

Pseudoscience

In his editorial "Pseudoscience" (21 June, p. 1233), Philip Abelson remarks on the widespread campus interest in such works as *Chariots of the Gods?* and *The Secret Life of Plants*. I agree that the current wave of mystical anti-intellectualism penetrates into the college campus. However, I do not think that college courses in science would constitute an effective response or provide students with resistance to such fantasy. Medical students have a more thorough education in general science than the average college graduate, but I find that a significant percentage of them profess a belief in one or more of the current fads—vegetarianism, acupuncture, or transcendental meditation—and an occasional student demonstrates an outright faith in magic.

I suggest that such beliefs are part of normal mental development. Perhaps one learns to be critical of flying saucers and telepathic plants only by going through such intellectual fads and being personally disillusioned. Personally, I would be judged by my students to be an excessively cynical skeptic, but I vividly recall a childhood enthusiasm for the works of Charles Fort and a brief but passionate affair with dianetics as a college student. These may be milestones of mental development in our students that we should welcome rather than deplore.

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The word *science* is derived from the Latin verb *scire*, to know, and can properly be used in an extremely broad context. In the natural sciences, and in the physical and biological sciences in particular, there are more or less well defined and generally accepted criteria for "scientific truth." This would seem to be necessary for the erection of an edifice which is sufficiently stable to provide support for continued progress, and a foundation for the continuing education and training of young scientists. The structure that has already been built, in physics, for example, is strong enough to support all sorts of temporary baroque additions, such as some of the theories relating to elementary particles, without undergoing a catastrophic collapse. It also provides many inspiring points from which to

contemplate all the wonderful structures and processes that do not submit to confinement in this somewhat rigid, man-made framework. I fail to understand why "unsubstantiated speculation" is to be regarded as an evil in fields outside orthodox science when, together with continuing observation and experiment, it is the very lifeblood of scientific advance.

I suspect that many of the students who read books of the genre criticized by Abelson may actually be a jump ahead of their professors in being able to recognize evidence for the probable existence of forces and processes that may well lie hidden among, and concealed by, the laws and structures that we already know, but which are making their presence felt only under special circumstances. I have to confess the sin of having read all but the first of the books mentioned by Abelson, and regardless of the ease with which they can be criticized, it is clear that there is a strong case for the existence of strange phenomena that are extremely difficult for many scientists to take seriously. But there is nothing unscientific about accepting such things by hypothesis as a basis for . . . further experimentation and observational study. . . .

What bothers me most about Abelson's editorial is the . . . seeming implication that some kind of censorship is necessary to protect the sacred honor of science. . . . I think it is a great mistake to suppose that what Abelson calls "pseudoscience" poses any threat to the integrity of science. A greater threat may lie in those scientists who are too eager to restrict its boundaries. . . .

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It is unfortunate that such a spate of pseudoscience activity is prevalent today. However, its presence begs an answer to the question—Why? The response of the public to the presence of this material reflects an internal human need or yearning that is being partially satisfied by the writings. The sad feature is that the scientific content is not as good as it should be or could be.

One reason for the lack of scientific quality is that there is a professional stigma against association with these types of ideas. One's peers think you have "lost your marbles" if you begin

to consider such ideas seriously. Another reason is that there is no funding to support serious, time-consuming investigations in these areas. Only by such investigations will enough real knowledge be generated that the pseudoscience label can be dropped.

When the human yearning is sufficiently great and when professional scientists and funding agencies abstain from responding to the need, then non-professional investigators enter the area to do what they can. Their uncritical faculties plus their own yearnings often lead to novel, biased, but sometimes very useful interpretations of data. These interpretations and the public response to them perturb the professionals, who see their marketplace being invaded by aliens. When the perturbation is of sufficient amplitude, both the professionals and the funding agencies begin to slowly swing into action to clearly look at the phenomena creating the furor. One example of this kind of cycle in the American experience can be seen in the study of acupuncture, which has only recently begun to enjoy professional and funding support.

