Pseudoscience and Postmodernism: Antagonists or Fellow-Travelers?

Alan D. Sokal
Department of Physics
New York University
4 Washington Place
New York, NY 10003 USA

Internet: SOKAL@NYU.EDU
Telephone: (212) 998-7729
Fax: (212) 995-4016

For *Archaeological Fantasies:*
How Pseudoarchaeology Misrepresents the Past and Misleads the Public
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Biographical Information

The author is a Professor of Physics at New York University. His main research interests are in statistical mechanics and quantum field theory. He is co-author with Roberto Fernández and Jürg Fröhlich of *Random Walks, Critical Phenomena, and Triviality in Quantum Field Theory* (Springer, 1992) and co-author with Jean Bricmont of *Fashionable Nonsense: Postmodern Intellectuals' Abuse of Science* (Picador USA, 1998).

> The human understanding is not composed of dry light, but is subject to influence from the will and the emotions, a fact that creates fanciful knowledge; man prefers to believe what he wants to be true.
>
> — *Francis Bacon,* The New Organon, *Aphorism 49*

1 Introduction

In this essay I propose to investigate the paradoxical relation between two broad categories of thought: *pseudoscience* and *postmodernism* (both will be defined more precisely in a moment). At first glance, pseudoscience and postmodernism would appear to be opposites: pseudoscience is characterized by extreme credulity, while postmodernism is characterized by extreme skepticism. More specifically, adherents of pseudoscience believe in theories or phenomena that mainstream science rejects as utterly implausible, while adherents of postmodernism withhold belief in theories that mainstream science considers to be established beyond any reasonable doubt.[1]

And yet, I will argue, there is, at least in some instances, a curious convergence between pseudoscience and postmodernism. On the one hand, advocates of pseudoscience — at least the most sophisticated among them — sometimes fall back on postmodernist arguments when the reliability or credibility of their evidence is challenged. (This strategem is admittedly second-best from their point of view, but at least it manages to avert outright refutation.) On the other hand, postmodernists' professed skepticism is often deployed selectively, so that a disdain for the knowledge claims of modern science sometimes coexists with a sympathy for (if not outright belief in) one or more pseudosciences. The bulk of this essay will be devoted to illustrating these two complementary moves through examples drawn from various brands of pseudoscience. In the final section I will argue that this is not merely an academic exercise, but has serious real-world consequences.

Since the three key terms of this discussion — "science", "pseudoscience" and "postmodernism" — have been used with widely varying meanings, it is incumbent on me, before proceeding further, to clarify and delimit, as best I can, how I intend to use these terms.[2]

Note first that each of these terms has a triple denotation: it can be understood as referring to a body of thought, to the arguments or justifications that are offered in support of that body of thought, or to the community of advocates of (or adherents to) that body of thought. I shall continue this triple usage, while distinguishing the three aspects whenever necessary.

The word *science*, as commonly used, has at least four distinct meanings: it denotes an intellectual endeavor aimed at a rational understanding of the natural and social world;

[1] Or rather, postmodernists *profess* to withhold such belief. Whether they actually do so in practice — for example, when they are seriously ill and must decide which type of medicine to follow — is a different question.

[2] Let me emphasize that there is no one "right" definition of these (or any) terms. Rather, each author has the obligation to his readers to clarify, to the greatest extent possible, how *he* proposes to use the word.

it denotes a corpus of currently accepted substantive knowledge; it denotes the community of scientists, with its mores and its social and economic structure; and, finally, it denotes applied science and technology. In this essay I will be concentrating on the first two aspects, with some secondary references to the sociology of the scientific community; I will not address technology at all. Thus, by *science* I mean, first of all, a worldview giving primacy to reason and observation and a methodology aimed at acquiring accurate knowledge of the natural and social world. This methodology is characterized, above all else, by the *critical spirit*: namely, the commitment to the incessant testing of assertions through observations and/or experiments — the more stringent the tests, the better — and to revising or discarding those theories that fail the test. One corollary of the critical spirit is *fallibilism*: the understanding that all our empirical knowledge is tentative, incomplete and open to revision in the light of new evidence or cogent new arguments (though, of course, the most well-established aspects of scientific knowledge are unlikely to be discarded entirely).

It is important to note that well-tested theories in the mature sciences are supported in general by a powerful web of interlocking evidence coming from a variety of sources; rarely does everything rest on one "crucial experiment". Moreover, the progress of science tends to link these theories into a unified framework, so that (for instance) biology has to be compatible with chemistry, and chemistry with physics.[3] Philosopher Susan Haack has illuminatingly analogized science to the problem of completing a crossword puzzle, in which any modification of one word will entail changes in interlocking words; in most cases the required changes will be fairly local, but in some cases it may be necessary to rework large parts of the puzzle.[4,5]

I stress that my use of the term "science" is not limited to the *natural* sciences, but includes investigations aimed at acquiring accurate knowledge of factual matters relating to *any* aspect of the world by using rational empirical methods analogous to those employed in the natural sciences.[6] Thus, "science" (as I use the term) is routinely practiced not only by physicists, chemists and biologists, but also by historians, detectives, plumbers and indeed all human beings in (some aspects of) our daily lives.[7,8] Likewise for the term "pseudoscience":

[3]For a good discussion of this point, see Weinberg (1992, especially chapters II and III).

[4]Haack (1993, 1998, 2003). These two situations correspond, of course, to historian of science Thomas Kuhn's (1970) notions of "normal science" and "revolutionary science", respectively. Let me stress that while this part of Kuhn's theory is fairly noncontroversial, the same cannot be said for the rest, particularly the alleged "incommensurability of paradigms", which has led many of Kuhn's followers to a full-fledged relativism. For a critique of Kuhn's ideas on incommensurability, see Maudlin (1996) and Sokal and Bricmont (1998, pp. 71–78).

[5]See Sokal and Bricmont (1998, chapter 4) and Bricmont and Sokal (2004a) for further details on my conception of science and scientific knowledge. For an excellent introduction to contemporary debates in the philosophy of science, see Brown (2001).

[6]Please note the limitation to questions of fact. I intentionally exclude from my purview questions of ethics, aesthetics, ultimate purpose, etc.

[7]The allusion to historians and detectives was employed previously by Haack (1993, p. 137): "there is no reason to think that [science] is in possession of a special method of inquiry unavailable to historians, detectives, and the rest of us". See also Haack (1998, pp. 96–97; 2003, pp. 18, 24, 95, 102 and *passim*).

[8]Of course, the fact that we all practice science from time to time does not mean that we all practice it

the subject matter can be any aspect of the world. The distinction between science and pseudoscience does not concern the subject matter, but rather the quality of the methods employed and the reliability of the knowledge (or purported knowledge) obtained.

More precisely, I shall use the term *pseudoscience* to designate any body of thought (along with its associated justifications and advocates) that

(a) makes assertions about real or alleged phenomena and/or real or alleged causal relations that mainstream science justifiably considers to be utterly implausible, and

(b) attempts to support these assertions through types of argumentation or evidence that fall far short of the logical and evidentiary standards of mainstream science.

This definition implies, first of all, that pseudoscientists are not postmodernists: they make assertions about the natural or social world that they claim to be *true* in an objective sense. Note also that this definition of pseudoscience involves both sociological and epistemic criteria. On the one hand, the mainstream scientific community must reject the beliefs in question as utterly implausible; in addition, this rejection must be *rationally justified* on the basis of the currently available evidence. Ordinarily this rejection is based on the fact that

(i) the evidence adduced in support of the beliefs is spurious, grossly mishandled, or otherwise utterly unconvincing;

(ii) the beliefs in question imply numerous observational consequences that are radically at variance with well-established scientific data; and

(iii) the beliefs in question conflict irremediably with well-tested scientific theories within the domain where there is good reason to believe that those theories are valid.

Most often (though not always), pseudoscience also

(c) claims to be scientific, and even

(c′) claims to relate its assertions to genuine science, particularly cutting-edge scientific discoveries.

In this way, pseudoscience attempts to wrap itself in the mantle of genuine science, with the evident aim of capturing for itself some of the epistemic respect that the general public (hard-core postmodernists excluded!) ordinarily accords to "science". Moreover, pseudoscience usually exhibits *some* of the logical and sociological characteristics of genuine science, such as:

(d) It involves not a single isolated belief, but rather a complex and logically coherent system that "explains" a wide variety of phenomena (or alleged phenomena).

(e) Practitioners undergo an extensive process of training and credentialing.[9]

equally well, or that we practice it equally well in all areas of our lives. See, for instance, note 262 below.

[9]I stress that points (c), (d) and (e) are *optional* aspects of "pseudoscience" in my definition. In particular, while (e) tends to hold for the grand schools of pseudoscience, it may not apply to all pseudosciences. For instance, Garrett Fagan has pointed out to me that pseudoarchaeology is most frequently a solo endeavor, not one in which "schools" are established.

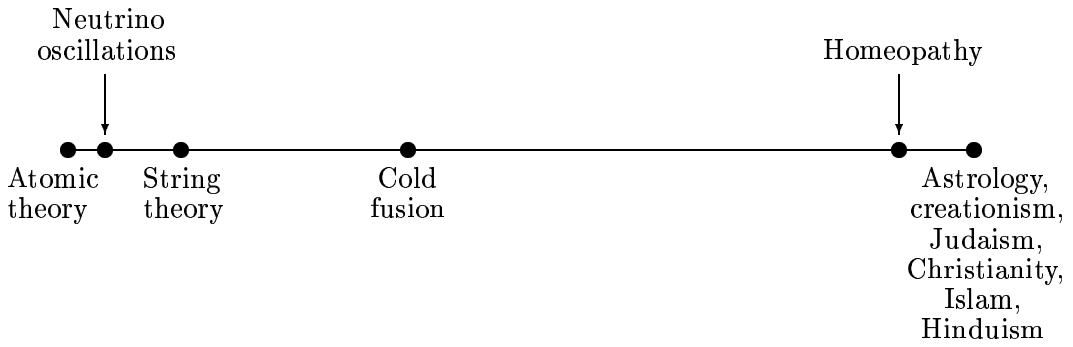

Figure 1: A very rough depiction of the continuum from genuine science to pseudoscience, based on the strength of the empirical evidence for or against the given theory and on the soundness of the methodology employed by the theory's advocates. This graph should be interpreted qualitatively, not quantitatively.

What pseudoscience utterly lacks, however, is the critical spirit and the robust empirical support that are characteristic of genuine science. Examples of pseudosciences are astrology, homeopathy, "creation science", Judaism, Christianity, Islam and Hinduism.[10,11]

The fact that one can distinguish (in most cases quite readily) between genuine science and pseudoscience does not mean, of course, that it is possible to draw a sharp line between them — much less a line based on rigid "demarcation criteria" such as those proposed by the philosopher Karl Popper.[12] Rather, one would do better to envisage a continuum (Figure 1) with well-established science (e.g. the idea that matter is composed of atoms) at one end, passing via cutting-edge science (e.g. neutrino oscillations) and mainstream but speculative science (e.g. string theory) — and then, much further along the way, through shoddy science (N rays, cold fusion) — and ending, after a long further journey, at pseudoscience. Though there is no precise location along this continuum where a line can be drawn, there is nevertheless a radical difference between the established natural sciences and the pseudosciences

[10] Numerous specific examples of pseudoscience are analyzed in the books of Gardner (1957), Radner and Radner (1982), Broch (1992), Park (2000), Feder (2002) and Shermer (2002). Several of these books also contain general discussions of the characteristics of science and pseudoscience; Radner and Radner (1982, chapter III) and Feder (2002, chapter 2) are particularly illuminating. Feder (2002, chapter 1) also provides a very useful table of references to earlier skeptical analyses of various types of pseudoscience.

[11] Regarding Judaism, Christianity, Islam and Hinduism, I am referring, of course, to the corpus of factual assertions about the natural and human world that are contained in the traditional doctrine of each of these religions (or of each variant thereof). It goes without saying that some practitioners of these religions adhere to the religion primarily for ethical, cultural, social, familial or nostalgic reasons without accepting any significant part of their religion's professed doctrine concerning matters of purported fact. For further discussion of the radical methodological opposition between science and religion, see al-'Azm (1982), Bricmont (1999), Haack (2003, chapter 10) and Kitcher (2004). See also the Appendix below.

[12] Popper's demarcation criteria are set forth in Popper (1959, 1989). For critiques, see Newton-Smith (1981), Kitcher (1982, pp. 42–50), Laudan (1996, chapter 11) and Sokal and Bricmont (1998, pp. 61–69), among many others.

as regards both methodology and degree of empirical confirmation.[13,14,15]

The term "postmodernism" is even more diffuse: it has been used to cover an ill-defined galaxy of ideas in fields ranging from art and architecture to the social sciences and philosophy. I propose here to use the term *postmodernism* much more narrowly, to denote

> an intellectual current characterized by the more-or-less explicit rejection of the rationalist tradition of the Enlightenment, by theoretical discourses disconnected from any empirical test, and by a cognitive and cultural relativism that regards science as nothing more than a "narration", a "myth" or a social construction among many others.[16]

Thus, postmodernists reject the idea that assertions about the natural or social world can be objectively (and hence transculturally) true or false; rather, they insist that "truth" is relative to some social or cultural group.[17] Frequently they redefine the word "truth" to denote mere intersubjective agreement (within some specified social group) or practical utility (for some specified goal).[18] Postmodernists therefore tend to reject objectivity even as an ideal towards which to strive (however imperfectly): everything becomes dependent on one's subjective viewpoint, and moral or aesthetic values displace cognitive ones as the criterion for evaluating assertions of alleged fact.

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[13]The fact that temperature is a continuum does not imply that the words "hot" and "cold" are meaningless, or that there is no difference between boiling water and ice!

[14]Since the demise of Popper's attempts at drawing a sharp demarcation between genuine science and pseudoscience, philosophers seem largely to have abandoned the task of developing and evaluating criteria for distinguishing the two. This is a shame, because although it may be impossible to draw a sharp demarcation based on universal methodological rules, it may nevertheless be possible to develop criteria which, taken together, can help to locate theories along the continuum illustrated in Figure 1 (or, perhaps better, a multidimensional analogue). For example, some scientists have proposed criteria for distinguishing good science from shoddy science (e.g. Langmuir 1989); it seems to me that philosophers and historians of science could play a useful role by carefully analyzing the strengths and flaws of these criteria.

[15]Noretta Koertge has kindly drawn my attention to an article by Philip Kitcher (1984/85) which eloquently makes these same points. Speaking of the gap between genuine sciences such as evolutionary biology and pseudosciences such as "creation science", Kitcher writes (p. 170): "We can manage without a criterion of demarcation. ... The issue is the location of various proposals on a continuum. To put the point briefly: There is excellent science, good science, mediocre science, poor science, [and] dreadful science ... "

Susan Haack (2003, p. 116) takes a similar point of view: "[R]ather than criticizing work as 'pseudo-scientific,' it is always better to specify what, exactly, is wrong with it: that it is not honest or serious inquiry; that it rests on assumptions for which there is no good evidence, or which are too vague to be susceptible to evidential check; that it uses mathematical symbolism, or perhaps elaborate-looking apparatus, purely decoratively; etc. ... [I]f we want to understand how creationism differs epistemologically from physical cosmology or evolutionary biology, we will do better to focus directly on questions of evidence and warrant, instead of fussing over whether creationism is bad science, or not science at all."

[16]Sokal and Bricmont (1998, p. 1).

[17]Alternatively, postmodernists may concede that statements can be objectively true or false, but insist that the criteria for judging whether a belief is *rationally justified* (relative to some specified set of evidence) are thoroughly culture-bound.

[18]For further discussion of redefinitions of truth, along with examples and a critique, see Bricmont and Sokal (2004a, section 2.4).

Let me stress that not all the authors whom I term "postmodernist" would identify with that label, since they may use the term in a sense different from mine (which is of course their right). Conversely, some authors who term themselves "postmodernist" may not be postmodernist in my sense.[19] Finally, it should be noted that there exist many different currents within what I have called postmodernism, which interact only weakly. Thus, some postmodernists (in my definition) rely heavily on Derrida and Heidegger, others more strongly on Foucault, others on constructivist sociology of science (Barnes, Bloor, Collins, Latour, ...), others on the feminist-constructivist subgroup (Haraway, Harding, Keller, ...), others on the postcolonial wing (Nandy, Alvares, Shiva, Sardar, ...).

In order to give a clearer idea of the types of views that I am here calling "postmodernist", it is perhaps useful to provide some examples. Consider the following assertions by prominent figures in the sociology of science:

> [T]he validity of theoretical propositions in the sciences is in no way affected by factual evidence.[20]
>
> The natural world has a small or non-existent role in the construction of scientific knowledge.[21]
>
> For the relativist [such as ourselves] there is no sense attached to the idea that some standards or beliefs are really rational as distinct from merely locally accepted as such.[22]
>
> Science legitimates itself by linking its discoveries with power, a connection which *determines* (not merely influences) what counts as reliable knowledge ... [23]

Assertions like these are in clear contradiction with the view of science I have set forth, i.e., as a fallible but partly successful attempt to obtain an objective (albeit approximate and incomplete) understanding of (some aspects of) the world. These statements exhibit, either

[19] For example, Griffin (1988), who advocates an "affirmative postmodernism" based on the "reenchantment of science", explicitly reaffirms that the goal of science is the search for truth, understood as correspondence with reality. He is thus *not* a postmodernist in the sense defined here. (In my opinion, Griffin's program is flawed by a series of gross misunderstandings about the content of modern science, which lead him give undue credence to crazy ideas like telepathy and clairvoyance; but relativism is not one of his sins.)

[20] Gergen (1988, p. 37).

[21] Collins (1981, p. 3). Two qualifications need to be made: First, this statement is offered as part of Collins' introduction to a set of studies (edited by him) employing the relativist approach, and constitutes his summary of that approach; he does not *explicitly* endorse this view, though an endorsement seems implied by the context. Second, while Collins appears to intend this assertion as an empirical claim about the history of science, it is possible that he intends it neither as an empirical claim nor as a normative principle of epistemology, but rather as a methodological injunction to sociologists of science: namely, to act *as if* "the natural world ha[d] a small or non-existent role in the construction of scientific knowledge", or in other words to *ignore* ("bracket") whatever role the natural world may in fact play in the construction of scientific knowledge. See Bricmont and Sokal (2001, 2004b) for an argument that this approach is seriously deficient *as methodology* for sociologists of science.

[22] Barnes and Bloor (1981, p. 27), clarification added by me.

[23] Aronowitz (1988, p. 204), emphasis in the original.

explicitly or implicitly, the cognitive relativism and extreme social constructivism that are characteristic of the intellectual current I am calling "postmodernism".

Statements as clear-cut as those just cited are, however, rare in the academic postmodernist literature. More often one finds assertions that are ambiguous but can nevertheless be interpreted (and quite often *are* interpreted) as implying what the foregoing quotations make explicit: that science as I have defined it is an illusion, and that the purported objective knowledge provided by science is largely or entirely a social construction. For example:

> Despite their names, conservation laws are not inevitable facts of nature but constructions that foreground some experiences and marginalize others. ... Almost without exception, conservation laws were formulated, developed, and experimentally tested by men. If conservation laws represent particular emphases and not inevitable facts, then people living in different kinds of bodies and identifying with different gender constructions might well have arrived at different models for [fluid] flow.[24]

> [G]iven their extensive training in sophisticated mathematical techniques, the preponderance of mathematics in particle physicists' accounts of reality is no more hard to explain than the fondness of ethnic groups for their native language. On the view advocated in this chapter, there is no obligation upon anyone framing a view of the world to take account of what twentieth-century science has to say.[25]

Let me emphasize once again that pseudoscientists are not, at least in the first instance, postmodernists: they make assertions about the natural or social world that they claim to be true in an objective sense; only with great reluctance will they fall back on the comparatively lame assertion that their "point of view" is "just as valid" as that of mainstream science. Indeed, some pseudoscientists are militantly anti-postmodernist. For instance, the leader of a major pseudoscientific cult recently issued an erudite proclamation criticizing

> different forms of agnosticism and relativism which have led philosophical research to lose its way in the shifting sands of widespread scepticism. Recent times have seen the rise to prominence of various doctrines which tend to devalue even the truths which had been judged certain. A legitimate plurality of positions has yielded to an undifferentiated pluralism, based upon the assumption that all positions are equally valid, which is one of today's most widespread symptoms of the lack of confidence in truth. Even certain conceptions of life coming from the East betray this lack of confidence, denying truth its exclusive character and assuming that truth reveals itself equally in different doctrines, even if they contradict one another.[26]

Still, some pseudoscientists do employ postmodernist arguments, whether opportunistically or systematically. In the remainder of this essay I would like to give some examples of that use.

Let me stress in advance that I will not be concerned here with explaining in detail why astrology, homeopathy and the rest are in fact pseudoscience; that would take me too

[24] Hayles (1992, pp. 31–32).

[25] Pickering (1984, p. 413).

[26] John Paul II (1998, p. 10). See also the Appendix below.

far afield. Nor will I address, except in passing, the important but difficult problems of understanding the psychological attractions of pseudoscience and the social factors affecting its spread.[27] Rather, my principal aim is to investigate the logical and sociological nexus between pseudoscience and postmodernism.

It goes without saying that none of my case studies should be treated as definitive — quite the contrary. I have no special expertise in any of the fields of study under discussion; I could easily have made mistakes. Moreover, my accounts are in no way claimed to be comprehensive. Rather, my aim is to point the attention of philosophers, sociologists and historians of science to a phenomenon that deserves a more detailed and rigorous investigation and analysis.

2 Pseudoscience and postmodernism in nursing

New York Times readers on the morning of April 1, 1998 were treated to a delicious front-page story that was not an April Fool's joke:

> Two years ago, Emily Rosa of Loveland, Colo., designed and carried out an experiment that challenges a leading treatment in alternative medicine. Her study, reported today in The Journal of the American Medical Association, has thrown the field into tumult.
>
> Emily is 11 years old [9 at the time of the experiment]. She did the experiment for her fourth-grade science fair.[28]

The technique Emily tested is called Therapeutic Touch (TT) — a slight misnomer because practitioners do not actually touch the patient. Rather, they move their hands rhythmically over the patient's body, about 2–6 inches (5–15 cm) away, in an effort to "rebalance" the "human energy field" that they believe surrounds the patient.[29]

[27] For a shrewd meditation on the former question, see Levitt (1999, especially pp. 12–22 and chapter 4). The latter question is indirectly addressed by Burnham (1987), in the context of a fascinating history of the popularization of science in the United States in the nineteenth and twentieth centuries.

For my own part, I have been struck by the fact that nearly all the pseudoscientific systems to be examined in this essay are based philosophically on *vitalism*: that is, the idea that living beings, and especially *human* beings, are endowed with some special quality ("life energy", *élan vital*, *prana*, *qi*) that transcends the ordinary laws of physics. Mainstream science has rejected vitalism since at least the 1930s, for a plethora of good reasons that have only become stronger with time (see e.g. Mayr 1982). But these good reasons are understood by only a tiny fraction of the populace, even in the industrialized countries where science is supposedly held in high esteem. Moreover — and perhaps much more importantly — the anti-vitalism characteristic of modern science is deeply unsettling emotionally to most (perhaps all) people, even to those who are not conventionally religious. See again Levitt (1999). Of course, none of these speculations pretend to any scientific rigor; careful empirical investigation by psychologists and sociologists is required.

