While so much is claimed * * * as due to climatic causes, it is admitted also that habits and food, and other conditions of life than those resulting from climate, have a marked effect in determining modifications of form and color among animals. A scarcity of a favorite kind of food will undoubtedly force species to subsist upon the next best that offers, which may be so different as to modify certain characters and fit the species to live upon the less desired food. A change of food may lead to modification of dentition, the muscles of mastication, and the organs of digestion, and, correlatively of other organs or parts of the body; the modification, however, arising simultaneously among all the descendants of the individuals thus driven to a change of diet, instead of appearing first in a single individual and becoming perpetuated in its descendants alone. Entomologists have found that, among insects of the same species, the forced or voluntary use of different food-plants gives rise to modifications of color and structure, and hence results in what have been termed phytophagic varieties or subspecies, and that man can also affect such changes at will by simply changing the food of the species. Again, the geological character of a country is well known to have a marked effect upon the size and color of animals inhabiting it, as is strikingly illustrated among molluscous animals, whose abundance, and even presence, is largely dependent upon the constituents of the soil. Over regions of the United States, for example, where the underlying rock is non-calcareous, the species are both few in number and sparsely represented. In respect to the fresh-water mussels, those of the same species from different streams are easily distinguishable by differences in the thickness of the shell, in color, shape, and ornamentation, so that the character of the shells themselves affords a clew to the locality of their origin. At some localities the species tend to become tuberculous or spinous * * *; at other localities, they acquire a very much thickened shell, or different colors, the same characteristics appearing simultaneously in quite diverse species, and thus becoming distinctive of particular localities. [After reference to mammals of certain regions being influenced in relation to size by the presence of calcareous or non-calcareous soils, and to the birds of the Galapagos Archipelago, with their short wings and large bills, etc., there follows:] The sedentary life necessitated by the confined habitats of species thus situated would naturally act more or less strongly on the organs of flight, and a reduction in the size of the wing would follow; not necessarily through the round-about process of natural selection, through the modification originally of a single individual, but by the direct action on all the individuals alike of the changed conditions of life.

There are thus what may be termed regional modifications due to the direct action of environment, independently of natural selection, in its original, restricted sense, or of isolation. The modifying influence may be either primarily climatic or due to peculiar constituents of the water or soil and the resultant vegetation. In a sense the two latter conditions may act as barriers, with the resultant effect of modified isolation. In general, however, in birds and mammals, in which regional modifications are so patent, the main factor is climate, the action general, and the transition between regions gradual. While all these influences may be as active on islands as on continents, there is in the former the powerful agency of isolation superimposed upon all the other agents that tend to the differentiation of animal forms.

J. A. Allen.

SCIENTIFIC BOOKS.

The Evolution Theory. By Dr. August Weismann, Professor of Zoology in the University of Freiberg in Breisgau. Translated with the author's cooperation by J. Arthur Thomson, Regius Professor of Natural History in the University of Aberdeen, and Margaret R. Thomson. London, Edward Arnold. 1904. 2 vols., illustrated. Pp. 416 and 405.

No one, in the last thirty years, has contributed more to the discussion and investigation of evolutionary problems than has August Weismann. The present work marks the culmination of his long series of stimulating writings. His fertility in hypotheses and keenness of criticism are well known; not less noteworthy is his readiness to withdraw hypotheses when disproved, or to modify them to conform with new discoveries. Thus, the

reader of 'The Evolution Theory' will note many minor changes from the positions taken earlier by Weismann in 'The Germ Plasm,' yet the substance of his theory of evolution remains unchanged.

The fundamental idea in 'The Germ Plasm' was the mutual independence of soma and germ, that is, of the body exclusive of the reproductive cells on one hand, and the reproductive cells on the other hand. Each, it was maintained, might be modified without modification of the other. This idea, at the time a novel one, has been shown by subsequent investigations to be substantially correct. It is the great merit of Weismann to have inspired those investigations. Through experimental studies, in which American zoologists have borne an honorable part, the effects of various external agencies upon the soma have been carefully analyzed. What effect, if any, these external agencies have upon the germ plasm is less clear. The opponents of Weismann, in common with Darwin, have at times maintained that induced modifications of the soma were handed on directly to the germ plasm and thus became hereditary. Weismann has always denied any such modification of the germ plasm through the soma, but concedes a modification of the germ plasm *parallel* with that which is directly induced by the environment in the soma. The germ plasm, however, in his opinion, is less sensitive than the soma to environmental changes, and so responds only to continuous influences, not to those which last for a single generation only. In this way Weismann seeks to find a basis for the innumerable and often marvelously perfect adaptations of organisms to their environment.

Weismann insists upon the germinal origin of variations which are heritable, but concedes that germinal variation may be given a particular direction by the environment. These variations may at first be too slight to have selectional value, but by the persistent action of the environment will be increased until selectional value is attained. Further, they will make their appearance not in an occasional individual merely, as we should expect if they are due to chance, but in so much of the race as is subjected to the continuous influence of the same environment. In taking this position Weismann attaches less importance than formerly to natural selection, adopts a different conception of the origin of variations which are heritable, and accounts more fully for adaptations.

