claim that species do not originate *now* in a state of nature, would certainly find it a difficult task to refute or explain on any but one hypothesis the facts given by our author. One case in particular is of great interest. It would appear that two butterflies, species of *Heliconius*, are extremely abundant in the forests along the river. They inhabit, however, different sections of the country, one of which in moister than the other. One species occurs in the dry forests, the other in the moister ones. One species, *H. melpomene*, is black with a large crimson spot on its wings; the other is *H. thelxiope*, in which the wings are beautifully rayed with black and crimson and have a number of bright-yellow spots. Both have the same habits, and they have long been regarded as perfectly distinct species. We quote now Mr. Bates's words: "There are, as might be supposed, districts of forest intermediate in character between the drier areas of Obydos, etc., and the moister tracts which compose the rest of the immense river valley. At two places in these intermediate districts, . . . most of the individuals of these *Heliconii* which occurred were transition forms between the two species. Already, at Obydos, *H. melpomene* showed some slight variation amongst its individuals in the direction of *H. thelxiope*, but not anything nearly approaching it. It might be said that these transition forms were hybrids, produced by the intercrossing of two originally distinct species; but the two come in contact in several places where these intermediate examples are unknown, and I never observed them to pair with each other. . . . These hybrid-looking specimens are connected together by so complete a chain of gradations that it is difficult to separate them even into varieties, and they are incomparably more rare than the two extreme forms. They link together gradually the wide interval between the two species. One is driven to conclude, from these facts, that the two were originally one and the same; the mode in which they occur and their relative geographical positions being in favor of the supposition that *H. thelxiope* has been derived from *H. melpomene*. Both are, nevertheless, good and true species in all the essential characters of species; for, as already observed, they do not pair together when existing side by side, nor is there any appearance of reversion to an original common form under the same circumstances."

We have already so far overstepped our space that we must reluctantly refrain from quoting further. We would, however, call particular attention to the account given of Termites on pages 209–214; that on Fire Ants on page 227; on Monkeys on pages 331–345; and on the general features of ant life on pages 355–363. The remarks upon floating pumice on pages 263–264 are well worthy the consideration of students of geographical distribution, and those on page 169 are commended to the student of comparative philology, as indicating a method of the formation of dialects among savage tribes.

One word more and we have done; for even at the risk of tiring the patient reader we add one more quotation. After a life of eleven years spent in the Amazonian forests, certainly Bates was well qualified to judge between that life and civilized man's. He had formed a love for the country, and he took leave of it with regret. The desire, however, of once again seeing his parents and of enjoying the pleasures of intellectual society drew him from this "Naturalists' Paradise." "During this last night on the Pará River," he says, "a crowd of unusual thoughts occupied my mind. Recollections of English climate, scenery, and modes of life came to me with a vividness I had never before experienced during the eleven years of my absence. Pictures of startling clearness rose up of the gloomy winters, the long, gray twilights, murky atmosphere, elongated shadows, chilly springs, and sloppy summers; of factory chimneys and crowds of grimy operatives, rung to work in early morning by factory bells; of union workhouses, confined rooms, artificial cares and slavish conventionalities. To live again amidst these dull scenes I was quitting a country of perpetual summer, where my life had been spent, like that of three-fourths of the people, in gypsy fashion, on the endless streams or in the boundless forests. I was leaving the equator, where the well-balanced forces of nature maintained a land surface and climate that seemed to be typical of mundane order and beauty, to sail towards the North Pole, where lay my home, under crepuscular skies, somewhere about fifty-two degrees of latitude. It was natural to feel a little dismayed at so great a change; but now, after three years of renewed experience of England, I find how incomparably superior is civilized life, where feelings, tastes, and intellect find abundant nourishment, to the spiritual sterility of half-savage existence, even if it were passed in the Garden of Eden. What has struck me powerfully is the immeasurably greater diversity and interest of human character and social conditions in a single civilized nation than in equatorial South America, where three distinct races of man live together. The superiority of the bleak north to tropical regions, however, is only in its social aspect; for I hold to the opinion that, although humanity can reach an advanced state of culture only by battling with the inclemencies of nature in high latitudes, it is under the equator alone that the perfect race of the future will attain to complete fruition of man's beautiful heritage, the earth."

JOSEPH F. JAMES

Text-Book of the Embryology of Man and of Mammals. By DR. OSCAR HERTWIG. Translated by Professor E. L. Mark. New York, Macmillan & Co. $5.25.

PROFESSOR MARK has done a great service to English science by translating this text-book of embryology. The appreciation of the book abroad is shown by the fact that the edition which is now translated is the third edition since its original publication in 1866, the third edition of the first part of the text-book being demanded before the second part was ready for publication. The valuable scientific researches of Hertwig are very well known by all naturalists, and his name alone is sufficient to indicate the reliability of the work in hand.

The title, "A Text-Book of Embryology of Man and Mammals," does not adequately express the scope of the book, for while it is in details largely confined to the study of mammals, there is so much of general embryology within its covers as to give it a value as a general text-book of vertebrate embryology. As such a text-book it is of the greatest value to a student, and it is safe to say that at the present time there is no text-book so well designed to give the student a general knowledge of vertebrate embryology as the present one.

