FRESH AND EXCITING

Title Nuclear Structure

Editors Anwar Hossain, Harun-ar-Rashid, Mizanul Islam

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Pages xiii + 342

Price $17.00

Reviewer Peter H. Rose

Seldom do the proceedings of a conference lead to an exciting book that can be recommended to a broad audience, as is indeed the case here. Perhaps the spirit of Al Mansur's Conference, referred to by Dr. Salam in his preface, did infect the first Symposium on Nuclear Science to be held in Pakistan. For myself, at any rate, the interest comes in being able to find in one place a series of intensive topical reviews by leading experts ranging from theory through instrumentation. Of course, a book composed of unconnected review articles cannot attempt to be complete, and this is not where the value lies. The book shows clearly the high level of sophistication that must be reached to contribute original work in the field of nuclear structure physics. As a supplement to text books on nuclear physics, the present volume will be invaluable because it is right up to the state-of-the-art. A student with a grounding in nuclear physics would see immediately, whether he be a theorist or experimentalist, the high standard required if he is to contribute to the growth of this field, and he would get a feeling for the continuing vitality of nuclear structure physics.

The book starts with an article on isospin mixing by Bohr, Damgård, and Mottelson and continues with a review of nuclear reaction theories by Huby, who makes it very clear that different theories have characteristic spheres of usefulness. While this conclusion would scarcely surprise anyone familiar with the field, it is instructive to examine some of the later sections which, like the articles by French, go into a particular theoretical problem, e.g., sum-rule methods or rotational particle coupling, in some detail. In the middle of the theoretical chapters there is an article by Endt who reviews some beautiful experimental data on analog states. The book is really very evenly divided between reviews of theory and experimental techniques. The main examples of reviews of experiments and experimental results, in addition to that given by Endt, are contained in articles by Morinaga on γ-ray spectroscopy, and Starfelt on neutron capture. I was disappointed not to find a review of heavy ion interactions, which are of increasing importance, but in a conference of manageable length it is only possible to deal with a few of the many possible topics. One lack, in my estimation, is the omission of a summary discussion; in a field with so many workers it is difficult for many of us to keep up with what is new and important, so this would have been very useful.

The technical section of the conference ranges from an article on neutron time-of-flight techniques by Starfelt to a discussion of semiconductor detectors by Dearnaley. The latter gives a very clear description of the physical principles and methods of construction of these detectors, and I highly recommend it. The book ends with two articles by Alburger which show how an important program can be built around a modest accelerator using ingenuity and sophisticated experimental techniques. For example, Alburger discusses how two-dimensional analysis can be used to sort out the correlation between the data and the many kinematic possibilities in complicated interactions. I would like to end by commenting on the *tour de force* by W. D. Allen, who discusses tandem electrostatic generators, AVF cyclotrons, beam pulsing, and polarized ion sources. Allen, drawing on his own wide experience and with generous references to others, gives informative and up-to-date treatments of these topics. The physical descriptions are presented clearly and with enough detail to be extremely useful.

In the case of this book, I find it very easy to resist the small carpings so often the downfall of a reviewer. Any omissions are more than made up by the freshness of the articles. The editors of this book and the organizers of the Dacca Conference should be congratulated for bringing together such a useful volume.

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LET'S HAVE AN IRDEY

Title Formulation of Research Policies

Editors Lawrence W. Bass and Bruce S. Old

Publisher American Association for the Advancement of Science, 1967

Pages iv + 210

Price $7.75 ($6.75 AAAS members)

Reviewer Chalmers W. Sherwin

This book is a collection of papers given at a Gordon Research Conference in February 1966, the first held on a subject of this sort, reflecting the increasing concern of the scientific community with this area. In the introduction, the editors note that not only are there no exhaustive studies on the impact of science and technology on the economic growth of a region or a nation, there are also no detailed analyses of the return from investment in research and development by individual corporations. Nonetheless, some individual corporations have succeeded in developing R&D policies that start with company long-range objectives and resources and provide usable guidance to the research director. The objective of the conference, therefore, was to examine the development of science policy (including technology and development) at three levels—national, international, and individual organizations.

