Méthodes Numériques, Interpolation, Dérivées. J. Kuntzmann. Dunod, Paris, 1959, xviii + 253 pp. Illus. F. 3600.

In the recent past, there has been a dearth of books on numerical analysis in French; the only available book was Mineur's *Techniques de calcul numérique*. Now the French have started to catch up, and if the present volume is any indication, the output will be of high caliber. *Méthodes numériques* is a thorough discussion of the field of interpolation and numerical differentiation. Kuntzmann takes us through the first steps of interpolation, deriving all the classical results and introducing some new ones. An important feature is his list of operation counts for the various methods of interpolation. This is obviously very important in deciding on the method to be used, especially in machine computation, where speed outweighs other considerations.

After some further sophisticated discussion of interpolation, the book goes on to numerical differentiation, a field in which the author has made many important contributions. However, in my opinion, the difficulties and dangers involved in numerical differentation are not sufficiently stressed. Other topics, including interpolation and differentiation in the complex plane and in spaces of many dimensions, are then discussed. Finally, a general theory of linear interpolation is developed, and some simple examples of nonlinear interpolation are studied.

The general layout of the book is unsatisfactory. While there is a comprehensive table of contents, there is no index. Furthermore, references are scattered throughout the text instead of being organized in one location. This is unfortunate since there are many useful references to tables and papers which are unavailable elsewhere. An appendix, listing the main formulas useful in practice or at least listing their location in the text, would have been most useful. While these faults limit the book's usefulness as a reference work, they in no way diminish its value as a comprehensive text in this branch of numerical analysis, which is becoming more important in these days of satellite tracking.

PHILIP RABINOWITZ
Weizmann Institute of Science
Rehovoth, Israel, and
National Bureau of Standards

The Rainbow. From myth to mathematics. Carl Boyer. Yoseloff, New York, 1959. 376 pp. Illus. $10.

This is the history of man's view of one physical phenomenon sufficiently spectacular to attract the attention of primitive man and sufficiently complex to attract that of the modern scientist. It would be difficult to imagine a case history better adapted to demonstrate the interest and value of the history of science. Carl Boyer has shown in previous works his competence to deal with both science and the history of science and this book is authoritative and eminently thought-provoking.

He begins with an account of the rainbow in ancient mythology and concludes with the work of Aichi and Tanakadate (1906). "The twentieth century so far has not contributed to the story of the rainbow on so spectacular a scale as did the seventeenth and nineteenth centuries; . . ." (page 320). In telling his story he is, of course, obliged to describe the development of most of the principles of optics, and to a considerable extent he has written a history of that science.

The organization of the book is rigorously chronological. Such organization may be inevitable in a pioneer work on an unfamiliar subject, but it leads to a certain monotony in the recitation of a long succession of opinions, most of which repeat earlier views. Although writers are commended or scolded for their advance toward, or regression from, the modern mathematician's theory of the rainbow, the author draws relatively few general conclusions. The thoroughness and the logical organization of his work make it a source book which will suggest generalizations to others, and it is one of the few comprehensive studies of early physics, outside the field of classical mechanics. The names familiar from studies of the latter field are here, and their views are recounted. But on the rainbow, the views of men such as Ptolemy, Archimedes, Philoponus, Alhazen, Buridan, Oresme, Leonardo, Gilbert, Galileo, and Kepler appear to have been of little immediate importance. Some were not interested; others were conspicuously unenlightened on the subject. Who, then, were the men responsible for advances in rainbow theory? Among those whose contributions were most important were Aristotle, Albertus Magnus, Witelo, Theodoric of Freiberg (whose contribution to rainbow theory, partially derived from experiment, is described as "the greatest contribution of the medieval age to physical science" [page 110]), De Dominis, Descartes, Marci, Newton, and Mariotte. With the exception of Descartes and Newton, none of these have been generally regarded as major figures in the development of physics. This expansion of our field of view in the history of physics is probably the greatest contribution of this book.