[28] Kolata (1998, p. A1).

[29] There is an extensive literature on Therapeutic Touch, by both its advocates and its critics. In describing Therapeutic Touch and its alleged theoretical basis, I will draw on the advocates' own explanations wherever possible. See, for example, Krieger (1979, 1981, 1987, 1993, 2002), Borelli and Heidt (1981), Macrae (1988), Kunz (1995, pp. 211–288 and 307–326), Cowens and Monte (1996), Wager (1996), Fischer and Johnson (1999), Fontaine (2000, chapter 13), Freeman and Lawlis (2001, chapter 18) and Sayre-Adams and Wright

Emily designed a simple experiment to test whether Therapeutic Touch practitioners can really sense a "human energy field", as they claim. The practitioner and Emily were seated opposite each other at a table, separated by an opaque screen with two cutouts at its base, through which the practitioner placed her hands. A cloth towel was attached to the screen and draped over the practitioner's arms. Before each set of trials, the practitioner was given time to "center" or make any other mental preparations she deemed necessary. Emily then flipped a coin and placed her right hand 3–4 inches (8–10 cm) above one of the practitioner's hands, chosen according to the coin flip. The practitioner was asked to state which of her hands was closest to Emily's hand, and was given as much time as she wished in order to decide. In 280 trials involving 21 Therapeutic Touch practitioners, they succeeded in choosing the correct hand 44% of the time, slightly worse than random guessing.[30]

When I first heard about Emily's experiment, I admired her ingenuity but wondered whether anyone really took Therapeutic Touch seriously. How wrong I was! Therapeutic Touch is taught in more than 80 college and university schools of nursing in at least 70 countries, is practiced in at least 80 hospitals across North America, and is promoted by leading American nursing associations.[31] Its inventor claims to have trained more than 47,000 practitioners over a 26-year period, who have gone on to train many more.[32] At least 245 books or dissertations have been published that include "Therapeutic Touch" in the title, subject headings or table of contents.[33] All in all, Therapeutic Touch appears to have become one of the most widely practiced "holistic" nursing techniques.

How did a profession based in science come to promote mysticism and quackery? The story is more complex — and more worrisome — than I initially realized.[34]

(2001), among many others. For critiques, see Rosa *et al.* (1998) and the literature cited there, as well as the essays in Scheiber and Selby (2000).

[30]For a more detailed description of the experiment and its statistical analysis, see Rosa *et al.* (1998). Of course, some aspects of Emily's experimental design can be criticized: for example, the sample sizes were small; there was no documentation of the practitioners' "qualifications" in TT; the immobile palms-up position of the practitioner is atypical of TT practice; controls were arguably inadequate. All of these features could easily be corrected if enough TT practitioners were to volunteer for a new study with a mutually agreed protocol. For some other recent experimental tests of TT, see Scheiber and Selby (2000, chapters 13–22).

[31]Supporters and critics of TT are in general agreement as to these basic facts: among the supporters, see e.g. Krieger (1987, p. 8; 1993, pp. 5, 187; 2002, p. 12), Fontaine (2000, p. 221), Freeman and Lawlis (2001, p. 493); among the critics, see e.g. Rosa *et al.* (1998, p. 1005), Stahlman (2000, pp. 37–39, 47–48), Glazer (2000b, p. 320). Nevertheless, these figures should be taken with a grain of salt, inasmuch as both advocates and detractors of Therapeutic Touch have an interest in exaggerating its incidence, albeit for different reasons.

[32]Kolata (1998, p. A20). If true, this is an astounding figure. Even if the course of study lasts only one week, it amounts to training a new class of 35 students each week, year in year out, for a quarter-century. According to a recent textbook of alternative medicine, "estimates of the total number of persons that have learned therapeutic touch now exceed 85,000" (Freeman and Lawlis 2001, p. 493).

[33]OCLC WorldCat, as of November 7, 2003. Available on-line at `http://newfirstsearch.oclc.org/`

[34]My account of pseudoscience and postmodernism in nursing is strongly indebted to the pioneering work of health journalist Sarah Glazer (2000a, 2000b). While I have added much new detail and documentation, the basic thread of the story is the one traced by Glazer.

2.1 Pseudoscience in nursing (I)

> **Experiential Exercise 5.** This exercise, "The Emperor's Clothes," is designed to test your perception of cues in the healee's energy field. I call the human energy field "the Emperor's Clothes" because, like the emperor's new clothes in the fairy tale of that name, the human energy field is invisible. To a bystander, the healer doing a Therapeutic Touch assessment seems to be attending to something that is invisible or imaginary.
>
> — *Dolores Krieger (1993, p. 32)*

Therapeutic Touch (TT) was invented in the early 1970s by Dolores Krieger, a professor of nursing at New York University, in collaboration with Dora Kunz, a noted clairvoyant and soon-to-be president of the Theosophical Society in America.[35,36] Krieger explains that

> Therapeutic Touch derives from, but is not the same as, the ancient art of the laying-on of hands. ... Therapeutic Touch has no religious base; it is a conscious, intentional act; it is based on research findings; and Therapeutic Touch does not require a declaration of faith from the healee (patient) for it to be effective.[37]

She notes that

> The term *Therapeutic Touch* may in fact be a misnomer because, in practice, the healer need not make physical contact with the patient (healee). Much of the work done by the person playing the role of healer has as its primary focus the modulation of the healee's energy field rather than the touch or manipulation of his or her skin.[38]

More precisely,

> *Illness is an imbalance in an individual's energy field.* In Therapeutic Touch, the healer directs and modulates this energy field, using the sense of touch as a telereceptor ... You as the healer act as a human support system, your own healthy energy field providing the scaffolding to guide the repatterning of the healee's weakened and disrupted energy flow.[39]

The Therapeutic Touch process consists of five phases:

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[35]Krieger (1979, pp. 4–13; 1981, pp. 138–147) provides a brief history of the development of Therapeutic Touch. See also Stahlman (2000) and Sarner (2002) for more detailed histories, written by critics.

[36]Kunz (1991, pp. 5–6) recalls that "Both my mother and grandmother had psychic abilities ... As for my clairvoyance, I suppose I began to become aware of it and to develop it when I was around six or seven years of age."

The Theosophical Society is a mystico-religious organization founded in 1875 by the celebrated psychic Helena Petrovna Blavatsky together with the lawyer Henry Steel Olcott. For a history, see Campbell (1980); additional information can be found in Carlson (1993) and Godwin (1994). Dora Kunz served as president of the American section from 1975 through 1987.

[37]Krieger (1981, p. 138). Freeman and Lawlis (2001, p. 495) confirm that "this process does not require that the patient consciously participate, nor is its effect dependent on the patient's belief in the intervention."

[38]Krieger (1993, p. 11), italics in the original.

[39]Krieger (1993, pp. 12–13), italics in the original.

1. Centering oneself.
2. Making an assessment of the healee.
3. "Unruffling" the field.
4. The direction and modulation of energy.
5. Recognizing when it is time to stop.[40]

Krieger is vague about the precise nature of the "human energy field", but she does make clear that it is not merely electromagnetic.[41] According to Krieger,

> the human energy field [is] a complex of many interpenetrating fields whose properties dynamically interrelate in a pattern we recognize as human nature. This field functions like a transformer. These foci convert energy systems, or prana, into the kind of energies that make our psychophysiological being what it is. The foci or transformers themselves are chakras. Their primary functions are to collect, change and distribute the prana to the organs of our physical bodies. These foci form the matrix of the chemicophysical field and the psychodynamic field in the individual and set the stage for psychosomatic functioning.[42]

Indeed, energy fields are not limited to humans, as Krieger enjoins the reader to

> Take every opportunity to become sensitive to the living energy field. If you are unable to work on people under your present circumstances, assess the energy fields of your pets or other domestic animals, the trees in your neighborhood (particularly if they are coniferous or eucalyptus trees, which radiate an immense energy field relative to their size), or groups of flowers.[43]

Although the human energy field is as yet unmeasurable by instruments, almost anyone can learn, with sufficient practice, to sense it[44]:

> Most frequently, the cues you pick up in the healee's energy field during the assessment are one or a combination of the following:
>
> - Temperature differentials, such as a sense of heat or cold.
> - Pressure, or feelings of congestion in the energy flow.
> - Changes in or lack of synchronization in the intrinsic rhythmicity of the healee's energy field.

[40] Krieger (1979, p. 69).

[41] Krieger (1987, p. 7). Of course, many biological processes involve low-level electric and magnetic fields within the body; but these fields decay rapidly outside the body, and in any case cannot be detected or significantly affected by human hands.

[42] Krieger (1987, p. 41).

[43] Krieger (1993, p. 35).

[44] Krieger (1979, pp. 3, 57; 1993, p. 25).

- Localized weak electric shocks or tingly feelings as you move the energy centers in the palms of your hands through the healee's energy field.[45]

Indeed, regular practice of Therapeutic Touch often leads to increased proficiency in the use of other natural human faculties, such as telepathy[46]:

> From written accounts in my students' journals, indications of the use of telepathy can be perceived on the average of two-and-a-half weeks from the time they put the healing techniques into consistent practice.[47]

Healing through Therapeutic Touch occurs by "unruffling" and "rebalancing" the healee's energy field, thereby allowing for the resumption of a more natural energy flow, and by transferring energy in a directed fashion from healer to healee.[48] One prominent advocate of Therapeutic Touch explains the process as follows:

> In a state of health, the life energy flows freely in, through, and out of the organism in a balanced manner, nourishing all the organs of the body. In disease, the flow of the energy is obstructed, disordered, and/or depleted. Therapeutic Touch practitioners, having learned to attune to the universal field through a conscious intent, direct the life energy into the patients to enhance their vitality. The practitioners also help the patients assimilate the energy by releasing congestion and balancing areas where the flow has become disordered. Drawing upon the universal field, the practitioners do not become drained of their own energy but, on the contrary, are continually replenished.[49]

Krieger explains the mechanism in greater "scientific" detail, as follows:

> Human beings are open systems. They appear to be a nexus of all fields of which life partakes. That is, human beings are the energetic matrices of inorganic as well as organic fields, psychodynamic as well as conceptual fields (i.e., electromagnetic is only one interface of the whole complex). Human beings are therefore exquisitely sensitive to wave phenomena (i.e., energy). I perceive a healer to be an individual whose personal health gives him access to an overabundance of *prana* for the well-being of others. (Prana is a Sanskrit term for what we in the West think of as the organization of energy that underlies the life process.) Prana is concerned with the intrinsic rhythmicity of energy ...
>
> Using deductive logic I re-examined my previous studies in the life sciences. It occurred to me that at the physical level, this projection of human energy during the healing act grounds itself in the ill person via electron transfer resonance.[50]

As a physicist, I am not impressed.[51]

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[45]Krieger (1993, p. 46).

[46]Krieger (1979, pp. 70–71; 1987, chapter 5).

[47]Krieger (1987, p. 78).

[48]Krieger (1979, chapter 7; 1993, chapters 3 and 4).

[49]Macrae (1988, p. 4).

[50]Krieger (1987, p. 7), italics in the original. See also Krieger (1981, p. 143).

[51]It is true (and obvious) that human beings are open systems, i.e. they interact with the world around

2.2 Pseudoscience in nursing (II)

How seriously are Therapeutic Touch and other pseudoscientific "healing modalities" taken in the nursing profession? I cannot claim to have made a comprehensive study of this question, but I would like to present briefly one illustration.

In 1999 the American College of Nurse-Midwives devoted a special issue of its official organ, the *Journal of Nurse-Midwifery*, to the topic of "complementary and alternative therapies in women's health". An introductory editorial insisted strongly on the importance of evidence-based practice, including scientifically sound studies of safety and efficacy.[52] Fortunately, a few of the accompanying articles do live up to that declaration. One article provides a fairly cautious summary of the currently available evidence concerning the efficacy of complementary and alternative therapies, underlining the need for randomized and (where possible) double-blinded clinical trials.[53] Another article provides scientific information concerning the efficacy and safety of various herbal preparations claimed to induce labor.[54] A third reports a retrospective study aimed at testing whether evening primrose oil is effective in shortening labor or reducing the incidence of post-dates pregnancies (the results are negative).[55]

But the level of most of the remaining articles is abysmally low. Two articles present homeopathic doctrine[56] as fact, without the slightest critical analysis.[57] While admitting that "the mechanism to explain *how* homeopathy works has not been discovered"[58], both articles take for granted not only the efficacy of homeopathic remedies beyond the placebo effect, but also the validity of homeopathic teachings such as the vital force, the Law of

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them. Everything else in this quotation is nonsense, despite the purportedly scientific language. For what it's worth, "wave phenomena" and "energy" are not synonyms, nor does energy have any "intrinsic rhythmicity". "Electron transfer resonance" is not, to my knowledge, a standard term in either physics or chemistry.

[52]Raisler (1999, p. 190).

[53]Murphy, Kronenberg and Wade (1999).

[54]McFarlin, Gibson, O'Rear and Harman (1999).

[55]Dove and Johnson (1999).

[56]Homeopathy was developed by Samuel Hahnemann (1755–1843), and its basic principles remain largely unchanged to this day, despite radical advances in our understanding of physics, chemistry and biology that thoroughly undermine its alleged scientific basis. Its central tenets are the so-called Law of Similars, or "like cures like" (i.e., the claim that a disease can be cured by small doses of a substance that in larger doses produces symptoms similar to the disease itself); the so-called Law of Potentization, i.e., the claim that homeopathic remedies become *stronger* with each successive dilution, provided that they are shaken ("succussed"); and a vitalist theory of biology which holds that living beings are endowed with some special quality ("vital force") that transcends the ordinary laws of physics.

It is important to stress that homeopathy is *not* a species of herbal medicine. Plants contain a wide variety of substances, some of which can be biologically active (with either beneficial or harmful consequences, depending on the situation). Homeopathic remedies, by contrast, are pure water and starch: the alleged "active ingredient" is so highly diluted that in most cases *not a single molecule remains in the final product.*

[57]Castro (1999) and Brennan (1999). Castro begins (p. 280) by stating, without any qualifications, that "Homeopathy is an effective and scientific system of healing ... The homeopathic principles constitute a unified hypothesis whose validity is tested empirically: cured patients confirm the hypothesis."

[58]Brennan (1999, p. 292), emphasis in the original.

Similars, and the Law of Potentization. A review of a book on "homeopathy for midwives", appearing in the same issue, is equally uncritical.[59]

Another article discusses the theory and practice of Therapeutic Touch, starting with uncritical presentation of Kunz's and Krieger's notions of the "human energy field" ("an ovoid of many-colored light interpenetrating and surrounding the physical body, and extending out from it to a distance of about twelve to eighteen inches") and Rogers' theory of Unitary Human Beings ("incorporating Bertalanffy's Systems Theory with quantum physics").[60] To its credit, this article also includes discussion of some skeptical studies, including Emily Rosa's famous experiment. The authors "compliment Ms. Rosa for attempting to conduct an experiment to detect energy fields", but assert that "the only reasonable conclusions that can be supported by the data is [*sic*] that a small group of practitioners of TT were unable to detect an energy field around one individual's hand."[61] They go on to cite two "qualitative" studies that take for granted the validity of Therapeutic Touch and report patients' "experiences" of their own energy fields[62], but they do not cite any positive evidence that "human energy fields" actually exist or that Therapeutic Touch practitioners can sense them. Nevertheless, they state unreservedly their belief that

> more definitive proof will come from the investigation of the process of TT, that is, the intentionality involved in the conscious desire to help or heal another. This task, however, may be as elusive as the ability to prove that prayer causes healing. In support of a more spiritual approach to the issue of energy transference, Zefron quoted an anonymous scientist who said, " ... we have come to the conclusion that a vibration of very high intensity and extremely fine wave-length with tremendous healing power, caused by spiritual forces operating through the mind of man, is the next thing science expects to discover." It may possibly be the spiritual aspect of this energy exchange that remains so elusive.[63]

2.3 Pseudoscience in nursing (III)

Tracking down the intellectual precursors of pseudoscience in nursing, one is soon led to the work of Martha E. Rogers (1914–1994), professor of nursing and Head of the Division of Nursing at New York University from 1954 through 1975.[64] In her 1970 book, *An Introduction to the Theoretical Basis of Nursing*, Rogers single-handedly "created a science that had

[59] Krov (1999).

[60] Fischer and Johnson (1999, pp. 301, 302).

[61] Fischer and Johnson (1999, p. 304).

[62] For a devastating critique of one of these two studies, devoted to documenting "children's lived experiences of perceiving the human energy field", see Glazer (2000b, pp. 331–332).

[63] Fischer and Johnson (1999, pp. 306–307). It goes without saying that the claim of the "anonymous scientist" is nonsense.

[64] Malinski, Barrett and Phillips (1994) is a useful biography of Rogers edited by her disciples, which also contains extensive excerpts from her writings and a series of brief articles "saluting" her contributions to nursing and to science.

never existed before", as one of her disciples modestly put it.[65] Here is how the founder of the Science of Unitary Human Beings explains her system as of 1986:

> Four concepts are postulated to be basic to the proposed system, namely: energy fields, openness, pattern, and four-dimensionality. These concepts are defined consistent with the general language and are given specificity according to the conceptual system under discussion.
>
> Energy fields are postulated to constitute the fundamental unit of both the living and the nonliving. *Field* is a unifying concept. *Energy* signifies the dynamic nature of the field. *Energy fields* are infinite. Two energy fields are identified: the human field and the environmental field. Specifically, human beings and environment *are* energy fields.[66]

After briefly conscripting relativity, quantum theory, probability, evolutionary theory and space exploration in support of the conclusion that "the closed-system, entropic model of the universe" is no longer tenable, Rogers goes on to explicate the last three of her basic concepts:

> In a universe of open systems, causality is not an option. ... Energy fields are open — not a little bit or sometimes, but continuously. The human and environmental fields are integral with one another. Causality is invalid. Change is continuously innovative.
>
> *Pattern* is defined as the distinguishing characteristic of an energy field perceived as a single wave. ...
>
> Four-dimensionality characterizes the human and environmental fields. It is defined as a nonlinear domain without spatial or temporal attributes. All reality is postulated to be four-dimensional.[67]

An uncharitable reader (such as myself) might object that this pseudoscientific verbiage is perfectly meaningless.[68] But Rogers has an answer:

> Definitions increase in clarity and specificity as the conceptual system emerges. The unitary human being (human field) is defined as an irreducible, four-dimensional

[65] Phillips (1994a, p. vii). Not only is Rogers "the 20th-century [Florence] Nightingale" (Fitzpatrick 1994, p. 322); she is also "a leader in the development of contemporary science" who has "made major contributions to science at large", extending far beyond nursing (Phillips 1994b, pp. 330, 335). Indeed, Rogerian scholarship "will revolutionize all views of the universe, similar to Einstein's theory of relativity" (Phillips 1997, p. 18).

[66] Rogers (1986, p. 4), emphasis in the original, reprinted in Malinski, Barrett and Phillips (1994, p. 234).

[67] Rogers (1986, p. 5), emphasis in the original, reprinted in Malinski, Barrett and Phillips (1994, p. 235).

[68] For instance, "energy" and "field" both have precise (not metaphorical!) meanings in physics; but "energy field", a key term in Rogers' writings, is meaningless in physics. Of course, Rogers and her supporters might reply that they are not purporting to give these terms their standard meaning in physics, but are instead providing their own definitions. That would be fine in principle; the trouble is that Rogers' purported "definitions" are as meaningless as the terms allegedly being defined. For instance, Rogers says that "Four-dimensionality ... is defined as a nonlinear domain without spatial or temporal attributes." But she nowhere clarifies what she means here by "domain" (much less "domain without spatial or temporal attributes"); moreover, the mathematical adjective "nonlinear" is meaningless in this context. Every one of Rogers' "definitions" suffers from a similarly fatal vagueness. See also Raskin (2000, p. 34) for a patient dissection of Rogers' pseudoscience.

> energy field identified by pattern and manifesting characteristics that are different from those of the parts and cannot be predicted from those of the parts. The environmental field is defined as an irreducible, four-dimensional energy field identified by pattern and manifesting characteristics that are different from those of the parts. Each environmental field is specific to its given human field. Both change continuously, mutually, and creatively. The human and environmental fields are infinite and integral with one another.[69]

With this clarification in hand, we can push onwards from concepts to principles:

> Unifying principles and hypothetical generalizations derive from the conceptual system. The Principles of Homeodynamics are three in number and together postulate the nature and direction of change. These principles are set forth as follows:
>
> **PRINCIPLES OF HOMEODYNAMICS**
>
> | | |
> |---|---|
> | Principle of Resonancy | The continuous change from lower to higher frequency wave patterns in human and environmental fields |
> | Principle of Helicy | The continuous, innovative, probabilistic increasing diversity of human and environmental field patterns characterized by nonrepeating rhythmicities |
> | Principle of Integrality | The continuous mutual human field and environmental field process[70] |

In later years, Rogers continued to make improvements in her system, replacing "four-dimensional" with "multidimensional" and finally "pandimensional", while deleting "probability" in favor of "unpredictability".[71]

The Science of Unitary Human Beings makes numerous empirically testable predictions, for example:

> The principle of helicy subsumes within it the principles of reciprocy and synchrony, and postulates further explanatory and predictive dimensions of nursing's theoretical system. The principle of helicy connotes that the life process evolves unidirectionally in sequential stages along a curve which has the same general shape all along but which does not lie in a plane. Encompassed within this principle are the concepts of rhythmicality, negentropic evolutionary emergence, and the unitary nature of the man-environment relationship.
>
> ...
>
> The principle of helicy ... may be stated in symbolic form thus:
>
> $$H \;=\; f\,S\text{-}T_1\,(M_1 \rightleftarrows E_1)\underset{\sim}{i}\,f\,S\text{-}T_2\,(M_2 \rightleftarrows E_2)\underset{\sim}{i}\,\text{—}f\,S\text{-}T_n\,(M_n \rightleftarrows E_n)$$

[69] Rogers (1986, p. 5), reprinted in Malinski, Barrett and Phillips (1994, p. 235).

[70] Rogers (1986, pp. 5–6), reprinted in Malinski, Barrett and Phillips (1994, p. 235).

