French Science Policy

Le Pouvoir et la Science en France. PIERRE PAPON. Editions du Centurion, Paris, 1978. 316 pp. Paper, 65F. "Faire Notre Histoire" Propositions.

In this overview of French science policy, Pierre Papon notes on several occasions the narrowness of the intellectual perspectives of French scientists, the lack of interaction among research institutions, and the fragmentation of public decision-making for R & D, features he holds largely responsible for many of the failings and disappointments of contemporary French science and technology. Papon's own career is not, however, a good illustration of the situation he deplores. As professor at the Ecole Supérieure de Physique et Chimie Industrielles in Paris and director of a laboratory affiliated with the Centre National de la Recherche Scientifique (CNRS), he is acquainted with the strengths and weaknesses of his country's efforts in both basic and applied research and equally familiar with the administration of research in universities, industry, and the major public laboratories. Moreover, as adviser to the Socialist Party on research policy and a former member of the "committee of wise men," the highest official organ giving science policy advice to the French government, Papon manages to be both a member of the R & D policy establishment and a critical observer of it.

These qualifications are put to good use in *Le Pouvoir et la Science en France*, a well-informed, comprehensive review and measured critique of French science policy. The book follows the now standard format in case studies of national science policies: a historical introduction tracing the institutional development of science and technology and the growth of government interest and support, chapters on university research, big science, and industrial R & D, an analysis of science-policy-making institutions, and an examination of efforts in international scientific and technological cooperation. These chapters provide an excellent, succinct introduction to French R & D policy even if they do not add appreciably to the analysis contained in Robert Gilpin's still excellent if now somewhat dated *France in the Age of the Scientific State*. In contrast, the final two chapters, where questions of social responsibility, democratic decision-making in science policy, and the limits of autonomy of modern science are raised, lack focus and direction.

Papon is not content to be a passive observer of his country's efforts to support and guide R & D, but makes several suggestions for improvement. In particular, he comes forth as a strong advocate of forecasting, planning, and comprehensive policy coordination, open debate of scientific and technological options among government officials, parliament, scientists, industry, and citizens, more imaginative political leadership, and a more forceful effort in European cooperation. One may question, however, whether the reforms he proposes are workable, adequate to deal with the problems considered, and mutually compatible. It is surprising to read, with respect to the country that has gone furthest among Western industrialized nations in the planning and coordination of research policy, both that these efforts have largely failed and that the situation can be remedied only through reinforced central control and longer-term, more comprehensive planning efforts. In his analysis, Papon fails to draw the full implications of the intrinsic difficulties in science and technology planning, the problems involved in making trade-offs and establishing priorities among disparate areas of R & D activity, and the dangers of making costly, irreversible mistakes when decision-making is highly structured and centralized. Similarly, in a country where scientists' demands on government tend to be narrowly corporatist and articulated almost exclusively through institutional channels and professional unions, it is difficult to see how their increased participation would make science policy more flexible, farsighted, coherent, and responsive to emergent needs. Papon also decries the almost complete absence in France of public debate and parliamentary intervention in decisions on science and technology. Yet it is not immediately clear how the greater involvement of social and political groups, however laudable in itself, can be made compatible with the kind of rationalistic planning the author favors.

Its title notwithstanding, the book stays close to the familiar themes and issues of R & D policy and rarely ventures into other facets of the complex relationship between modern science and political power. The role of scientists and technical experts in more general areas of public policy-making, such as safety regulation and defense policy, is not discussed. Also, the comparatively modest but nonetheless detectable movement in France toward public-interest and radical science is not mentioned. Finally, the book is not referenced as thoroughly as one would expect from a scholarly publication; it does include, as appendixes, a short bibliography and a curious selection of reprinted documents ranging from observations of 19th-century French scientists to excerpts from the works of Max Weber, Karl Popper, and R. Richta.

RONALD BRICKMAN
Program on Science, Technology and Society, Cornell University, Ithaca, New York 14853

Experimental Model

Placenta. A Neglected Experimental Animal. Proceedings of a discussion, London, Oct. 1978. PETER BEACONSFIELD and CLAUDE VILLEE, Eds. Pergamon, New York, 1979. xvi, 442 pp. Cloth, $50; paper, $22.

The placenta, it seems, is not merely a highly selective barrier between mother and fetus of interest primarily to the obstetrician; at the meeting on which these proceedings are based attention was focused on its possible value as an experimental model in a number of diverse fields—biochemistry, cell replication, cancer, immunology, and aging. After all, the placenta is possessed of a remarkably wide range of metabolic activities and produces a number of hormones; it has a conveniently short "life" encompassing phases of development, maturity, and perhaps senescence; and of course it is readily available. Immunological interest naturally centers on the part it may play in preventing rejection of "nature's allograft," the fetus; the invasive properties of the trophoblast present obvious similarities to, as well as differences from, those of malignant tissues.

In inviting contributions from specialists in the various fields of interest, the organizers' aim was to provide reviews of each subject, both of a general nature and having particular reference to the placenta, whose possible role in future studies was also to be considered. However, they had a further objective in mind: by placing emphasis on the discussions that followed the formal presentations they hoped to create an atmosphere in which fundamental new concepts might be developed, or at least new avenues for experimentation suggested. In the event, as the senior editor freely conceded during the course of the meeting, the speakers, apart from the clinicians, hesitated to venture into one another's territories. So, although the organizers would have wished for less attention to detail and more enlightened discussion at the meeting, the book in

fact mainly consists of a number of quite comprehensive, well-documented reviews (the discussion, incidentally, is presented in narrative form). Perhaps the reader, having more time than was available to the participants at the meeting, will be in a better position to mull over and derive inspiration from the mass of detail that is presented.

