book reviews

Science of science

Science Observed: Science as a Social and Intellectual Activity. By F. R. Jevons. Pp. 186. (Allen and Unwin: London, August 1973.) £3.75 boards; £2.25 paper.

THE science of science has developed rapidly into a somewhat subsidiary but on the whole almost respectable field of scholarly endeavour. The lack of any comprehensive and generally accepted model of the structure and dynamics of scientific and technological activity, however, cripples much of the work undertaken in this area. It may well be that a "unified field theory" will never really emerge in this particular branch of the social sciences any more than in others. In the meantime, students of science are understandably eager to grasp at the small number of more general hypotheses which have emerged and which seem to bring some element of order into a chaotic universe—often, one is tempted to say, at the expense of reality. Thus, an overview and assessment of progress in the field calls less for synthesis and compilation of a well established body of knowledge than for an explicit and critical examination of the extensive application of a few widely accepted assumptions which may, however, be justified only within very specific and limited conditions.

Professor Jevons has succeeded in providing—in a wonderfully clear, concise and precise manner—with just such an assessment. No doubt one could point to some of the gaps in his presentation, which does not deal directly with the science policy structure that has emerged in recent decades to become an essential component of modern science, or with the controversies on the so-called differences between hard and soft sciences. But *Science Observed* accomplishes its essential objective in putting into perspective some of the basic concepts of science studies in the past decade.

To begin with, the author establishes the new social dimension which calls for more thorough understanding of the scientific universe and the mores of its inhabitants: knowledge is a prerequisite of planning and, however awkward, the planning of science is unavoidable when the waging of war, the limitation of environmental pollution, and the creation of wealth have induced society to enlist the service of a rapidly growing body of researchers. Thus, Weinberg's internal and external criteria are, in many ways, a challenge to provide planners with knowledge of science's internal mechanisms and their relations with society.

The scientific study of science is generally expected to produce objective and quantitative knowledge. Numbers of scientific journals, of abstracts, of papers or of citations are some of the indicators most widely used. But these indicators are not straightforward reflections of quality and progress in science, and are influenced by many extra-scientific features of the research profession and the academic marketplace. Thus, "numerology is interesting but should be used only with the utmost circumspection" since "in particular cases it could be wildly misleading" (page 45). The case would even be strengthened if the author had explored some of the abuses and inaccuracies of research and development statistics.

Unfortunately, as the author points out, the disappointments of quantification are not compensated by reliable qualitative analysis. What is scientific method? Neither the inductive or the hypothetico-deductive theories really account for "inspired guesses" and 'intuitive hunches" which so often seem to underlie scientific creativity. In a historical perspective, T. S. Kuhn's exploration of the structure of scientific revolutions may provide an ideal pattern of evolution of, at least, some disciplines. It remains that his attractive distinction between "normal" and "revolutionary" research is not, in practice, as clear cut as one might wish: "it is difficult not to be convinced by direct inspection of science that contributions form a continuous spectrum" (page 69).

Lacking an acceptable formulation of the laws of the scientific universe, can one at least determine what moves its actors? The striving for recognition by fellow scientists, which has often been presented as the key motivation to scientific work seems only to apply to limited numbers and circumstances, leaving aside such modern developments as teamwork, expansion of research activities in non-academic institutions and increasingly complex career patterns.

The opacity of the internal workings of science is matched by that of the relations between science and society. For example, in spite of many decades of scrutiny, the processes governing the contributions of science to economic growth remain unchartered. Only the complexity of the factors involved become more and more apparent.

Professor Jevon's new book, with its careful exposition and appraisal of the meagre results accumulated to date (an anthology of fundamental writings on the subject is provided in the appendices) should, it is hoped, inspire new, unprejudiced and more ambitious efforts to clarify the complex dynamics of the internal structures and external links of the system of science. It should also serve to caution educators and policy makers against short cuts and rash approximations in dealing with a system that is still not understood. If these results are achieved, the concluding note of optimism on the future of technology may turn out to be not as unrealistic as it may seem today.

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High energy physics

Particle-interaction Physics at High Energies. By S. J. Lindenbaum. Pp. xiii+512. (An International Series of Monographs on Physics.) (Clarendon: Oxford; Oxford University: London, October 1973.) £15.00.

THE author of this scholarly work is an internationally recognised experimental physicist and expert, having made his own original contributions at the Brookhaven National Laboratory in this research field on several topics. The book starts at the level of the postgraduate student in high energy physics, and should appeal primarily to research workers in the field. The style is not particularly pedagogic, nor does one set out from first principles. Instead the book traces the development and reviews progress made upon particular topics. The first three chapters deal briefly with introductory matter about pions and meson field theory. The following three chapters contain considerable detail on pion-nucleon scattering, dispersion relations and models of pion production. The next four chapters comprise concise summaries of topics concerning kaon and hyperon physics, particle classifications, and electron scattering. The penultimate chapter is concerned with weak interactions, and the