often had disappointing results and has frequently been rejected in favor of an extreme formalism which emphasizes objective facts. Economics confines itself to its own abundant data. Political scientists limit themselves to whatever may be studied with a few empirical tools and techniques, and confine themselves, when they deal with theory, to formalistic analyses of political structures. A strong structuralist movement is evident in sociology. Linguistics emphasizes formal analyses of semantics and grammar.

Straight-laced commitments to pure description and formal analysis appear to leave no place for explanatory principles, and the shortcoming is often blamed on the exclusion of mental activities. For example, participants at a recent symposium on "The Limits of Behavioralism in Political Science" (*8*) complained of a neglect of subjective experience, ideas, motives, feelings, attitudes, values, and so on. This is reminiscent of attacks on behaviorism. In any case, it shows the same misunderstanding of the scope of a behaviorial analysis. In its extension to the social sciences, as in psychology proper, behaviorism means more than a commitment to objective measurement. No entity or process which has any useful explanatory force is to be rejected on the ground that it is subjective or mental. The data which have made it important must, however, be studied and formulated in effective ways. The assignment is well within the scope of an experimental analysis of behavior, which thus offers a promising alternative to a commitment to pure description on the one hand and an appeal to mentalistic theories on the other. To extend behaviorism as a philosophy of science to the study of political and economic behavior, of the behavior of people in groups, of people speaking and listening, teaching and learning—this is not "psychologizing" in the traditional sense. It is simply the application of a tested formula to important parts of the field of human behavior.

References and Notes

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News and Comment

High-Energy Physics: Panel Proposes Construction, Operation Program To Run through 1981

A federally convened panel on future needs in high-energy accelerator physics issued an $8-billion, 18-year shopping list last week, and, in doing so, served up a nice case study on the complexities of deciding how much should be spent for what in science. (Copies of the study, entitled *Report of the GAC-PSAC Panel on High Energy Accelerator Physics*, may be obtained without charge from the U.S. Atomic Energy Commission, Division of Technical Information Extension, P.O. Box X, Oak Ridge, Tenn.)

In some fields, such as medical and agricultural research, long-standing and widespread public support exerts constant pressure for greater expenditures. As a result, one of the principal tasks facing the political decision makers and their scientific advisors is to guard against excess. But in fields that are largely beyond public view and comprehension, such as high-energy physics and radio astronomy, the decisions are virtually unencumbered by political considerations, and it is easier to shoot for a rational assessment of the "right amount." The main impediments to reaching that goal are the competing demands of other fields of science. The federal money pie, which is the largest source of sustenance for basic research, is just so big, and a fatter slice here means a thinner slice there; but in the more esoteric fields of science it is possible, within fairly generous bounds, to make the needs of the field the main criterion for federal support. The reason for this is that Congress is strongly inclined toward the promotion of science; it tends to dabble and display its prejudices and sentiments in those areas that it can begin to comprehend, such as medical research, but where its own knowledge is glaringly insufficient, it will go along with the experts and scarcely offer a quibble. This practice raises some serious and disturbing questions about the role of Congress in a critically important and expensive area of national activity; the best that can be said is that that's the way it is, and that's the way it will continue to be until someone figures out a way to raise the level of scientific competence within Congress. In the meantime, Congress's inadequacy in such matters places an unusually heavy burden of responsibility on those who are summoned to make recommendations for scientific investment, for, in the absence of a critical performance by the Congress, a formalized recommendation by a prestigeful advisory body is likely to carry the day. The main potential counterweight to such a recommendation is the science advisory organization at the presidential level, but in practice the relationship between advisory panels and the presidential advisors tends to be one of cooperation rather than opposition. This is not to suggest that it should be otherwise, but the fact is that in the case of high-energy physics, for example, an $8 billion proposal has been set afloat without any audible hard questioning. Eight billion dollars may be precisely the right figure, but, if competing, or even sympathetic, interests should feel otherwise, it is difficult to see how they are going to get their views taken into consideration.

Not unreasonably, the issue of the future of high-energy physics was submitted to a panel consisting entirely of physicists, and to this extent the procedure conforms to the federal practice of bringing in those who know best to obtain advice on technical matters. But beyond this point, the very complexity of the subject makes it extremely difficult, if not impossible, to bring the general public—and even the scientific public—into the deliberations; and if there is unhappiness over the prospect that the nation will have to assume that the experts know best, it must at the same time be acknowledged that Congress and nongovernmental scientific institutions such as the National Academy of Sciences and the American Association for the Advancement of Science have not developed any effective alternatives. The panel touched on the lack of public involvement by noting that high-energy physics "has not caught the imagination of the public," and, in effect, it urged that the government and the scientific community undertake a public relations program "to explain the meaning and extent of this highly successful United States activity. . . ."