While proving invaluable to the clinician interested in all aspects of the biology of the placenta, the book, then, also has much to offer the basic research worker who wishes to broaden his or her outlook. It is divided into four sections. The first, on biochemistry, contains a general review of metabolic pathways and their regulation followed by other reviews relating to the placenta, including an up-to-date account of its endocrine functions by Dorothy B. Villee. The second section, headed Cell Replication, includes papers on the development of the placenta and on the biology of the cancer cell. A paper on trophoblastic neoplasia includes a full account of the earlier cytogenetic studies but does not mention the recent evidence (published in 1977) for the androgenetic origin of hydatidiform moles. The remaining two sections deal with immunology and aging, respectively, and include commendable contributions from W. D. Billington ("The placenta and the tumour: variations on an immunological enigma") and Harold Fox (on the placenta as a model for organ aging).

N. B. ATKIN
Department of Cancer Research, Mount Vernon Hospital, Northwood HA6 2RN, England

Astronomical Phenomena

Active Galactic Nuclei. Papers from a NATO Advanced Study Institute, Cambridge, England, Aug. 1977. C. HAZARD and S. MITTON, Eds. Cambridge University Press, New York, 1979. viii, 318 pp., illus. $32.50. Cambridge Astrophysics Series.

Stimulated by the discovery of quasars in the 1960's and by rapidly accumulating, multifaceted observational data, research on the subject of active galactic nuclei has become one of the most exciting and vigorous fields of modern astrophysics. It encompasses such phenomena as the quasars, Seyfert nuclei, BL Lacertae objects, and powerful radio or x-ray emitters. If quasars are at their cosmological redshift distances, they must be capable of prodigious outputs of energy (of order 10^{47} erg sec^{-1}) from regions of space light-months across. The other sources named above are also extremely energetic, and they appear to be associated with the nuclei of galaxies of stars. Because of various spectroscopic resemblances, many astronomers believe quasars also lie in the centers of galaxies at earlier epochs in the universe.

As yet, no completely satisfactory theoretical explanations have emerged to account for the energetics of active galactic nuclei. It is generally (though not unanimously) agreed that some form of gravitational accretion involving massive black holes must be responsible, but the details of the accretion process and the source of accreting material are still open to speculation. Also, the conversion of gravitational energy into observed continuous or emission-line radiation and the resulting implications for the physical and dynamical gas conditions are not satisfactorily understood.

These are some of the issues that led to the convocation of a NATO Advanced Study Institute in August 1977. The volume reviewed here contains keynote lectures presented at that institute. Two speakers' rules are in evidence: discussion of the local versus cosmological redshift controversy is kept to a minimum and observational data are examined only as they facilitate the discussion of theoretical implications for classes of objects. The presentations may be divided into two groups. Papers in the first group (by Hazard, Osterbrock, Baldwin, McKee, O'Dell, Weedman, Netzer, Perry, and Wolfe) are primarily of a review nature and summarize and interpret existing observational data, including radio, infrared, optical, ultraviolet, and x-ray continuous radiation as well as emission and absorption features. The theoretical interpretations concern the physical conditions in, processes taking place in, and location of the emitting or absorbing gas. In the opinion of this reviewer, these papers constitute one of the best and most comprehensive compilations available on the subject.

The second group of papers concentrates on theories of accretion and energy release for massive black holes in the nuclei of galaxies. Being relatively unfamiliar with this aspect of the research, I especially appreciated Carter's introductory overview. In simple, clear terms he reviews the basic principles of black holes, puts them into perspective with other types of astronomical phenomena, and discusses their possibilities and limitations as power sources in galactic nuclei. The other papers in this group are by Gunn, McCray, Blandford, and Mestel.

The book does not solve the mysteries of the quasars; that was not the intent. What it does accomplish, admirably, is the presentation of available information and current theoretical views regarding the environments and energy sources of active galactic nuclei. Though there have been some new and exciting developments since 1977 (for instance, suggestions that intrinsic quasar radiation is significantly altered by dust extinction, satellite x-ray and γ-ray observations, and a novel idea about the production of FeII emission), the value of the book is not significantly diminished. I highly recommend it for persons working in the field or for persons with a sound background in astronomy or physics who are looking for an excellent introduction to the subject.

GORDON M. MACALPINE
Department of Astronomy, University of Michigan, Ann Arbor 48109

Crystalline Solids

Disorder in Crystals. N. G. PARSONAGE and L. A. K. STAVELEY. Clarendon (Oxford University Press), New York, 1978. xxviii, 926 pp., illus. $69. The International Series of Monographs on Chemistry.

Disorder in Crystals deals with an extremely interesting and broad subject in solid state physics. Though the authors explicitly exclude nonstoichiometric systems and systems with lattice defects, the book includes topics as divergent as molecular crystals (both ionic and van der Waals), inclusion compounds, alloys, superionic conductors, ferroelectricity, and magnetism. This is done in order to show that crystals with positional, orientational, or magnetic disorder—or perhaps a combination of these—have numerous aspects in common. In the past few years several reviews have been published on one or another of these topics, yet nobody has attempted such an extended presentation. One of the successes of the book is certainly that it tells a reader who is familiar with, say, disorder in ionic conductors that it is similar to disorder phenomena in other crystals.

Parsonage and Staveley claim that a look at magnetic systems, which have been most thoroughly studied in the past, may be particularly helpful in revealing similarities with other disordered systems. This is undoubtedly true, and the study of magnetic systems has turned out to be a mainspring in the study of many disorder problems in the last few years. A second main line of the book is the idea that disordered phases can only be understood if they are contrasted with