[71] Rogers (1990, 1992). A useful overview of the evolution of Rogers' Science of Unitary Human Beings is given by Malinski (1994). See also Malinski (1986, pp. xiii–xix).

in which H stands for helicy

 stands for the spiral of life

i stands for innovation

and can be read as: "Helicy is a function of continuous innovative change growing out of the mutual interaction of man and environment along a spiralling longitudinal axis bound in space-time."[72]

Not to mention the following:

> Clairvoyance, for example, is rational in a four-dimensional human field in continuous mutual, simultaneous interaction with a four-dimensional environmental field. So too are such events as psychometry, therapeutic touch, telepathy, and a wide range of other phenomena. Within this conceptual system such behaviors become "normal" rather than "paranormal."[73]

> Unitary human and environmental rhythms find expression in the rhythmicities of the living–dying process. Just as aging is deemed developmental, so too is dying hypothesized to be developmental. The nature of the dying process and after-death phenomena have gained considerable public and professional interest in recent years. ... A new approach to studying the dying process is provided by the conceptual system herein presented. The nature and continuity of field patterning subsequent to dying, while admittedly a difficult area to study, nonetheless is open to theoretical investigation.[74]

What is the rational reader to make of the Science of Unitary Human Beings? From a logical or empirical point of view, there is only one appropriate word: loony. From a stylistic point of view, Rogers' mumbo-jumbo is perhaps a cut or two above run-of-the-mill New Age fare, but is vastly inferior to the sophisticated charlatanry produced by virtuosos of the genre such as Jacques Lacan, Julia Kristeva, Gilles Deleuze, Félix Guattari and Paul Virilio.[75]

Despite this, Martha Rogers has attracted around herself a devoted cult of followers, who have edited books with titles like *Explorations of Martha Rogers' Science of Unitary Human Beings*, *Visions of Rogers' Science-Based Nursing*, *Rogers' Scientific Art of Nursing Practice*, and *Patterns of Rogerian Knowing*.[76] Rogers' "visionary" work is kept alive by the Society of Rogerian Scholars, which publishes a thrice-yearly newsletter, the *Rogerian Nursing Science News*, and an annual scholarly journal, *Visions: The Journal of Rogerian Nursing Science*.

Most importantly, the influence of Rogers' ideas now extends far beyond her circle of immediate disciples, reaching into the mainstream of the nursing profession. Textbooks on

[72]Rogers (1970, pp. 99–101), reprinted in Malinski, Barrett and Phillips (1994, pp. 217–218). Please note that Rogers' "equation" is mathematically meaningless. Her use of symbols resembling (to a layperson's eye) a mathematical equation is nothing more than a crass attempt to give her ideas a veneer of "scientificity"; the "equation" in fact adds nothing to its verbal "translation" (which, alas, is also scientifically meaningless).

[73]Rogers (1980, p. 335), reprinted in Malinski, Barrett and Phillips (1994, p. 230).

[74]Rogers (1986, p. 8), reprinted in Malinski, Barrett and Phillips (1994, p. 237).

[75]See e.g. Sokal and Bricmont (1998, chapters 2, 3, 9 and 10).

[76]Malinski (1986), Barrett (1990), Madrid and Barrett (1994), Madrid (1997). See also Rogers, Malinski and Young (1985), Sarter (1988), Lutjens (1991), Barrett and Malinski (1994).

nursing theory often devote a chapter, in utter seriousness, to the Science of Unitary Human Beings.[77] Rogers' work is cited frequently in the academic nursing literature: for instance, *An Introduction to the Theoretical Basis of Nursing* has been cited 289 times since its 1970 publication.[78] Student dissertations extend and apply her system: at least 91 dissertations (74 doctoral, 17 masters) were completed between 1977 and 2002 that have "Martha Rogers" or "Science of Unitary Human Beings" in the title or abstract.[79] And finally, in 1996, a mere two years after her death, Martha Rogers was inducted into the Hall of Fame of the American Nurses Association, the main professional group for nurses in the United States. Her citation begins and ends as follows:

> Widely known for her discovery of the science of unitary human beings, Martha E. Rogers provided a framework for continued study and research, and influenced the development of a variety of modalities, including therapeutic touch. ...
>
> A proponent of rigorous scientific study, Rogers wrote three books that enriched the learning experience and influenced the direction of nursing research for countless students: *Educational Revolution in Nursing* (1961), *Reveille in Nursing* (1964), and *An Introduction to the Theoretical Basis of Nursing* (1970), the last of which introduced the four Rogerian Principles of Homeodynamics. Following her retirement in 1975, Rogers continued to teach at New York University, was a frequent presenter at scientific conferences throughout the world, and consistently worked to refine her conceptual system. ... She was honored with numerous awards and citations for her sustained contributions to nursing and science.[80]

2.4 Postmodernist philosophy in nursing (I)

I propose now to analyze the writings of nursing pseudoscientists, in an effort to extract their (mostly implicit) epistemological premises. By what means, according to these

[77] For example: Riehl-Sisca (1989), McQuiston and Webb (1995), Meleis (1997), Fawcett (2000), Young, Taylor and Renpenning (2001), George (2002), Marriner-Tomey and Alligood (2002), Alligood and Marriner-Tomey (2002). It is important to note that Rogers' Science of Unitary Human Beings is by no means the only pseudoscientific theoretical framework that has achieved prominence within the nursing profession. As one advocate of "alternative/complementary modalities" points out,

> there are several nursing theories that incorporate the concept of "human energy field" and "environmental energy field", specifically Rogers' Theory of Unitary Human Beings, Newman's Theory of Expanding Consciousness, and Parse's Theory of Human Becoming. All energy-based modalities are congruent with these theories. While Therapeutic Touch (TT) is a modality developed by and researched by nurses, other energy-based modalities such as Reiki and Healing Touch techniques are widely used by and taught to non-nurses. (Frisch 2001)

In fact, most of the textbooks cited above also have chapters on Newman's and Parse's theories.

[78] Science and Social Science Citation Indexes combined, as of November 7, 2003. Available at `http://isi4.isiknowledge.com/`

[79] Dissertation Abstracts, as of November 6, 2003. Available at `http://wwwlib.umi.com/dissertations/` It is likely that many masters' dissertations are missing from this database.

[80] The full text of the citation is available at `http://nursingworld.org/hof/rogeme.htm` (accessed January 12, 2004).

theorists, can human beings arrive at reliable knowledge of the world? I shall attempt, in particular, to assess the extent to which the advocates of pseudoscience have resorted to postmodernist arguments. (In the next subsection I will focus on nursing theorists whose primary identification is with postmodernism, and assess the extent to which they have endorsed pseudoscience.)

The literature of "complementary and alternative nursing" is replete with contrasts between mainstream scientific medicine — which these authors criticize as mechanistic, reductionist and anti-human — and the evolving "holistic" paradigm.[81] For example:

> Biomedical or Western medicine ... is founded on the philosophical beliefs of René Descartes (1596–1650), that the mind and body are separate, and on Sir Isaac Newton's (1642–1727) principles of physics, that the universe is like a large mechanical clock where everything operates in a linear, sequential form. The mechanistic perspective of medicine views the human body as a series of body parts. It is a reductionistic approach in which the person is converted into increasingly smaller components: systems, organs, cells, and biochemicals. People are reduced to patients, patients are reduced to bodies, and bodies are reduced to machines.[82]

Of course, this is simplistic, to say the least. For what it's worth, Newtonian physics is perfectly capable of describing complex interactive systems that need not "operate in a linear, sequential form" (whatever that may mean).[83] Scientific reductionism, understood as the view that there are no autonomous principles of chemistry or biology that are not ultimately rooted in physics, in no way entails reductionism *as a methodology* for investigating the world: this may be an appropriate method for studying some phenomena and not for studying others.[84] Finally, science in no way enjoins doctors to ignore the emotional needs of their patients or to treat them as mere "bodies" and "machines". (Insurance companies may do so, however.)

Advocates of "holistic healing" also criticize mainstream science for ignoring alleged good evidence in favor of homeopathy, Therapeutic Touch, telepathy, healing by distant prayer, and other phenomena that are inconsistent with the modern scientific worldview. For example:

> When therapies such as acupuncture or homeopathy are observed to result in a physiologic or clinical response that cannot be explained by the biomedical model, many have

[81] See Williams (1985) for a judicious and balanced overview of "holistic nursing".

[82] Fontaine (2000, pp. 4–5). Very similar comments are made by the editor of a recent textbook on "complementary and alternative medicine" (Micozzi 2001, p. 4).

[83] Note also that the allusion to Descartes is highly misguided. If modern science has any characteristic worldview, it is surely not Cartesian dualism, but rather materialist monism, i.e. "the view that there is essentially only one kind of 'reality,' one kind of material existence, governed by its unique and invariable set of laws or, if you prefer, regularities" and in particular that the mind "must be understood as a physical function of a physical body". Descartes' philosophy is more accurately understood as a dead end in the history of science, "a late, postmedieval attempt to rescue the world of thought from the monism toward which it was apparently heading". (Quotations from Levitt 1999, p. 19) Alas, this clarification is hardly likely to increase the fondness of "holists" for modern science.

[84] For a clear explanation of this point, see Weinberg (1992, chapter III; 1995).

> tried to deny the results rather than modify the scientific model. ... If people limit themselves to the five senses, they will never come to understand human energy fields, electromagnetic fields, thoughts as a form of energy, or the healing power of prayer.[85]

It is important to note that the foregoing critiques, radical and global though they may be, are aimed at the *content* of modern science, not at its epistemology or methodology. Indeed, advocates of "holistic healing" frequently buttress their case with appeals to scientific evidence of a perfectly traditional kind: experiments, observations, clinical trials, deductions from accepted theories, etc. The quality of this evidence is often ludicrously low, as is the cogency and precision of the reasoning accompanying it; that is why much of this literature can properly be characterized as pseudoscience. But it is not — or at least not yet — postmodernist.

Furthermore, despite the ritual denunciation of soulless modern science, holistic theorists also shamelessly wrap themselves in its mantle:

> Einstein said that all matter is energy, energy and matter are interchangeable, and all matter is connected at the subatomic level. No single entity could be affected without all connecting parts being affected. In this view, the universe is not a giant clock, but a living web. The human body is animated by an integrated energy called the *life force*. The life force sustains the physical body but is also a spiritual entity that is linked to a higher being or infinite source of energy.[86]

(Poor Albert must be turning over in his grave.)

> Tibetan Buddhists ... believe that thought is infinitely powerful and actually holds sway over matter. Quantum physics is increasingly lending credence to this notion, in that infinite energy can be an attribute of an infinitely short wave of vibration — that is, energy as ascribed to thought processes helps to make new understandings of mind-body interactions.[87]

(Ugh.) The modern-physics-justifies-New-Age-medicine argument is also proferred, in vastly more sophisticated form, by Larry Dossey, executive editor of the journal *Alternative Therapies in Health and Medicine* and author of numerous best-selling books on health and spirituality. Dossey repeatedly invokes quantum mechanics to argue that the mind is "nonlocal" and hence capable of telepathy, prophecy, and healing by prayer-at-a-distance.[88] This idea is picked up by the editors of a handbook on holistic nursing, who assert that

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[85] Fontaine (2000, p. 12).

[86] Fontaine (2000, p. 6), emphasis in the original. The first sentence of this quote is a fairly accurate, though incredibly superficial, summary of certain aspects of special relativity (interchangeability of energy and matter) and quantum mechanics (interconnectedness in a certain limited sense). But to call the universe a "living web" is pure metaphor; and the last two sentences of this quote are a complete *non sequitur*. It goes without saying that modern physics provides no support whatsoever for the notion of "life force".

[87] Watson (1999, p. 106). The author is a Distinguished Professor of Nursing at the University of Colorado Health Sciences Center and former president of the National League for Nursing. For what it's worth, quantum physics does *not* lend any credence whatsoever to the bizarre notions proferred by Watson.

[88] Dossey's earliest work (1982, pp. 98–101, 122–134, 146–150, 194–196, 208–209, 233–234) invokes quantum mechanics, as interpreted in the extremely controversial speculations of some physicists, to argue that human

> Era III [nonlocal or transpersonal medicine], the newest and most advanced era, originated in science. Consciousness is said to be nonlocal in that it is not bound to individual bodies. The minds of individuals are spread throughout space and time; they are infinite, immortal, omnipresent, and, ultimately, one.[89]

Holistic theorists do, however, also criticize scientific methodology, with the clear aim of "moving the goal post" in studies of alternative treatments. For example, Karen Lee Fontaine asserts that the method of double-blind clinical trials

> is based on the assumption that single factors cause and reverse illness, and that these factors can be studied alone and out of context. Alternative medicine, however, believes that no single factor causes anything nor can a magic substance single-handedly reverse illness. Multiple factors contribute to illness, and multiple interventions work together to promote healing. The double-blind method is incapable of reconciling this degree of complexity and variation.[90]

These claims are false. Irrespective of whether the proposed treatment (a) consists of single or multiple interventions, and (b) is standardized or is tailored to the specific patient, it can be compared against a placebo or alternate treatment in a randomized and (in most cases) double-blind study.[91] Fontaine goes on to observe that

> Although major alternative medical systems may not have a great deal of quantitative research, they are generally *not* experimental. They rely on well-developed clinical observational skills and experience that is guided by their explanatory models.[92]

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consciousness is a fundamental element in the ontology of the universe. In later books he elaborates on this theme, stressing the element of nonlocality — a rather technical, very important, but also extremely controversial aspect of quantum physics (see e.g. Mermin 1993 and Maudlin 1994) — from which he draws increasingly exotic conclusions about telepathy and kindred "phenomena": see Dossey (1989, pp. 153–186 and *passim*; 1993, pp. 84–85, 128, 155–156; 1999, pp. 26–27, 68; 2001, pp. 113–114, 189–191, 238–239). At one point, Dossey (1993, p. 85) observes correctly that quantum-mechanical nonlocality *cannot* be used to send messages — thereby demolishing his claimed physical basis for telepathy — but he then goes on to conjecture, bizarrely and erroneously, that "perhaps nonspecific prayer strategies do *not* violate physics' prohibition on sending messages nonlocally" (p. 85, emphasis in the original). For clearly explained critiques of "quantum medicine" and "quantum parapsychology", see Stalker and Glymour (1985a) and Gardner (1981).

[89] Dossey and Guzzetta (2000, p. 11). These notions are also incorporated into the *Core Curriculum for Holistic Nursing* developed by the American Holistic Nurses' Association (AHNA) and are enshrined in the Practice Examination Questions designed to help the reader prepare for the Holistic Nursing Certification (HNC) exam. See Dossey (1997, pp. 7–8, 249). Some parts of this Core Curriculum are quite bizarre. For example, in the chapter on "energetic healing", among the "knowledge competencies" required of the student are to "Describe two characteristics of an electromagnet", "Discuss the quantum theory of consciousness-created reality", "Compare a Fourier analyzer to the chakra system and L–C circuits to individual chakras", and "Describe one traditional portrayal of an aura" (Dossey 1997, chapter 7, p. 52).

[90] Fontaine (2000, p. 12).

[91] To be sure, double-blinding is not always feasible or effective: the patient may be able to deduce from the drug's side effects whether he is in the experimental or control group; and for some interventions it may be physically impossible to devise "sham" interventions that maintain the double-blinding. The classic example of inability to double-blind is the path-breaking study, "Is coitus implicated in causing pregnancy?: Some preliminary findings".

[92] Fontaine (2000, p. 12), emphasis in the original.

But the *inadequacies* of "well-developed clinical observational skills and experience" in providing reliable evidence of statistical causation are precisely what led medical researchers to develop randomized, double-blind studies in the first place. Fontaine does not explain how practitioners of alternative medicine manage to escape from these known inadequacies.[93] She concludes by saying that

> This text does not offer meticulous documentation for all claims which are made by the various therapies. ... Successful alternative therapies, however, should not be withheld from the public while research is being debated.[94]

This of course begs the question of whether the therapies at issue *are* in fact successful — an assertion that can only be tested by rigorous research.[95]

These animadversions against double-blind clinical trials constitute blatant special pleading, but they are not *per se* postmodernist. At other moments, however, advocates of pseudoscience do engage in preemptive postmodernist rhetoric. Consider the following passage, in which Kuhn's alleged incommensurability of paradigms is implicitly invoked (in a radical form that even Kuhn — at least the later Kuhn — would very likely disavow):

> Scientific beliefs rest not just on facts but on paradigms. ... A common yet seemingly almost invisible presumption is that "experts" of conventional medicine are entitled and qualified to pass judgment on the scientific and therapeutic merits of alternative therapies. Since the paradigm is quite different, they are not qualified.[96]

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[93] Fontaine (2000, p. 12) makes the valid observation that medical tests and procedures are not subject, under current American law, to the same rigorous evaluation that new drugs are required to undergo. But the proper remedy would be to close this loophole by requiring a higher standard of scientific evidence for all medical interventions, not to extend the loophole by lowering the standard of proof for "alternative" treatments (some of which are indeed drugs). Indeed, most "alternative" treatments are already exempt from regulation, either *de jure* or *de facto*.

[94] Fontaine (2000, p. 12).

[95] Even cruder versions of begging the question can be found in the writings of other advocates of "alternative healing practices". For instance:

> [T]he fact that cellular, organ, and whole-organism phenomena, as are reported in mice and people under the influence of *qigong* and other energy healing modalities, have continued to attract patients and practitioners for literally thousands of years, must surely indicate that there is something of untold significance to be rediscovered. (Jobst 2002, p. 524)

> Homeopathy is an effective and scientific system of healing ... The homeopathic principles constitute a unified hypothesis whose validity is tested empirically: cured patients confirm the hypothesis. (Castro 1999, p. 280)

> [O]ur intuitive faculty is nothing other than a source of sound premises about the nature of reality. ... [T]here exists within us a source of direct information about reality that can teach us all we need to know. (Weil 1998, pp. 151–152; see also p. vii)

See Beyerstein (1999, 2001) for an incisive analysis of some common errors of reasoning among advocates and users of alternative medicine; and see Relman (1998) for a detailed analysis and critique of the epistemology underlying the writings of Andrew Weil, the self-described "guru of alternative medicine".

[96] Fontaine (2000, p. 10).

In other words, each paradigm is entitled to set up its own criteria for judging the scientific merits of proposed theories, and these judgments are declared (by fiat) immune from rational critique by adherents to another paradigm.[97,98]

Some prominent nursing pseudoscientists have endorsed even more explicit forms of postmodernist relativism. A telling example is provided by Dolores Krieger, co-inventor of Therapeutic Touch. Immediately after claiming that Therapeutic Touch "is based on rational theory derived from formal research that requires rigorous replication" — an affirmation that she deems necessary because "science is the reality that Western civilization accepts" — she goes on to emphasize that

> there is not only one reality, or even specified "alternate" realities, that satisfy all the conditions for reality among the many cultures of our global village, Earth. It is now recognized that the concept of multiple realities is valid; a particular view of reality is dependent only upon the particular facet of human consciousness that is permitted to operate at the time.[99,100]

Along similar lines, Jean Watson, Distinguished Professor of Nursing at the University of Colorado Health Sciences Center and former president of the National League for Nursing — and one of the major contemporary theorists of nursing pseudoscience[101] — avers that

> The art and science of nursing with its concern with caring-healing and health as a field of study, research and practice within its own paradigm is realizing that in this postmodern time, science, knowledge and even images of nursing, health, environment, person become one among many truth games.[102]

Finally, the grander theorists of nursing pseudoscience — such as Martha Rogers and her successors — have built elaborate systems on a fog of verbiage reminiscent of, though vastly

[97] Similar arguments are offered by many advocates for (or sympathetic analysts of) "complementary and alternative medicine". See, for example, the essays of Cassidy and Watkins contained in Micozzi (2001), and the essays of Schaffner, Hufford, O'Connor, Wolpe and Tauber contained in Callahan (2002).

[98] For a summary and critique of Kuhn's ideas on the incommensurability of paradigms, see Maudlin (1996) and Sokal and Bricmont (1998, pp. 71–78).

[99] Krieger (1993, p. 6).

[100] Another example of extreme postmodernist relativism is provided in a recent textbook on complementary and alternative medicine: "[A]ll answers are right from within the logic of the model in use. ... From this position, clinicians, researchers, or students ... can avoid becoming mired in determining which method is true because nothing is really true when all realities are constructed." (Cassidy 2001, p. 21) Similarly, a disciple of Martha Rogers states that "the Rogerian ontology does not distinguish between subjective and objective realities. Furthermore, pandimensionality recognizes multiple, even infinite, realities." (Butcher 1999, p. 113) Finally, another nursing theorist sympathetic to the "new paradigm" ideas of Rogers and her successors argues that "upon close examination of the ontologies, it is clear that core postmodern ideas, such as constructed realities, the centrality of meaning and interpretation, and valuing the multivocality of discourse, are also central to the new paradigm ontologies." (Cody 2000, p. 94)

[101] Watson's pseudoscientific theories can be found in Watson (1999). See also Watson and Smith (2002), in which Watson's Caring Science and Rogers' Science of Unitary Human Beings are "creatively synthesized" into a new Unitary Caring Science; and see the extensive interview with Watson published by Fawcett (2002).

[102] Watson (1995, p. 63).

less sophisticated than, that of Deleuze and Guattari.[103] Their method, to the extent that one can be discerned, seems to be to *postulate* an abstract system and then "deduce" its consequences. In principle that procedure could be assimilated to the hypothetico-deductive approach characteristic of modern science, but the trouble is that the starting "principles" are so vague ("Field is a unifying concept. Energy signifies the dynamic nature of the field. Energy fields are infinite.") that there is no precise way of distinguishing valid from invalid "deductions", much less of deducing falsifiable empirical predictions. The whole exercise becomes, in the end, little more than an elaborate taxonomy of angels, replete with scholastic arguments as to whether those angels are "four-dimensional" or "multidimensional" or "pandimensional". This approach makes contact with another aspect of what I have called postmodernism, namely, theoretical discourses disconnected from any empirical test.

2.5 Postmodernist philosophy in nursing (II)

Postmodernist ideas originating in literary criticism, continental philosophy and feminist theory began to be influential among nursing theorists in the early 1990s.[104] Starting then, there appeared a surprising number of citations to Heidegger, Foucault, Derrida, Rorty and other "postmodernist" philosophers.[105]

Theoretical articles on postmodernism in nursing tend to recycle the same arguments and rhetoric as are found in postmodernist writings in the social sciences and literary theory. The argumentation tends to remain on an abstract philosophical or political plane, and rarely addresses concrete questions of nursing interventions or the methodology by which they should be evaluated.[106] At the level of epistemology, some authors are fairly precise while others are maddeningly vague:

> Postmodernism is a rejection of the modern, post-Enlightenment concern with the rational and scientific. ... [T]ruth is seen as problematic and not necessarily progressively accessible through scientific exploration or logical reasoning. Complexity and ambiguity are celebrated and inconsistencies, paradoxes and contradictions are not of concern ... [N]ursing ideas and nursing research are good if the stories they tell allow nurses and people in care to get on with their lives.[107]

[103] For comparison, see the introduction to the University of Warwick conference devoted to "DeleuzeGuattari and Matter", cited in Levitt (1999, pp. 85–86). Or see Sokal and Bricmont (1998, chapter 9).

[104] The Cumulative Index to Nursing and Allied Health Literature (CINAHL) lists 131 articles using the words "postmodernis$" or "poststructural$" ($ = anything) in the title or abstract. The first of these articles appeared in 1989, but in the period 1989–1994 they averaged only 2 per year; starting in 1995 they took off and averaged 14 per year, continuing up to the present. Data are as of December 10, 2003. See also the much larger number of articles cited in the next footnote. CINAHL is available on-line at `http://gateway.ovid.com/`

[105] CINAHL shows a whopping 663 articles that mention Foucault in the title, abstract or bibliography/cited references, Heidegger with 531, Rorty with 99, and Derrida with 81. Nearly all of these citations appeared in 1995 or after. Data are as of December 10, 2003.

[106] See e.g. the essays in Omery, Kasper and Page (1995), Kikuchi, Simmons and Romyn (1996), and Thorne and Hayes (1997).

[107] Stevenson and Beech (2001, pp. 144–145, 149).

