Through each of the five stages—Pleistocene, Pliocene, Miocene, Oligocene and Eocene—of the uppermost eras of geological history we can trace a more or less complete gradation from the horses of the present day to primitive, many-toed animals, scarcely larger than foxes, and presenting few of the features which render the horse and its relatives such a remarkable group. Some idea of the immense lapse of time which has taken place during the slow evolution of the Eocene *Hyracotherium* into the modern *Equus* has been thus expressed by Professor H. F. Osborn, whom Lydekker quotes:

> The Rocky Mountains, it is true, began their elevation during the close of the Age of Reptiles; they had only attained a height of four or five thousand feet when the Age of Mammals commenced; they continued to rise during the entire period. But consider the map of Europe and Asia at the beginning of Eocene time and realize that the great mountain systems of the Pyrenees, the Alps, and the Himalayas were still unborn, level surfaces in fact, partly washed by the sea. . . . The birth of the Pyrenees was at the beginning of the Oligocene. At this time Switzerland was still a comparatively level plain, and not until the close of the Oligocene did the mighty system of the Swiss Alps begin to rise. Central Asia was even yet a plain and upland, and only during the Miocene did the Himalayas, the noblest existing mountain chain, begin to rise to their present fellowship with the sky. In North America, again, since the close of the Eocene the region of the present Grand Cañon of the Colorado has been elevated 11,000 feet and the river has carved its mighty cañon through the rock to its present maximum depth of 6,500 feet.
>
> Those who have been impressed with a sense of the antiquity of these wonders of the world, and will imagine the vast changes in the history of continental geography and continental life which were involved, will be ready to concede that the Age of Mammals alone represents an almost inconceivable period of time.

RICHARD SWANN LULL
YALE UNIVERSITY

Electricity and Magnetism for Advanced Students. By SYDNEY G. STARLING. Longmans, Green & Co. 1912. 583 pages, with 452 figures.

This book is the outcome of a number of years' experience in teaching the subject to senior students in an English municipal technical school, and it is a good book. To quote from the preface, it aims "to give such students an adequate knowledge of the present state of the subject, with due reference to the historical sequence of its development, and to the effect of modern research upon it." Its seventeen chapters are devoted to magnetism, terrestrial magnetism, the electric current (2), electrostatics (2), electrolysis, thermoelectricity, electromagnetics, magnetic properties of materials, varying currents, alternating currents, units, electromagnetic radiation, conduction in gases, radioactivity, and electrons. Instruments and methods of measurement receive a great deal of consideration. Each chapter is provided with a number of examples, mostly taken from London B.Sc. and B. of E. papers.

The book follows for the most part conventional lines. Its descriptive matter is clear and full and usually correct. Its mathematical demonstrations are ordinarily sufficiently direct and simple, though it seems to the reviewer that some of them might have been dispensed with and that others, *e. g.*, those pertaining to the Wheatstone and Thomson bridges, would profit by simplification. The calculus is freely used throughout.

As to matters of fact the book is fairly up to date. In many cases, however, important recent contributions receive no mention—such as the use of the methods of electromagnetic induction in terrestrial magnetism, the precise work of Rosa and Dorsey on the ratio of the unit charges, and the brilliant work of Langevin, Weiss and others in the domain of magnetism.

In matters pertaining to fundamental theory the treatment is not always logical and free from looseness. Thus the definitions of electromotive force and potential difference are unsatisfactory; resistivity is defined without reference to the direction of the streamlines; the curl of a vector is defined as its line integral around a closed path; and Gauss's theorem, demonstrated for a homogeneous field only, is assumed without comment to

hold for all fields—an error common to nearly all books on this subject. And many other errors have been noted, most of them pertaining to the theory of instruments.

As in many other books, great use is made of the magnetic shell. In the reviewer's opinion magnets of all types, real or fictitious, but especially the magnetic shell, should be completely abolished from the fundamental parts of electrical theory—as indeed they have already been abolished by some writers. The reviewer must protest also against the author's use of the word *field,* which properly denotes a *region,* to designate field *strength* or field *intensity;* and the use of the word *force* in place of the word *stress* when two forces—both action and reaction—are contemplated. These usages are all too common, and the book under review is no more guilty than many others.

In spite of such defects as have been mentioned it may be stated again that this is a good book. And it should be useful to many students.

S. J. Barnett
The Ohio State University

The Science of Human Behavior: Biological and Psychological Foundations. By Maurice Parmelee, Ph.D. New York, The Macmillan Company. 1913. Pp. xviii + 443. $2.00 net.

It is the subtitle rather than the main title that indicates the scope of this work, which might perhaps have been better named prolegomena to a science of human behavior. No attempt is made to gather together the rather extensive studies of human behavior already produced by experimental psychology, and indeed the existence of this work is not even recognized, nor are its methods set forth. The author's view is that human behavior must be approached from the biological and physiological side. "Psychical and social phenomena should be reduced as far as possible to biological terms, just as vital phenomena should be reduced as far as possible to chemical and physical terms" (Preface). "To begin the study of behavior from a biological point of view has, I believe, a very wholesome effect, for it necessitates the use of more or less exact methods of observation which are not always used in psychology and sociology. The use of these methods results in the disappearance of hazy and mystical explanations of human phenomena frequently proposed by writers in these two sciences. These explanations are replaced by more or less exact mechanical explanations" (pp. 2–3). The nature of these mechanical explanations is indicated by the author's method, which seeks to obtain clear concepts of the simpler types of behavior, and then to show how these simpler acts are combined into more complex behavior of a mental and social sort. The method is, therefore, comparative and genetic; and phylogenetic rather than ontogenetic. Tropisms and other reactions of the simplest organisms, reflexes of animals possessing a nervous system, instincts, which are defined as combinations of reflexes integrated by the nervous centers, learning, intelligence, consciousness, society, are successively treated; and some attempt is made to trace the evolutionary process through these increasingly complex modes of behavior. As might be expected, this attempt to trace the phylogenesis of human behavior is not specially successful, on account of the impossibility of selecting a series of animal forms representing the direct line of human descent; and the study is thus, after all, comparative rather than genetic. For example, considerable attention is devoted to the social behavior of insects and of birds, which certainly has no direct bearing on the evolution of human behavior. For the specific purpose of the book, much of this incidental material might well be replaced by something on the growth of behavior in the human individual.

The book is of the Spencerian type, beginning with the characteristics of matter in general, and ending with social evolution. It has required the bringing together of material from various sciences: physics and chemistry, zoology, physiology, psychology, anthropology. One would expect it, accordingly, to be broad rather than notoriously exact; and it is likely to produce the same sort of impression