Book Reviews

Justifications

Elementary Particles. Science, Technology, and Society. LUKE C. L. YUAN, Ed. Academic Press, New York, 1971. xii, 314 pp., illus. $15.

Particle physics is the most fundamental known branch of science, in the sense that the objects and phenomena studied in it can be used to understand many other aspects of the universe, while these objects cannot, as yet, be understood in terms of anything else. The aspects of particle physics most relevant to everyday phenomena are relatively well understood. The wide unknown areas in the field do not concern the properties of ordinary matter under conditions found naturally on earth, and hence in order to study these areas matter must be subjected to special conditions, such as high energy, which can be obtained only through the use of elaborate equipment. Particle physics is therefore probably also the most expensive branch of pure science, and some $3 billion has been spent on it by various governments since 1945.

It is not altogether clear why governments in the past have been willing to support particle physics research at this high level. It is probably unrealistic to imagine that this support implies an understanding by those in government of the aims and accomplishments of particle physics. Nevertheless, on several occasions, particle physicists have attempted to explain and justify their work to the public and to the government. One such effort, made several years ago, was a booklet entitled *The Nature of Matter,* edited, like the book under review here, by L. C. L. Yuan. This booklet contained a number of short articles by physicists, mainly attempting to justify particle physics as a thing worth doing in itself, without special reference to its applications.

The present volume takes a somewhat different tack. It contains seven long articles, six of which deal with applications of the results and techniques of particle physics to other branches of science and technology. This approach is perhaps more appropriate for a period when, at least in the United States, support for particle physics has come under question and the best justification for government support of any activity is considered to be applicability to immediate practical ends.

The opening article, by R. P. Shutt, is a brief summary of the subject matter and techniques of particle physics together with some thoughtful speculations about the purposes of scientific research and the reasons for public support of such research. This article is the one in the volume most likely to be understood by a nonspecialist.

A particle physicist is likely to find the article by M. A. Ruderman and W. A. Fowler, "Elementary particle interactions in astrophysics," of interest. Although written before the discovery of pulsars, this article convincingly describes several areas of astrophysics that may affect, or be affected by, the answers to yet unsolved questions in particle physics.

The other articles describe applications to chemistry, biology, and engineering, and tend to deal with somewhat peripheral aspects of particle physics. While the specific applications described would probably not benefit much from new fundamental research in particle physics, they do illustrate the possibility that new discoveries coming from such research might also have unexpected applications.

In the reviewer's opinion, justifying new research in particle physics by its possible practical applications, or by its applications in other areas of science, is implausible. In my view, physicists would be better advised to explain to the public more clearly what we have done and what we hope to do in our research. I trust that a wider public understanding would lead to a wider appreciation of these activities and result in their continued support.

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Influencing Government

Science, Scientists, and Public Policy. DEAN SCHOOLER, JR. Collier-Macmillan, London, and Free Press, New York, 1971. xiv, 338 pp. Cloth, $6.95; paper, $3.95.

Schooler's book is an only partly successful attempt "to build a theory explaining the relationship of scientists to public policy making." The major finding of the study is that scientists' influence on policy is strongly conditioned by political forces and interests and that, since these forces and interests vary for different types of public policies, so does scientists' influence. In reaching this conclusion, Schooler develops and applies a conceptual framework for comparing different types of policy processes which is a significant advance over prior approaches to analyzing the science–public-policy relationship. However, he does a poor job of operationalizing his key concepts and of gathering and presenting evidence, and these weaknesses bring into question the validity of many of his generalizations.

Most earlier analyses either have been case studies of a particular policy or have discussed the scientist-policy relationship without paying much attention to how it differs for different policies. The key concept in Schooler's attempt is "policy arena," which he defines, following Theodore Lowi, as "the political context surrounding policy formulation." This context will be determined by the perceived impact of the policy on society. For example, the political context surrounding a policy which is seen as "distributive"—that is, as having benefits that accrue to one group, or to society as a whole, without depriving any groups of something they value—will be different from the context of a policy seen as "redistributive"—that is, as conferring benefits on one sector of society at the expense of other sectors.

Schooler concentrates on the influence of scientists within the executive branch of the federal government during the period 1945–1968. He examines 20 different types of government policy in terms of nine policy arenas. Three of these—the "distributive," the "regulative," and the "self-regulative"—are taken directly from the works of Lowi and other political scientists. The other six categories result from Schooler's adaptation and extension of the policy arena concept; these are the "social redistributive," the governmental redistributive," the "economic