions, to support them in their attempt to prove all mathematics self-contradictory. Thence the Hegelian account of these matters passed into the current thought of philosophers, where it has remained long after the mathematicians have removed all the difficulties upon which the philosophers rely. And so long as the main object of philosophers is to show that nothing can be learned by patience and detailed thinking, but that we ought rather to worship the prejudices of the ignorant under the title or 'reason' if we are Hegelians, or of 'intuition' if we are Bergsonians, so long philosophers will take care to remain ignorant of what mathematicians have done to remove the errors by which Hegel profited. [Russell (1946)]

So, although abuses of the sciences by “philosophers” are not exactly new, they have to be exposed over and over again by all those who do not accept the “the bankruptcy of intellect and the triumph of intuition.”

## 6.2 Cultural issues.

Another issue is the broader effect on the general culture of this kind of fraudulent work<sup>25</sup>: if almost anything can be said about the sciences, why should they be taken seriously? Epistemic and cultural relativism and sloppy thinking about the sciences strengthen each other. We fear that skepticism and hostility to science and reason, if unchecked, will ultimately lead to cultural disasters: pure skepticism won't last, and religious fundamentalism or other forms of deep irrationalism will take its place. As pointed out by Weinberg:

As I mentioned earlier, our civilization has been powerfully affected by the discovery that nature is strictly governed by impersonal laws. As an example I like to quote the remark of Hugh Trevor-Roper that one of the early effect of this discovery was to reduce the enthusiasm for burning witches. We will need to confirm and strengthen the vision of a rationally understandable world if we are to protect ourselves from the irrational tendencies that still beset humanity. [Weinberg (1996a).]

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<sup>25</sup>Note that, in the fields studied by the natural sciences, it is also sometimes necessary, for the sake of the general culture, to “waste time” in order to expose charlatanism (astrology, quack medicines, etc...).

### 6.3 Political issues.

Finally, there is a political issue (we realize, however, that the questions discussed here are so broad that many people will agree with us without sharing our political orientations). In the United States, a large part of this “postmodern” discourse originates from sectors of the academic Left. Neither Sokal nor myself wish to attack the Left as such, quite the contrary. But, as Sokal observed:

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. And yet, over the past two decades, a large number of “progressive” or “leftist” academic humanists and social scientists (though virtually no natural scientists, whatever their political views) have turned away from this Enlightenment legacy and — bolstered by French imports such as deconstruction as well as by home-grown doctrines like feminist standpoint epistemology — have embraced one or another version of epistemic relativism. [Sokal (1996b)]

Here is how Sokal himself views his efforts, from a political point of view (Sokal 1996c):

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<sup>26</sup>.

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

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<sup>26</sup>See e.g. Snow (1963).

large fraction of my all-too-short life to it? I don't aspire to be the Emily Post of quantum field theory<sup>27</sup>. )

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. [Ryan (1992)]

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 (1993)]

(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.” [Andreski (1972)]”

I will conclude with some remarks of a self-described “child of the Enlightenment”, who has maintained a high level of intellectual rigor both in his professional and in his political work:

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<sup>27</sup>Emily Post wrote one of the best-known American books on etiquette.

If you really feel, Look, it's too hard to deal with real problems, there are a lot of ways to avoid doing so. One of them is to go off on wild goose chases that don't matter. Another is to get involved in academic cults that are very divorced from any reality and that provide a defense against dealing with the world as it actually is. There's plenty of that going on, including in the left. I just saw some very depressing examples of it in my trip to Egypt a couple of weeks ago. I was there to talk on international affairs. There's a very lively, civilized intellectual community, very courageous people who spent years in Nasser's jails being practically tortured to death and came out struggling. Now throughout the Third World there's a sense of great despair and hopelessness. The way it showed up there, in very educated circles with European connections, was to become immersed in the latest lunacies of Paris culture and focus totally on those. For example, when I would give talks about current realities, even in research institutes dealing with strategic issues, participants wanted it to be translated into post-modern gibberish. For example, rather than have me talk about the details of what is going on in the U.S. policy or the Middle East, where they live, which is too grubby and uninteresting, they would like to know how does modern linguistics provide a new paradigm for discourse about international affairs that will supplant the post-structuralist text. That would really fascinate them. But not what do Israeli cabinet records show about internal planning. That's really depressing. [Chomsky (1994)]

and finally,

Left intellectuals took an active part in the lively working class culture. Some sought to compensate for the class character of the cultural institutions through programs of workers' education, or by writing best-selling books on mathematics, science, and other topics for the general public. Remarkably, their left counterparts today often seek to deprive working people of these tools of emancipation, informing us that the "project of the Enlightenment" is dead, that we must abandon the "illusions" of science and rationality – a message that will gladden the hearts of the powerful, delighted to monopolize these instruments for their own use. [Chomsky, 1993, chap. 11.]

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