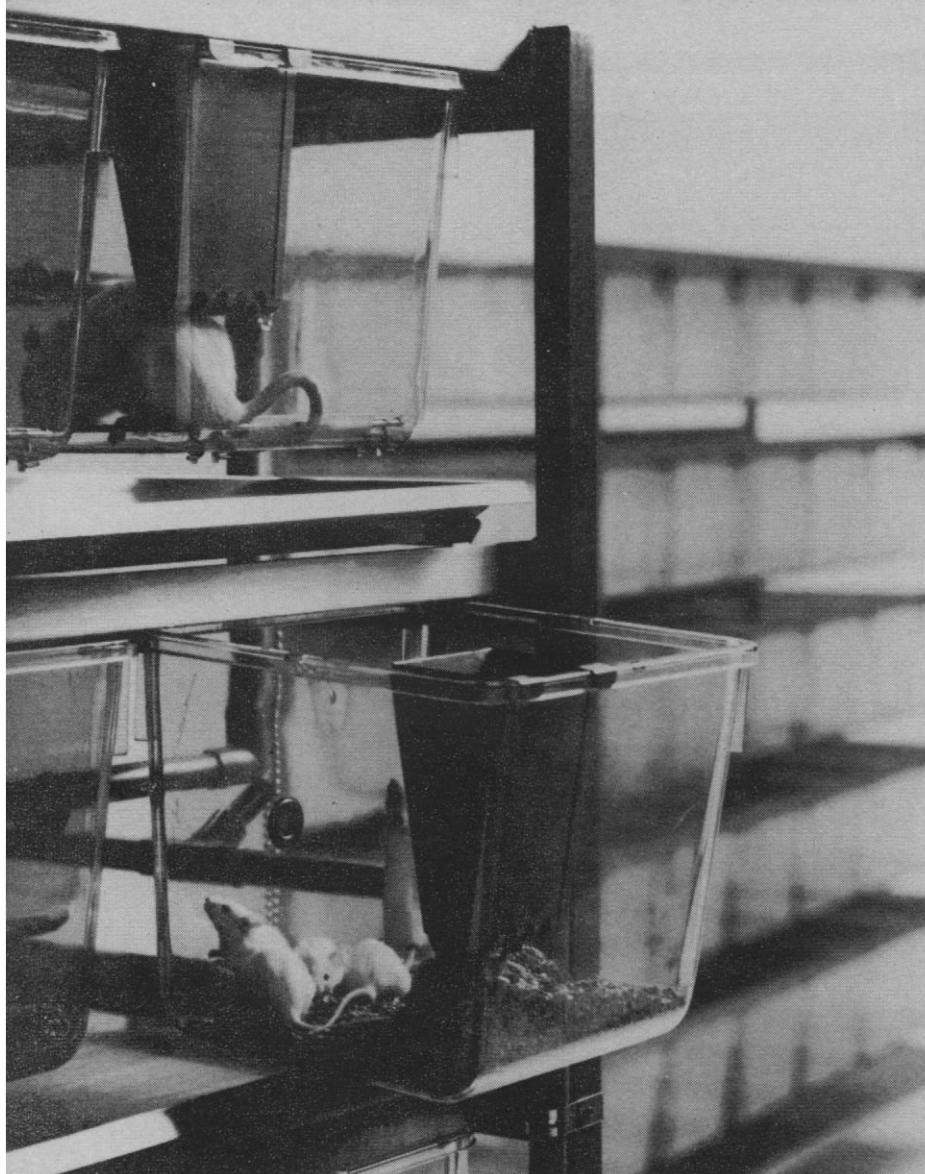
There are two ways of responding to the stimuli from pseudoscience activities: (i) institute a rigid rejection of the whole idea; or (ii) move to have open-minded but professionally competent scientists begin to look into these ideas on an adequately funded basis. If we follow the former path, then we set ourselves apart from the common man and ultimately earn his rejection. If we follow the latter path, we are serving, to some degree, the constituent who is paying the freight for our national research program. We are also recognizing that the subconscious yearnings of our society may be pointing us in a direction where new, relevant, and exciting secrets of nature are to be found.

