

development of civilization. But Professor Wilson holds that science should confine itself to counting the chemical elements and becomes a 'noxious, intoxicating gas' when its methods are applied to the study of the development of society.

Views such as Professor Wilson offers on the limitations and evil effects of science seem like a survival from the denominational college of fifty years ago, and I regard it as unfortunate that they should have been presented in an official address at the inauguration of Princeton University.

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SCIENTIFIC LITERATURE.

Monograph of the Bombycine Moths of America, North of Mexico, including their Transformations and Origin of the Larval Markings and Armature. Part I., Family 1, the Notodontidæ. By ALPHEUS S. PACKARD. Nat. Acad. of Sci., Vol. VII., First Memoir. 1895. Pp. 291, 4to, plates 49, many colored, and 10 maps.

"I am greatly pleased," writes Dr. A. Spuler, of Erlangen, "when I note how much, in these latter days, the study of entomology in America is pursued by true zoologists, and not by mere dilettants." Dr. Spuler and other exponents of scientific entomology will be convinced in this belief if American entomology maintains the standard set for it by Dr. Packard's latest important work, the first part of his monograph of the Bombycine moths of North America.

It is with the chapters of the book included in its first eighty pages that my brief criticism will chiefly have to do. These introductory chapters present a discussion of the present knowledge of the phylogeny of the Lepidoptera, a knowledge to which Dr. Packard has been a conspicuous contributor, and with the details of which he is thoroughly conversant.

Since there have been students of insects there has been classification of insects. There have been pre-Darwinian and post-Darwinian classifications. But not until very recent years has there been much of a revealed phylogeny of insects. However fully and unreservedly we have, for years now, accepted the theory of descent, we have been, speaking for the while only of entomologists, very slow to align our work with our beliefs. We have been content

with Linnæan classifications. We have been inconsistent. We have let phylogeny and ontogeny mean to us—if, haply, they had any meaning for us—problems for the 'general zoologists,' the German morphologists and embryologists. But if we are Darwinians our systematic entomology must take on the aspect of phyletic study, and drop its too long persistent Linnæan character.

Of late, fortunately, there has appeared an awakening among American entomologists, and some notable progress has been made toward an appreciative recognition of the demands made upon us by our beliefs. This welcome beginning of the phylogenetic study of insects is specially noticeable in the treatment of the Lepidoptera. The recent studies of Comstock and Dyar, of Chapman (England) and of Spuler and Walter (Germany), combined with his own, have enabled Dr. Packard to present in the preliminary chapters of this monograph a suggestive and reasonable discussion of the phylogeny of the moths and butterflies. It would be ill advised to attempt to refer here to the details of this discussion; many of these details are yet moot points, most of them, indeed. There is yet no consensus of authority to refer to on these questions. There are not enough men competently familiar with the matters at issue to form a consensus of authority, if one may so put it. It is a bold undertaking, perhaps, to attempt, as yet, to arrange phyletically the species of a family of insects; but it is a praiseworthy undertaking, because it is consistency. Dr. Packard is a Neo-Lamarckian. He believes that he finds much evidence for Neo-Lamarckism in the adaptational characters of the larvæ and pupæ. A Neo-Darwinian might affirm that the author has assumed the truth of Neo-Lamarckism and has explained the origin and development of these characters in accordance with his belief. There is an unsatisfying character about the treatment of the interpolated adaptive characters of the immature stages. The categorical distinguishing between the adaptational and the congenital characters seems arbitrary. But any questioning of the interpretations or dissent from the conclusions contained in these chapters on the phylogeny of the Lepidoptera cannot lessen

our enthusiastic appreciation of the character of the discussion. There is much inspiration for the right sort of entomology to be got from reading these eighty and odd pages.

It is that part of the work as yet unreferred to which alone is indicated by the title of the book. Much of the inspiration gained from the perusal of the introductory chapters would be lost if the purely systematic part of the work were not treated consistently with the author's beliefs. But the treatment is consistent. The Bombycine family Notodontidæ, including, according to Dr. Packard's delimitation of the group, '21 genera and about 78 species,' found in America, north of Mexico, is the subject of a careful monograph. The biology of each species is given as fully as known, a special attention being paid to the details of larval markings and armature. It is hardly necessary to say that careful descriptions of immature stages "in the light of the recent very suggestive and stimulating work of Weismann, entitled 'Studies in the Theory of Descent,' " are not so common in monographs of Lepidopterous families that, met with, they should pass without comment. Such treatment is distinctly rare. The detailed descriptions of these immature stages are supplemented by a splendid series of colored plates of larval forms. There are also a series of plates of wing venation, some figures of the external anatomy of the heads of imagines and a number of maps showing the geographical distribution of the family.

The book is a valuable one for its point of view as well as for the actual matter of it. American entomology will be helped by it in reputation and in inspiration.

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Determinative Mineralogy and Blowpipe Analysis.

By GEORGE J. BRUSH. Revised and enlarged by Samuel L. Penfield. New York, John Wiley & Sons. 1896. Pp. 163 and 33 double pages of tables. \$3.50.

Mineralogists, metallurgists and students in these branches of science, who have been using the former edition of this book, on account of the value of text and tables, will gladly welcome this revised edition.

In this new edition, the text has been thoroughly revised and for the most part new material has been substituted. The work has been greatly enlarged by the addition of a new chapter and by the expansion of the chapter on 'The Reactions of the Elements.'

In the introductory chapter, the author has very clearly and concisely explained and defined the commoner terms and names used in mineralogy and also those in chemistry, necessitated by the study of the chemical character of the minerals.

The second chapter has been devoted, (1) to a description of the blowpipe apparatus "which is necessary or convenient for making the simple tests for the identification of the elements and the determination of the minerals;" (2) to the reagents commonly employed in the study of minerals; (3) 'to the nature and use of flames.' There is here a very full and clear description of the character and use of the different flames, well illustrated with cuts and descriptions of experiments on the composition and use of the different parts of the flame.

In the chapter on the reactions of the elements, which occupies nearly one hundred pages of the text, the elements have been taken up alphabetically, for convenience of reference. In connection with each of the elements, a short description is given of their occurrence and rarity. The tests described, which include a great many new ones especially devised for this work, have all been carefully verified by the author, and are applicable for the elements in their many forms of combination. Many of the old tests have been simplified and improved, and details are given concerning methods of manipulation in making many of the tests, which will be found exceedingly useful. This part of the book will be greatly appreciated by mineralogists on account of the thorough and exhaustive work that has been done in bringing the text up to date. In connection with most of the elements, experiments are very carefully described, by which the tests can be very characteristically illustrated. This adds greatly to the value of the work as a text-book. To facilitate the use of the work as such and also as a book of reference, the descriptions of the rarer elements are given in fine print, as well