The subjects treated comprise all matters of importance connected with invertebrate embryology. They are treated in a masterly style, and the facts and discussions are in all cases brought up to date. In the chapters on the sexual products and their fertilization may be found a summary of the essential facts of our present knowledge upon this important subject. The chapter on cleavage discusses the general matter of the segmentation of eggs, giving the various types of such segmentation, their relations to each other and defining the terms used in descriptions in various text-books. The chapter on the gastrula is especially valuable, for it gives in a clear, logical, but concise manner, illustrated by valuable and intelligible drawings, our present ideas as to the application of the gastrula theory to the embryology of vertebrates. It is a subject which is always puzzling to the student of embryology to understand the gastrulation of the vertebrate egg, and Professor Hertwig has done very much toward making this difficult subject intelligible. Not the least valuable part of this section is an outline history of the gastrula theory, tracing our knowledge of embryology of the germ layers from its infancy to the present time. The gastrula theory is accepted by Professor Hertwig in its fullest sense. The chapter on the formation of the body cavity gives Professor Hertwig an opportunity of explaining clearly his "coelomthorie" which he does in a clear style, and the significance of which he makes plain by its historical consideration. In addition to the above, there are considered in the first part of the work the segmentation of the vertebrate embryo, the origin of connective tissues, the method of formation of the external form of the vertebrate body and a study of the fœtal membranes of reptiles, birds, mammals, and man. In all of these sections the aim of Professor Hertwig is not only to give facts but to give a logical connective account of the significance of the facts and a logical understanding of the various phases in the development of the vertebrate body, and he has greatly added to the value of

the discussions by short historical accounts of the development of our knowledge on the various topics.

The second part of the book is devoted to the development of special organs, and here the author is more confined to the mammals and gives less consideration to the other vertebrates. The method of consideration is that of the study of organs according to their origin in the different layers of the body. These are considered, therefore, under four heads. The organs of the endoderm include the alimentary system in general; the organs of the ectoderm include the nervous system; the organs of the middle germ-layer include the muscles, the urinary and sexual organs. Professor Hertwig's views of the body cavity lead him to the formulation of a fourth layer of the vertebrate embryo, which he calls the intermediate layer or mesenchyme, and the last section of the text-book studies the development of the organs from this mesenchyme. These, according to Hertwig, are the circulatory system and the skeleton.

The special merits of this book are the logical treatment and its consideration of the embryological facts as parts of a system. The general method of the treatment of the subject is a comparative rather than a physiological one, and the text-book will give the student an insight into comparative anatomy but very little consideration of the physiology of the developing embryo In one of the two sections, it is true, the mechanics of development are considered, but in general, the text-book is a morphological rather than a physiological study. This is, of course, a natural outcome of the line of work in which Professor Hertwig has been so successfully engaged for so many years.

Not the least valuable part of the book consists in the abundant literature. Some fifty pages are devoted to giving the titles and references to the most important papers of vertebrate embryology. The book has, also, another feature, somewhat rare in German scientific books, but of extreme value to students, in the form of short, logical, but intelligible summaries at the end of every section giving in outline the important conclusions.

On the whole, the text-book of Professor Hertwig is probably the best general study of vertebrate embryology that has appeared in the English language up to the present time, and it can be most heartily recommended to all interested in these subjects.

Chemical Lecture Experiments. Non-Metallic Elements. By G. S. NEWTH, F.I.C. London and New York, Longmans, Green & Co. 323 p. 8°.

A BOOK of chemical lecture experiments, carefully classified and systematically arranged, cannot but be welcome to many. Moreover, a book from a practised hand, such as Mr. G. S. Newth, chemical lecture demonstrator in the Royal College of Science, South Kensington, has a particular value in that its experiments are so given as to be readily repeated and are not, as is often the case, merely a statement of the reaction with a few confusing details. Mr. Newth has chosen his experiments well and has described them in clear concise language. The book has a two-fold purpose in easing the labors of the lecturer and of the student alike. For the former it supplies a useful repertoire of lecture experiments and will surely be gladly received, removing, as it does entirely, the humdrum search for such examples and reactions as can be suitably and successfully demonstrated on the lecture table. This, as every lecturer knows, is by no means a small item in the preparation of a lecture, and, moreover, being important, it cannot be carelessly or hastily done. The experiment must be quickly and successfully performed or the interest of the student is turned to illy-concealed ridicule, and the lecturer is, so to speak, lost.

To the student the book appeals in providing a ready reference to serve as a companion in the lecture room, and in supplying the deficiencies of his notes. Indeed, it may in most cases entirely relieve him of the necessity of taking notes upon the experiments themselves, drawings of the apparatus, etc., and he will thus be enabled to devote his attention to the explanations

CALENDAR OF SOCIETIES.

Anthropological Society, Washington.

March 14.—Major John W. Powell, A Study in Psychology.

Geological Society, Washington.

March 22.—G. K. Gilbert, An Open Fissure; G. P. Merrill, Remarks on the So-Called Onyx Marbles or Travertines; C. D. Walcott, The Algonkian Rocks of the Grand Canyon of the Colorado.

Chemical Society, Washington.

Feb. 9.—W. H. Krug, A New Method for Estimating Furfurol-Hydrazone; E. E. Ewell and H. W. Wiley, On Some Products of the Cassava Plant Professor Wiley describes the plant as it occurs in Florida, and says there is every reason to believe that, if the attention of capitalists is called to it, a large quantity of land now covered with pines could be profitably cleared and devoted to the cultivation of the cassava plant. A minimum average yield is four tons of roots per acre, which may be readily increased by proper fertilization to eight or ten tons per acre. Maize could not compete with cassava if the same intelligent cultivation is applied, and there is a prospect that the cassava will eventually take the place of maize in the production of starch, glucose, etc.

March 9.—W. D. Bigelow and K. P. McElroy, Determination of Lactose in Presence of Invert Sugar and Sucrose.

Philosophical Society, Washington.

March 18.—W. H. Holmes, Traces of Glacial Man in the Trenton Gravels; Asaph Hall, The Planet Mars.