

Letters

Relations with South Africa

For a decade the Smithsonian Astrophysical Observatory (SAO), closely associated with Harvard College Observatory (HCO), has been contributing to the support of Boyden Observing Station in Bloemfontein, South Africa. Recently SAO has been asked to quadruple its support. Many members of HCO and SAO are upset by the use of government money to support a scientific facility which is operated according to the racist principles of South Africa's apartheid system. We have sent copies of the following letter, with 71 signatures, to Fred Whipple, director of SAO in Cambridge, and to S. Dillon Ripley, head of the Smithsonian Institution in Washington:

We have recently learned that the Smithsonian Astrophysical Observatory is planning to support observing trips by its staff members to Boyden Observatory in South Africa. Because of the racist policies of the South African government, we strongly oppose both the use of South African facilities by SAO and Harvard staff members and the continued financial support which SAO provides for Boyden Observatory.

Scientists in South Africa are not removed from apartheid. All facilities, scientific and otherwise, that a scientist uses there depend on cheap, black labor. Any scientist speaking out against apartheid would be banned from the country if he were a foreigner and imprisoned if he were South African.

Isolation is one of the few nonmilitary pressures the outside world can exert on South Africa. This isolation can be especially important in science because of the dependence of much of South Africa's economic growth on applied science. Visits even by scientists engaged in "pure" research contribute to the overall growth of the South African scientific community, which in turn contributes to the economic health of South Africa's apartheid system.

We believe in the internationalism of science, but the most basic ideal of internationalism—the spread of scientific knowledge and technological advances to all people, without national or racial barriers—is violated by South Africa's denial to blacks of equal education and economic benefits of modern technology.

Any professional visits to South Africa by American astronomers, especially with government support, lend legitimacy to

that country's established system. Surely SAO's support could be used by observers at other southern hemisphere telescopes. The refusal by a prestigious establishment like the Smithsonian Institution to support research in South Africa would influence many American scientists to refrain from going to South Africa until its racial policies are changed.

The use of government money to support a facility which practices racial discrimination is probably in violation of the 1964 Civil Rights Act. We are currently looking into the possibility of legal action. We feel that cooperation with South African policies is certainly immoral. Members of the scientific community should know about the activities of SAO in South Africa and we hope they will join us in support of our endeavors.

JEFFREY HOFFMAN

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Your acceptance of an advertisement from the University of Natal at Pietermaritzburg does an injustice to the nonwhite members of the AAAS, since, because of their color, they would never be considered for such a position.

I would like to suggest that *Science* refuse to accept any more advertisements from institutions or organizations in the Republic of South Africa. By their very nature, these advertisements are insults to a portion of our membership.

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On Paradigms

In "The Paradigm Concept" (14 May, p. 706), reviewing the second edition of Kuhn's *The Structure of Scientific Revolutions* and the proceedings of a colloquium, *Criticism and the Growth of Knowledge*, dealing with Kuhn's work, Shapere follows the majority of the essays in the second book in subjecting Kuhn's work to painstaking philosophical analysis. After

two pages of such analysis he concludes his review with:

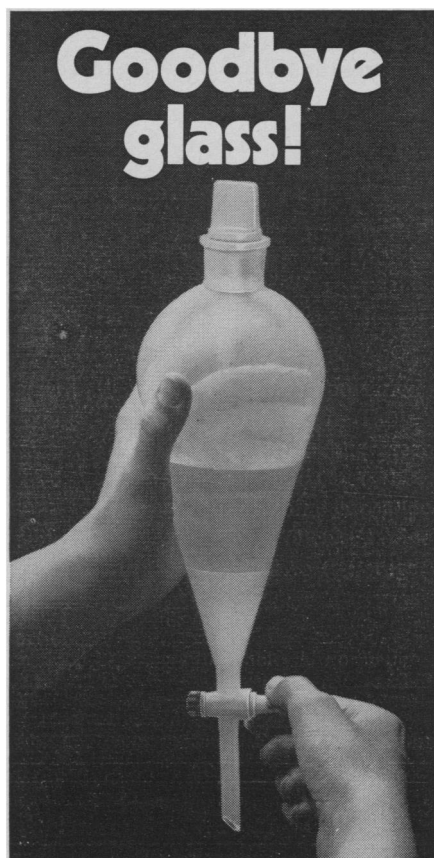
The point I have tried to make is not merely that Kuhn's is a view which denies the objectivity and rationality of the scientific enterprise; I have tried to show that the arguments by which Kuhn arrives at his conclusions are unclear and unsatisfactory.

