

BOOK REVIEWS

Selection of books for review is based on the editors' opinions regarding possible reader interest and on the availability of the book to the editors. Occasional selections may include books on topics somewhat peripheral to the subject matter ordinarily considered acceptable.



DISPARITY DRAWN TOGETHER

Title A Survey of the Teaching of Physics at Universities

Coordinator W. C. Kelly

Publisher UNESCO, 1966

Pages 396

Price \$6.50

Reviewer Sanborn C. Brown

One of the foremost recommendations of the International Conference on Physics Education, held in Paris in 1960, was to urge an international exchange of information about the teaching of physics, and this encouraged UNESCO to start a project to prepare a report and survey which would prove useful to developing countries. The International Commission on Physics Education of the International Union of Pure and Applied Physics was asked to advise UNESCO on this project, and suggested that surveys be made and reports published on outstanding university physics departments in the following countries: Czechoslovakia, the Federal Republic of Germany, France, the Union of Soviet Socialist Republics, the United Kingdom, and the United States of America. The book under discussion is a result of this project.

By choosing outstanding examples of the most advanced university teaching in these six countries, the book provides a stimulating example

of what various educational systems believe to be the best way of presenting material to their university students. The book is arranged in chapters in which a particular problem is discussed from the point of view of each one of the participating countries. Thus, one chapter is on the preparation for the study of physics in universities and related admission requirements of universities, discussed from each country's point of view. Then chapters on the education of professional physicists, the education of school teachers, education toward higher degrees, and the problem of academic research are all dealt with under these headings by each of the specific countries represented. Special programs are included for continuing education, evening schools, and extramural education; also designed are programs for the teachers of physics in universities, which include various experiments for the improvement of teaching physics. One of the useful parts of the presentation is a demonstration of the level of excellence required by the inclusion of specific examples of examinations, and types of experiments, and by reproduction of actual instruction sheets. Detailed syllabuses of various outstanding universities, from the freshman through senior years, are included, in many cases on a parallel basis, so that one can compare age groups in the various countries. One of the difficulties in discussing university education in various countries is the lack of uniform nomenclature and uniform sequence of courses. This book makes the comparison between countries by charts relating the age of the student to his intellectual

attainment, and gives flow diagrams of the educational systems as a function of age, to illustrate the channels through which students pass toward the attainment of the degrees sought.

I believe that the authors of this book, Professor M. Valouch, Charles University, Czechoslovakia; Professor W. Hanle, University of Giessen, Federal Republic of Germany; Professor M. Y. Bernard, Conservatoire National des Arts et Métiers, France; Professor A. S. Akhmatov, Moscow Institute of Machines and Instruments, USSR; Mr. N. Clarke, Institute of Physics and the Physical Society, United Kingdom; and Dr. W. C. Kelly, American Institute of Physics, USA, have done an outstanding job in creating a uniform and readable volume. The coordinator of the project was Dr. W. C. Kelly, and he is to be especially congratulated on being able to draw together such disparate material and present it in a useful form. The various authors met several times in Paris after they had collected their material and after they had sent their material to all the other authors, so a great attempt was made to achieve uniformity. These attempts are not always successful, but it is a pleasure to read a volume where this effort has been made.

Sanborn C. Brown, Professor of Physics and Associate Dean of the Graduate School of Massachusetts Institute of Technology, has had a distinguished career spanning more than 30 years. A Fellow of APS, AAAS, and of the American Academy of Arts and Sciences, he has been particularly active in the field of physics education. He has authored or edited six books, and has been a

frequent US representative at international conferences, including the 1958 Geneva Conference on the Peaceful Uses of Atomic Energy where he served as a technical advisor, and as US delegate to the 1961 IAEA Conference on Plasma Physics and Controlled Thermo-nuclear Fusion, in Salzburg, Austria. His PhD (1944) is from MIT.

