

Daedalus On The Challenges To Science

A Review

by John H. Douglas

The American Academy of Arts and Sciences, under grants provided by the National Science Foundation's Office of the Public Understanding of Science, and by the Commonwealth Fund, devoted the summer issue of its journal Dædalus to examination of what its editor called a "crisis of reason," in his commissioning letter to the scholars participating in the project. The work, a pulse-check of science after the shocks of the 60's, is re-examined here by Science and Society editor John H. Douglas.

For anyone who has worried about the alienation of science from the youth "counterculture" and the deterioration of national commitment to scientific investigation, the summer issue of DÆDALUS, the journal of the American Academy of Arts and Sciences, is imperative reading. Focusing on the issue "Science and its Public: The Changing Relationship," 16 authors offer a series of remarkably diverse articles on what they perceive as a growing challenge to the theoretical foundations of science and to its place in society. The very limitations of these individual perceptions, however, as much as anything the writers actually conclude, convey the extent to which communication has already disintegrated between scientists and nonscientists. Unfortunately, the profound sense of loss this fragmentation of intellectual endeavor implies for both sides is only hinted at, and the reader can only hope that this disturbing work will stimulate further discussion.

The volume sorely needs an introduction. Though the viewpoints vary from the abstract depths of positivist philosophy to explicit suggestions on how to improve relations between the scientific community and the White House, the articles can be grouped around two distinct themes that finally emerge as complexly interrelated. The authors themselves seem to have reviewed each other's manuscripts in some instances, and careful cross-

referencing can produce lively dialogue; however, such synthesis is left strictly as an exercise for the reader. As substitutes for an introduction, the article by Etzioni and Nunn on public appreciation of science gives the essential background data for the theme I will call the Popular Challenge, and the article by DÆDALUS guest editor Gerald Holton introduces the protagonists in what I will call the Theoretical Challenge.

Columbia University sociologist Amitai Etzioni and Center for Policy Research associate Clyde Nunn cite various public opinion polls spanning the last 20 years to demonstrate that while science is perceived as generally beneficial by most people and that confidence is especially strong among the young, that position has fluctuated sharply, along with general public disaffection with authority. Much of the popular "belief" in science rests on a tenuous foundation of ignorance about the scientific method and confusion of science with technology. "Of all American institutions," the authors conclude, "science seems to be the least understood by the wider public."

With this in mind, one can more easily understand the anomalies that have arisen in the relationships of science to government and to the public, cited by other authors. The problem in government funding of science, writes Don K. Price, Dean of the J. F. Kennedy School of Government at Harvard, is likely to be "too much faith, or too much uncritical faith, rather than too little. . . . Politicians try to interfere with research not in order to stop it or hamper it, but to apply it prematurely." Other authors trace the fragmentation of science within the government bureaucracy and in the university community. MIT nuclear engineering professor David J. Rose proposes one partial solution: the establishment of new, interdisciplinary institutions dedicated to *problematique*, the current European term for such issues as energy, environmental quality,

transportation and public health.

