biology' from two of our leading universities, still has work to do. As Prof. Brooks tells us (SCIENCE III., p. 708), the Johns Hopkins University had not in the twenty years of its history examined a candidate for the doctorate in 'biology.' Yet this year, perhaps as a declaration of independence from the influence of Prof. MacMillan, it has conferred the degree of Doctor of Philosophy on a candidate who chose 'biology' as one of his subjects.

Questions of nomenclature seem to be more interesting to the botanist than to the zoologist, and it is not the present writer's intention to discuss this one. But the occasion seems favorable for asking Prof. MacMillan why it is that zoology has become to such a large extent synonymous with biology. Is it not, perhaps, because the zoologist is usually a biologist, whereas the botanist is usually only a botanist? The great advances which, during the past forty years, have transformed biology, have come almost exclusively from the side of the zoological sciences. Zoologists have not hesitated to use botany when they could, but in the advancement of biology, botany, even as a silent partner, does not seem to have contributed its share of capital. Y.

AN UNCOMMON AFTER-IMAGE.

SOME days since, while traveling by boat, I awoke in the early morning, and, thrusting my head out of the window, was almost overpowered by the yellow glare. I then raised the blind with its yellow horizontal slats, and for a moment noticed the glare pouring through them. Then, shutting my eyes, I had for a few seconds an after-image of some half-dozen *vertical* green lines gradually fading away into *vertical* violet lines.

HIRAM M. STANLEY.

MACKINAC ISLAND, June 20.

THE NINE-BANDED ARMADILLO.

TO THE EDITOR OF SCIENCE: In his recent paper, in the *Bulletin of the American Museum of Natural History*, on mammals collected in Bexar County and vicinity, Texas, Prof. Allen refers to the capture of specimens of the nine-banded armadillo at several places north and west of Bexar County, but mentions none from that county. It may be of interest, therefore, to note that five specimens were taken in the county in May, 1895, about four miles from San Antonio. There were two adults and three young, all captured immediately after a heavy rain which had driven them from their burrow. This family of armadillos was presented by Mr. F. Hardman, of San Antonio, to the National Zoological Park in this city, where two of its members may still be seen, apparently in excellent health.

A. B. BAKER.

WASHINGTON, D. C., June 22, 1896.

ROCHEFORT ON THE CARIBBEANS.

TO THE EDITOR OF SCIENCE: Appropos of the wonderful explorations of Mr. Frank Hamilton Cushing and his party in San Marco, Florida, last winter, under the auspices of the University of Pennsylvania, I would call attention to the following sentence in Rochefort (Caribby Islands, London, 1666, p. 291). Speaking of the Caribbeans he says: "Their Habitations are somewhat near one to another, and disposed at certain distances after the manner of a Village; and for the most part they plant themselves upon some little ascent, that so they may have better air and secure themselves against those pestilent flies which we have elsewhere called *Mosquitos* and *Maringoins*, which are extreamly troublesome, and whereof the stinging is dangerous in those parts where there is but little wind stirring. The same reason it is that obliges the *Floridians*, beyond the bay of *Carlos* and *Tortugues*, to lodge themselves for the most part at the entrance of the Sea in Huts built on Piles or Pillars."

O. T. MASON.

U. S. NATIONAL MUSEUM, July 2, 1896.

SCIENTIFIC LITERATURE.

Handbuch der paläarktischen Gross-Schmetterlinge für Forscher und Sammler. Zweite gänzlich umgearbeitete und durch Studien zur Descendenztheorie erweitete Auflage, etc. VON DR. MAX STANDFUSS, mit 8 lithographischen Tafeln und 8 Textfiguren. Jena, Gustav Fischer, 1896. 8°. Pp. 392.

This is much more than an ordinary handbook for the lepidopterist, since it comprises a

great deal of new matter relative to the hybridization and seasonal dimorphism of Lepidoptera, the result of some twenty-five years of work. It is therefore a most important contribution to biology, and is another in the series of notable works called out by the epoch-making essays of Weismann contained in his 'Studies in the Theory of Descent,' published over fifteen years ago, when the author was an orthodox Lamarckian.

The practical topics discussed relate to the mode of collecting, the breeding of larvæ, including pairing of the sexes of the same and of different species. This portion is succeeded by lengthy accounts of certain special cases of hybridization and of hybrids between different European species of Saturnia, with details regarding the biological, anatomical and physiological peculiarities of the hybrids, including a very neat and obviously correct phylogeny of the genus as concerns the European species. This part is followed by generalities on hybridization and hybrids, and on pairing both in confinement and in nature.

The egg-state, larva and pupa, their care, artificial hibernation, diseases, etc., are fully treated from the point of view of one who has reared thousands of specimens in the most successful, careful and scientific manner.

Next to the subject of hybridization that of seasonal dimorphism as discussed by Standfuss is of special value, since he brings forward many new facts. It is treated under the following heads: Albinism, melanism, change of color, exchange of colors, local races, local forms, local varieties, seasonal dimorphism, based on experiments on butterflies (species of Papilio, Rhodocera, Vanessa, Argynnis, and on a moth, *Dasychira abietis*.

The paper succeeding, devoted to thoughts relative to the question of species-formation, contains the author's general views, and the book ends with the directions for collecting the imagines.