> Such an ontological and epistemological shift [associated with postmodernism] invites and works with context, connections, relations, multiplicity, ambiguity, openness, indeterminacy, patterning, paradox, process, transcendence and mysteries of the human experience of being-in-the-world ... [108]

Though postmodernist nursing theorists seem in general reluctant to commit themselves concerning specific nursing interventions — particularly those claiming biological effects — a recent debate in the pages of the journal *Nursing Philosophy* brought some of these issues to the fore. An article by health journalist Sarah Glazer, criticizing both Therapeutic Touch and the postmodernist trend in nursing, was answered by Janice L. Thompson on behalf of postmodernism.[109] Thompson repeatedly protested (at least five times in four-and-a-half pages, by my count) that her view is not "antiscientific":

> Like most nurses who have been influenced by advanced study, I have considered the dilemmas of developing truth claims outside the discourses of science. No longer comfortably modern in my professional identity, I don't believe that there is *a* condition for 'right reason'. There are many. This plural view does not mean that I am nihilistic or antiscientific. It means that I recognize science as one among many way(s) to produce meaning and truth.[110]

Glazer responded that

> I do argue that the scientific method is the correct approach for evaluating factual claims about the world (e.g. 'Cigarette smoking is a cause of lung cancer', 'Energy fields exist that can be sensed by therapeutic touch practitioners'). Thompson and other nurses of the postmodern persuasion confuse moral with factual issues. Thompson repeatedly insists that she is not 'antiscientific'. ... But one cannot believe in the scientific method and also believe in 'other ways', such as intuition, for evaluating *factual* claims like those of therapeutic touch.[111]

Thompson went on to assert, as did Fontaine, the alleged incommensurability of paradigms, linking it directly with therapeutic touch, shamanic healing and homeopathy:

> As a non-discursive practice, therapeutic touch, like shamanic healing, may elude our current epistemic 'paradigms'. Precisely for this reason, we should be careful about how and why we judge it. ... [T]o argue for evidence-based practice means we must consider the questions 'What evidence?' and 'Whose evidence?'. These are the very questions that have been and will continue to be highly contested in the ongoing story of therapeutic touch. They are the questions that emerge when allopathic providers encounter the healing practices of homeopathic providers. When western physicians encounter the shamanic practices of folk healers from other cultures. ... They are questions that always emerge when *incommensurable* truth claims meet and the framework for adjudicating these differences eludes us.[112]

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[108] Watson (1995, p. 61).

[109] Glazer (2000b), Thompson (2002), Glazer (2002).

[110] Thompson (2002, pp. 59–60), emphasis in the original.

[111] Glazer (2002, p. 64), emphasis in the original.

[112] Thompson (2002, pp. 60–61), emphasis mine.

As Glazer observed in her rebuttal,

> I find it interesting that Professor Thompson doesn't address the central question of my article, which is why a highly suspect therapy known as therapeutic touch continues to be practised and embraced by nurses. After reading Thompson's critique, I am still not sure whether this is because she finds therapeutic touch to be an embarrassment to the profession or because she believes in it but is unwilling to defend it openly.[113]

At one point in her essay, however, Thompson descends from the abstract plane and addresses concrete nursing theories; curiously, this is also the only place in the article where her tone shifts from patient rebuttal to indignation. While pleading unfamiliarity with therapeutic touch, Thompson adds that

> I am familiar, however, with the work of Martha Rogers and I am offended by the characterization of her offered by an author who appears to have limited knowledge of Professor Rogers' studies. We may disagree with some of the applications that have been made in therapeutic touch, but we should at least acknowledge with respect the commitment of this intellectual who carefully studied the work of her mentors in theoretical physics. She was a widely read and very strong interdisciplinary scholar.[114]

As Glazer aptly comments, "One does not have to be a physicist to find Rogers' use of physics to justify therapeutic touch laughable."[115] But just for the record, let me state that Rogers does not exhibit the slightest knowledge of physics — not even at the level of the freshman survey course for non-scientists that I frequently teach. Rather, she borrows terms from physics and then throws them around without regard for their meaning.[116]

2.6 Concluding remarks

In writing this account of pseudoscience and postmodernism in nursing, I have endeavored to immerse myself in the nursing literature, but my study makes no pretense of being comprehensive. Many questions still await careful quantitative (and of course also qualitative) investigation by sociologists and historians. How widespread is the teaching of pseudoscience in American nursing schools, and the practice of pseudoscience in American hospitals? In what way have these evolved over time? How popular is postmodernist philosophy among professors and students of nursing, both in its "high" form (Heidegger, Derrida, Foucault, ...) and in its watered-down form (loose talk about social construction and a multiplicity of perspectives)? To what extent, and in what ways, do pseudoscience and postmodernism overlap (both intellectually and sociologically) in the nursing community? To what extent

[113] Glazer (2002, p. 63).

[114] Thompson (2002, p. 60). See Dzurec (1989, p. 75) for another example of a postmodernist nursing theorist commenting favorably on Rogers' Science of Unitary Human Beings.

[115] Glazer (2002, p. 63).

[116] Rogers' grasp of basic physics is perhaps also illustrated by her enthusiastic and wholly uncritical endorsement of Immanuel Velikovsky's crackpot theories of astronomy (Rogers 1970, p. 12). For further analysis of Rogers' pseudo-physics, see Glazer (2002, p. 63) and Raskin (2000, p. 34).

have these trends spread (or developed independently) outside the United States? What are the social and psychological forces underlying the development and spread of pseudoscience and postmodernism within the nursing profession?[117]

3 Hindu nationalist pseudoscience and postmodernism in India

In an important new book, *Prophets Facing Backward: Postmodern Critiques of Science and Hindu Nationalism in India*, philosopher-sociologist of science Meera Nanda has recounted in dispiriting detail how postmodernist-oriented leftist Indian intellectuals have, since the early 1980s, unwittingly helped pave the way for the rise to power of right-wing Hindu nationalism — a politico-religious doctrine in which pseudoscience, passed off as real science, plays a central role. I propose here to summarize briefly Nanda's story, laying stress on the ideas put forth by the "postcolonial" theorists on the one hand and the Hindu nationalists on the other, analyzing their similarities and differences. Readers interested in a fuller account of the historical and political context are urged to consult Nanda's engrossing book.

3.1 Postmodernism in India

In July 1981, a group of Indian scientists and intellectuals published a "Statement on Scientific Temper", in which they lamented the persistence of illiteracy, superstition and religiously-grounded social hierarchies in a country that simultaneously boasted of world-class universities and the world's third-largest scientifically trained workforce. Noting that "the best Indian minds in the pre-independence times insistently propagated the need for the people to think independently and fearlessly, and to question traditional beliefs" — a ferment that led in time to "a critique of the colonial system [and] ... a powerful national movement for our liberation" — the statement regretted that at independence

> No systematic and sustained effort was made to work out, specifically and concretely, what needed to be done to build a society which is animated by a spirit of enquiry rather than passivity and acceptance. The result ... was accommodation, even compromise, with the forces of obscurantism and with the existing inegalitarian social and economic structures.[118]

Three decades later,

> There is a cancerous growth of superstition at all levels. Rituals of the most bizarre kind are frequently performed often with official patronage. Obscurantist social customs are followed even by those whose profession is the pursuit of scientific enquiry. Our entire educational system works in an atmosphere of conformity, non-questioning and obedience to authority.[119]

[117] A preliminary analysis of this last question can be found in Glazer (2000b).

[118] Haksar *et al.* (1981, p. 7).

[119] Haksar *et al.* (1981, p. 7).

The statement's signers urged the cultivation of rationalist and scientific habits of mind in the service of social justice:

> The spirit of inquiry and the acceptance of the right to question and be questioned are fundamental to Scientific Temper. ... It leads to the realisation that events occur as a result of interplay of understandable and describable natural and social forces and not because someone, however great, so ordained them. ... When the social structure and stratification prevent the application of rational and scientifically proven solutions, the role of Scientific Temper is to lay bare the anatomy of such social barriers.[120]

The idea was not new: decades earlier, Jawaharlal Nehru, the first Prime Minister of India, had lauded

> the adventurous and yet critical temper of science, the search for truth and new knowledge, the refusal to accept anything without testing and trial, the capacity to change previous conclusions in the face of new evidence, the reliance on observed fact and not on preconceived theory, [and] the hard discipline of the mind ... The scientific approach and temper are, or should be, a way of life, a process of thinking, a method of acting and associating with our fellow men.[121]

The Statement on Scientific Temper was an attempt to reclaim Nehru's Enlightenment vision in an unevenly modernizing India.[122]

But the Statement was immediately subjected to harsh attack from neo-Gandhian intellectuals, using what in later years would be called "postmodernist" arguments. The first shot was fired by Ashis Nandy, who disparaged the Statement as "ultra-positivist", "pseudo-empiricis[t]" and "a posthumous child of colonialism" and proceeded to launch a full-scale onslaught against modern science in all its aspects: technological, social and epistemological.[123] Assailing the complicity of scientists in both inter-state warfare and within-state oppression, Nandy observed (correctly) that "science today is big business" and (more dubiously) that "in some [unnamed] countries, more illness is now caused by the modern medical system than by natural causes"; all in all, he asserted, "science today is the main instrument of oppression in the world."[124] But the problem, according to Nandy, is not merely the misuse of science for oppressive ends; it is the scientific worldview itself. In the case of Galileo,

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[120] Haksar *et al.* (1981, pp. 8–9).

[121] Nehru (1946, p. 523). Nehru's book was written in April–September 1944 in Ahmadnagar Fort prison, where he and other leaders of the Indian independence movement had been interned by the British since mid-1942.

[122] Indeed, since the 1960s a plethora of People's Science Movements have been active throughout India — numbering well over 100,000 members in total — under the banner of "science for social revolution", which includes promoting a scientific worldview "in order to demystify the religious legitimations of caste, patriarchy, and other sources of discrimination based on concepts of purity" (Nanda 2003, p. 220). For more information on these movements, see Nanda (2003, pp. 219–222) and Isaac *et al.* (1997).

[123] Nandy (1981, pp. 16, 17).

[124] Nandy (1981, pp. 17, 16), commentary in brackets added by me.

> it was the Church which proved itself more open and sought to have plural images of the cosmos. Galileo, like the signatories to the statement, thought he knew the truth and he wanted to oust all other concepts of truth. The Church, though it might have gone about it foolishly and hamhandedly, objected to that part of the story.[125]

Asserting that the argument against astrology had already been "so badly mauled by Paul Feyderabend [*sic*] on scientific, normative and methodological grounds" that the details need not be rehashed, Nandy added that

> in a world where arbitrary authorities constantly deny one control over one's fate, a situation created partly by modern science and technology, astrology is for the poor a psychological defence; it is an attempt to find meaning for an oppressive present in a controllable future. ... Everything said, astrology is a myth of the weak; modern science that of the strong.[126]

The bottom line, said Nandy, is that "We must learn to reject the claim to universality of science. *Science is no less determined by culture and society than any other human effort.*"[127] Nandy urged the development of a counter-consciousness

> which accepts science as only one of the many imperfect traditions of humankind and which allows the peripheries [of] the world to reclaim their human dignity and reaffirm ... various forms of traditions, religions and myths.[128]

Over the next decade, Nandy's attack on "Western" science was taken up by a cohort of "postcolonial" Indian intellectuals, in books and articles with titles like *Science, Hegemony and Violence* (edited by Nandy), *Science, Development and Violence* (written by Claude Alvares), and "Reductionist Science as Epistemological Violence" (written by Vandana Shiva). These writings make three central claims:

- *Modern science is fundamentally violent and exploitative*, against both Nature and human beings. This violence does not result merely from the misuse of scientific knowledge through militarist, economically oppressive or ecologically unsound technology, but is inherent in the modern scientific worldview itself.

- *Modern science's claim to universality and objectivity is illusory.* Modern science is, in reality, nothing more or less than the ethno-science of the West; modern scientific "knowledge", far from being objective and universal, is permeated with Western values. Other ways of knowing are equally valid, and in some cases superior.

[125] Nandy (1981, p. 17).

[126] Nandy (1981, p. 17). Let me stress that my quarrel is only with the second sentence, which asserts the epistemic equality of astrology and modern science. The first sentence may well be an astute sociological observation (that is an empirical question that I am not competent to assess). But the following recent comment by Nandy (assuming that he has been accurately quoted) is worth noting: " 'Astrology hardly has any influence among the illiterate and poor in rural India,' said a sociologist, Asish [*sic*] Nandy. 'It's the urban educated, grappling with an increasingly complex and uncertain reality, who are in its thrall.' " (Rahman 2003)

[127] Nandy (1981, p. 18), emphasis in the original.

[128] Nandy (1981, p. 17).

- *Each civilization has the right to create its own science*, in conformity with its own traditions.

It is not my purpose here to expound in detail the reasoning leading to these claims, much less to explain why I think this reasoning is grossly deficient.[129] Rather, I would simply like to illustrate, by means of a few quotations of representative passages, these three fundamental themes.

The most innovative aspect of the postcolonial Indian authors on science, compared to the Western postmodernists, is the shrill assertion that modern science is inherently violent.[130] For instance, Claude Alvares argues

> that both science and the technology based on it are fundamentally violent forms of handling the world, that violence is intrinsic to science, to its text, to its design and implementation. . . . There is no way in which the science of our times can be dissociated from its structure of violence.[131]

Likewise, Ashis Nandy asserts that

> There is a direct correlation between the claims to absolute objectivity, inter-subjectivity, internal consistency, dispassion and value-neutrality, on the one hand, and violence, oppression, authoritarianism, killing uniformity and death of cultures, on the other.[132]

In fact, Nandy says, "modern science [is] the basic model of domination in our times and . . . the ultimate justification for all institutionalized violence."[133] Vandana Shiva concurs that modern science is intrinsically violent, and locates the source of this alleged violence more specifically in scientific reductionism[134]:

> I argue that modern science is violent even in peaceful domains such as, for example, health care and agriculture . . . The argument is based on the premise that modern science is quintessentially reductionist. . . . In order to prove itself superior to alternative modes of knowledge and be the only legitimate mode of knowing, reductionist science resorts to suppression and falsification of facts and thus commits violence against science itself . . . [135]

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[129] Suffice it to say that, like much postmodernist discussion of science, these claims are based on simplistic readings of controversial works in the philosophy of science (notably Kuhn and Feyerabend), combined with cavalier leaps of (il)logic about subtle issues like the role of epistemic and nonepistemic values in science, the theory-ladenness of observation, the epistemic status of scientific knowledge, the multiple aspects of reductionism, and the conceptual and socioeconomic relations between science and technology. For more detailed critiques of postmodernist and "postcolonial" claims in the philosophy of science, see Nanda (2003, chapters 5 and 6), Sokal and Bricmont (1998, chapter 4), Haack (1998, 2003) and Brown (2001).

[130] This theme can also be found in some Western authors, beginning with Carolyn Merchant (1980), albeit most often in a less extreme form.

[131] Alvares (1988, pp. 70–71). See also Alvares (1992, p. 64) for a similar statement.

[132] Nandy (1981, p. 18).

[133] Nandy (1987b, p. 122).

[134] Unfortunately, Shiva rides roughshod over the crucial distinctions between different notions of reductionism. For a clear discussion of these different notions, see Weinberg (1992, chapter III; 1995).

[135] Shiva (1988, pp. 232–233). See also Shiva (1989, chapter 2).

Secondly, it is argued that modern science's claim to universality and objectivity is illusory. According to Claude Alvares,

> The claim of modern science to a universalism independent of culture (and cultures) is the first instance of its kind. ... For all practical purposes, however, modern science is nothing more and nothing less than western science, a special category of ethno-science. In fact, its too readily assumed universalism has had disastrous consequences for other ethno-sciences.[136]

Ashis Nandy is even more explicit:

> We must learn to reject the claim to universality of science. *Science is no less determined by culture and society than any other human effort. ...*
>
> *Modern science is one of the many traditions available to humankind. It is also one of the many traditions of science.* Unfortunately, like some of the semitic creeds, it claims to be the only truth outside all traditions. It is time for us to affirm that modern science has the right to praselytise [*sic*] but not to forcibly convert.[137]

Vandana Shiva likewise avers that modern science's "claim to truth" is "fraudulent", and adds that

> The fact-value dichotomy is a creation of modern, reductionist science which, while being an epistemic response to a particular set of values, claims to be independent of values. According to the received view, modern science is the discovery of the properties of nature in accordance with a 'scientific method' which generates 'objective', 'neutral', 'universal' knowledge. This view of modern science as a description of reality as it is, unprejudiced by value, can be rejected ... [S]cientific facts are determined by the social world of scientists, not by the natural world.[138]

> If reductionist science has displaced non-reductionist modes of knowing, it has done so not through cognitive competition, but through political support from the state ... The 'facts' of reductionist science are socially constructed categories which have the cultural markings of the western bourgeois, patriarchal system which is their context of discovery and justification.[139]

Finally, the postcolonial theorists seek to create "alternative" sciences on the foundations of traditional religions and values, as well as on the "folk" beliefs of the common people:

> *The common man has not only his traditional or folk science, he has his own philosophy of science.* It might be vague, implicit and non-professional but it is informed with the experience of suffering. Such folk sciences and folk philosophies must be taken seriously. In fact, we can hope to build an indigenous science only when such lost sciences and implicit philosophies are respectfully articulated by contemporary Indian scholars.[140]

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[136] Alvares (1992, p. 150).

[137] Nandy (1981, p. 18), emphasis in the original.

[138] Shiva (1988, pp. 233–234, 237).

[139] Shiva (1989, pp. 24, 27).

[140] Nandy (1981, p. 18), emphasis in the original.

The proclaimed strategy is one of syncretism, i.e. incorporating selected elements from modern science while rejecting its worldview:

> The critical traditionalism I am talking about does not have to see modern science as alien to it, even though it may see it as alienating. It sees modern science as part of a new cognitive order which can be occasionally used for critical purposes within the earlier traditions. Such traditionalism uncompromisingly criticizes isolation and the over-concern with objectivity, but it never denies the creative possibilities of limited objectivity. ... Such a tradition refuses to give primacy to the needs of pure cognition at the expense of totality of consciousness ... [141]

The precise content of the proposed "alternative" science is left vague, as are the criteria for deciding which elements from traditional beliefs and modern science are to be included and which discarded. Nevertheless, the urgency of a new science is stressed:

> The search for alternatives to reductionism is basically a political struggle which cuts across material and intellectual domains. The non-reductionist alternatives that people across the world are building together is a non-violent science that respects the integrity of nature and man and truth and seeks the liberation of the people ... [142]

> [O]ne day there will have to be post-modern societies and a post-modern consciousness, and those societies and that consciousness may choose to build not so much upon modernity as on the traditions of the non-modern or pre-modern world.[143]

But at the same time as postmodernist Indian intellectuals were singing the praises of "local knowledges" and "pre-modern traditions" against "colonialist Western science", other Indian intellectuals were making this encomium concrete.

3.2 Hindu nationalism and "Vedic science"

> [T]he conclusions of modern science are the very conclusions the Vedanta reached ages ago; only, in modern science they are written in the language of matter.
>
> — *Swami Vivekananda (1970 [ca. 1900], vol. 3, p. 185)*

> Many of the questions arising in Quantum Physics today had been anticipated by Swami Vivekananda.
>
> — *N.S. Rajaram (1998, p. 192)*

[141] Nandy (1987a, pp. 125, 124).

[142] Shiva (1988, p. 255).

[143] Nandy (1987a, p. xvii). See also the essay by Nandy and Visvanathan (1990), which is a paean to Theosophy, vitalist biology and Ayurvedic medicine as allegedly prescient critiques of modern scientific medicine ("a politically powerful knowledge system which shows immediate practical results in some areas but is intellectually, socially, and morally disorienting", p. 181). In lauding "cognitive resistance to the gross appetite of modern science" (p. 175), Nandy and Visvanathan go so far as to approvingly quote Gandhi: "to study European medicine is to deepen our slavery" (p. 174).

> [T]he Ṛgveda is a book of particle physics and cosmology.
>
> — *Raja Ram Mohan Roy (1998, p. xiii)*

On February 23, 2001, the University Grants Commission (UGC) — the central government body overseeing the funding of higher education in India — announced that

> there is an urgent need to rejuvenate the science of Vedic Astrology in India, to allow this scientific knowledge to reach to the society at large and to provide opportunities to get this important science even exported to the world ... [Accordingly,] the Commission decided to approve in principle [the] setting up of a few departments of Vedic Astrology in Indian universities ... leading to certificate diploma, under-graduate, post-graduate and Ph.D. degrees.[144]

The plan provoked a storm of protest from Indian scientists and rationalist intellectuals.[145] But what on earth prompted such a bizarre decision in the first place?

The answer, not surprisingly, is politics: more precisely, the Hindu nationalist politics of the Bharatiya Janata Party (BJP), which governed India between March 1998 and May 2004. The BJP is the political expression of a multifaceted mass movement for *Hindutva*, or "Hindu-ness", "an ultranationalist and chauvinistic movement that seeks to modernize India by recovering the supposedly pristine Vedic-Hindu roots of Indian culture."[146] As part of its program for the Hinduization of Indian education, the BJP rewrote school history textbooks to excise the contributions of Muslims and other non-Hindus, and promoted university-level courses not only in Vedic Astrology (*Jyotir Vigyan*) but also in *karmakanda* (Hindu priestly rituals), *vastu shastra* (sacred architectural rules), "human consciousness and Yogic science", and "Vedic mathematics".[147]

Science plays a central role in Hindu nationalist ideology.[148] As Nanda explains,

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[144] Government of India, Department of Education (2001). In the first year of the plan's operation, "the UGC selected 19 universities for providing exclusive teaching and training in the subject leading to undergraduate, postgraduate and doctoral degrees. During the financial year 2001–02, an amount of Rs. 2.71 crore [= 27.1 million rupees ≈ $600,000] was paid to 17 universities for setting up of these departments." (Government of India, Department of Education 2003, p. 132) Though this sum is modest, it is nearly double what was spent in the same year for upgrading/modernizing the computer centres at 59 Indian universities (*ibid.*, p. 145).

[145] See e.g. Ramachandran (2001), Balaram (2001) and Jayaraman (2001a, 2001b), among many others. In particular, Jayaraman (2001a) provides a detailed explanation of why astrology is a pseudoscience.

[146] Nanda (2003, p. 4).

[147] See Menon and Rajalakshmi (1998), Pannikar (2001), Bidwai (2001) and Menon (2002) on the rewriting of history textbooks; Ramachadran (2001), citing the UGC guidelines, on *vastu shastra* and Vedic mathematics; Government of India, Department of Education (2003, pp. 134–135) on Yogic science; and Nanda (2003, pp. 73, 75–76) generally. See also Dani *et al.* (2001) for a scathing critique of "Vedic mathematics", signed by over a hundred Indian mathematicians, scientists and other academics, and Patnaik (2001) for a probing critique of the BJP educational policies.

[148] Another central aspect of Hindu nationalist ideology — not discussed here, for lack of competence on my part — is the tendentious rewriting of the early history and archaeology of South Asia. For a detailed analysis, see the article of Michael Witzel in this volume.