ROBERT P. MULTHAUF
Department of Science and Technology, Smithsonian Institution

Automatic Teaching: the State of the Art. Eugene Galanter, Ed. Wiley, New York; Chapman and Hall, London, 1959. viii + 198 pp. $3.25.

Although the teaching machine as a piece of hardware dates back at least to the last century, enthusiasm for the possible uses of automatic teaching devices is a relatively new development. This book, an early product of that enthusiasm, is a collection of papers and abstracts, presented at a conference on the automatic teaching of verbal and symbolic skills, held at the University of Pennsylvania in December 1958.

The present-day teaching machine, characterized by an emphasis upon small response units, active responding, immediate reinforcement, and the prevention of errors, was conceived by B. F. Skinner, the Harvard psychologist, and his ideas about operant conditioning have largely dominated attempts to automate teaching. A reading of the book leads to the conclusion that his thinking also dominated the conference.

The book itself can be divided roughly into four sections: papers dealing with certain general problems of automatic teaching, summaries of programs in which teaching machines have been used, reports covering several related attempts at automatic instruction (for example, the scrambled text), and three papers that critically evaluate certain aspects of the over-all approach to the issue.

As do most reports of this sort, the book suffers from a disjointedness, a tendency toward repetitiousness, too much detail on occasion but not enough on others, and the failure to include a general introduction to set the stage and integrate the topics under discussion. I suggest that the prospective reader, unfamiliar with attempts at automatic teaching, first read Skinner's

article which appeared in *Science* [**128**, 909 (1958)]

Much can be said on the positive side. The papers taken together undoubtedly reflect quite accurately the present state of the "art." Furthermore, they contain a great deal of information and many stimulating ideas. The book's most important contribution, however, is in the reiteration of the vast number of questions that must be answered before such techniques can even approximate their maximal usefulness, and the emphasis on the role teaching machines can play as a research tool in providing the answers.

LYNE STARLING REID
Department of Psychology,
University of Virginia

Rehabilitation of the Mentally Ill. Social and economic aspects. A symposium of the American Psychiatric Association. Cosponsored by the Section on Social and Economic Sciences of the American Association for the Advancement of Science and by the American Sociological Society, December 1957. AAAS Publ. No. 58. Milton Greenblatt and Benjamin Simon, Eds. American Association for the Advancement of Science, Washington, D.C., 1959. 260 pp. Illus. Prepaid to members, $4.; others, $4.50.

In general one may say that no symposium should be published as a symposium, for the editorial task of fitting the pieces together and of eliminating redundant repetitions always takes so much time and raises so much resentment that no editor, not even the most conscientious one, is persistent or heartless enough to accomplish the task. Consequently, every published symposium is longer than it should be, and too much fine material is lost in a welter of words. This volume is no exception; if cut to one-third its size, it would be about 10 times as useful. Nevertheless, that which remains is of sufficient value to make the volume timely and worth a good deal of angry digging.

After a foreword and a preface, *Rehabilitation of the Mentally Ill* is divided into four sections: "General problems" (Ewalt, Greenblatt, and Hunt), "Hospital phases of rehabilitation" (Martin, Notman, Landy, Raulet, Key, Wittkower, and Azima), "The transition from hospital to community" (Temple Burling, George Brooks, Knudson, Sanders, and Carmichael), and "The community aspects of rehabilitation" (Ernest Gruenberg, Huxley, Elsa Kris, Bertram J. Black, and Simon Olshansky).

I kept wishing that the simple diagrammatic staircase presented on page 18 had been used as the skeleton of the book. Each aspect of the social rehabilitation of the mentally ill is placed on a step in this staircase. At the bottom is "Hospital," then as one ascends the staircase he goes through "Night hospital," "Day hospital," "Sheltered workshop," "Half-way house," "Family care," "Ex-patient clubs," "After-care clinics," and "The community." Each of these steps could have been a chapter, and all the participants' discussion, properly winnowed, could have been assembled under one or another of these categories. In this way, the whole volume could have been condensed, and the material concentrated instead of scattered.