Weismann shows his open-mindedness and breadth of view in adopting from his opponents an idea upon which paleontologists have laid stress, that when an organism has once begun to vary in a given direction, there is an inherent internal tendency for it to go on varying in that same direction, this tendency being quite independent of the environment and due to a struggle of the determinants of the germ plasm among themselves, a process which Weismann calls germinal selection. To this position he has been led by two considerations: (1) that there occur among organisms adaptations too subtle and complicated to have selectional value in the struggle for existence, and (2) that many organisms are over-adapted, that is, have progressed beyond what is advantageous in a particular sort of adaptive variation, as, for example, the extinct Irish elk with his tree-like antlers.

'The Evolution Theory,' while containing a full exposition of Weismann's own views, includes much else. It contains an accurate and interesting historical account of the development of the evolutionary idea from its origin in the speculations of Greek philosophers to its culmination in Darwin's 'Origin of Species.' A very full account is given of Darwin's views and of the lines of evidence on which those views were based. The mutation theory of de Vries is critically examined, though it finds little favor in Weismann's eyes. Like Darwin, he considers sport variation (mutation) of small consequence in the production of species, believing its effects to be local and temporary, resulting in the production of small and peculiar groups within species, but not of the broader species groups themselves. In breadth of scope and fullness of treatment Weismann's book surpasses all other works on the same subject; it will doubtless long remain the authoritative statement of Darwinism.

The translation from the second German edition has been executed with rare skill and fidelity. The work of the publisher is also good.

W. E. Castle.

Bacteria in Relation to Plant Diseases. By Erwin F. Smith, in charge of Laboratory of Plant Pathology, Office of Physiology and Pathology, Bureau of Plant Industry, U. S. Department of Agriculture. Volume I., Methods of Work, and general literature of Bacteriology exclusive of Plant Diseases. Washington, D. C., published by the Carnegie Institution of Washington. September, 1905. Pp. xii + 285. 4to. Publication No. 27.

We are told in the preface that "the present volume contains an 'outline of methods of work' which was written up in substantially the same form four years ago, in connection with the investigations of the Laboratory of Plant Pathology, Bureau of Plant Industry, United States Department of Agriculture, its publication having been delayed in order to bring the rest of the manuscript into suitable shape." In its present form it is now published 'with the approval of the Secretary of Agriculture.' This book has thus a quasi-official authority, representing, as it does, the high standards set by the scientific bureaus of Washington.

The author says that his monograph 'is not intended to take the place of ordinary text-books of bacteriology, but rather to supplement them.' While primarily intended for the plant pathologist, 'it is hoped that it will be of value to physicians and animal pathologists for purposes of comparison.'

The principal topics touched upon in this volume are the nature of disease, the morphology, physiology and pathogenic character of the organism, the preparation and use of various kinds of culture media, economic aspects, methods of infection, methods of prevention, location and equipment of the laboratory, methods of work, microscopes, nomenclature and classification, working formulae etc. At the close of the book there is a classified bibliography including almost fourteen hundred titles, which must prove of the greatest value to the bacteriologist.

Turning to the section which deals with nomenclature and classification, one reads with a smile the crisp remarks of the author, as when he says 'the nomenclature of the bacteria is in a somewhat chaotic state, as might be expected of a science which has been cultivated so largely by medical men, and so comparatively little by systematic botanists and zoologists.' The designation of species by numbers and letters is condemned, as also the use of polynomials. Better descriptions are strongly urged, and far more care in associating a particular organism with a certain disease. The suggestion is made that the starting point for species should be 1881, when pure cultures became possible. The suggestion is made, also, that the starting point for genera should be 1872, the date of Cohn's 'Untersuchungen über Bakterien.' With some modifications the author adopts Migula's plan of classification in his 'System der Bakterien,' 'until some distinctly better system makes its appearance.'

On the question of the polymorphism or fixity of bacteria Dr. Smith holds 'a sort of middle ground':

> There can be no doubt that the same organism sometimes exists as a long filament in which no septa are visible, and at other times as a short or nearly isodiametric rod, but we are not thereby compelled to consider the short form as a *Micrococcus, i. e.*, as something very different from the long form. Physical conditions probably have much to do with bringing about these differences.

We should like to quote further from this very suggestive and helpful book, but must refer the reader to the volume itself. The value of this volume is so evident that we look with great interest for the second, whose publication it is hoped will not be long delayed.

Charles E. Bessey.

The University of Nebraska.

SCIENTIFIC JOURNALS AND ARTICLES.

The *Journal of Nervous and Mental Diseases* for November opens with a paper by D'Orsay Hecht in which he reviews the literature of dementia præcox, frequently illustrating the