

of some of his shorter works has appeared; and, now that we have a good sketch of his life, English readers can easily learn all they may wish to know of the great pessimist of Germany.

The Colours of Animals, their Meaning and Use, especially considered in the Case of Insects. By EDWARD BAGNALL POULTON. (International Scientific Series, Vol. LXVII.) New York, Appleton. 12°.

WITH this volume another new and valuable member is added to the classical International Scientific Series. It comes to us with the fascinating qualities which accurate and well-written accounts of animal life must have both for the general reader and the biologist. Mr. Poulton has given his book a general title, though it treats mainly of the origin of colors in insects, and more especially in moths and butterflies. This use of a general title may be excused on the ground that nearly all the difficulties in explaining the evolution of color in the animal world are met with among insects. After devoting an introductory chapter to the structures in animal tissues whereby colors are produced, the author proceeds to discuss the origin of colors by means of natural selection. Animal colors are classified as non-significant and significant; and the latter category is again subdivided into colors of direct physiological value to the organism (chlorophyl, pigment, etc.), colors of protective and aggressive resemblance, colors of protective and aggressive mimicry, warning colors, and colors displayed in courtship. Each of these classes of significant colors is then taken up in order, and discussed at length, with numerous illustrations drawn mainly from the group of lepidopterous insects. It is impossible in this brief notice to do full justice to the wealth of interesting examples with which the author presents us. Only a very small portion of the work deals with the hackneyed cases of mimicry and protective resemblance found in zoölogical text-books. Many of the observations are original, and others are taken from the recent works of reliable investigators. Perhaps the most original portion of the volume is that which treats of the author's own experiments on the chrysalides of the butterflies. He exposed larvæ to surfaces of different colors during pupation, with results which may be briefly summarized in his own words:—

"I worked upon the allied small tortoise-shell butterfly (*Vanessa urticae*), which can be obtained in immense numbers. In the experiments conducted in 1886, over 700 chrysalides of this species were obtained, and their colors recorded. Green surroundings were first employed in the hope that a green form of pupa, unknown in the natural state, might be obtained. The results were, however, highly irregular, and there seemed to be no susceptibility to the color. The pupæ were, however, somewhat darker than usual, and this result suggested a trial of black surroundings, from which the strongest effects were at once witnessed. The pupæ were, as a rule, extremely dark, with only the smallest trace, and often no trace at all, of the golden spots which are so conspicuous in the lighter forms. These results suggested the use of white surroundings, which appeared likely to produce the most opposite effects. The colors of nearly 150 chrysalides obtained under such conditions were very surprising. Not only was the black coloring-matter as a rule absent, so that the pupæ were light-colored, but there was often an immense development of the golden spots, so that in many cases the whole surface of the pupæ glittered with an apparent metallic lustre. So remarkable was the appearance, that a physicist to whom I showed the chrysalides suggested that I had played him a trick, and had covered them with gold-leaf. These remarkable results led to the use of a gilt background as even more likely to produce and intensify the glittering appearance. . . . The results quite justified the reasoning; for a much higher percentage of gilded chrysalides, and still more remarkable individual instances, were obtained among the pupæ which were treated in this way."

Warning colors are discussed at some length, and many interesting examples and experimental results adduced. There is a decided antithesis between warning and protective colors; as "the object of the latter is to conceal the possessor from its enemies, the object of the former is to render it as conspicuous as possible." It is shown that warning colors are usually accompa-

nied by a nauseating taste, strongly smelling or irritant fluids, etc. Attention is called to the fact that there is a general similarity in the warning colors of all animals, the prevalent patterns being alternating bands of striking colors, and that consequently enemies soon learn not to attack conspicuous and unusually colored animals, because a few experiments have taught them to associate these striking patterns with disagreeable tastes and odors.

In the chapter on mimicry, more examples, we think, might have been introduced. Many startling cases of *Hymenoptera* mimicked by *Diptera* seem to have escaped the author's notice. The classical case of South American heliconids and pierids, long since described by Bates, really merits fuller treatment than it has received on pp. 232, 233.

The work closes with several very interesting chapters on the colors used in courtship. This is perhaps the most interesting portion of the work, as it deals very successfully with a subject about which there is still wide difference of opinion among zoölogists. Poulton takes his stand with Darwin, and maintains that the peculiar colors, appendages, etc., displayed during courtship by one of the sexes (usually the male) in the presence of the other, owe their origin to sexual selection. This differs from the standpoint taken by Wallace, who denies that the so-called secondary sexual characters thus originate. He maintains that they receive their explanation in natural selection pure and simple. It would be difficult, we believe, to explain many of the facts cited by Poulton, notably Peckham's observations on the courtship of spiders, from Wallace's standpoint.

At the end of the book is given a table illustrating the author's classification of animal colors. Although the Greek derivatives to designate the different uses of colors are well chosen, they will probably not be generally adopted. Zoölogists will probably continue to speak of mimetic rather than pseudoposematic and pseudepisematic colors.