One topic that is being considered at Fountain House is not discussed here: the preparation of families for the return of patients to the family group. Family groups would be brought together to discuss their problems and their feelings while the patients are still in the hospital but are nearing the time when they will make their first visits home. These could be group therapy sessions in anticipation of the return of patients. (This could also be done with foremen in industry, with employers, and others.)

I found certain chapters exemplary, but it would not be seemly to make invidious distinctions. Furthermore, others will undoubtedly find that other chapters are best for their needs. Therefore I limit myself to one recommendation: those working in this field should take the time and make the effort to extract from the book its essential data, even though they will surely groan over the inhumanity of the symposium format for the ultimate reader.

LAWRENCE S. KUBIE
Sheppard Pratt Hospital,
Towson, Maryland

New Books

Annual Reports on the Progress of Chemistry, 1958. vol. 55. R. S. Cahn, Ed. Chemical Society, London, 1959.

Approach to Archaeology. Stuart Piggott. Harvard Univ. Press, Cambridge, Mass., 1959. 144 pp. $3.

Chronic Illness in a Rural Area. The Hunterdon study. Reported by Ray E. Trussell and Jack Elinson. Published for the Commonwealth Fund by Harvard Univ. Press, Cambridge, Mass., 1959. 454 pp. $7.50. This volume completes a series of four reports on the problems of chronic illness in the United States. The reports, published under the sponsorship of the Commission on Chronic Illness, are available from the Harvard University Press.

La Culture des Tissus Végétaux. Techniques et réalisations. R. J. Gautheret. Masson, Paris, 1959. 881 pp. F. 10,500.

Dictionary of Discoveries. I. A. Langnas. Philosophical Library, New York, 1959. 206 pp. $5. Alphabetically arranged biographical entries cover explorers, some instrument makers, and some people who financed the journeys. The entries vary from a few lines to a full page or more.

Histologie und Mikroskopische Anatomie des Menschen. W. Bargmann. Thieme, Stuttgart, Germany, 1959 (order from Intercontinental Medical Book Corp., New York 16). 835 pp. $16.55.

History of the American Dietetic Association, 1917–1959. Mary I. Barber, Ed. Lippincott, Philadelphia, Pa., 1959. The first official history of the American Dietetic Association from its inception in 1917 through 1959.

International Tables for X-ray Crystallography. vol. 2, *Mathematical Tables.* John S. Kasper and Kathleen Lonsdale, Eds. Published for the International Union of Crystallography. Kynoch Press, Birmingham, England, 1959. 462 pp.

An Introduction to Differential Geometry. T. J. Willmore. Oxford Univ. Press, New York, 1959. 327 pp. $5.60.

Larousse Encyclopedia of Astronomy. Lucien Rudaux and G. de Vaucouleurs. Prometheus Press, New York, 1959 (order from Putnam's, New York). 506 pp. Until 1 Jan., $12.50; after 1 Jan., $15.

Melchior Treub. Pioneer of a new era in the history of the Malay Archipelago. H. H. Zeijlstra. Koninklijk Instituut voor de Tropen, Amsterdam, Netherlands, 1959. 127 pp.

Memory and Hypnotic Age Regression. Developmental aspects of cognitive function explored through hypnosis. Robert Reiff and Martin Scheerer. International Universities Press, New York, 1959. 263 pp. $5.

The Military and Industrial Revolution of Our Time. Fritz Sternberg. Praeger, New York, 1959. 373 pp. $5.75.

Principles of Mineralogy. William H. Dennen. Ronald, New York, 1959. 434 pp. $7.50.

Psychoendocrinology. Max Reiss, Ed. Grune and Stratton, New York, 1958. 215 pp. $7. This volume contains 16 papers from the symposium on psychoendocrinology. The symposium was arranged in conjunction with the Second International Congress for Psychiatry at Zurich to correlate the progress made in the study of endocrine function in psychopathology during the 7 years since the first congress.

Real Analysis. Edward James McShane and Truman Arthur Botts. Van Nostrand, Princeton, N.J., 1959. 281 pp. $6.60.

Regression Analysis. E. J. Williams. Wiley, New York; Chapman and Hall, London, 1959. 223 pp. $7.50.