A good starting place for this effort might have been the panel report itself, which was released to the public without even the most timid attempt at a fanfare, to be lost, as might have been expected, in the daily deluge of government press releases and reports. A few newspapers took notice, but by and large, it was ignored by the press, which has a keen eye for multi-billion dollar federal proposals, but no appetite for the mysteries of high-energy physics.

The 18-year program for high-energy physics was issued with a unanimous endorsement by a panel convened by the President's Science Advisory Committee and the General Advisory Committee of the Atomic Energy Commission, which now supports 92 percent of all high-energy physics research in the United States. The panel, chaired by Norman F. Ramsey of Harvard University, consisted of Philip Abelson, editor of *Science* and director of the Carnegie Institution Geophysical Laboratory; Owen Chamberlain, University of California; Murray Gell-Man, California Institute of Technology; E. L. Goldwasser, University of Illinois; T. D. Lee, Columbia University; W. K. H. Panofsky, Stanford University; E. M. Purcell, Harvard University; Frederick Seitz, president of the National Academy of Sciences; and John H. Williams, University of Minnesota.

With competition for federal research funds intensifying, the panel sought at the outset to make it clear that it was not writing a letter to Santa Claus but seeking to develop a program that would permit the orderly development of high-energy physics consistent with economy. "The panel," it reported, "has interpreted its task to be that of presenting a program that is scientifically desirable and technically feasible, that can be carried out by scientists and engineers who will be available, and that is likely to yield far-reaching results. . . . In the course of its deliberations, the panel has considered alternative programs involving both higher and lower rates of expenditure. By its very nature, the field of high energy physics is costly and any significant growth requires large expenditures. Although the program is obviously expensive, it is at the same time restrained in the sense that it is limited and selective in the number of new facilities to be provided. Although the panel has not presumed to define appropriate programs in other fields of science, it believes that the recommended program in this most fundamental field of physics is consistent with the increasing emphasis on all branches of basic science."

The task ahead, the panel continued, is to develop a generation of machines to follow the Stanford Linear Accelerator, which will provide the highest-energy x-ray beam in the world, 20 Bev and perhaps eventually 40 Bev, and the Alternating Gradient Synchrotron at Brookhaven, which uses 33 Bev protons, both at distances of about 1/100 nuclear size. "If we are to continue the exploration of elementary particle structure down to even smaller distances with beams of particles," the panel stated, "there is no alternative to the construction of new accelerators aimed at reaching higher energies."

Case for Investment

As for why the nation should invest in higher energies, at an estimated cost of $100 million per 100 Bev, the panel offers possibilities, but no promises.

Experiments at Brookhaven and elsewhere, it points out, have raised questions that may be answered with an order-of-magnitude increase in accelerator energy, but "in the range of energies beyond the present frontier, the prospect of surprises is even more important than the specific questions that physicists now ask. In the past, many striking discoveries have been totally unexpected. . . . We must expect that nature will have a number of surprises in store for us in the next region of energy. Some of these may be inconceivable at present, while others may be found among the subjects of current speculation, such as the possible existence of a fundamental distance within which ordinary space and time lose their meaning."

With the case for an expanded investment in high-energy physics thus stated, the panel then goes on to specific recommendations for a construction and operation program that would raise the federal investment in this field from $143 million in the current fiscal year to a peak of $607 million in 1976, taper off slightly for a few years, and conclude the 18-year program with a $600 million expenditure in 1981.

Its specific recommendations include immediate authorization of a 200-Bev high-energy proton accelerator at the Lawrence Radiation Laboratory, to be completed in 1974; design studies for a 600- to 1000-Bev accelerator at Brookhaven, which would be completed in 1981; authorization in about 2 years for construction of a 12.5-Bev supercurrent accelerator by Midwestern Universities Research Association; and continued support of productive existing facilities, with elimination or reduced levels of operation of accelerators which become "relatively unproductive."

According to an announcement from the Atomic Energy Commission, the report is now under consideration.

The White House Office of Science and Technology, which is charged with generally overseeing federal support for science, may introduce modifications, but since OST was closely involved in the selection of the panel and in the provision of staff support, it seems unlikely that it is going to suggest any radical changes. The outcome, then, is quite probably going to be administration—and, eventually, congressional—endorsement for the program. This is fine for high-energy physics and, more likely than not, in the national interest; but if someone would like to argue that it would be better to put some of the $8 billion into research on canker sores or better automobile bumpers, it is difficult to see how he could get a hearing in the present decision-making apparatus.—D. S. GREENBERG