The text is provided with sixty six woodcuts and a chromolithographic frontispiece illustrating a remarkable case of mimicry in South African butterflies.

NOTES AND NEWS.

THE College of Physicians of Philadelphia announces that the next award of the Alvarenga prize, being the income for one year of the bequest of the late Senor Alvarenga, and amounting to about a hundred and eighty dollars, will be made on July 14, 1891. Essays intended for competition may be upon any subject in medicine, and must be received by the secretary of the college on or before May 1, 1891.

—A lady, writing to the *British Medical Journal*, says she recently heard a young girl of fourteen years "whistle," as her people called it; but "warble" it really was, for she kept her mouth slightly open, and the lips merely trembled, the notes being formed in the throat, the centre of it working as a bird's does when singing, and the sounds produced were exactly like those of blackbirds and thrushes. She warbled several airs to pianoforte accompaniments faultlessly, and most beautifully modulated; and so powerful were the notes, that her grandmother, who was excessively deaf, could catch every one, without the slightest effort, in another room a little distance off. In the same room some notes were deafening when she poured them out at the *forte* parts. She had been self-taught entirely from "whistling" to her dog and sitting in the window to "warble" to the birds.

—The flora of the Kutais and Tchernomorsk regions, on the eastern coast of the Black Sea, says M. Kuznetsoff in the "Izvestia" of the Russian Geographical Society (*Nature*, Nov. 6), belongs, as already known, to the Mediterranean region of ever-green trees. Next comes the region of West European flora, characterized by the extension of the beech-tree, and offering on the slopes of the mountains the very same subdivisions as one is accustomed to see in the Alps. That region extends over the provinces of Kuban and Terek as far east as the water-parting between the Terek and Sulak Rivers. The territory to the east of it was formerly thought to have a flora more akin to that of Asia, but a distinctly European flora appears again on the eastern slopes

of the Daghestan plateau turned towards the Caspian Sea; while the dry Daghestan plateau itself has a flora decidedly recalling that of the highlands of central Asia. M. Kuznetsoff explains these differences by the moister climate of the Caucasus highlands, due to the proximity both of the Black and of the Caspian Sea. But it may also have a deeper cause. In fact, the plateaus of Daghestan cannot but appear to the orographer as a continuation of the geologically oldest plateaus of Asia Minor, now separated from the main plateau by the relatively much younger chain of the Caucasus. Referring to the vegetation of the Caucasus during the tertiary epoch, when the Caucasus was a vast island surrounded by tertiary seas, M. Kuznetsoff considers that the flora of Daghestan has undergone the greatest change since the tertiary epoch. The floras of both the western and the eastern Caucasus have maintained more of their old characters, owing to less change having gone on in their climate, which has remained moist; and the vegetation of the Black Sea coast, which has a climate very much like that of the Japan archipelago, has retained still more of the aspects it had during the tertiary epoch. Further exploration will be necessary to show how far climate alone can account for the present characters of the flora of the Caucasus.

—Mr. Arthur Winslow, State geologist of Missouri, in his report of the State Geological Survey for October, states that detailed mapping has been continued in the central and south-eastern portions of the State, and about 140 square miles have been covered in Randolph, Howard, Chariton, Johnson, Madison, and St. Francois Counties. During the first half of the month the examination of the clay deposits of the western central counties was in progress; but during the latter half this work was discontinued temporarily in order to make final additions to other work already nearly completed. This work in these counties will be resumed this month with the hope of completing the field-work there this season. Examination of the mineral waters has been made in the following nine counties, and samples for analysis have been collected: Adair, Schuyler, Macon, Daviess, Mercer, Chariton, Pike, Marion, and Ralls. In the laboratory, analyses have been made of mineral waters and clays, and a number of specimens sent in by outside parties have been determined. For the purpose of preparing a preliminary report upon the coal-industry of the State, inspections have been made in Callaway, Clay, Ray, Johnson, Saline, Henry, and Barton Counties. The survey has many applications for information concerning the coal-deposits of the State, and there are no publications on hand with which to satisfy this demand: hence this preliminary report will be prepared for early distribution. It will not be possible to give in such a report all of the valuable detail as to the distribution and character of the coal beds which the final reports and maps are designed to contain; but it will furnish general information relating to the present condition of the coal-industry and its prospective development, concerning which nothing comprehensive and official is available now. Work has also been in progress in Webster and Greene Counties in extension of what was done there last summer.