> Hindu nationalists are obsessed with science. They are obsessed with science the way creation scientists are obsessed with science. They use the vocabulary of science to claim that the most sacred texts of Hinduism ... are, in fact, scientific treatises, expressing in a uniquely holistic and uniquely Hindu idiom, the findings of modern physics, biology, mathematics, and nearly all other branches of modern natural science.[149]

At the same time,

> Vedic science is supposed to lead to a better, a more whole natural science that will cure the reductionism and matter-spirit dualism of "Western" science. Vedic science apologists promise to "raise" the lower knowledge (*apāra vidya*) of "mere matter" provided by modern science by integrating it into the "higher knowledge" (*pāra vidya*) of the spirit disclosed by their own traditions.[150]

In this way, Hindu nationalists seek to legitimate as "scientific" not only such traditional practices as Vedic astrology, *vastu shastra* and Ayurvedic medicine but also the classical Hindu cosmology in which the human social hierarchy is determined by karma (moral or immoral deeds in previous lives). Furthermore, any aspects of modern science that challenge this cosmology — for instance, the modern understanding of biology that makes reincarnation unlikely, to put it mildly — are quietly ignored: "Modern science is being absorbed into an elite Brahminical-Vedantic form of Hinduism, without admitting any contradictions between the two, and thus, *without allowing any challenge to the latter's anti-naturalistic, anti-rational, and anti-democratic aspects.*"[151]

The intellectual method followed by the Hindutva ideologues is straightforward:

> [A]ny traditional Hindu idea or practice, however obscure and irrational it might have been through its history, gets the honorific of "science" if it bears any resemblance at all, however remote, to an idea that is valued (even for the wrong reasons) in the West. Thus, obscure references in the Vedas get reinterpreted as referring to nuclear physics. By staking a phony priority, modern science gets domesticated; it was always contained in India's "wisdom" anyway.[152]

The example was set by Swami Vivekananda (1863–1902), one of the founding fathers of modern neo-Hinduism:

> Today we find wonderful discoveries of modern science coming upon us like bolts from the blue, opening our eyes to marvels we never dreamt of. But many of these are only re-discoveries of what had been found ages ago. It was only the other day that modern science ... discovered that what it calls heat, magnetism, electricity, and so forth, are

[149] Nanda (2003, p. 65).

[150] Nanda (2003, p. 66). See, for instance, Frawley (1990, p. 117): "In the Vedic system knowledge is defined as both higher and lower or superior and inferior (para and apara). The lower or inferior knowledge consists of the knowledge of the outer world. ... All science is a form of the lower knowledge, as it is based on measurement and mathematics and the information which comes to us through the senses."

[151] Nanda (2003, p. 8), emphasis in the original.

[152] Nanda (2003, p. 72).

> all convertible into one unit force ... But this has been done even in the Samhita ...[153]

after which he goes on to expound Vedic cosmology:

> The unit from which [gravitation, electricity, magnetism and other forces] spring is called Prâna. Again, what is Prana? Prana is Spandana or vibration. When all this universe shall have resolved back into its primal state, what becomes of this infinite force? Do they think that it becomes extinct? Of course not. If it became extinct, what would be the cause of the next wave, because the motion is going in wave forms, rising, falling, rising again, falling again? ... At the end of a cycle, everything becomes finer and finer and is resolved back into the primal state from which it sprang ... And what becomes of all these forces, the Pranas? They are resolved back into the primal Prana, and this Prana becomes almost motionless — not entirely motionless; and that is what is described in the Vedic Sukta: "It vibrated without vibrations" — Ânidavâtam.[154]

And so on and so forth for pages on end — but without, alas, ever citing anything even vaguely resembling Maxwell's equations of electromagnetism.

Contemporary Hindu-nationalist intellectuals, many of whom are trained scientists and engineers, have brought this art to an even higher level of refinement. For instance, Subhash Kak, a professor of electrical and computer engineering at Louisiana State University and one of the leading intellectual luminaries of the Hindu-nationalist diaspora, claims to find "astronomical codes" in the *Rig Veda*'s descriptions of ritual fire altars, using a method that, as Nanda wryly observes, "is breathtakingly ad hoc and reads like numerology 101."[155] Even more ludicrously, Raja Ram Mohan Roy asserts that "the Vedas are a coded book ... of particle physics and cosmology": thus, verses referring to wild and domestic animals are *really* alluding to fermions and bosons, respectively; passages recounting the destruction of black-skinned people are in fact "about annihilation of anti-matter"; and the phrase "ten-finger form" in the Puruṣa hymn gives us "compelling evidence of [the] universe being considered ten-dimensional in Vedic cosmology", just as in modern superstring theory.[156] As Nanda comments, this method "eras[es] all distinctions between science and associative thinking, the latter being the hallmark of magic."[157]

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[153]Vivekananda (1970 [1897], vol. 3, pp. 398–399). This excerpt comes from a lecture on "The Vedanta" delivered at Lahore on 12 November 1897.

[154]Vivekananda (1970 [1897], vol. 3, p. 399).

[155]Nanda (2003, p. 112). For details of Kak's calculations, see Kak (1994) and Feuerstein, Kak and Frawley (1995, pp. 201–208); and for a critique, see Plofker (1996), Witzel (2001, section 28) and Nanda (2003, pp. 112–114).

[156]Roy (1998, pp. xii–xiii, 115, 56, 30–31). Subhash Kak provides a foreword in which he lauds Roy's "audacious reinterpretation of [the] Vedic system of knowledge" (p. xv) and concludes: "Roy's book is a bold, new way of looking at Vedic physics. Since he is a pioneer, this is not the place to quibble with the details of his story. We celebrate the new path he has hewn through the bush of old scholarship. It is the task of future researchers to further sharpen and modify the ideas of Roy." (p. xviii)

[157]Nanda (2003, p. 115).

But the goal of Hindutva is not simply to claim priority for the invention of modern science; rather, it is to insist that "Western" science is an *inferior* version of the true Vedic science:

> The gist of this argument, as it appears in Hindu nationalist writings on Vedic science, is simple — all that is dangerous and false in modern science comes from the Semitic monotheistic habit of dualistic and "reductionist" thinking, which separates the object from the subject, nature from consciousness, the known from the knower. All that is truly universal and true in modern science comes from the Hindu habit of "holistic" thinking, which has always seen the objects in nature and the human subjects not as separate entities but as different manifestations of the same universal consciousness. For the non-logocentric Hinduism, reality is not objective, but "omnijective", a co-construct of mind and matter together. While Western science treats nature as dead matter, Hindu sciences treat nature as a sacred abode of gods. Thus Hindutva scholars claim that traditions of yoga, transcendental meditation (TM) and Ayurveda are sciences of the future, for they bring matter in alignment with the "cosmic energy" that permeates all matter.[158]

Of course, if the *Rig Veda* really did contain modern astronomy and elementary-particle physics, one would then be obliged to ask, as Nanda does:

> How did the Vedic sages know all this physics? What was their method? Why don't we find any material evidence of observatories, or records of observations? Invariably, the answer one gets is that the Vedic sages "intuited," "experientially realized," or "directly perceived ... in a flash" the laws of nature by altering their consciousness through yogic meditation. *By knowing themselves, they came to know the world.*[159]

For instance, one advocate of the convergence of science and Vedanta asserts that

> Hindu spiritual doctrines have at the core certain profound insights into the nature of ultimate reality ... Hindu seers were telling us something that is not only meaningful but revelatory about the cosmos and consciousness. ... Their assertions ... [arose] from experiential certitudes resulting from sustained experimentation with the subtlest centers of the inscrutable self. Their words and wisdom are to be taken, therefore, not simply as magnificent mythopoesy but as findings about the translucent aspects of the physical universe ... [160]

The method is explained in more detail in another influential Hindutva work:

> The Vedic worldview acknowledges that there is an intimate relationship between the cosmic, the terrestrial, and the spiritual, which is expressed in terms of equivalences. The idea of equivalence, which is fundamental to what has been called initiatic science, is that the universe is an interconnected system ... A related idea is that the macrocosm

[158]Nanda (2004).

[159]Nanda (2003, p. 115), emphasis in the original. Subhash Kak, in his foreword to Roy's book, says this explicitly: "knowing oneself one can know the world!" (Roy 1998, p. xvi, exclamation in the original)

[160]Raman (2002, pp. 89–90).

> is mirrored in the microcosm ... [and that] the human being is a mirror image of the cosmos. ... By *postulating* [emphasis mine – A.S.] interconnections and similarities across Nature, they [the Vedic thinkers] were able to use logic to reach extremely subtle conclusions about diverse aspects of reality.[161]

As Nanda points out, reasoning founded on purported but unproved

> correspondences and equivalences between different parts of creation is the very essence of magical practices ... [and] was as prevalent in pre-Reformation Europe as it is in India even today. ... In the West, this magical view of the world peaked around the Renaissance, and began to decline with the Protestant Reformation and the rise of the mechanical philosophy in the seventeenth century. It saw a brief revival in theosophy and holistic schools of biology in the nineteenth and early twentieth centuries, especially in Germany. It is now a province of fringe occult groups in the West.[162]

But the advocates of Hindutva, when they bother to address this criticism at all, insist that this story is Eurocentric, and appeal implicitly to the alleged incommensurability of paradigms:

> Western scientific thought ... draws on the traditions of Greek rationalist thinking according to which only what is within the purview of the five senses is taken cognisance of. ... Scientific methods ... follow some kind of closed scientific reasoning which insulates itself against facts that its methods cannot account for. ... How else can they [scientists] dare dismiss Jyotisha [Vedic astrology] which sees a level of existence beyond the purview of the five senses?[163]

Another author goes so far as to assert that, in India, any contradiction between science and religion is impossible:

> The idea of '*contradiction*' is an imported one from the West in recent times by the Western-educated, since 'Modern Science' arbitrarily imagines that it only has the true knowledge and its methods are the only methods to gain knowledge, smacking of Semitic dogmatism in religion.[164]

What is needed, therefore, is the "decolonization of the Indian mind":

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[161] Feuerstein, Kak and Frawley (1995, pp. 197–198, 227), emphasis added. As evidence for the claim that the human being is a mirror image of the cosmos, the authors adduce the following: "the Ayurvedic savants made the astonishing discovery that the number of bones in the human body equals the number of days in the year. They arrived at this number by counting the 308 bones of the newborn, 32 teeth, and 20 nails." (p. 197) Even more astonishing, it seems to me, is the discovery, by this method, that the year has exactly $308 + 32 + 20 = 360$ days, not 365.25636 (sidereal orbit) as modern astronomers have hitherto naively believed. Feuerstein *et al.* also explain that the theory of correspondences and equivalences underlies the development of other important sciences, notably astrology (p. 211) and Ayurvedic medicine (pp. 212–216).

[162] Nanda (2003, p. 116).

[163] Vasudev (2001). The author is editor of *The Astrological Magazine*. This article appeared in *The Organiser*, an English-language publication of the Rashtriya Swayamsevak Sangh (RSS), the main radical Hindu-nationalist organization.

[164] Mukhyananda (1997, p. 94), italics in the original.

> The Hindu revivalist movement perceives itself as the cultural chapter of India's decolonization. This means that it tries to free the Indians from the colonial condition at the mental and cultural level, to complete the process of political and economic decolonization.[165]

And here we make contact with postmodernism and its critique of the transcultural objectivity of modern science. Indeed, some Hindutva ideologues make explicit use of "postmodernist" rhetoric:

> We must keep in mind that equally valid alternative scientific formulations are possible — just as we have in medical science Allopathy, Homeopathy, Ayurveda, Unani, Acupuncture, etc. It is not justifiable to say that the Western reductionist and mechanistic scientific way of presentation is the only way.[166]

Others make superficial reference to contemporary philosophy of science in an attempt to make space for "other ways of knowing", such as Yogic introspection:

> According to the Yogic and Vedic system the scientific method is not entirely scientific; that is, it is not truly objective and cannot give us knowledge of reality. ... The scientific method is based on making an assumption, inventing a theory, and then amassing data or making experiments to prove the theory. Whatever we assume we are bound to find facts to prove it ... [167]

(If this were true, then scientists would never have to revise their theories.)

> [Modern] science ... fails to take into account knowledge that is accessible through introspection and higher states of awareness as cultivated in the spiritual traditions [such as Hinduism]. ... Today we often tend to dismiss their knowledge systems, or worldviews, as mere myth. In doing so, we fail to acknowledge that in our push for objective knowledge we too utilize intellectual modes that are not always strictly rational, as has been shown by philosophers like Michael Polanyi and Paul Feyerabend.[168]

(No details of the argument are given; in particular, the authors fail to make the crucial distinction between the context of discovery and the context of justification.[169]) Vedic creation-

[165] Elst (2001, p. 10). The author is a prominent foreign sympathizer of Hindutva.

[166] Mukhyananda (1997, p. 100).

[167] Frawley (1990, p. 20). It goes without saying that the scientific method involves amassing data or making experiments to *test* a theory (or various competing theories), not to *prove* it! Indeed, some philosophers (e.g. Popper) have argued that the essence of the scientific method is the attempt to *falsify* theories. Frawley attempts to justify his final rather extraordinary claim by arguing that "as Einstein noted, it is the theory that determines what the facts are and where to look for them." (p. 20) But this is a vulgarization of Einstein's view. It is indubitably true that *some* theoretical presuppositions are needed to translate raw sensory data into presumed facts about the world, but these theoretical presuppositions need not (and ought not!) include *the particular theory under test*; furthermore, these presuppositions can themselves be subjected, at least in part, to independent experimental tests where needed. For a brief discussion of what the theory-ladenness of observation does and does not entail, see e.g. Sokal and Bricmont (1998, pp. 64–67).

[168] Feuerstein, Kak and Frawley (1995, p. 195).

[169] In the idiosyncratic process of inventing scientific theories, all methods are in principle admissible — deduction, induction, analogy, intuition and even hallucination — and the only real criterion is pragmatic.

ists Michael Cremo and Richard Thompson are even more explicit about their intellectual debts:

> We are not sociologists, but our approach in some ways resembles that taken by practitioners of the sociology of scientific knowledge (SSK), such as Steve Woolgar, Trevor Pinch, Michael Mulkay, Harry Collins, Bruno Latour, and Michael Lynch ... [namely that] Scientists' conclusions do not identically correspond to states and processes of an objective natural reality. Instead, such conclusions reflect the real social processes of scientists as much as, more than, or even rather than what goes on in nature.[170]

It is worth noting, however, that some advocates of Hindutva are explicitly non-relativist[171] and advocate the Vedas as the foundation for a universal science and religion:

> Today we are in need of a philosophy, science, and spirituality that are deep and broad enough to accommodate the emerging global civilization. In releasing our grip on merely local expressions of mind and culture, we inevitably are led back to considering, as did our ancestors, the infinite, eternal, impartite Reality. ... This brings us face to face with the need to create a global spirituality that transcends all parochial religious modes of knowledge and experience. ... The *Vedas* are the earliest available expression of the perennial philosophy, or universal spirituality.[172]

Regardless of their attitude toward postmodernist relativism, all ideologues of Hindutva concur on two key stances, both of which are asserted by fiat: first, that Yogic introspection,

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On the other hand, the justification of theories must be rational; otherwise we would simply not be doing science.

[170] Cremo and Thompson (1993, p. xxiv). The authors of this 950-page tome are candid about their goals:

> [We] are members of the Bhaktivedanta Institute, a branch of the International Society for Krishna Consciousness that studies the relationship between modern science and the world view expressed in the Vedic literature. This institute was founded by our spiritual master, His Divine Grace A. C. Bhaktivedanta Swami Prabhupāda ... From the Vedic literature, we derive the idea that the human race is of great antiquity. ... [W]e expressed the Vedic idea in the form of a theory that various humanlike and apelike beings have coexisted for a long time. (Cremo and Thompson 1993, p. xxxvi)

Seven hundred and fifty pages later, they conclude that, indeed, "anatomically modern humans have coexisted with other primates for tens of millions of years." (p. 750) Nanda comments that

> So far, this United States-based Vedic anti-Darwinism has not made significant inroads in India. Darwinism is not much of an issue in India, as it has never been able to displace the traditional Hindu cosmology in the first place. Creationism in India takes the form of giving a scientific gloss to the Hindu view of transmigration, karma, and cyclical time. (Nanda 2003, p. 119)

[171] "We have won through to the recognition that there is only one science — that the laws of science do not change relative to our varying opinions or beliefs, cultures, or customs. ... Similarly, there is only one Truth, one Reality, to be discovered by humanity. There is not a distinct God, or Truth, for each of the world's religions, any more than there is a different Sun or Moon for astronomers of various nations." (Feuerstein, Kak and Frawley 1995, p. 278) Note also that Elst (2001, p. 8) decries postmodernism and claims to "restore objectivity".

[172] Feuerstein, Kak and Frawley (1995, pp. 274–275), italics in the original.

combined with ratiocination using the method of correspondences and equivalences, provides a valid method for obtaining reliable knowledge of the world; and second, that scientific knowledge, properly interpreted, cannot possibly conflict with Vedantic teachings.[173] In this way, Hindu nationalists aim to "domesticate" modern science, taking what suits them and ignoring or reinterpreting the rest, thereby immunizing the traditional Hindu cosmology from empirical critique. The conclusion is invariably the same: "*Modern Western science is partial science and not total science.* ... [T]he greater the advance in Science, the nearer it is coming to the Vedantic conclusions."[174] "[A]ccording to Vedic tradition, science and religion are not only compatible but essentially identical, because both endeavor to know the truth."[175]

Nanda concludes by pointing out that

> There is a deep irony in declaring the rationality found in the three-millennia old Vedic corpus to be at par with how today's natural scientists go about forming and testing hypotheses. If there is one thing that is distinctive about modern science it is that it has learnt to take refutations seriously. Notwithstanding the social interests that promote conformity with the ruling paradigms, and notwithstanding the personal investment of individual scientists in their pet theories, modern science owes its phenomenal success to the institutionalization of skepticism. Paradigms *do* change; old theories and old explanations *are* thrown overboard, however reluctantly and belatedly, when confronted with better evidence, simpler theories, and more comprehensive and consilient explanations.[176]

Pseudoscience, by contrast, is content with recycling "ancient wisdom".

3.3 Postmodernism and Hindutva: A comparison

What are the similarities and differences between the ideas advocated by the left-wing "postcolonial" theorists and the right-wing ideologues of Hindutva?

There is one obvious difference: While the advocates of Hindutva are eager to claim modern science as their own, the "postcolonial" intellectuals denounce them for precisely this capitulation to "Western" ways of thinking. But the supposed capitulation is much less far-reaching than it seems: for, as Nanda stresses, Hindu nationalists "claim the Vedas to have presaged all the advances in modern science without admitting that, in fact, modern sciences challenge the metaphysical foundation of the Vedic view of the world."[177] Any findings of modern science that undermine the Vedic metaphysics are either discreetly ignored or else ascribed to Western materialist and monotheistic prejudices. In this way, Hindutva ideologues attempt to have their cake and eat it too.

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[173] See e.g. Mukhyananda (1997, chapter 5) for a detailed statement. See also Frawley (1990, pp. 20–23) and Feuerstein, Kak and Frawley (1995, pp. 217–228, 272–285), among many others.

[174] Mukhyananda (1997, pp. 92, 104), emphasis in the original.

[175] Feuerstein, Kak and Frawley (1995, p. 279). By the same "logic", David Beckham's and my ways of playing soccer are not only compatible but essentially identical, because both of us endeavor to score goals.

[176] Nanda (2003, p. 121), emphasis in the original.

[177] Nanda (2003, p. 158).

A second, more subtle, difference concerns their respective attitudes toward the "clash of civilizations". Hindu nationalists believe unabashedly in the existence of an eternal "Hindu worldview" or "Hindu mind", which is inherently opposed to the "Western" (or "Judeo-Christian" or "Semitic") one. Postmodernists, by contrast, are sensitive to anything that smacks of "essentialism"; with some exceptions, they take great care "to define subalternity or marginality not in racial, gender or national identities, but in terms of 'oppositional consciousness' ... [or] the ability to speak".[178] But there is less difference here than meets the eye, for the postcolonial theorists advocate "a *strategic* use of positivist essentialism in a scrupulously visible political interest"[179], leading them to an attitude that is in practice not significantly different from that of the Hindu nationalists.[180]

On several key points the postcolonial theorists and the Hindutva intellectuals are in substantial (though not complete) agreement. First, they agree that political and economic decolonization must be supplemented by a thoroughgoing "decolonization of the mind". The postcolonialists, along with their postmodernist and social-constructivist supporters in the West, insist that modern science, despite its claims to objectivity, is nothing more than the ethno-science of the West, and they urge the development of "alternative sciences" based on the recovery of "local knowledges" and indigenous cultural traditions.[181] The Hindu nationalists concur, and add that decolonization of the Indian mind requires, in particular, "understanding science through Hindu categories. Echoing the postcolonial critiques of epistemic violence, Hindutva ideologues ... see any scientific assessment of the empirical claims made by the Vedic texts as a sign of mental colonialism and Western imperialism."[182] As Nanda points out, "it is the stress on the preservation of cultural difference — rather than its critical examination — that unites the postcolonialists with Hindutva."[183]

Furthermore, the postmodernists and postcolonialists deny the existence of universal standards of rationality and evidence; they insist that *all* sciences are ethno-sciences, and that each ethno-science must be evaluated according to the norms of its own cultural context. This view is, of course, a central tenet of much contemporary "science studies", particularly in its feminist, multiculturalist and postcolonial wings.[184] Advocates of Hindutva, by contrast,

[178]Nanda (2003, p. 156). Hard-core poststructuralists are particularly assiduous in avoiding any whiff of essentialism, but neo-Gandhians and ecofeminists are more ambiguous. An extreme example of neo-Gandhian essentialism is provided in an essay by Ashis Nandy and Shiv Visvanathan (1990, p. 158), who quote approvingly an author who says: "to put women to do men's work is as foolish as to set Beethoven or a Wagner to do engine driving".

[179]Spivak (1988, p. 13), emphasis in the original.

[180]See Nanda (2003, pp. 156–157) for a more detailed discussion.

[181]Among the Western supporters, Sandra Harding (1996, pp. 21–22) is typical in urging the coexistence of "many, different, and in some respects conflicting representations of nature"; she insists that this does not lead to relativism but rather to "a borderlands epistemology that values the distinctive understandings of nature that different cultures have resources to generate." She does not explain the criteria by which these distinctive understandings are to be reconciled when they conflict, as she admits they will.

[182]Nanda (2004).

[183]Meera Nanda, personal communication to the author, January 15, 2004.

[184]For a detailed discussion of this principle of "epistemic charity", see Nanda (2003, chapter 5).

are divided on this question. Some tend towards cultural and intellectual nationalism, while others propound the universal validity of the Hindu worldview. Nearly all accept the validity of modern science as a partial description of the world, but they insist that Vedic science is infinitely superior to modern science, which it both subsumes and surpasses. (The hard-core postmodernists would not agree with this claim to superiority, but the more romantic postcolonials and ecofeminists might, for the reasons to be explained next.)