It would have been better, we think, if Dr. Standfuss had divided the work into two parts, separating the practical directions from the scientific part, but the result will be that the amateur and collector will be perhaps, in some cases at least, insensibly led to become a scientific observer, and thus great good will result in placing the study of insects on a higher plane.

The results of the experiments in keeping the pupa of *Papilio Machaon* at a temperature of 98–99° F. produced not only changes in markings and hue, but also in form, such as the lengthening of the 'tail,' while the specimens were lighter in color, some bearing a perfect resemblance to those that fly in August, near Antioch and Jerusalem. On the other hand, the pupa subjected to cold gave out butterflies which resembled the Swiss and German forms emerging from hybernated chrysalids. The experiments were numerous and confirm the earlier results obtained by Weismann, W. H. Edwards, Merrifield and others.

Dr. Standfuss is a neo-Lamarckian, believing that, as the result of his experiments, seasonal and local varieties or species are the result of direct changes in the environment—a logical conclusion from the facts. And if this is the case in the laboratory it logically follows that it must be so in nature, especially where isolation occurs. His observations afford him proof of the inheritance of acquired characters. He states that the results of his experiments on the effects of change of temperature render it impossible to bring them into harmony with the views of Weismann, and he is in accord with the conclusions of Eimer as to the direct influence of the environment and of the inheritance of acquired characters in species-building. He thinks that natural selection is limited in its operation, many species having originated and become established without its aid. Finally, he gives us the following definition of the idea of a species: "Species are groups of individuals which, through the direct influence of certain factors of the external world, have diverged so far from the nearest allied types that they can no more cross with these in their sexually developed forms; that the completely developed offspring resulting from this crossing, should it occur, are absolutely incapable of breeding with one another."

It is to be hoped that an English translation of this important work may be published, so as to infuse a more scientific spirit into the minds of the many who are interested in the collection

and rearing of Lepidoptera. The plates are most excellent and add greatly to the interest and value of the book.

A. S. Packard.

A Compendium of General Botany. By Max Westermaier. Translated from the German, by Albert Schneider. New York, John Wiley & Sons.

In the preparation of the English edition of this book the translator has endeavored, as stated in his preface, to 'adhere as closely as possible to the author's form, style and concept of the science of botany,' and 'to make it a translation in the true sense of the word.' The title of the German edition, 'Kompendium der allgemeinen Botanik für Hochschulen,' indicates that the work was intended for the higher grade of institutions in Germany, *i. e.*, for the universities; and so, in the translation of the author's preface, the literal rendering of the word 'Hochschulen' as 'high school' in this country is misleading as to the place which the book was intended to occupy. That the book was not intended for the high school, as that term is used in this country, can be seen from even a hasty examination of the text, and the preface states that "it is assumed that the pupil has a general knowledge of chemistry, of physics, of the proper use of scientific terminology, and has the ability to estimate the value of hypotheses and undecided problems."

A similar notion of the *Hochschule* caused adverse criticism to be made of the German edition, as being too technical and advanced for the 'high school.'

The work is divided into five parts which treat of the following topics: The cell, tissues and simple organs, organs and systems of organs, reproduction, the general chemistry and physics of plant life, classification of plants, taxonomy.

In Part I., the cell, the author treats of the primordial utricle and cell wall in their mutual relationship, turgor, plasmolysis, both the living and dead inclusions of the cytoplasm, as well as the cell sap, etc., the internal structure and method of growth of the cell wall, its chemical composition, subsequent changes, and the products of growth in thickness and surface of the cell walls. The chemical and physical aspects of the cell and its contents are treated more fully than the phenomena of the active cell, indirect division of the nucleus being passed by with a few illustrations and very brief descriptions of the stages represented.

Part II., tissues and simple organs, has received greater consideration than any other part of the subject, 107 pages being covered in the discussion, which with the 37 pages devoted to the Cell make 144, or more than one-half of the entire work. This part is divided into eleven chapters as follows: 1st, the function of formative tissues (meristum and cambium); 2d, structure and function of the epidermal tissue system; 3d, function of mechanical tissues; 4th, the function of the conducting system; 5th, protection of the meristematic areas of the plant body; 6th, food substances derived from the atmosphere; 7th, the function of aeration; 8th, the function of roots; 9th, the appropriation of assimilated food substances; 10th, the storing and function of reserve material; 11th, secretion.

Under the function of the conducting system a full discussion is given of the various cell forms of the system, the stem structure of mosses, vascular cryptogams, monocotyledons, dicotyledons and gymnosperms, the structure of roots, and the special physiology of the movements of food substances and water in plants.

Part III., organs and systems of organs, treats of the morphological and physiological relations of organs, their principal forms and modifications, metamorphosis, correlation, phyllotaxy, and the various kinds of inflorescence.

Part IV., reproduction, receives very brief mention, being merely an outline, with illustrations, of the development and reproduction of representative plants in the larger groups, the morphology and physiology of the seed and fruit of phanerogams, the general physiology of reproduction, pollination, hybridization, heredity, special creation and the 'so-called theory of natural descent.'

Part V., the general chemistry and physics of plant life, includes chemical physiology, the physiology of growth, the relation of light, gravity and other factors to plant life, and the physiology of plant movements.