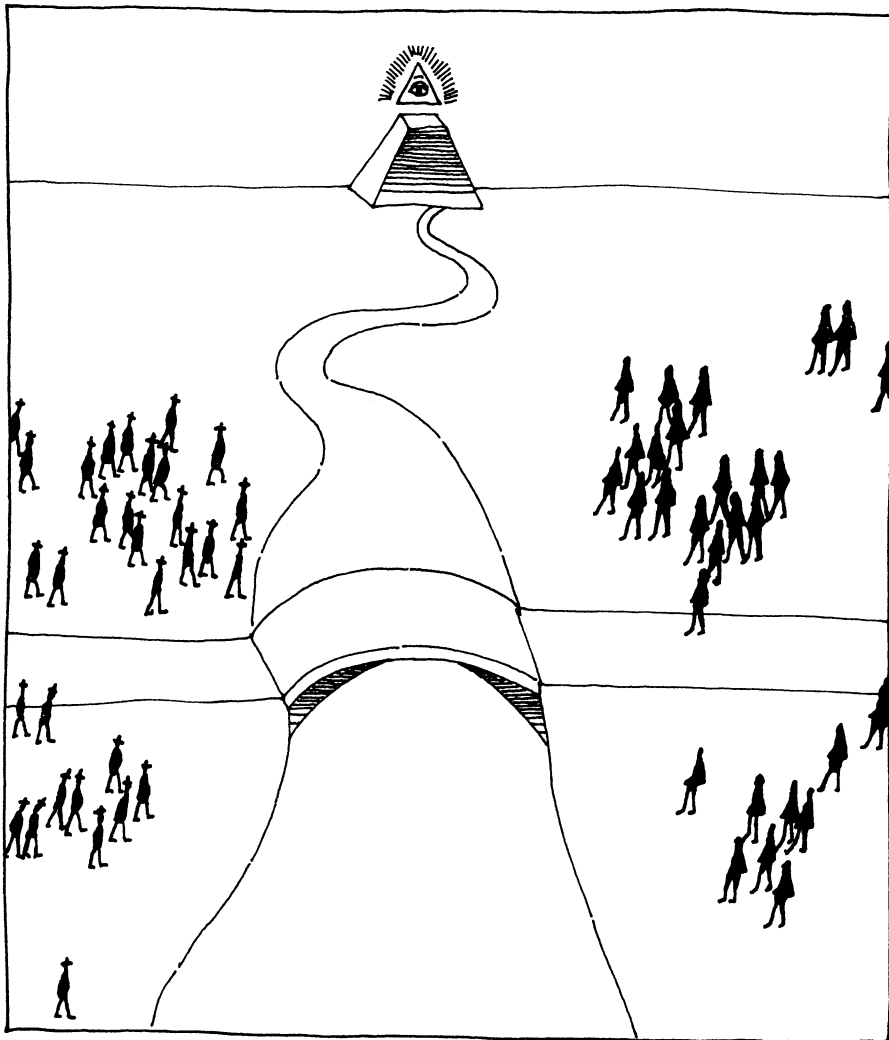
Among the general public, an ignorance of the basic principles and methods of science has led history to repeat itself. Many of the anxieties of scientists today and the disillusion of vocal minorities of youth parallel developments during a similar period of rapid change in late 19th century Germany, which are traced by Johns Hopkins historian Russell McCormmach. University of California biologist John A. Moore shows how confusion about the nature of scientific knowledge led to the recent, almost successful attempts in California to demand "equal time" for Biblical theories of creationism beside evolution in public school classrooms. Science writer David Perlman concludes the volume with a plea for more openness among scientists to responsible journalists, in order to better communicate the mood and realities of science to the public.

Not surprisingly, the authors who attempt to deal with the Theoretical Challenge to science find themselves on shakier ground, unable to identify their opponents beyond the vague categories of "counterculture" and "existentialists" or to consistently distinguish between the intuitive *nonrationality* of enigmatic sages and the glib irrationality of a few current pop writers.

Holton, a Harvard physicist and science historian, introduces us to the two extremist factions he sees attacking science from both sides: the "new Dionysians" who would widen the spectrum of scientific knowledge to include nonrational experience and the "new Apollonians" who would restrict scientific investigation to dealing only with those questions that seem to guarantee rational solution from the outset. On the left stands Charles Reich (*The Greening of America*) who says the emerging Consciousness III counterculture is "deeply suspicious of logic, rationality, analysis, and of principle," and advises, "It is essential to get free of what is now accepted as rational thought." On the right stand the Vienna Circle of logical positivists who assume, "The body of scientific propositions exhausts the sum of all meaningful statements."

Both postures, Holton concludes, are antithetical to the spirit of scientific inquiry, which alternates between the imaginative and the critical faculties. He quotes Peter Medawar that "the process by which we come to form a hypothesis is not illogical but nonlogical, i.e., outside logic. But once we have formed an opinion we can expose it to criticism, usually by experimentation."