Finally, many (though not all) postmodernist and feminist critics of modern science lament in particular the disenchantment of Nature wrought by the scientific revolution of the seventeenth century, and argue that the "dualist" separation of spirit/God and matter, together with reductionist scientific methodology, are the source of "violence" against both Nature and women.[185] This theme plays a central role in the work of the Indian postcolonial commentators on science, especially Vandana Shiva. Indeed, the feminist, postcolonial and Hindu theorists all coincide in urging that the reductionist worldview of "Western" science be replaced by a more "holistic" outlook (though the details invariably remain vague). The Hindutva ideologues simply add that the interconnectedness of all things and the immanence of spirit within matter are central tenets of Vedic metaphysics, which is thus ideally suited to become the foundation of a new holistic science.[186]

It should not be supposed, however, that the Hindu nationalists simply appropriated the theses propounded by the postcolonial theorists. On the contrary, Nanda observes,

> the postcolonial critics of science and modernity ended up rediscovering the case for a uniquely Indian science that was already taken for granted in right-wing circles. ... The right-wingers' relativistic defense of mysticism as science is not based principally on Kuhn and Feyerabend, but rather on more nationalistic principles, which bear the hallmarks of Johann Herder and Oswald Spengler: namely, the idea that each nation has a "cultural soul" and a "destiny" that leave its mark on all intellectual efforts, from music and painting to science. Substitute "paradigm" in place of "culture", and the right-wing was Kuhnian long before Kuhn.[187]

Nanda concludes that

> Each one of the three prongs of the Vedic science project — a critique of dualist science, the idea that standards of rationality are internal to cultures, and that the rationality of modern science is as socially embedded and culturally constructed as that of any other knowledge system — is a part of the central dogma of contemporary science studies, women's studies, and postcolonial studies ... The idea that there is nothing special about modern science that premodern, non-Western sciences need to learn from, and that what counts as reasonable and real varies with the cultural context, has become a part of the common sense of the postmodern academia. Defenders of

[185]In the Western science-studies literature, assertions of this kind go back at least to Carolyn Merchant (1980).

[186]See Nanda (2003, pp. 95–103) for further discussion. As Nanda (2004) observes, "Most of the claims of superiority of 'holism' are unsubstantiated. On closer examination, they end up affirming pseudo-sciences involving disembodied spirit acting on matter through entirely unspecified mechanisms."

[187]Meera Nanda, personal communication to the author, January 14, 2004.

> Vedic science count upon this widespread and diffused attitude of cultural relativism to garner sympathy for their position.[188]

3.4 Concluding remarks

When all is said and done, the Hindutva ideologues' claims that modern science is contained in the Vedas are about as plausible as the contention of *The Bible Code*, a 1997 best-seller, that future events are encoded in the Old Testament.[189] It would be the stuff of comedy, were the context — destruction of the mosque at Ayodhya by Hindu mobs, repeated pogroms against Muslims and other religious minorities, the potential of nuclear confrontation between India and Pakistan — not so serious. As Nanda observes wearily about the fashion for "Vedic science": "Whatever good they might do for national pride, such claims cannot cover up the fact that Indian people remain mired in a view of the world that is deeply irrational and objectively false."[190]

For lack of both space and competence, I have not dwelt on the historical and political context of Hindu nationalist ideology, but perhaps a few words are in order. Nanda makes a good case that contemporary Hindu nationalism is best viewed as an instance of "reactionary modernism", a term that she borrows from Jeffrey Herf's much-cited study of Nazi Germany's modernity without liberalism, i.e.

> the embrace of modern technology by German thinkers who rejected Enlightenment reason. ... Before and after the Nazi seizure of power, an important current within conservative and subsequently Nazi ideology was a reconciliation between the antimodernist, romantic, and irrationalist ideas present in German nationalism and the most obvious manifestation of means-ends rationality, that is, modern technology. Reactionary modernism is an ideal typical construct. ... [I]t incorporated modern technology into the cultural system of modern German nationalism, without diminishing the latter's romantic and antirational aspects.[191]

In a similar way, Nanda explains, Hindu nationalists seek "dharma and the bomb ... an era when India will have nuclear bombs in its silos and the Vedas in schools."[192] She further argues that

> the social conditions that led to this phenomenon in the Weimar Republic and the Third Reich — namely, "capitalist industrialization without a successful bourgeois revolution [and] weak traditions of political liberalism and the Enlightenment" — obtain [today]

[188] Nanda (2003, p. 122).

[189] *The Bible Code* (Drosnin 1997) was on the *New York Times* best-seller list (for non-fiction!) for 13 weeks in the period June–September 1997, at one point reaching #3. The original claims about the encoding of future events in the book of Genesis can be found in Witztum, Rips and Rosenberg (1994). For a careful refutation, see McKay, Bar-Natan, Bar-Hillel and Kalai (1999); see also the introduction by Kass (1999).

[190] Nanda (2003, p. 72).

[191] Herf (1984, pp. 1–2).

[192] Nanda (2003, p. 37; see also pp. 39–42).

> in many parts of the developing world, including India. In these conditions, the dangers of fascistic nightmares cannot be ignored.[193]

The "postcolonial" intellectuals do not, of course, support the chauvinist and intolerant aspects of Hindu nationalism, and they cannot be held responsible for its rise. But, as Nanda has shown, their denunciations of modern science and defenses of "local knowledges" played directly into the hands of the ideologues of Hindutva, by undermining any principled ground for opposition to Vedic pseudoscience and, more generally, to the Vedic worldview. "What reasons can they give against the supposed scientificity of Vedic astrology? Can they hold on[to] their relativist view of all sciences as social constructs and yet challenge the scientisation of the Vedas that is going on in the theories of Vedic physics or Vedic creationism?"[194]

The bottom line is that abstract philosophical debates can have real-life consequences. Nanda tells the following story about the recent craze for *vastu shastra*, the ancient Vedic rules governing the construction of buildings in alignment with the cosmic "life-force":

> N.T. Rama Rao, the late chief minister of the southern state of Andhra Pradesh, sought the help of a traditional *Vastu Shastri* to help him out of some political rough weather, and was told that his troubles would vanish if he entered his office from an east-facing gate. But on the east side of his office there was a slum through which his car could not pass. [So he] ordered the slum to be demolished.[195]

Nanda observes that

> If the Indian left were as active in the people's science movement as it used to be, it would have led an agitation not only against the demolition of people's homes, but also against the superstition that was used to justify it. ... A left movement that was not so busy establishing "respect" for non-Western knowledge would never have allowed the power-wielders to hide behind indigenous "experts."[196]

This is but a minor example; the crux of the matter is that

> while the Western postmodernists could at least take the hegemony of modern, mostly liberal, ideas for granted, the postcolonial critics were condemning modernity even before it had a chance to take root in the lives of their societies. ...
>
> Under the circumstances of an incomplete modernity that prevail in India, the postmodern-style total critique of modernity amounts to a grand betrayal of the intellectuals of their vocation. This betrayal is in part responsible for the growth of reactionary modernity that we are witnessing in India under the sway of Hindu nationalist parties. With self-consciously left-wing humanists embracing a nativist and anti-rationalist agenda made respectable by highfaluting postmodern theory, there is hardly any organized resistance left to the Hindu nationalists. This is not to deny that

[193]Nanda (2003, p. 7), citing in part Herf (1984, p. 6).

[194]Nanda (2004).

[195]Nanda (1997, p. 82).

[196]Nanda (1997, p. 82).

> the left and secular intellectuals are carrying out a valiant struggle against the Hindu nationalist policies of cultural indoctrination and ethnic cleansing. But what is missing is the existence of a well-articulated secular worldview which has the power to mobilize popular opinion, and which is not afraid to challenge the purported "wisdom" of popular traditions. ... The new social movements of the secular, left-wing intellectuals in India run the risk of fighting a merely strategic war against the religious right, while losing the battle for the hearts and minds of the masses.[197]

4 Some moderate examples

> Whether the accused in a murder trial is or is not guilty depends on the assessment of old-fashioned positivist evidence, if such evidence is available. Any innocent readers who find themselves in the dock will do well to appeal to it. It is the lawyers for the guilty ones who fall back on postmodern lines of defence.
>
> — *Eric Hobsbawm,* On History *(1997, p. viii)*

I would like now to present briefly a few additional instances in which the advocates of shoddy research have resorted to postmodernist arguments (either when the reliability of their evidence was challenged, or else preemptively). Unlike the examples analyzed in the preceding sections, which dealt with the far end of Figure 1 — astrology, Therapeutic Touch and the like — here we will be discussing more-or-less mainstream research in the natural or social sciences that somewhere took a wrong turn. Of course, in science it is no sin to propose a theory that turns out, on closer examination, to be wrong (I myself have done so on countless occasions). The only sin is to cling stubbornly to one's theory when the evidence against it becomes so strong that any fair-minded person would concede the mistake and move on. Alas, this is an ancient and enduring sin, to which even the best scientists are far from immune.[198] What is perhaps novel, however, is the way that postmodernist arguments have lately been invoked, in some circles at least, to rationalize this sin.

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[197] Nanda (2003, p. 28).

[198] Nearly four centuries ago, Francis Bacon observed that

> Men fall in love with particular pieces of knowledge and thoughts: either because they believe themselves to be their authors and inventors; or because they have put a great deal of labour into them, and have got very used to them.

And again:

> Once a man's understanding has settled on something (either because it is an accepted belief or because it pleases him), it draws everything else also to support and agree with it. And if it encounters a larger number of more powerful countervailing examples, it either fails to notice them, or disregards them, or makes fine distinctions to dismiss and reject them, and all this with much dangerous prejudice, to preserve the authority of its first conceptions.

See Bacon 2000 [1620], p. 46 (Aphorism 54) and p. 43 (Aphorism 46). Luckily, the social organization of the modern scientific community — which in most cases allows for reasonably open debate, in which even the ideas of great scientists can be challenged — ensures that the scientific community *as a whole* is more objective than any of its individual members. For further discussion of this point, see Haack (1998, pp. 97–99 and 104–109).

4.1 Radical environmentalism

Geographer Martin Lewis, in an article entitled "Radical environmental philosophy and the assault on reason", has shown how some exponents of radical environmentalism have turned to postmodernism as a way of rescuing favored theories whose empirical support had become shaky. I would like here to sketch Lewis' argument in abbreviated and admittedly oversimplified form; the reader is referred to the original article for supporting evidence as well as for many important subtleties.

Lewis' critique is concerned with a school of thought that he calls "radical environmental philosophy", or "ecoradicalism" for short. "Most ecoradicals believe that human beings existed for millennia in a state of environmental grace as merely one species among a myriad in a balanced, harmonious global ecosystem."[199] But the industrial revolution shattered this equilibrium, bringing us today to the brink of environmental collapse. "The task for ecophilosophy", Lewis summarizes, "is to explain how such a total rupture could have occurred, and more importantly, to show how balance might be restored in time to save the planet from annihilation. ... The key error is often assumed to lie in the ideological realm, particularly in concepts about nature and the human position within it"[200], though ecoradical theorists differ about the precise location of this central intellectual misstep. "For many radical ecophilosophers, the great error was nothing less than the glorification of reason that began in Europe in the early modern era and that culminated in modern scientific methodology."[201] Others push the pivotal error back to Plato, to the book of Genesis, or even to the Neolithic emergence of agriculture.

Lewis stresses that

> The ecoradical attack on reason and science was initiated within a framework of reasoned debate. Historical evidence was examined, and plausible linkages were hypothesized among developments in philosophy, science, technology, and economics ... Ecophilosophers also sought confirmation of their vision of premodern ecological harmony from the archeological and anthropological record. Moreover, they attempted to ground their entire framework in the science of ecology.[202]

The trouble, Lewis goes on to note, is that "more careful consideration of the same lines of argument has since discredited the principal concepts of ecoradical philosophy. The roots of modern society are far more entangled and multistranded than they would have it, and the premodern world is now known to have been far less ecologically and socially benign."[203] For instance,

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[199] Lewis (1996, p. 210).

[200] Lewis (1996, p. 210).

[201] Lewis (1996, p. 211). This view was notably promulgated by Carolyn Merchant (1980) and has since become the conventional wisdom not only among radical environmentalists but also among many feminists. For similar views, see Easlea (1981), Shiva (1989) and Plumwood (1993, 2002), among many others.

[202] Lewis (1996, p. 217).

[203] Lewis (1996, pp. 217–218).

> Torture of animals, male oppression of females, and outright (local) ecological devastation may not have been universal conditions, but they were common enough everywhere. Even if we revert to the upper Paleolithic ... much evidence suggests that human beings at this time were responsible for the extinction of dozens of species of large mammals.[204]

Finally, "even the science of ecology has failed the Greens, for it now emphasizes continuous flux and patchy distribution patterns, rather than the stability of coherent ecosystems that once underwrote the vision of harmonious relations between people and nature."[205]

What to do?

> One might imagine that such difficulties with evidence and theory would lead to a crisis of confidence and a questioning of assumptions. But ecoradical beliefs are often held with a religious vigor; the very existence of life on earth is thought to be at stake ... Inasmuch as it is a religious world view, this position is impervious to evidence against its key tenets.[206]

But, Lewis continues,

> environmental philosophy is only partially religious, being in equal measure a scholarly pursuit. As scholars, Green thinkers must address the evidentiary problems outlined above. It is here that postmodernism comes in: as a ready exit from their quandary.[207]

"The overriding attraction of a postmodern attitude", Lewis points out, is that

> it annuls the inconvenient requirement of empirical confirmation. In more extreme versions, the notion of evidence, like the formal rules of logic, is regarded merely as a social construct that society's power holders use to maintain and justify their positions. Stories of the human past invented by an active ecoradical imagination ... can thus be argued to have just as much legitimacy as the reconstructions of professional archeologists and other "scientists" trapped within the confines of objectivist discourse. If anything, they have more validity because of their moral authority; in the postmodernists' world, ethics are not to be separated from matters of "fact." By the same criteria, the problems implicit in the new ecology can simply be ignored. Ecologists are merely constructing their own stories about nature, and those currently being told in the scientific journals may be regarded as suspect, for they could potentially be used to justify a modernist agenda of human-imposed environmental change.[208]

Thus, feminist ecophilosopher Carolyn Merchant avers that

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[204] Lewis (1996, p. 215). The currently available evidence is inconclusive as to whether the Paleolithic extinctions of large mammals in the Americas and Australia were caused by human hunting, by climatic and environmental changes, or by some combination of the two (see e.g. Bogucki 1999, pp. 102–104). I thank Arne Jarrick for drawing my attention to this issue.

[205] Lewis (1996, p. 218).

[206] Lewis (1996, p. 218).

[207] Lewis (1996, p. 218).

[208] Lewis (1996, p. 218).

> Science is not a process of discovering ultimate truths of nature, but a social construction that changes over time. The assumptions accepted by its practitioners are value-laden and reflect their places in both history and society ... Ecology is likewise a socially constructed science whose basic assumptions and conclusions change in accordance with social priorities and socially accepted metaphors.[209]

Indeed, geographer David Demeritt goes so far as to urge that "environmental historians and other Green critics should end their search for foundational authority, be it in science or elsewhere, and appeal instead to diverse moral, political, and aesthetic criteria to arbitrate between particular representations of nature in particular situations." Demeritt "does not rule out appropriations from ecological science or other fields of knowledge where they prove useful and convincing", but stresses that "ultimately, environmental narratives are not legitimated in the lofty heights of foundational epistemology but in the more approachable and more contested realm of public discourse."[210] The net result, as Paul Gross and Norman Levitt point out, is that "in practical terms, this leaves the radical theorist free to accept what flatters his worldview and to reject what does not."[211]

Lewis cautions that

> it would be a serious error to conclude that postmodernism and ecoradical philosophy share identical concerns, much less that the two movements have somehow merged. Most environmental philosophers strongly mistrust the mainstream Derridean/Foucauldian schools of postmodernism ... Extreme postmodernism is far too relativistic and skeptical for Greens. Whereas poststructuralists condemn the search for the "transcendental signified" as a pointless quest, ecoradicals not only want to isolate the "transcendental signified" in the form of nature, but propose literally to worship it. ... Waving aside the pastiche, superficiality, and cool skepticism of the scholarly *avant garde*, most ecoradicals rather seek a reassertion of religious or quasi-religious values founded upon a spiritualized ecology.[212]

Their resort to postmodernist reasoning, though frequent enough, is episodic and opportunistic.

Lewis concludes that

> By spreading the message that science is no more reliable than shamanism, and especially by arguing that reason itself is the ultimate source of our environmental crisis, Green philosophers do little to enhance the public's ability to think clearly about the world and its very real problems. Earth-spirit worship may be psychologically beneficial for certain individuals, but at a societal level it is symptomatic of a dangerous tendency toward escapism.[213]

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[209] Merchant (1992, p. 236).

[210] Demeritt (1994, p. 22).

[211] Gross and Levitt (1994, p. 165).

[212] Lewis (1996, p. 219).

[213] Lewis (1996, p. 220).

4.2 History

The Swedish historian Arne Jarrick has observed that even postmodernist historians are not consistent relativists: they would reject without difficulty (at least in private) a belief in witches and trolls, or in American creationists' account of the origin of the human species. Furthermore, when they engage in empirical research — as at least the more moderate postmodernists do — they, no less than any other historian, gather evidence and attempt to defend their interpretations with rational arguments. Nevertheless,

> even if most historians in their daily tasks work as if it were possible to get to grips with real circumstances in the past, post-modern rhetoric still contributes to a kind of irresponsibility in thought and work in those situations where it is advantageous to be irresponsible. ... If it is not possible to demonstrate the validity of your own hypothesis, you can always rest on the thought that historical research is nevertheless a form of story, of fiction. If you cannot read something expected from the material, it is always possible to inscribe it there, as, after all, that is what post-modern historians consider that everyone is doing: writing themselves and their time into the text. Perhaps bending the truth a little does not matter, as the truth nevertheless does not exist ... [214]

Along the same lines, the British historian Eric Hobsbawm has eloquently 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.[215]

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 how the postmodernist attitude disarms us in the face of these threats.

Over the past decade there has been much discussion, among theoretically inclined historians, of the pros and cons of postmodernist ideas (broadly defined) in historiography.[216] In addition, several historians have published case studies in which they critically analyze the

[214] Jarrick (2003).

[215] Hobsbawm (1993, p. 63), reprinted in Hobsbawm (1997, p. 6).

[216] Some relevant essays are collected in Jenkins (1997). Among the vast literature on postmodernism in historiography, Evans (1997) and Zagorin (1999) give particularly illuminating and judicious analyses; both of them also provide extensive references to earlier commentary. See also the reply to Zagorin by Jenkins (2000), and the rejoinder by Zagorin (2000).

The books of Appleby, Hunt and Jacob (1994) and Windschuttle (1997) are also of considerable interest, though they suffer, in my view, from curiously complementary flaws. Appleby–Hunt–Jacob are unfortunately somewhat superficial and confused in their treatment of the epistemology of science (chapter 5), which leads them to concede too much to weak critiques of science; they are consequently too soft on postmodernism (though they do begin and end their book by arguing strongly for the importance of truth in historical research). Windschuttle's discussion of the philosophy of science (chapter 7) is more detailed and solid, but it ultimately founders on his untenable claim that science seeks (and in some cases attains) not just well-

handling of evidence by their postmodernist-oriented colleagues.[217] As I am not a trained historian, I am not competent to take sides on the substantive controversies of historical interpretation being discussed. But if the critics are correct, Jarrick's fears are borne out, and postmodernist rhetoric can indeed serve as a smokescreen for sloppy research and dubious interpretation.

5 Postmodernists' selective skepticism

> 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 pernicious manifestation of anti-intellectualism in our time.
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> — *Larry Laudan,* Science and Relativism *(1990, p. x)*

It might appear bizarre, at first sight, that postmodernists, who pride themselves on their skepticism toward even the most well-established principles of mainstream science, should sometimes display sympathy for — or even belief in — one or more pseudosciences. After all, many of their skeptical arguments — the theory-ladenness of observation, for instance, or the alleged non-referentiality of language — are *universal* in nature: if valid, they apply to astrology or homeopathy no less than to Maxwell's electromagnetic theory. But on reflection,

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founded objective knowledge but *certainty*. As a result, he gives short shrift to some legitimate ideas (e.g. moderate versions of the theory-ladenness of observation) that cast doubt on some traditional philosophies of science (e.g. logical positivism, Popperian falsificationism) but in no way undermine the objectivity of the scientific enterprise. For my own views on these matters, see Sokal and Bricmont (1998, chapter 4) and Bricmont and Sokal (2004a).

[217] Particularly fascinating is the monograph of Spitzer (1996), who demonstrates that even hard-core postmodernists (e.g. Derrida) will put aside their declared philosophy and argue on the basis of *facts* (which they accuse their opponents of *distorting* or *misrepresenting*) when issues they consider important are at stake.

There is an extensive literature critically analyzing Foucault's histories of madness, medicine, incarceration and ideas: see, for example, Huppert (1974), Midelfort (1980, 1990, 1994, 1999), Megill (1987), Porter (1987, 1990), Gordon (1990), Scull (1990, 1992), Gutting (1994a, 1994b) and Jones and Porter (1994) for a variety of viewpoints.

Several chapters of Windschuttle (1997) are devoted to detailed analyses of case studies of postmodernist-oriented history, often to devastating effect (at least as regards the history of the Pacific). See also Hobsbawm (1990), Spiegel (2000) and Jarrick (2003) for analyses of specific instances of postmodernist-influenced historical work.

postmodernists' sympathy for pseudoscience seems less odd. Scientific method, for those who adopt it, serves principally as a *filter* for distinguishing true propositions from false ones, plausible ones from implausible, and more generally for evaluating propositions and theories according to the degree of *rational warrant* that they enjoy in the light of the currently available evidence. Remove or weaken that filter — for example, by denying that there can *ever* be any reasonably objective way to evaluate rational warrant — and you don't only let mainstream science flow out; you also let pseudoscience flow in. Furthermore, once cognitive considerations are demoted from their central role in evaluating theories, then social, political and psychological considerations can move to center stage. In this way, we are led to look favorably on those theories that seem to support our political or personal goals, or whose advocates gain our sympathy in one way or another; we cast a skeptical gaze on theories that we deem politically incorrect (or simply unpleasant) or whose proponents seem unsympathetic.[218] And we deploy the postmodernist arguments — universal though they may logically be — only (or principally) in the case of the latter.

The authors to be considered in this section are not, for the most part, hard-core postmodernists. It would be fairer to call their attitude "postmodernism lite". Still, their strong social constructivism accords reasonably well with my definition of postmodernism as

> an intellectual current characterized by the more-or-less explicit rejection of the rationalist tradition of the Enlightenment, by theoretical discourses disconnected from any empirical test, and by a cognitive and cultural relativism that regards science as nothing more than a "narration", a "myth" or a social construction among many others.

If pressed, these authors might deny claiming that science is *nothing more* than one story among many others; they might even concede that modern science is the best tool yet developed for predicting and controlling the natural world; but they would strenuously avoid conceding that scientific theories might be closer to the *truth* than their nonscientific competitors, or even that they might enjoy a stronger *rational warrant*.[219] Indeed, many of these authors would strenuously deny that transculturally valid evaluations of rational warrant are even possible.