MISLEADING TITLE

Title Optimal Shutdown Control of Nuclear Reactors
Author Milton Ash
Publisher Academic Press, 1966
Pages xiii + 169
Price \$8.50
Reviewer J. R. Fredsall

The main fault of this book is its title; it is misleading. The book does not present optimum shutdown schedules applicable to nuclear reactors in general, nor does it give the methods that can be used to determine such schedules. Rather, it is a presentation of the dynamic programming method as applied to a simplified form of the general problem. Perhaps one is to infer that dynamic programming is used since R. Bellman is the editor of the series. However, a more representative title would have been that used for the author's recent *Nuclear Science and Engineering* article (1966) "Application of Dynamic Programming to Optimal Shutdown Control," [which is a re-presentation of the analysis contained in this book which, in turn, is a re-presentation of his document IA-988 (1964)].

Actually, the applicability of shutdown scheduling is so limited that it is difficult for me to see why anyone would want to write a book about this subject at all, except as an academic exercise. About 20 papers have been written on optimum shutdown control and, as far as I know, the methods have been tried on only a couple of reactors. The reasons for this apparent lack of interest are that the reliability and possibly safety of the reactor may be reduced, and that the function (e.g., electrical power or irradiation) may be adversely affected by rapid power cycling. (The

author uses a submarine reactor as an example, but surely such a reactor would have complete xenon override as an operational requirement.)

On top of this, almost all of the present analysis methods used for deriving optimum shutdown control methods demand a simplified phrasing of the problem. Thus, samarium, prompt and/or delayed temperature coefficients, and flux period limits have been ignored. This has been realized by the author when he states that solution of such a problem by dynamic programming would "demand the services of million-word core-memory computers possessing nanosecond arithmetic and memory access times"

However, this book does have value if viewed as an introduction to the shutdown scheduling problem with emphasis on the dynamic programming method of solution. As such, the book would be useful to the budding nuclear-systems analyst or to the nuclear technologist who wishes to learn something about dynamic programming. The book is well written and gives a succession of example problems that leads to a good understanding of the final method used to solve the problem. A fair amount of background information is also included that gives the reader insight into the effect of xenon transients on reactor operation.

The author even includes a listing of his digital computer code that was developed to solve this problem—a rather unorthodox inclusion for a book like this, but it is perhaps of interest to those who do not have access to the document IA-988. Also of interest are the experimental results of a run on the Israeli IRR-1 reactor using the author's derived shutdown control schedule.

About one and one-half chapters of this book are devoted to discussing the use of Pontryagin's maximum principle as an alternative to the dynamic programming method of problem analysis. Unfortunately, the essence of this discussion is that dynamic programming provides the best approach for many classes of problems, including reactor shutdown optimization. This argument is rather questionable, since the recent works of Roberts and Smith (University of California) show that the use of the maximum principle leads to results that are as good as, if not

better than, the results presented here. Had this information been available, I'm sure the author would not have been able to underrate the use of the maximum principle to such an extent.

J. R. Fredsall has been with the Australian Atomic Energy Commission for the past two and one-half years, and is engaged in the assessment of possible suitable reactor systems for Australia. His interest in reactor optimization was developed during the three years he worked as an operational physicist on the Hanford production reactors. He received BS and MS degrees in engineering from the University of Washington.

DEMONSTRATED SUCCESS

Title Handbook of Metal Powders
Editor Arnold R. Poster
Publishing Reinhold Publishing Corporation, 1966
Pages x + 274
Reviewer R. W. Fraser

The editor's scope in preparing this book was a review which dealt with the types of powders available, their source of supply, their properties, the available literature, and the methods used to test and characterize them. The book is divided into five sections:

- 1) Characteristics, testing and applications of metal powders
- 2) Data on commercially available metal powders
- 3) Suppliers of powders, listed according to metal element and alloy
- 4) Suppliers listing, including address and statement of activities
- 5) Annotated Bibliography of characteristics and testing of metal powders.

Section 1 consists of ten chapters which discuss the characteristics of individual powder particles and bulk powders, and the methods of measuring these characteristics (average size, size distribution, surface area, density, and flow properties).