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Abelson's editorial decries the current turn of the public and university students to mysticism and pseudoscience and urges the scientific community to provide "antidotes to the new intellectual poisons." This sounds reasonable. But then Abelson goes on to say that "much of the appeal of the new pseudoscience seems to relate to a deep-seated

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quirk of human nature—a predisposition to believe in the supernatural." What is a quirk? Certainly not anything deserving of serious consideration. Abelson tells us in effect to ignore certain deep-seated aspects of human nature. This, I submit, is pseudoscience. Nature is orderly, and scientists want to understand human nature and its deep-seated motives, whether these relate to mysticism or to any other areas. In an orderly universe there are no quirks.

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I heartily agree with Abelson's concern about the "pseudoscience" that seems to be cropping up in many places. Nevertheless, I believe that we must ask ourselves whether there is perhaps something missing in the current presentations of science, in particular in the domain of biology, which can lead to misunderstanding.

Abelson points out that research in plant biology is one of the great scientific frontiers today. This cannot be denied, but it must be kept in mind that the outcome of this research is presented from the point of view that explanations must be sought exclusively in the system of description developed for present-day physics and chemistry. Thus every explanation looks for causal relationship with past events, insofar as these can be described in physical terms. The relation can be deterministic or statistical, but there is no possibility of finding a link with judgments concerning that which may be termed to be "good" or "bad" for the future. Important and valuable as the hypothesis of causal relationship is in the domain of the physics of nonliving systems, there is no proof that it can fully explain the nature of living organisms.

I am not looking for anything "supernatural"—a term and a complex of unclear notions which I abhor. However, daily observation shows that, within ourselves (and with great probability also in many animals), there is active, along with causal relationship, an effect of an *anticipation* of a near future, associated with a feeling that we can choose between options which seem to be open to us (1). This feeling is a part of nature—not something outside of it. The problem is how much attention must be given to this concept. Rather than denying its importance and its effects, or being content with a vague suggestion that future developments in

quantum theory will clarify it, I propose that we hold the concept of anticipation before us as a descriptive term which has a place in biology. At present, physics has nothing in its descriptive system to which the notion of a value judgment can be linked, and it must leave completely unanswered the question of whether value judgments have effects upon our actions. I believe that a genuine extension of our scientific world picture is possible, one which would give us hope of finding a bridge between science and values. Perhaps this could be helpful to the young people who now are looking elsewhere for a connection.

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References

1. J. M. Burgers, *Proc. R. Neth. Acad. Sci. Ser. B* 75, 375 (1972).

Of Skunks and Tomato Juice

The report by Thomas H. Maugh II on Anderson and Bernstein's work on the chemistry of skunk scent (*Speaking of Science*, 27 Sept., p. 1146) reminded me of the last day of a week-long hunt in North Dakota several years ago. My German shorthaired pointer, Belle, tangled with a skunk in a marsh, as she had done many times before. She was heavily doused, which resulted in severe lacrimation, profuse salivation, and emesis. Seconds later, however, she was on a rock-solid point, and we shot our last pheasant of the trip with the help of the smelliest dog in seven counties. We then took her to the nearest village, where we scrubbed her down with a No. 10 canful of tomato juice. We were watched with amusement by the local residents who were on their way to church that beautiful Sunday morning.

I suggest that Anderson and Bernstein investigate the following questions: Why don't hunting dogs learn that skunks stink? How can they smell pheasants after being doused? Why does tomato juice work so well? Could the tomato molecules fit between the double bonds?

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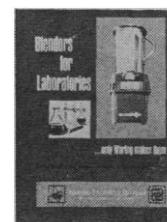
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