Let me be frank at the outset: my (admittedly incomplete) research turned up many fewer examples of postmodernists expressing unequivocal support for pseudoscience than I

[218] Feminist postmodernist Kelly Oliver (1989, p. 146) has explicitly advocated this sort of politicization of science:

> ... in order to be revolutionary, feminist theory cannot claim to describe what exists, or, "natural facts." Rather, feminist theories should be political tools, strategies for overcoming oppression in specific concrete situations. The goal, then, of feminist theory, should be to develop *strategic* theories — not true theories, not false theories, but strategic theories. [emphasis in the original]

But even if we put aside the obvious scientific and moral objections to this version of postmodernist doctrine, we are still left with the perennial problem of self-refutation: how can one know whether or not a theory is "strategic", except by asking whether it is *truly, objectively* efficacious in promoting one's declared political goals? The problems of truth and objectivity cannot be evaded so easily.

[219] For further discussion of this point, along with examples from the science-studies literature, see Bricmont and Sokal (2000, pp. 376–377).

expected at first to find. I will, therefore, have to modify my initial hypothesis as a result of the evidence collected! I propose to begin by presenting the unambiguous cases; next I will present the more equivocal cases; and finally, I will attempt to provide some analysis of the findings.

5.1 Postmodernists on pseudoscience (I)

Some (admittedly lesser-known) postmodernists have given explicit endorsements of pseudoscience. For instance, Richard E. Palmer, in an article on "postmodernity and hermeneutics", asserts that

> Instances of telepathy or faith healing are incomprehensible within the framework of naturalist assumptions, and it is almost comical to see the absurd lengths to which the empirically minded will go to deny them. ... While it is not feasible here to enter into cases, one may mention a few recent works that ... give a veritable catalog of instances that suggest agencies beyond the ken of naturalism. ... The career of Edgar Cayce, the remarkable psychic, raises many questions about telepathy, perception of illness and great distances, the intuitive prescription of treatment, and so on.[220]

Palmer adds that "the works of [Erich] von Däniken offer an interesting challenge to the prevailing evolutionary concepts."[221] Likewise, Gary Lee Downey and Juan Rogers, in an article on "the politics of theorizing in a postmodern academy", propose

> to shift the explicit goals of academic theorizing from producing authoritative, truthful knowledge to producing knowledges that inform popular theorizing in desirable ways. ... [T]his strategy encourages one to view people as doing science in their everyday lives *all the time*. ... Such practices might also include well-established and highly organized forms of alternative science, such as alternative medicines, astrology, parapsychology, and various New Age sciences.[222]

Among well-known postmodernists (in my definition), I have found only two instances of explicit endorsement of pseudoscience. Feminist philosopher Sandra Harding has repeated uncritically a series of assertions from the book *Blacks in Science*, edited by Ivan van Sertima: in so doing, she has swallowed whole some whoppers of Afrocentric pseudoscience along with some genuine facts about African contributions to technology and medicine.[223] For example, Harding states as fact that

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[220] Palmer (1977, p. 376).

[221] Palmer (1977, p. 377). For a sober (but ultimately caustic) evaluation of von Däniken's theories on ancient extraterrestrial visitors, see Feder (2002, chapter 9).

[222] Downey and Rogers (1995, pp. 275, 276), emphasis mine.

[223] Van Sertima (1983). Among the genuine facts are an 1879 eyewitness account of a Caesarean section in Uganda, at a time when successful Caesarean sections in Europe were still rare (Davies 1959); and a 2000-year tradition of steel-making in Tanzania (Schmidt and Avery 1978; but see also Rehder 1986 and Avery and Schmidt 1986).

> In West Africa between 1200 and 1400, the Dogon reported the rings of Saturn, the moons of Jupiter, and the spiral structure of the Milky Way galaxy ... They also knew that a small star, invisible to the naked eye, had an eliptical [*sic*] orbit around the star Sirius that took fifty years to complete.[224]

These assertions are taken from a pair of articles by Hunter Havelin Adams III, where they are supported by ludicrously weak evidence; indeed, they are easily refuted.[225] As archaeologist Kenneth Feder observes, "The ancient and modern peoples of Africa represent some of the great cultural achievements of humankind and there is no need to exaggerate their intellectual contributions to the world."[226]

Along similar lines, Vandana Shiva, in her zeal to discredit "modern western patriarchal science" and to vindicate both "ancient Indian traditions" and "women's indigenous knowledge"[227], has endorsed some rather startling superstitions. For instance, she provides the following paean to what might be termed "botanical astrology":

> Sacred seed is perceived as a microcosm of the macrocosm with *navdanya* [nine seeds] symbolizing the Navagraha. The influences of planets and climate are seen as essential to plant productivity. In contrast, HYVs [high-yield varieties] break links with all seasonal climatic and cosmic cycles. ... On the grand scale [biodiversity] involves a relationship between planets and plants, between cosmic harmony and agricultural harmony captured in *navdanya*.[228]

In addition, Shiva has endorsed the work of Indian botanist J.C. Bose (1858–1937), who claimed to have established the existence of consciousness in plants.[229] Though Bose's theories have long been discredited, it is worth noting that "he remains a hero of the Vedic science tradition", according to Meera Nanda.[230]

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[224]Harding (1991, p. 223). In a subsequent article, Harding moves the alleged discoveries back more than a thousand years: "[M]any of the observations that Galileo's telescope made possible were known to the Dogon peoples of West Africa more than 1500 years earlier: either they had invented some sort of telescope, or they had extraordinary eyesight." (Harding 1994, p. 309)

[225]Adams (1983a, 1983b). For a refutation, see Ortiz de Montellano (1996, pp. 566 and 570n32).

[226]Feder (2002, p. 120).

[227]Shiva (1989, p. 58) and Mies and Shiva (1993, chapter 11). It goes without saying that ancient traditions and modern indigenous beliefs should not be assumed, *a priori*, to be pure superstition; some of them may indeed constitute perfectly valid — indeed, perfectly *scientific* — knowledge of the local ecosystem. I merely insist that all the relevant empirical evidence needs to be weighed rationally, without prejudice or romanticism.

[228]Mies and Shiva (1993, pp. 169, 171). The chapter from which this quotation comes was authored by Shiva.

[229]Shiva (1989, p. 59).

[230]Nanda (2003, p. 107). See Dasgupta (1999) for a biography of J.C. Bose; and see Jitatmananda (1993) for a celebration of Bose's theories by a partisan of Vedanta.

5.2 Postmodernists on pseudoscience (II)

There are numerous instances in which relativist-constructivist sociologists, without explicitly endorsing astrology, telepathy or other pseudosciences, have criticized the mainstream scientific community for giving short shrift to the alleged good evidence in favor of those theories. For example, Stanley Aronowitz writes that

> Rejected or marginal sciences such as parapsychology, the study of clairvoyance ... are just a few examples of the evidence that the scientific "community" as a site of power determines what counts as legitimate intellectual knowledge, even when the results of the marginalized sciences are obtained by traditional methods.[231]

Along similar lines, Barry Barnes, David Bloor and John Henry, in their textbook on the sociology of science, write that

> Astrology ... and homoeopathy ... remain firmly saddled with the label of pseudosciences in spite of recent work which seems to some to call for a reassessment (Gauquelin, 1984; Benveniste, 1988).
>
> Michel Gauquelin's statistical evidence in support of astrology would perhaps be a serious embarrassment to scientists if they were not so good at ignoring it. But one day it could conceivably come to be accommodated as a triumph of the scientific method. Gauquelin's work seems to imply the existence of forces and interactions unrecognized by current scientific theory and yet it is based on methodological principles and empirical evidence which have so far stood up to sceptical challenge.[232]

Though these passages do not indicate unequivocal support for clairvoyance or astrology, they do demonstrate a tolerant (and even cautiously favorable) attitude towards these theories, as well as a failure to comprehend the vast gulf between the established natural sciences and the pseudosciences as regards both methodology and degree of empirical confirmation. As physicist David Mermin noted in his review of the Barnes–Bloor–Henry book,

> BBH's gloss on astrology — 'the existence of forces and interactions unrecognized by current scientific theory' (BBH, 141) — fails adequately to convey the truly spectacular degree to which compelling evidence in support of astrology would require a massive radical reconstruction of our current understanding of the world.[233]

(A similar remark can be made for homeopathic claims, though the reconstruction might be somewhat less radical in this case.) Mermin goes on to note that

> An important motive behind rejecting such claims without any attempt at replication, unmentioned by BBH but clearly recognized by those doing the rejecting, is the gross inefficiency of investing extensive time and resources in an attempt to refute

[231] Aronowitz (1996, p. 191). Bizarrely, in this list of "rejected or marginal sciences" Aronowitz also includes "ecological and evolutionary biology" — a fact that would surely be news to most biologists.

[232] Barnes, Bloor and Henry (1996, p. 141). Here they are referring to data collected by Michel Gauquelin in support of the astrological theory that there is a "Mars effect" affecting the destiny of sports champions. See Benski *et al.* (1996) for a critical and detailed factual examination of the "Mars effect".

[233] Mermin (1998, p. 642).

> overwhelmingly improbable claims. For similar reasons, one turns down an offer, rendered on the spot, to purchase the Brooklyn Bridge for five dollars, without making a trip to the courthouse to confirm the conjectured non-existence of the claimed deed of ownership.[234]

5.3 Postmodernists on pseudoscience (III)

In the work of relativist-constructivist practitioners of "science studies" and "cultural studies of science", one frequent theme is the study of dissident or marginalized communities, such as those of parapsychology or alternative medicine.[235] On the one hand, the methodological (and in some cases also epistemological) relativism that is virtually axiomatic in science-studies circles precludes any rational evaluation of the scientific evidence pertaining to the factual questions under debate.[236] On the other hand, this methodological relativism allows the authors' sympathy for the "marginalized" — or distaste for mainstream science — to determine their intellectual stance.

For instance, cultural-studies exponent Andrew Ross has published an impressionistic ethnography of New Age interventions into science and technology, in which sometimes astute sociological observations are combined with an overarching lack of interest in whether the theories in question are true or even plausible. Ross leads the reader through a panoply of New Age enthusiasms — bioenergetics, crystal healing, magnet therapy, brain machines and channeling, to name only a few — with a wry mixture of sympathy, bemusement and detachment. Though Ross does not say so explicitly, the reader gets the distinct impression that he is skeptical about many of the New Agers' factual claims; but his explicit criticisms concern only the socio-economic and political aspects of New Age "science" (commercialism, individualism, desire to become part of "respectable" science), not the utter implausibility of the theories.[237] Furthermore, when discussing the intellectual luminaries of New Age (Karl Pribram, David Bohm and others), Ross becomes more respectful:

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[234] Mermin (1998, p. 642).

[235] For some early examples, see the essays collected in Nowotny and Rose (1979) and Wallis (1979).

[236] It is very important to distinguish between methodological relativism and various forms of philosophical relativism. Roughly speaking, methodological relativism is the precept that "the sociologist or historian should act as though the beliefs about reality of any competing groups being investigated are not caused by reality itself", while epistemological relativism is the claim that "one social group's way of justifying its knowledge is [always] as good as another's" and ontological relativism is the claim that "reality itself is different" for different social groups (Collins 2001, p. 184; see also Bricmont and Sokal 2001, p. 244n4). In the 1980s, statements implying epistemological relativism were fairly common in the science-studies literature; but nowadays most sociologists of science stress that they advocate only methodological relativism, not ontological or epistemological relativism. What they fail to do, however, is to give a cogent argument in favor of methodological relativism; the appropriateness of a relativist methodology for sociologists of knowledge is largely taken for granted. By contrast, Bricmont and I (2001, 2004b) have argued that methodological relativism is unjustifiable *unless* one adheres to some form of philosophical relativism. For a detailed debate of this issue, see the various essays collected in Labinger and Collins (2001).

[237] On Ross' approach, see especially Ross (1991, pp. 8–9 and 27–28). To his credit, Ross does address the question of scientific accuracy at least in passing (p. 29): "I do not believe that New Age culture has produced anything like a more consistently accurate account of the world than rationalist science."

> It is from modern brain science, however, that New Agers have drawn the most competent explanatory models for a new cosmology with science as its sustaining core. ... Once the brain's ecology is understood as holographic, the principles of isomorphism and synchronicity, from brain to brain, come into play. Sensory reality appears as a relatively stable representation, but is projected holographically from a point that is, in principle, beyond time and space. If the universe itself becomes a master hologram, all of reality can then be recovered from its smallest portion; each brain incorporates the universe's information. Holism is thereby established at all the implicate levels of experience.[238]

In Ross' view, this paradigm has the advantage that

> It not only establishes a permanent, fluid ground for intersubjective communication, but also allows for a more socially equitable overall distribution of energy than the *karmic* universe of retributions and rewards. Just as a formalist might argue that the politics of atom-smashing somehow equates to an attack on the centered Cartesian subject, so holism's proponents see the unified holographic field of perceiver and perceived as a leveling critique of the privileges of subjectivism. Such a field accommodates "mystic experience" not as a contingent or aberrant encounter but as a rational apprehension of the conscious holo-movement of sensory reality.[239]

(Come again?) In a footnote, Ross cites approvingly Rupert Sheldrake's eccentric notion of "morphogenetic fields ... operating on a subquantum level, linking every pattern in the universe."[240]

Along similar lines to Ross, but in a more professional manner, anthropologist-sociologist of science David Hess has produced a fascinating book-length ethnography of Spiritism in Brazil, placing it in the context of Brazilian religious syncretism (principally Yoruba and Catholic). Hess provides a series of case studies of what he calls "Spiritist scientific thought", but without once (as far as I can tell) asking whether the doctrines in question merit, on epistemic grounds, to be called "science". Indeed, he explicitly rules that question out of bounds:

> I am making no claim that one or another of the discourses discussed here is more or less scientific than any other, nor even that the phenomena labeled "paranormal" have obtained the status of scientific facts; instead, I put in brackets the question of

[238] Ross (1991, p. 41).

[239] Ross (1991, p. 42).

[240] Ross (1991, p. 253n20). It should be noted, however, that Ross also makes an astute and cogent criticism of Fritjof Capra's *The Tao of Physics*:

> For those who want scientists to make their work more accountable to the nonexpert, Capra's analogy [between physicists and Zen students] is, in every respect, a step in the wrong direction. Far from demystifying the work of science, it elevates the scientific vocation beyond the status it already enjoys as a secularized Western priesthood. Ordinary language and everyday rationality are revealed as inadequate, archaic, and therefore redundant media of communication. When the words of the physicist begin to sound like a koan, the aim of explicating science in the vernacular to a nonexpert audience has been abandoned. (Ross 1991, p. 44)

> the scientific status of Spiritist thought as "true" or "false", and I use the claims of scientificity (or lack thereof) in order to get at issues of cultural values and ideological meaning.[241]

Hess refers in passing to the mainstream medical community's disapproval of Spiritist cures, but only in sociological terms, as "boundary-work" by the orthodoxy to contain heterodox competitors; at no point does he inquire into the objective evidence concerning the efficacy of different therapies, or even acknowledge that the question exists. The same strict methodological relativism governs Hess' subsequent book on New Agers, parapsychologists and skeptics in the United States.[242] The net effect of this forced "neutrality" is to give unearned credence to pseudoscience.

Sociologist of science Steve Fuller is more explicit than Ross or Hess in advocating the demotion of science from its position of epistemic hegemony (a programme that he terms the "secularization of science"). Noting the little progress made thus far in this direction by sociologists of science, he says: "[I]t may turn out that more effective vehicles for the secularization of science will be found among the customized knowledges promoted by such New Age movements as homopathic [*sic*] medicine, parapsychology, dianetics, and (*mirabile dictu!*) Creation science."[243]

Discussing the controversy over teaching creationism alongside evolution in American public-school science classes, Fuller makes the sensible pedagogical observation that "Given that two thirds of those who believe in evolution also believe that it reflects a divine intelligence, it would seem that such ex cathedra dismissals [of theological ideas] fail to engage the average student's intellectual starting point."[244] But far from taking this as an opportunity to challenge students' prejudices and to teach the critical analysis of evidence, Fuller urges that students' prejudices be comforted wherever possible:

> [F]rom a Creationist standpoint, just because some important findings and perspectives in environmental science were originally developed under the rubric of Darwinian evolution, it does not follow that those findings and perspectives cannot be understood

[241] Hess (1991, pp. 54–55).

[242] Hess (1993). At one point, Hess does let his relativism slip: he admits that "the skeptically minded *rightly* reject the scientific solidity of much New Age discourse and practice" (Hess 1993, p. 175, emphasis mine). But this is a rare lapse.

It is worth noting that, despite his methodological relativism, Hess makes what is in my view a sensible psychological/sociological observation:

> A large number of sincere people are exploring alternative approaches to questions of personal meaning, spirituality, healing, and paranormal experience in general. To the skeptic, their quest *may* [emphasis mine] ultimately rest on a delusion, but debunking is hardly likely to be an effective rhetorical device for their rationalist project of getting the Other to recognize what appears to the skeptic as mistaken or magical thinking. Instead, if skeptics were to understand the world more from the perspective of their Others, then their attempts to educate and enlighten them might be more successful. (Hess 1993, pp. 158–159)

[243] Fuller (1996, p. 47), italics in the original.

[244] Fuller (1996, p. 49).

> or appropriated without the Darwinian framework. In order to protect students' freedom of inquiry, teachers should try, whenever possible, to show that similar results can be reached holding alternative theoretical presuppositions.[245]

What this suggestion really protects is not students' freedom of inquiry, but rather parents' freedom to insulate their children *from* inquiry.

A few pages later, Fuller predicts that

> As governments continue to let market demand drive science policy ... scientific teams in search of funding will need to adapt their research goals to the interests of potential investors. This, in turn, will bring them closer to the kind of customized knowledge production that is characteristic of New Age movements: that is, they will gradually lose the universalist gloss of knowledge per se and become knowledge for specific constituencies.[246]

Fuller's prediction may, alas, come to pass; but he sloughs over the question of whether homeopathy, parapsychology and dianetics are *really* knowledge (i.e., rationally justified true belief) or merely *purported* knowledge. Advertisers and cynics might not care about the difference, but consumers and rationalists should.

5.4 Concluding remarks

Among academic intellectuals whose primary commitment is to postmodernism (broadly defined), only a tiny handful appear to exhibit, at least in public, any significant attraction to pseudoscience. Occasionally, it is true, they make favorable comments about homeopathy, astrology or parapsychology; but this seems, in most cases, simply a calculated attempt to *épater les scientifiques*, not a sincere assertion of their own belief. The confluence of postmodernism with pseudoscience seems, rather, to be strongest among those whose primary commitment is to one or another brand of pseudoscience, be it Hindutva or Therapeutic Touch. For these people, postmodernism supplies a ready-made ideology that they can use opportunistically to ward off the critiques of rationalists.

There is, however, one situation in which postmodernists seem more readily to give unequivocal endorsement of pseudoscience: namely, when the theories in question appear to support their intellectual and/or political goals. For instance, Sandra Harding has proposed to remake science along feminist and multicultural lines, asserting that the new science will be more "strongly objective" than existing science.[247] Her uncritical recitation of Afrocentric pseudo-history forms part of an effort to show that "Western" science has unjustly neglected

[245] Fuller (1996, pp. 48–49).

[246] Fuller (1996, p. 50).

[247] Harding (1991, 1993, 1994, 1996, 1998). The idea that increasing the cultural and gender diversity of the scientific profession could, *in some cases* and *to some extent*, lead to more objective science (in addition to being a worthy social goal in its own right) ought not be rejected out of hand; in my view it has some validity, most obviously in the social sciences and areas closely related to them (e.g. primatology) but conceivably also elsewhere. On the other hand, it also seems to me that the relevance of these considerations to the bulk of the natural sciences has been vastly overrated by some feminist and multiculturalist theorists. For moderate views on this question, see e.g. Wylie (1992) and Brown (2001, pp. 89, 184–187 and 201–205).

discoveries made by Africans — a thesis that, to the extent it is true, would provide some support for her philosophical and political project. Clearly, Harding's motivation in endorsing pseudoscience is not any attraction to pseudoscience *per se*, but simply opportunism and intellectual laziness (traits that, alas, are not the monopoly of any academic or political faction). As Gross and Levitt comment, harshly but under the circumstances not unjustifiably,

> In the gospel according to Harding, skepticism is to be reserved exclusively for scientific work done by white males and backed by the methodologies of scientific orthodoxy. "Strong objectivity" turns out to be another name for pathetic gullibility.[248]

Likewise, Vandana Shiva's endorsement of traditional Indian pseudoscience is motivated by her political and cultural sympathies, not by an objective analysis of the empirical evidence. These incidents provide at least some confirmation for my fear that postmodernist doctrine leads its adherents to look favorably on those theories that seem to support their political goals, while casting a skeptical gaze on theories that they deem politically pernicious.

6 Does it matter?

> The concept of "truth" as something dependent upon facts largely outside human control has been one of the ways in which philosophy hitherto has inculcated the necessary element of humility. When this check upon pride is removed, a further step is taken on the road towards a certain kind of madness — the intoxication of power which invaded philosophy with Fichte, and to which modern men, whether philosophers or not, are prone. I am persuaded that this intoxication is the greatest danger of our time, and that any philosophy which, however unintentionally, contributes to it is increasing the danger of vast social disaster.
>
> — *Bertrand Russell (1961a, p. 782)*

Does it matter if some people believe in homeopathy or Therapeutic Touch? Perhaps not a great deal. I personally am irked when the purveyors of quackery (many of whom are now large corporations) succeed in lightening the wallets of the gullible; but in this scam, unlike most consumer frauds, the victim is a willing participant in his own victimization. My libertarian instincts urge a hands-off attitude toward pseudoscientific acts between consenting adults.[249]

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[248] Gross and Levitt (1994, p. 212).

[249] A far more serious ethical question is raised when *children* are endangered on account of their parents' pseudoscientific beliefs (often but not always religiously based). In this case I have no hesitation in insisting that the state impose the scientifically indicated best treatment, and if necessary undertake criminal prosecution for child abuse (or, in cases of avoidable death, negligent manslaughter) against recalcitrant parents and their accomplices. For a preliminary quantitative investigation of the incidence of this type of child abuse in the United States, resulting in the death of the child, see Asser and Swan (1998). For related statistical information concerning preventable illness short of death, see Salmon *et al.* (1999) and Feikin *et al.* (2000). Concerning the ethical and legal issues, see American Academy of Pediatrics (1997), Dwyer (2000) and Merrick (2003).

Likewise, does it matter if some people — mostly, let's face it, academics — believe that truth is an illusion, that science is merely a species of myth, and that standards for judging rationality and correspondence with reality are thoroughly culture-bound? Once again, perhaps not a great deal: far more pernicious doctrines abound in human society, and anyway, intellectuals' influence on the world outside the ivory tower is much smaller than we frequently flatter ourselves into thinking.

In the preceding two paragraphs I have — as the reader will no doubt have guessed — bent over backwards to be tolerant, perhaps to the extent of obscuring my real views.[250] Thus, I am indeed mildly disconcerted by a society in which 50% of the adult populace believes in extrasensory perception, 42% in haunted houses, 41% in possession by the devil, 36% in telepathy, 32% in clairvoyance, 28% in astrology, 15% in channeling, and 45% in the literal truth of the creation story of Genesis.[251] But I am far more profoundly worried by a society in which 21–32% believe that the Iraqi government under Saddam Hussein was directly involved in the attacks of September 11, 2001, 43–52% think that U.S. troops in Iraq have found clear evidence that Saddam Hussein was working closely with al-Qaeda, and 15–34% think that U.S. troops have found Iraqi weapons of mass destruction.[252] And

[250] For instance, I have not mentioned the real danger when people with curable illnesses are diverted from effective treatments. And I have been worried enough about the harmful cultural effects of postmodernism to co-author a book criticizing it (Sokal and Bricmont 1998).