At the national level, science policies, particularly with respect to governmental encouragement of industrial development, are authoritatively presented by representatives from Belgium, Canada, Denmark, France, W. Germany, Ireland, and the Netherlands. The basic pattern is the operation of national mission-oriented laboratories and the encouragement of industrial R&D through cost-sharing (usually 50-50), and through cooperative research institutes and associations, sponsored partly by industry and partly by government. These presentations are largely a factual description of what the policies are and how they grew, but, as the editors noted, there is no systematic effort to determine whether they have been successful in an economic sense. With one or two exceptions, not even examples of unusual success were quoted.

At the international level, attention was directed mainly at describing the activities of the OECD and the west-European international cooperative research associations, although there was one paper on the organization of industrial research in developing countries. Again, the papers were mainly factual descriptions of current activities interspersed with what might be called conventional wisdom on R&D management, reminiscent of the many articles on this subject in the R&D management journals. They do contain some useful information about the relative research expenditures (research dollars per capita) in various Western countries, a ranking which is rather weakly correlated with GNP per capita, a fact that emphasizes once again how little we know about the set of conditions needed to maximize the economic output of research. In my opinion, the most interesting paper in this section is by Arnold Kramish which amounts to another plea for getting on with the business of measuring the output of these activities, particularly the national and international cooperative efforts.

The last section contains a description of the research organization and policies of two highly successful firms (Montecatini of Italy and Philips of the Netherlands), a statement of the policies of the U.S. Air Force Office of Aerospace Research, and a paper by the two editors of this volume giving a general description of the typical industrial R&D product development process. In this latter paper the authors note that one of the most important and most difficult tasks for a director of R&D is to get top management to give clear and adequate policy guidance regarding company goals and strategy which are an essential basis for an effective R&D program. Apparently, in many cases, industrial management still resists facing up to this critically important task.

What has been accomplished in this book? We have a good description of what research policies *are*, and we have (at last) good methods and comparable data to describe the magnitude of the effort on a national and international scale. However, the nature of the various national research policies with respect to industry are, in my opinion, quite similar, and, in all advanced countries, the magnitude of effort (as a fraction of GNP) varies over the rather narrow range of 1 to 3%. One has a bit of the feeling that everybody is following everybody else, and no one quite knows where we are all heading.

What is needed? Clearly, until one can unambiguously connect economic or other objective value to private and publicly supported R&D efforts, there is no chance of rational modification of our present policies. This is a difficult but not an impossible task, and, I believe, can be accomplished in a reasonable time if we will devote even a small percentage of our current very large R&D efforts to this end.

In my opinion, there is probably only one practical route to the goal of objective economic evaluation: One must start with a measurement of the improvements in unit efficiency that existing products and processes have over their predecessors, typically 5 to 20 years earlier in time. Then, one determines in each case what fraction of the improvement is attributable to specific contributions from R&D, as contrasted to those from other management tools. If a substantial fraction of existing products and processes could be thus consistently analyzed, we would have a new basis for evaluating recent R&D efforts. Because science and technology flow so freely between industries and nations, such an effort would be quite appropriately international. What we need, therefore, is an International R&D Evaluation Year. At the end of this year we might know whether the research policies so well described in this book are in fact effective.

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BOOK ANNOUNCEMENTS

Although the following will not be reviewed, they may be of interest to some of our readers:

Ionising Radiations: Precautions for Industrial Users, British Ministry of Labour and the Central Office of Information, 1967, 63 pp, .70¢

Reduction of Radiation Exposure in Nuclear Medicine, 1967, Kenneth D. Williams, James F. Cooper, Raymond T. Moore, Albert W. Hilberg, Eds., U. S. Department of Health, Education and Welfare, xxiii + 153, free

The following are publications of the International Atomic Energy Agency:

Thermodynamics of Nuclear Materials, 1967, 1968, 890 pp, $18.00

Heavy-Water Power Reactors, 1968, 981 pp, $20.00

Basic Factors for the Treatment and Disposal of Radioactive Wastes, 1967, 41 pp, $1.00