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.

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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.

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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