[251] All data are from Gallup polls taken in the United States in 2001. Concerning "ESP or extrasensory perception", 50% "believe in", 20% "are not sure about", and 27% "don't believe in" (the remainder have "no opinion"). "That houses can be haunted": 42–16–41. "That people on Earth are sometimes possessed by the devil": 41–16–41. "Telepathy, or communication between minds without using the traditional five senses": 36–26–35. "Clairvoyance, or the power of the mind to know the past and predict the future": 32–23–45. "Astrology, or the position of the stars and planets can affect people's lives": 28–18–52. "Channeling, or allowing a 'spirit-being' to temporarily assume control of a human body during a trance": 15–21–62. See Gallup (2002, pp. 136–138).

Concerning creationism, the exact question was: "Which of the following statements comes closest to your views on the origin and development of human beings — human beings have developed over millions of years from less advanced forms of life, but God guided this process; human beings have developed over millions of years from less advanced forms of life, but God had no part in this process; or God created human beings pretty much in their present form at one time within the last 10,000 years or so?" The results were 37% developed with God, 12% developed without God, 45% God created in present form (the remainder have "no opinion"). These results have been essentially stable for at least the past 20 years. See Gallup (2002, pp. 52–54). A Gallup poll from 1982 also gave breakdowns by sex, race, education, region, age, income, religion, and community size. Differences by sex, race, region, income and (surprisingly) religion were rather small (perhaps because evangelical Protestants and liberal Protestants were lumped together). By far the largest difference was by education: only 24% of college graduates supported creationism, compared to 49% of high-school graduates and 52% of those with a grade-school education. See Gallup (1983, pp. 208–214).

[252] Kull *et al.* (2003, pp. 3–5 and 2004, pp. 3–5), reporting results of a series of PIPA/Knowledge Networks polls taken in the United States between February 2003 and March 2004.

Concerning Iraq and September 11, respondents were offered four choices: "Iraq was directly involved in carrying out the September 11th attacks"; "Iraq gave substantial support to al-Qaeda, but was not involved in the September 11th attacks"; "A few al-Qaeda individuals visited Iraq or had contact with Iraqi officials"; "There was no connection at all". The results averaged 21%, 35%, 30%, 8%, respectively, and have been quite stable (plus or minus only a few percent) over the whole period from February 2003 to March 2004. In an August 2003 *Washington Post* poll, respondents were asked: "How likely is it that Saddam Hussein was personally involved in the September 11th attacks?" 32% answered "very likely", 37% "somewhat likely",

if I am concerned about public belief in clairvoyance and the like, it is largely because of my suspicion that credulity in minor matters prepares the mind for credulity in matters of greater import — and, conversely, that the kind of critical thinking useful for distinguishing science from pseudoscience might also be of some use in distinguishing truths in affairs of state from lies.[253] (Not a panacea, mind you, but just *of some use*.)

As historian of science Gerald Holton has observed, both pseudoscience and postmodernism — and the Romantic rebellion against science and reason that often links them together — become most dangerous when they are conjoined to political movements, such as National Socialism in Germany or Hindu nationalism in India.[254] In the West, it is unlikely that either New Age spiritualism or academic postmodernism will, in the foreseeable future, acquire significant political weight. Christian fundamentalism remains, despite ups and downs, a powerful political force in the United States, but one that has been contained, thus far at least, by a countervailing legal tradition of separation between church and state. In large parts of the developing world, by contrast, profound social and economic dislocations coexist with a strong popular religiosity and weak (or nonexistent) traditions of liberalism and secularism. In these circumstances, religiously-inspired reactionary modernism is a permanent threat or, in some countries, an ongoing reality.

According to one prominent postmodernist epistemologist (echoing the ideas of dozens of others),

> [T]here has never been a science without presuppositions, one that is "objective" and free of values and worldview. ... That Newton's system conquered the world was not the result of its internal truth content and value or of its persuasive power, but rather an aftereffect of the political hegemony that the British acquired in that era and that grew to an Empire.[255]

This thinker derides the objectivity of science in terms virtually identical to those of the Indian "postcolonial" theorists:

> The case is simply this, that an idea born of the Enlightenment — that is, an idea of Western civilization, bearing the marks of a limited period — has set itself up as an

12% "not very likely", 3% "not at all likely".

Concerning Saddam Hussein and al-Qaeda, respondents were asked: "Is it your impression that the U.S. has or has not found clear evidence in Iraq that Saddam Hussein was working closely with the al-Qaeda terrorist organization?" Between June 2003 and March 2004, the results have varied in a narrow band from 43–52% yes, averaging to 48%.

Concerning weapons of mass destruction, respondents were asked: "Since the war with Iraq ended, is it your impression that the U.S. has or has not found Iraqi weapons of mass destruction?" The results have shown a gradual decline over time, from 34% in May 2003 to 15% in March 2004.

N.B.: I am writing this in August 2004. I do not exclude the possibility that U.S. troops might at some future date discover weapons of mass destruction in Iraq. But that could not retrospectively legitimate the belief that U.S. troops have *already* found such weapons.

[253]The degree of validity (if any) of this conjecture is an empirical question, which merits careful investigation by psychologists, sociologists and educational researchers.

[254]Holton (2000).

[255]Krieck (1942, pp. 9, 13). I thank Gerald Holton and Gerhard Sonnert for translating this quotation and the next two.

> absolute and declared itself a criterion applicable to all peoples and at all times. Here we have an example of Western imperialism, a bold assertion of supremacy.[256]

On this basis, he concludes that

> Decisions grounded on a race-based worldview determine the basic form — the principle or elemental phenomenon — upon which a science is founded. ... [A] German can look at and understand Nature only according to his racial character.[257]

The postmodernist in question is Ernst Krieck, notorious Nazi ideologue and rector of the University of Heidelberg in 1937–38.[258]

I am not, of course, claiming that all postmodernists are Nazis, far from it. I am not even claiming that postmodernist ideas are in some way "proto-Nazi". My claim is, rather, that postmodernism — like most philosophical ideas — has no inherent political coloration at all, and can be used for a variety of purposes. In particular, postmodernism's attack on universalism and objectivity and its defense of "local knowledges" fit particularly well with nationalist ideologies of all stripes. Most contemporary postmodernists are politically progressive intellectuals, sincerely concerned with the fate of the poor and the downtrodden. But ideas have a way of escaping from the intentions of their creators.

Of course, if a theory is supported by cogent reasoning or persuasive empirical evidence, then it is unfair to criticize it on the grounds that it may lead, in some people's hands, to bad consequences; rather, it is the misuse of a valid idea that should be criticized instead. But if a doctrine is based on sloppy reasoning — as I believe postmodernism is[259] — then it is not out of place to observe that it can *also* have pernicious consequences.

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[256]Krieck (1936, p. 31), as translated in Holton (2000, p. 340).

[257]Krieck (1942, pp. 13, 19). Ironically, a nearly identical assertion is made by Afrocentrist author Hunter Havelin Adams III (1983a, p. 32): "[S]cience cannot always spring from a universal or culturally independent base. It must be consistent with the essentials of its people's 'common sense.' " Alas, postmodernism makes strange bedfellows.

[258]Gerhard Sonnert and Gerald Holton have kindly provided me the following brief biography of Krieck:

> Ernst Krieck (1882–1946) was a fierce ideologist and voluble writer, Nazi since the early 1920s, but originally a teacher in a primary school (*Volksschule*). On 1 April 1934 he was appointed to the chair of Pedagogy and Philosophy at the University of Heidelberg; his subsequent rise was, at first, irresistible. In mid-1935, upon the dismissal of the philosopher Ernst Hoffmann, Krieck became co-head of the Philosophical Seminar, together with Karl Jaspers. On 30 September 1937, Jaspers was pushed out as having "Jewish connections", leaving Krieck as the sole head. Concurrently, in January 1937, Krieck was made rector (= president) of the University of Heidelberg. He remained as rector only until 1 October 1938, having submitted his resignation because his views on anthropology had annoyed Alfred Rosenberg. Krieck remained in the chair of Pedagogy and Philosophy, and wrote numerous books on National Socialist education.

[259]The degree of validity of postmodernist ideas is, of course, a vast issue that goes far beyond the scope of this essay. It becomes particularly thorny because of the great diversity of ideas that go under the name of "postmodernism" (even within my rather restrictive definition). Some of my views on these matters can be found in Sokal and Bricmont (1998, especially chapters 4 and 12) and Bricmont and Sokal (2004a). See also Haack (1998, 2003), Brown (2001) and Nanda (2003) for cogent critiques of postmodernist philosophical doctrines.

Though intellectuals tend to overestimate their impact on the larger culture, it is nevertheless true that the ideas — even the most abstruse ones — taught and debated within universities have, over time, cultural effects beyond academia. For instance, postmodernist theorizing has had real effects "on the ground" in India, and those effects have not been uniformly positive, to put it mildly. Bertrand Russell (in the epigraph to this section) undoubtedly exaggerated when he denounced the perverse social consequences of confusion and subjectivism, but his fears were not entirely unfounded.

In this essay I have given examples of explicit convergence between pseudoscience and postmodernism: cases in which pseudoscientists resorted to postmodernist arguments, or in which postmodernists defended pseudoscience. To be honest, my (admittedly incomplete) research has turned up fewer instances of explicit convergence than I had initially expected to find.

But perhaps the most serious nexus between postmodernism and pseudoscience is one that I have not investigated here at all — one that is less explicit, and harder to pin down, but more insidious. To the extent that postmodernist ideas are widely disseminated in the culture, even in watered-down form, they create a climate in which the incentives promoting the rigorous analysis of evidence are undermined.[260] After all, doing real science is difficult. Why bother investing the time to seriously learn physics, biology and statistics if it's all, in the end, just a matter of opinion anyway? One paradigm against another, your paradigm against mine. (Or in the more fashionable argot, "one among many truth games".) It's a lot quicker, and more exhilarating as well, to erect a revolutionary system based on verbal manipulation of phrases culled from vulgarizations of popularizations of relativity and quantum physics. Why bother studying David Bohm (1951, 1952) when it's far more exciting, and a hell of a lot easier, to read David Bohm (1980)? Why bother learning about non-commuting operators, when you can get all the quantum mechanics you need from Fritjof Capra?

There are also powerful psychological motivations impelling pseudoscience, which postmodernism reinforces. As Francis Bacon recognized nearly four centuries ago, "man prefers to believe what he wants to be true."[261] Logic and empirical science, on the other hand, intrude on human freedom, or at least on our fantasies of it: the universe may or may not turn out to conform to our desires. Indeed, one aspect of the transition from childhood to adulthood involves learning to relinquish pleasant but false beliefs — in Santa Claus, for instance — and, more generally, to distinguish between our desires and reality. But this is a difficult process, and none of us, scientists included, achieves it perfectly.[262] Natural selection equipped the human brain with propensities toward accurate perception and reasoning

[260] For an entertaining account of the proliferation of various types of woolly thinking in modern public life, see Wheen (2004).

[261] Bacon (2000 [1620], Aphorism 49, p. 44).

[262] For example, it is embarrassing nowadays to read what some eminent British scientists were writing in the 1930s about the new socialist commonwealth then being constructed under Stalin. Clearly, these authors' powerful and legitimate desires for a more just society overrode their trained scientific skepticism.

in those areas of life that were relevant to our ancestors' survival and mating; but there was no selective pressure toward accuracy in cosmology, and there may even have been selective pressure against it.[263] Science is an extremely recent (relative to our species' lifetime) cultural innovation that has allowed humans to overcome some of our innate propensities toward wishful thinking and to harness our intellectual capacities towards ends light-years distant (literally) from life on the African savannah. It is utterly extraordinary how effective that innovation has proven, in a mere 400 years, in generating accurate knowledge of the world, from quarks to quasars; indeed, that success would have to be reckoned a near-miracle, if we did not already take it for granted. But the scientific attitude toward the world — the "scientific temper", as our colleagues in India so elegantly put it — is still very much a minority taste, even in the advanced industrialized countries where the technological products of science are ubiquitous. In many ways science cuts against the grain of human psychology, both in its methods and in its results; pseudoscience may well be more "natural" for our species. To maintain a scientific outlook requires a constant intellectual and emotional struggle against wishful, teleological and anthropomorphic thinking, misjudgments of probability, correlation and causation, perception of nonexistent patterns, and the tendency to seek confirmation rather than refutation of our favorite theories.[264]

Postmodernism did not create pseudoscience, and in most cases does not explicitly promote it. But by weakening the perceived intellectual and moral foundation for scientific thought, postmodernism abets pseudoscience and heightens the "ocean of insanity upon which the little barque of human reason insecurely floats".[265]

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[263] See Miller (2000, pp. 262–265, 420–425) for the intriguing (though insufficiently fleshed-out) suggestion that the human propensity for creative but not necessarily factually accurate ideologies — as exemplified by the near-universality of religion in human society — may arise, at least in part, from sexual selection. See also Boyer (2001) and Atran (2002) for detailed analyses of religion through the lens of evolutionary psychology. I thank Helena Cronin for very interesting discussions on this issue.

[264] Ideas similar to those in the preceding two paragraphs have been put forth by Levitt (1999, especially chapters 2, 4 and 14) and Wolpert (1993, chapter 1). Please note that there is no contradiction between this emphasis on the *psychological* impediments to accurate reasoning and the contention that, as a *logical* matter, the scientific method is nothing more or less than the deepest (to date) refinement of the rational attitude in everyday life (Sokal and Bricmont 1998, pp. 56 ff.; Bricmont and Sokal 2004a).

[265] The phrase is due to Bertrand Russell (1961b, p. 531), who was speaking of nationalist and religious passions.

references. Of course, none of these people are in any way responsible for what I have written.

I would also like to thank the Interlibrary Loan office at NYU's Bobst Library for efficiently processing my innumerable requests.

Finally, I wish to thank Garrett Fagan for his kind invitation to write this article, and for his tolerance both of my tardiness in producing it and of its unexpected length.

Appendix: Religion as pseudoscience

> The attempt to efface the features of the struggle between religion and science is nothing but a hopeless effort to defend religion.
>
> — *Sadiq al-'Azm (1982, p. 116)*

Some readers will no doubt be offended by my description of the Pope as "the leader of a major pseudoscientific cult". Others will concede the accuracy of the description but consider it unnecessarily aggressive. I beg to differ on both counts.

Few people would, I presume, take umbrage were I to term Heaven's Gate a "pseudoscientific cult" or call the gods of Olympus a "myth"; these would simply be considered accurate descriptions of the epistemic status of the beliefs in question.[266] But adherents of Heaven's Gate are few and socially marginal, while believers in the Greek gods are long dead. Judaism, Christianity, Islam and Hinduism, by contrast, number millions of adherents around the world — hundreds of millions in the case of the latter three — and wield significant (though by no means unchallenged) political, economic and social power in many countries. As a consequence, honest talk about the epistemic status of the dominant religions (e.g. Christianity in the West) is generally considered bad manners at best, blasphemous at worst. Nevertheless, to include these religions in a discussion of pseudoscience is in no way "aggressive"; it is simply to refuse the double standard that mandates favored treatment for some pseudosciences over others. Indeed, an unbiased count would probably show that Christianity, Islam and Hinduism are *the most widely practiced* pseudosciences in the world today, far above homeopathy or astrology. And in their fundamentalist versions they are the most dangerous as well.

In saying this so openly, I realize that I am in the minority. Even most liberals and agnostics nowadays take a dim view of blunt talk about religion, except to denounce the excesses of fundamentalism. After all, the battles of the eighteenth and nineteenth centuries between the Church and secular liberals were largely resolved in favor of the latter; religion in the West has largely abandoned its pretensions at political influence, except on matters of sexual morality and (in areas of the United States where fundamentalists are strong) education. As a consequence, nonbelievers have reached a *modus vivendi* with organized religion: you agree to stay out of politics (more or less); we, in turn, will refrain from publicly questioning your theology and from attacking the remnants of your temporal privileges (e.g.

[266] For those who may not remember: Heaven's Gate was a group, based in Southern California, who believed that a spaceship travelling behind (or alongside) the comet Hale–Bopp would transport their liberated souls to heaven; 39 members committed mass suicide in March 1997. For a history, see Daniels (1999, chapter 12); and for a fascinating "inside" ethnography, written before the mass suicide, see Balch (1995).

state subsidies in Europe, tax exemptions in the United States). Why bother criticizing ideas that are so inoffensive? Indeed, the liberal churches do much social good (e.g. in the civil rights and anti-war movements in the United States, and liberation theology in Latin America) and serve as an ethical counterweight to the untrammeled power of money.

A similar *modus vivendi* has been reached between the scientific community and the non-fundamentalist churches. The modern scientific worldview, if one is to be honest about it, leads naturally to atheism — or at the very least to an innocuous deism or pan-spiritualism that is incompatible with the tenets of all the traditional religions — but few scientists dare to say so publicly.[267,268] Rather, it is religious fundamentalists who make this (valid) accusation about "atheistic science"; scientists, by contrast, generally take pains to reassure the public that science and religion, properly understood, need not come into conflict. This is no doubt shrewd politics, especially in the United States, where the majority of people take their religion quite seriously; some scientists have labored to convince themselves (and the rest of us) that it is intellectually honest as well.[269] But the arguments do not hold water.[270]

Look back at my definition of pseudoscience and ask honestly whether the traditional religions fit:

(a) It makes assertions about real or alleged phenomena and/or real or alleged causal relations that mainstream science justifiably considers to be utterly implausible.

(b) It attempts to support these assertions through types of argumentation or evidence that fall far short of the logical and evidentiary standards of mainstream science.

(c) Most often (though not always), pseudoscience claims to be scientific, and even

(c′) claims to relate its assertions to genuine science, particularly cutting-edge scientific discoveries.

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[267]Some prominent exceptions are Dawkins (1987, 2003), Weinberg (1992), Levitt (1999) and Bricmont (1999).

[268]The empirical data on scientists' religious beliefs are mixed. A recent survey shows that approximately 39% of U.S. scientists believe in "a God to whom one may pray in expectation of receiving an answer", while 45% disbelieve and 15% have no definite opinion (Larson and Witham 1997). On the other hand, among members of the National Academy of Sciences, belief dropped to 7%, with 72% disbelieving and 21% agnostic (Larson and Witham 1998). See also Iannaccone *et al.* (1998) and Brown (2003) for different viewpoints on the available evidence.

[269]Most such arguments come, of course, from believers: see, for example, Barbour (1990), Peacocke (1990) and Polkinghorne (1991). A theologically more modest version is offered by physicist Freeman Dyson (2000), who describes himself as "a practicing Christian but not a believing Christian" (Dyson 2002, p. 6). A different argument in favor of the compatibility of science and religion — the so-called "non-overlapping magisteria" (NOMA) — comes from paleontologist Stephen Jay Gould (1999), who calls himself an "agnostic" (p. 8) but who could perhaps more accurately be described as "an atheist bending over backwards far beyond the call of duty or sense" (Dawkins 2003, p. 252n89).

[270]See Bricmont (1999) for a brief but devastating critique of four variants of the idea that science and religion are compatible; and see Dawkins (2003, pp. 146–151) for a briefer but equally devastating critique of several of these variants. See also Kitcher (2004) for a more detailed account of the multifaceted incompatibility between science and religion.

(d) It involves not a single isolated belief, but rather a complex and logically coherent system that "explains" a wide variety of phenomena (or alleged phenomena).

(e) Practitioners undergo an extensive process of training and credentialing.

Items (a), (b), (d) and (e) describe the traditional religions so perfectly that it hardly needs further explanation.[271] Items (c) and (c′) are less common in the traditional religions, but are becoming increasingly frequent in recent years among the more sophisticated advocates of religious ideas.[272]

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[271] Well, I *thought* that this point was so obvious that no further explanation was needed! But since some readers of an early draft of this essay requested elaboration of points (a) and (b), let me try to provide it briefly:

Examples of (a) include alleged "miracles" of all types — both the ancient miracles recounted in the holy books and those purportedly occurring in modern life — and more generally, all the interventions by God(s), saints, angels and sundry supernatural beings (e.g. in response to prayer) that, by definition, involve suspension or temporary modification of the ordinary laws of physics and biology.

Examples of (b) include alleged eyewitness observations taken at face value, without being subjected to the critical scrutiny that is routinely practiced by historians, jurors and indeed all human beings in our daily lives; alleged historical accounts taken at face value, without being subjected to the cross-checking of evidence that is routinely practiced by historians and archaeologists; and alleged accounts of miracle cures, healing by prayer, etc. taken at face value, without being subjected to the statistical tests routinely employed by medical researchers and epidemiologists.

[272] Particularly noteworthy in this regard are the activities of the John Templeton Foundation, which makes grants (over 100 per year) to promote

> work in which both science and religion are taken seriously in the quest to more fully understand reality. What can research tell us about God, about the nature of divine action in the world, about meaning and purpose? What spiritual insight can be gained from the way in which science unveils aspects of nature and of human creativity?

Special attention is given to subsidizing college courses in Science and Religion, which are diverse in detail but uniformly aimed at showing that science and religion are compatible (see Wertheim 1995 for a report by a supporter). In addition, the Foundation awards an annual Templeton Prize for Progress Toward Research or Discoveries about Spiritual Realities, valued at slightly over $1 million, which according to a Foundation press release "is the world's largest monetary annual award given to an individual":

> [T]his award is intended to encourage the concepts that resources and manpower are needed to accelerate progress in spiritual discoveries, which can help humans to learn over 100 fold more about divinity. ... The Prize is intended to help people see the infinity of the Universal Spirit still creating the galaxies and all living things and the variety of ways in which the Creator is revealing himself to different people.

Recent recipients include physicist (and Anglican priest/theologian) John Polkinghorne, biochemist (and Anglican priest/theologian) Arthur Peacocke, and physicists Ian Barbour, Paul Davies and Freeman Dyson. [Quotations and information come from Templeton Foundation (2003).]

For a detailed statement of the Templeton credo, see Templeton and Herrmann (1989). For critiques of the Templeton Foundation's activities by scientists and others sharing a scientific worldview, see Krauss (1999), MacIlwain (2000) and Brown (2000). For an amusing (but perfectly cogent) critique of the Templeton Foundation's wishy-washy theology from the perspective of Christian fundamentalism, see Grigg (2002) and Herrmann (2002).

Playing a similar (but possibly less lavish) role in the French-speaking world is the Université Interdisciplinaire de Paris (UIP), which is not in fact a university, but rather an association that organizes conferences on science and religion and publishes a journal, *Convergences*. For further information on the UIP, along with a sharp critique, see Dubessy and Lecointre (2001).

After all, when we say of a pseudoscientific cult — Therapeutic Touch, for instance, or Lacanian psychoanalysis — that it has become "virtually a new religion" or that its adherents "defend its doctrines with a quasi-religious fervor", we mean these comments as epistemic judgments, and we mean them pejoratively. Should doctrines that *admit* to being religions be treated any differently?

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