admirably selected and well executed, except for their tendency toward schematization. The original figures are not numerous and are chiefly diagrams.

In conclusion, it may be said that any student who, with the aid of practical laboratory work, masters Hertwig's book will have mastered the general subject of human embryology from the comparative morphological standpoint, and will be qualified to pursue more advanced study, but he must remain ready to modify many of his general theories and to fill out a number of important gaps in his knowledge. His chief gain will be insight into the very spirit of morphology, through the guidance of one of the very ablest of morphologists.

C. S. MINOT.

A Handbook of the British Macro-Lepidoptera. By BERTRAM GEO. RYE. With hand-colored illustrations by MAUD HORMAN-FISHER. London, Ward & Foxlow. Parts 1–4, Jan.–Oct., 1895.

The four parts issued give a fair idea of the scope and execution of this addition to the already large number of works relating to the butterflies and moths of Great Britain. Each part contains eight pages and two plates.

In the introduction the changes that take place during metamorphosis and the principal characters used in classification are briefly described. Eight families of Rhopalocera are recognized, namely, Papilionidæ, Pieridæ, Nymphalidæ, Apaturidæ, Satyridæ, Lycænidæ, Erycinidæ and Hesperidæ. A table separating these is given, and the genera and species can be readily distinguished by means of similar tables. The species are fairly well described, and the notes on the early stages, haunts, times of appearance, and abundance are clear and concise.

The plates are excellent, and the distinctive value of Mr. Rye's work consists in the description and illustration of the varieties and local races, apart from the consideration of the species, of the Macro-Lepidoptera of Great Britain. Beginning with 1896 the parts will be issued bi-monthly, instead of quarterly. The price per part is 2s. 6d.

SAMUEL HENSHAW.

Mollusca and Crustacea of the Miocene Formations of New Jersey. By R. P. WHITFIELD. Monograph U. S. Geol. Survey. Vol. XXIV. 1894.

This latest contribution of Professor Whitfield to the paleontology of New Jersey is most opportune, since the detailed mapping of the coastal plain formations of the State has recently shown an extensive development of Miocene strata. The character of the deposits is such, however, that determinable fossils have only been detected at a very few points, the great majority coming from the marl beds in the vicinity of Shiloh and Jericho and from the deep well-borings at Atlantic City. These forms Prof. Whitfield has evidently studied with great care and has presented in a most acceptable manner.

Prior to the publication of this report by Prof. Whitfield, little systematic work had been done upon the fossils of the Miocene of New Jersey. Meek's list, published in the 'Smithsonian Miscellaneous Collections' in 1864, contains reference to only seventeen species. Prof. Heilprin in his 'Tertiary Geology of the eastern and southern United States,' published in 1884, gives twenty-seven species, seventeen of which he regards as peculiar to the State. Later, from time to time, the same author added to this list, until in 1887, in an article on 'The Miocene Mollusca of the State of New Jersey,' he enumerates eighty-two species, describing three new species and one variety.

In his monograph Prof. Whitfield recognizes one hundred and four species, but states that there is no doubt that many more species might be obtained were the beds more thoroughly examined and other localities explored. Of the species described thirty-six are regarded as peculiar to New Jersey.

Besides the molluscan remains enumerated, Mr. Anthony Woodward gives a list of twelve species of foraminifera found in the marls at Shiloh and two at Jericho.

Prof. Whitfield, from a study of the fossils, would correlate the deposits with the Miocene of the States to the south, which is fully substantiated upon physical grounds as well. The writer of this review has traced the strata across Delaware into Maryland so that there can be no doubt but that the New Jersey Miocene is

the direct continuation northward of the Chesapeake formation of the Middle Atlantic slope.

W. B. Clark.

SOCIETIES AND ACADEMIES.

THE PHILOSOPHICAL SOCIETY OF WASHINGTON, FEBRUARY 1.

Mr. Lester F. Ward read a paper on 'The Filiation of the Sciences.' The purpose of the paper was to trace the progress of the conception of a natural order of development for the larger groups of phenomena, as distinguished, on the one hand, from any attempt at a logical classification of the sciences, and on the other, from the consideration of the order in which the sciences have been historically developed. Without going back of the present century to deal with the more or less fanciful notions of the Ancients or of such moderns as Oken, Hegel, d'Alembert, Hobbes, Locke, etc., he drew attention to the views of Auguste Comte and Herbert Spencer, as the two philosophers who had clearly conceived the problem of natural evolution.

He first traced the development of the idea in the mind of the first of these writers from 1820 to 1842. In a paper published by him in 1820, he had quite clearly expressed the fundamental truth, and arranged the great groups of phenomena, or sciences, in the following order: 1, Mathematics; 2, Astronomy; 3, Physics; 4, Chemistry; 5, Physiology; giving to each of these terms a wide meaning, but admitting that mathematics was not coördinate with the others, but was only the criterion by which each of the others was to be judged and its position in the series fixed. From 1826 to 1829 he elaborated this scheme in a course of lectures, soon after published as his well-known work on Positive Philosophy, the first volume of which appeared in 1830. In the prospectus of these lectures, circulated in manuscript form in 1826, he added to the above five sciences a sixth, viz., Social Physics, and the scheme as then drawn up was introduced in tabular form at the beginning of the first volume of the Positive Philosophy. In Vol. III. of that work, which appeared in 1838, he substituted for his 'Physiology' Lamarck's term Biology, but the scope of this science was the same as before and practically that of biology as now understood. The last chapter of that volume was devoted to what he called the intellectual and moral, or cerebral, functions of life, in which he fully recognized the present science of psychology, but denied that it could be properly separated from biology. In the fourth volume, published in 1839, he speaks of this as 'Transcendental Biology.' It is in this volume, too, that he first proposed the term 'Sociology,' as the exact equivalent of his 'Social Physics,' and continued to the end to use both these terms interchangeably. It was not till 1842, with the appearance of the first volume of his Positive Polity (*Politique Positive*), that he added anything to the scheme of sciences thus drawn up. He then recognized, as the seventh and last term of the series, the science of Ethics. The entire series, then, as he finally left it, was as follows: 1, Mathematics; 2, Astronomy; 3, Physics; 4, Chemistry; 5, Biology (including cerebral or transcendental biology); 6, Sociology; 7, Ethics.

Comte was at great pains to explain that this series represented the true order of nature, and that the phenomena corresponded to the actual evolution that has taken place in the universe. The degree of 'positivity' of any science is that to which it can be reduced to mathematical laws. The first of the sciences that represent phenomena, viz., astronomy (from which sidereal astronomy was excluded) is therefore the most positive, and the degree of positivity diminishes with each term in the series. The sciences thus arranged also diminish in their generality while they increase in their complexity.

Moreover, each higher science has its roots in the one next below it and is, as it were, derived from it. The relationship is genetic, and hence his favorite term 'filiation,' a word much better chosen than the term 'hierarchy' which he also applied to the system.

Mr. Ward next proceeded to consider the scheme of Mr. Herbert Spencer as elaborated in his Synthetic Philosophy. A prospectus of that work was circulated in 1860. It was to embrace one volume on First Principles, two volumes on the Principles of Biology, two volumes on the Principles of Psychology, three volumes on the Principles of Sociology, and two volumes on the Principles of Morality. In this pro-