The clash between culture and counterculture is dramatized in this volume by Harvard physicist Steven Weinberg and philosopher-science critic Theodore



Roszak. Against the depersonalizing, reductionist knowledge of science, Roszak postulates *gnosis*, "an older and larger kind of knowledge" involving the participation of the knower so that mere facts are perceived in the larger context of existence. He invites scientists to participate in the "disciplines of the visionary minds as well as of the rational intellect," in order to appreciate knowledge as the artist does, rather than just using it to predict or manipulate physical phenomena.

Nonsense, replies Weinberg. To follow Roszak's lead would require abandoning commitment to objectivity. Besides, if there is an essential element of science that is "cold, objective, and nonhuman," precisely at this most abstract level one finds certain compensations: "harmony and order."

What emerges from the discussion is narrow science and bad Zen. Science, as it is done, is a far cry from the neat logical process conveyed in journal articles. From the intuitive insight that spawns a hypothesis, to the patient creativity that invents an experiment, to the anguished ethical misgivings that can follow a discovery, to the inspired understanding of a master teacher who communicates seemingly unrelated ele-

ments as a comprehensible whole, the process of science is as infiltrated by emotional animation and nonrational perception as any other human endeavor. Similarly, there is nothing inherently antirational or antiscientific in the greater part of the ancient meditative, intuitive or mystical traditions that are now reemerging for another incarnation. The physicist Kunihiko Hashida used to say that his practice of Zen was precisely his study of physics; that his lifework was "to science" (the act of discovery and understanding) rather than just "to study science." The lines of demarcation between the rational and nonrational aspects of research blur even further in the social sciences, as illustrated by other DÆDALUS writers.

The differences between the two modes of conception are basically ones of goal and style. The goal of meditation and nonrational knowledge is not orderly delineation, but integration: "Knowing others is wisdom; knowing the self is enlightenment. Mastering others requires force; mastering the self needs strength."—Lao Tsu (from a translation in which one of the collaborators is a high-energy physicist). The style is not analysis, but intuition: "Zen never explains but indicates, it does not

appeal to circumlocution, nor does it generalize. . . . Zen is not an enemy of anything. There is no reason why it should antagonize the intellect."—D. T. Suzuki. Even that old curmudgeon Friedrich Nietzsche was not so much interested in destroying scientific thought as in warning about its limitations and possible misuses: "Only a man who has a firm grasp of the overall picture of life and existence can use the individual sciences without harming himself; for without such a regulative total image, they are strings that reach no end anywhere and merely make our lives still more confused and labyrinthine."

What is needed is a synthesis of the intuitive and the deductive faculties, not their further alienation. None of the authors mention that recent research indicates that the origins of this mental dichotomy may lie in the very structure of the brain, with the left hemisphere performing predominantly verbal and analytic functions and the right hemisphere dominating spatial and holistic processes. Biofeedback research is shedding new light on many of the perceptual and somatic phenomena associated with meditation and altered states of consciousness. Psychotropic drugs, despite the emotionalism surrounding their abuse, may yet offer a key to understanding man's cognitive nature as well as the complex functioning of his nervous system.

What is needed is *better* criticism of science, not fewer critics. Almost without exception, the existential philosophers who suspect or even outright reject the scientific method match their ferocity with their ignorance of science: "The conclusions of passion are the only reliable ones."—Kierkegaard. Since scientists, like most people, are willing to listen only to arguments couched in their own language, those who would communicate to them a personal anxiety over what science is doing to humanity should be informed enough to understand the principles involved. Of course, the same applies to scientists who wish to have a voice in public policy. Nothing is more embarrassing than to watch some distinguished scientist appear before a Congressional committee and blither himself into ineffectuality by exposing his naked innocence of economics and political reality.

Einstein was well aware of the impact and validity of nonrational thought: "Who can no longer wonder and stand rapt in awe is as good as dead." Rather than discrediting either the rational or intuitive components of knowledge, we should find, with Gerald Holton, a practical use for both in the survival of mankind, through tapping a "generation of new ideas that are both imaginative and effective." □