to pass successive events." If such statements as these are warranted by the evidence which is offered, then the logic of this science is not that of the other sciences.

The popular interest in the topic which this volume treats, the obvious intention to gain the ear of the public by recounting tales of merely personal interest and passing them off as scientific data, the confident expression of the author in the certainty of his conclusions, will all combine to circulate the notion among the public at large that the conclusions of the volume represent the final verdict of science on these momentous questions; and it is in this respect that the volume is likely to exert a seriously unfortunate influence. It is difficult enough at best to get the intelligent layman to understand that the ability to interpret soundly and rationally phenomena of this field demands, like all expert opinion, a special knowledge and a fitness of training and intellect. It is quite idle to expect the layman to distinguish too closely between one scientist and another, or between the methods which they use and the dicta which they express. Possibly (and it were better if one could say probably) M. Flammarion has so seriously overstepped the limits of sound judgment and expression in this matter, that his authority will be called into question by the reader who reflects as he reads. There is no good reason why an astronomer with a gift for popularization and an interest in the phenomena of the 'Unknown' should not prepare as good and valuable an account of these phenomena as the present state of knowledge permits. There is no desire on the part of psychologists to discountenance such investigation, whatever its origin. But it is essential that the investigator should thoroughly know what the present state of knowledge really is, and above all, that he should possess the indispensable logical appreciation of the conditions of the various problems.

This logical vigor and discernment, this essential logical insight that is both a natural endowment and the result of conscientious training is not the prerogative of any one science nor of scientists at large; and he who has it has the most important part of the equipment necessary to the participation in such investigations. It is because this volume is conspicuously lacking in these qualities, and because it as a consequence substitutes for them uncritical collections of narratives and dogmatically stated conclusions, that it must be disavowed by those who stand for the thoroughly scientific investigation of the unexplored regions of the psychological universe. It is very certain that if M. Flammarion and his colleagues had used the same methods in astronomy as he applies to the investigations of this volume, modern astronomy would be held in very different repute from that which it now enjoys. There is an amateur and an expert exploration of this field, just as there is in geographical exploration, and it will require the best trained and most scientific explorer to reveal the true nature of this 'darkest Africa' of the human mind.

JOSEPH JASTROW.

Histoire des mathématiques. Par JACQUES BOYER. GEORGES CARRÉ et C. NAUD, Éditeurs. Paris. 1900. Pp. 260.

The growing interest in the history of science is made manifest by the number of historical works which have appeared in recent years. Perhaps in no science is this movement so marked as in mathematics. During the last twenty years there have appeared not only the monumental works of Moritz Cantor and Maximilien Marie, but also a large number of brief histories. The volume before us belongs to the latter class.

An attractive feature of this book are the page-portraits of nineteen mathematicians and seven facsimiles of parts of celebrated manuscripts and of old drawings of mathematical instruments. We know of no other general history of mathematics which furnishes the reader such a treat. So high is our appreciation of this feature that we are ready to forgive the author when we discover that, out of a total number of nineteen mathematicians whom he has honored with portraits, eleven are Frenchmen.

M. Boyer's history is written in an interesting style and will doubtless stimulate more serious study of mathematical history in larger works. But in two respects the author has hardly achieved what might have been expected of him.

In the first place, the author has in several instances failed to embody the latest fruits of historical research. Thus, in connection with the graphical representation of imaginaries he fails to mention Wessel; in speaking of non-Euclidean geometry he refers to Saccheri, but not to Lambert and Taurinus; in tracing the history of trigonometry he apparently overlooked the researches of Suter and Braunmühl, who show that the Arabs distinguished themselves by original work much more than was formerly supposed; he makes no mention of the Bakhshali manuscript, which throws considerable light on early Hindu arithmetic. As a rule, the facts presented are stated accurately. Among the exceptions are the following: Athelard of Bath is mentioned as the first translator of Euclid from the Arabic into Latin, but there is ground for the belief that earlier translations existed. Boyer attributes to Benjamin Peirce a research which seems to be due entirely to Charles S. Peirce; he misspells the name of Crozet, the author of the first American text on descriptive geometry; he gives Antissa instead of Antinoeia as the birthplace of Serenus.

In the next place, the book is deficient because it does not trace the evolution of theories. Something on the growth of mathematical ideas we have a right to expect even in a short history. If the reader consults this work on the introduction of the notion of infinity or of continuity, on the evolution of the theory of limits, on the number concept, or on the foundations of algebra, he will receive little satisfaction. But these topics are all of vital importance in elementary as well as in advanced mathematics.

Florian Cajori.
Colorado College, Colorado Springs.

Elementary Chemistry. For High Schools and Academies. By A. L. Arey, C.E., Rochester (N. Y.) High School. New York, The Macmillan Co. 1899.

The author has adopted the theoretically ideal plan of forcing the student to note the various features of chemical reactions without any suggestion as to the phenomena which one is expected to observe. Very few students have cultivated and trained their power of observation, and one of the most advantageous purposes of the study of a science is to develop this side of their nature. This can only be done by teaching him what he sees and how he should see it and thus gradually training his powers of observation until he is able to observe new phenomena for himself and becomes independent of the observations of others. Several dangerous experiments are placed in the early part of the book with no notice of the precautions to be taken, and if this book was put into the hands of an inexperienced worker there would probably be disastrous results.

J. E. G.

Laboratory Exercises with Outlines for the Study of Chemistry, to accompany any Elementary Text. By H. H. Nicholson, Professor of Chemistry in the University of Nebraska, and S. Avery, Professor of Chemistry in the University of Idaho. New York, Henry Holt & Co. 1899.

This book is intended as a laboratory guide to be used in connection with a text-book. It is well arranged and the descriptions are clear and logical, and with conscientious use of a reference book should produce the desired results. In cases where dangerous materials are to be handled too much caution cannot be given. In exercise 3 the student is directed to rub in a mortar a piece of sulphur and a crystal of potassium chlorate the size of a grain of wheat. One who had never had experience with students just beginning the study of chemistry would be surprised at the differences of opinion as to the size of a grain of wheat.

J. E. G.

School Chemistry. By Chas. Baskerville, Ph.D. The University of North Carolina. Richmond, Va., B. F. Johnson Publishing Co. 1899.

The author wrote this book for use in summer schools for teachers. In attempting to cover the whole field in a short course he has prepared a work which will not give a student the necessary foundation either for teaching the elements of the subject or continuing its study with advantage. A few subjects thoroughly understood would probably be of more value than a little knowledge of many, so far as its use by the class of students for whom it is intended is concerned. The author has no doubt supplemented it by