Shapere may not regard "the objectivity and rationality of the scientific enterprise" as unarguable givens, but the sentence quoted implies that to deny them is a fault or flaw in Kuhn's thought. In the same issue of *Science*, Chargaff, a practicing scientist, discusses (p. 637) a situation curiously similar to the incommensurability, deprecated by Shapere, that is postulated by Kuhn as existing between paradigms and, in addition, challenges any uncritical acceptance of the objectivity and rationality of science. He writes:

It is almost impossible to retrace the course of the history of science to an earlier stage, for not only should we be required to forget much of what we have learned, but much of what a previous epoch knew or believed to know has simply never been learned by us. We must remember that the natural sciences are as much a struggle against as for facts.

Shapere points out in some detail the shifts in Kuhn's position and the logical problems engendered by such shifts. He examines the philosophical implications of that position and finds it wanting. (At this point it is difficult to resist speculation about which scientific or social scientific insight, principle, or law could have resisted the attack of the modern philosopher, armed with many more destructive weapons than constructive tools.) The paradigm concept is certainly open to philosophical attack and insofar as it is a philosophic construct should fail if found wanting philosophically. The paradigm concept is not strictly and solely a philosophic construct, however. It has at least two other layers. First, it describes occurrences in science and perhaps in other areas of knowledge. Second, repeated assertions by Kuhn (which are liberally quoted by Shapere) that in examining the scientific enterprise he is seeking psychological or sociological explanations force us to regard the paradigm concept, at least in part, as a construct (paradigm?) in the social sciences about the natural sciences.

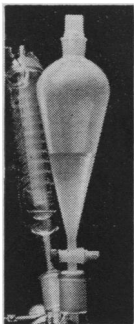
Chargaff in the section quoted earlier is only one of the scientists who currently describe their endeavor in Kuhnian terms. In "System and Hu-



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manism in Social Science" (also 14 May, p. 661) Simpson, reviewing Friedrichs' *A Sociology of Sociology* and Gouldner's *The Coming Crisis of Western Sociology*, uses the word "paradigm" at least seven times and also refers explicitly to Kuhn's work. The widespread acceptance of Kuhn's ideas by scientists indicates that his insights illuminate the circumstances in which they actually practice science. His rejection by philosophers indicates that concepts that are clear to the research worker whose situation and environment they describe are unclear to the philosopher.

Nowhere, either in *Criticism and the Growth of Knowledge* or in Shapere's review, is the paradigm concept considered as a construct in the field of sociology. It is perhaps in this role that the paradigm concept will ultimately stand or fall. That Galileo recants or that Kuhn retreats has little to do with the descriptive and predictive power of their insights or with the productivity of the research that can go on under the aegis of their conceptual frameworks. Obviously, my approach here is intentionally Kuhnian. The acid test of the paradigm concept is not logic but effect, that is, its descriptive and predictive power. If the concept is effective it will survive and then the philosophers will have to find a way to deal with it.

WALTER J. FRASER

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Indicators of Drug Effectiveness

One of the major problems in the practice of preventive medicine in developing countries is guaranteeing that drugs and biologicals are still effective at the time of use. This is especially true for live virus vaccines which must be kept within a narrow temperature range. Because of the hazardous conditions that sensitive pharmacologicals encounter in transit from the laboratory to the patient, many ineffective (and thus potentially harmful) drugs and biologicals are administered, or many effective drugs and biologicals are discarded because of a suspicious history.

Field workers desperately need a fail-safe indicator which either changes the color of the material or appears on the label (perhaps obliterating it) when temperature, time, or other factors have

adversely affected the effectiveness of the material. Sterilization indicators, which are routinely used in autoclaving, operate according to the same principle.

If the United States were to adopt similar devices for drugs and biologicals, the immediate benefits would be international.

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Reform at the National Academy of Sciences

Page's editorial (14 May, p. 635) on the new Institute of Medicine of the National Academy of Sciences (NAS) raises some important issues that deserve further discussion. The most serious problem is whether the NAS or an institute within it can provide the kind of leadership that is needed to "encourage creative change" [Stewart Udall, quoted in C. E. Barfield, *Nat. J.* 3, 111 (1971)]. Clearly some of the innovations outlined by Page are attempts to improve the situation. Especially laudable is the intent to make a candidate's election to the Institute of Medicine contingent upon a commitment of time for public service. Perhaps this same stipulation should be extended to the entire Academy, which in the past has been a kind of exalted Phi Beta Kappa.

Unfortunately, such minor reforms do not go far enough. The most regressive feature of NAS—the election of members by a closed group—would be retained. This virtually assures that the institute and the NAS would remain unaccountable to the public and to the scientific community at large. I cannot help but feel that the problems of the poor and of minority groups will continue to be neglected under these circumstances.

The model provided by NAS is so deficient that a wholly different institution should be established to supply scientific and medical advice to the government. It should be designed to encourage inputs from competent scientists and nonscientists who are not necessarily members of the elite establishment.

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