—*Nature* announces the death of Dr. Alexander John Ellis, F.R.S. The following notice of his career is from the *London Times*: "Dr. Ellis, whose original name was Sharpe, died at his residence in Auriol Road, West Kensington, on Oct. 28. He was born in Hoxton in 1814, and educated at Shrewsbury, Eton, and Trinity College, Cambridge, of which he was elected a scholar in 1835, and graduated B.A., being sixth wrangler, and first in the second class in classics, in 1837. He was elected a fellow of the Cambridge Philosophical Society in 1837, of the Royal Society in 1864 (being a member of the council for 1880-82), of the Society of Antiquaries in 1870, of the College of Preceptors in 1873, and a life governor of University College, London, in 1886. He was president of the Philological Society during 1872-74, and also 1880-82. He was also a member of the Mathematical Society of London, of the Royal Institution, of the Society of Arts, and honorary member of the Tonic Sol-Fa College. Dr. Ellis was a voluminous author, his works including 'The Alphabet of Nature,' 1845; 'Essentials of Phonetics,' 1848; 'Plea for Phonetic Spelling,' 1848; 'Universal Writing and Spelling,' 1856; 'Early English

Pronunciation, with Special Reference to Chaucer and Shakspeare,' 1869-86; 'Glossic,' 1879; 'Practical Hints on the Quantitative Pronunciation of Latin,' 1874; 'On the English, Dionysian, and Hellenic Pronunciation of Greek,' 1877; 'Pronunciation for Singers,' 1877; 'Speech in Song,' 1878; together with numerous other works and tracts on music and phonetics. He received the silver medal of the Society of Arts for three papers in connection with the 'Musical Pitch' at home and abroad."

—The following is a complete list of the papers presented to the National Academy of Sciences, at its meeting in Boston, Nov. 11, 12, and 13: "On the Primary Cleavage Products formed in the Digestion of the Albuminoid, Gelatine," by R. H. Chittenden; "On the Classification and Distribution of Stellar Spectra," by Edward C. Pickering; "On the Relation of Atmospheric Electricity, Magnetic Storms and Weather Elements, to a Case of Traumatic Neuralgia," by R. Catlin; "On the Growth of Children studied by Galton's Method of Percentile Grades," by Henry P. Bowditch; "On Electrical Oscillations in Air, together with Spectroscopic Study of the Motions of Molecules in Electrical Discharges," by John Trowbridge; "Some Considerations regarding Helmholtz's Theory of Dissonance," by Charles R. Cross; "A Critical Study of a Combined Metre and Yard upon a Surface of Gold, the Metre having Subdivisions to Two Millimetres, and the Yard to Tenths of Inches," by W. A. Rogers; "On Evaporation as a Disturbing Element in the Determination of Temperatures," by W. A. Rogers; "On the Use of the Phonograph in the Study of the Languages of the American Indians," by J. Walter Fewkes; "On the Probable Loss in the Enumeration of the Colored People of the United States, at the Census of 1870," by Francis A. Walker; "On the Capture of Periodic Comets by Jupiter," by H. A. Newton; "On the Proteids of the Oat-Kernel," by Thomas B. Osborne; "On the Present Aspect of the Problems concerning Lexell's Comet," by S. C. Chandler; "The Great Falls Coal Field, Montana, its Geological Age and Relations," by J. S. Newberry; "Notes on the Separation of the Oxides in Cerite, Samarskite, and Gadolinite," by Wolcott Gibbs; "On the Relationships of the Cyclopteroidea," by Theo. Gill; "On the Origin of Electro-Magnetic Waves," by Amos E. Dolbear.

—The Brooklyn Institute, through its department of geography, is preparing to open about Jan. 1, 1891, a permanent exhibition of specimens of the best geographical text-books, maps, atlases, globes, reliefs, models, telluria, and other apparatus used in the various countries of Europe and America in their courses of geographical instruction, or required by persons of culture or wealth who equip their libraries with the best geographical material. The plan having been submitted to the foremost educators in this country, to heads of scientific bureaus of the United States Government, and to leaders in business and financial affairs, has received their indorsement, and will have the advantage of their hearty co-operation. The exhibition will be open for one month in the building of the Brooklyn Institute. The collection will then be exhibited for one month in each of the cities of New York, Philadelphia, Boston, Baltimore, Washington, Chicago, St. Louis, and other great centres of population. The entire collection, except loaned specimens, will then be arranged as a permanent exhibition in the building of the Brooklyn Institute. In connection with the exhibition, the Brooklyn Institute is collecting material for a comprehensive report which it will publish regarding the position and methods of geographical instruction in America and Europe. The exhibition will also illustrate lectures to be delivered on the teaching of geography. The exhibition will be free to the public. The collection will be fully catalogued and conveniently arranged for purposes of comparative examination and study. The intention is to illustrate the methods of geographical instruction in all grades, from primary to university, and to give the American public an unequalled opportunity to become acquainted with the best examples of all the various appliances, wherever produced, that are used to illustrate geography. It is desired to make a very prominent department of books that are helpful to teachers of geography. For further information address Cyrus C. Adams, president Department of Geography, Brooklyn Institute, Brooklyn, N.Y.