

or indirect, which they are making toward state endowments for medical education in Nebraska, Illinois and elsewhere. This opposition, however, will not be misunderstood and the progress for better standards of medical education has received too much impetus to be stopped by obstructions prompted by selfish interests. It is not only the right, but also the duty, of each state to provide a good training for those who are to have in charge the health of the people of that commonwealth as is the case in nearly all other countries.—*Journal of the American Medical Association.*

SCIENTIFIC BOOKS

Some Neglected Factors in Evolution. An Essay in Constructive Biology. By HENRY M. BERNARD, edited by MATILDA BERNARD. New York and London, G. P. Putnam's Sons, 1911.

The late Mr. H. M. Bernard has written several works which testify to a painstaking industry and a desire to take a broad view of the problems which arose in connection with his line of work. His more important contributions to zoology were volumes on the Apodidæ, the "Catalogue of the Madreporarian Corals in the British Museum" and his studies on the retina, and it was these last, especially, that were responsible for the ideas expressed in the volume under review, which has been edited from unpublished manuscripts by Mrs. Bernard. Bernard's studies of the retina led him to regard it as a syncytial network, and this conception rendered him skeptical as to the cell as the ultimate structural unit; it seemed to him to demand the postulation of a simpler unit, which might stand in the same relation to the cell as this does to a metazoan. This unit he termed a chromidium and described it as a particle of chromatin from which delicate linin filaments radiate, the stellate linin-chromatin mass being "embedded in a minute drop of some fluid albuminous matrix to the surface of which the filaments extend." By the growth and frequent partial division of such a unit a cell is formed, a unit of a higher

grade and capable of being regarded as a synchromidium in which the chromatin material has become aggregated mainly at the center of the mass, the linin-filaments of the various component chromidia uniting to form a network and felting together to form the nuclear membrane. By this conception of the cell the author imagined that he had succeeded in reconciling two very divergent theories of cell structure, the chromatin particles being identical with Altmann's granules, while the linin-network produces the appearance which Bütschli had attributed to a foam structure. Just as the chromidium by imperfect division gives rise to the cell person represented by the protozoa, so this gives rise to individuals of a higher grade, the gastræal unit, represented by the cœlentera and the platyhelminths, and this to an annelidan unit, represented by the remaining groups of animals with the exception of man, who constitutes the final grade. And throughout each of these units there is continuity of structure, the linin-filaments forming a continuum throughout the entire organism to whatever grade it may belong, and the chromatin aggregating at the nodes of the linin-reticulum to form nuclei. Special condensations of the linin-filaments occur to form such structures as the cœlenterate mesogloea and basement membranes in general, on the surface of which the nuclear nodes arrange themselves to form epithelia. Skeletal structures, from the radiolarian shell, the sponge spicule and the cœlenterate corallum to the vertebrate supportive tissues, also form in connection with it, and it gives rise to such structures as the nematocysts, cilia and nerve- and muscle-fibers.

This is, in brief, a statement of the first of the two main theses which the book seeks to establish. It is, however, difficult to perceive the necessity for such a unit as the chromidium. It stands in quite a different plane than the other intracellular units, such as biophores, gemmules, etc., that have from time to time been suggested, in that it is an independent unit of such a great complexity that the distinction between it and a cell, except

as regards volume, is by no means clear. Furthermore, it stands on a different plane from the supracellular units recognized by the author, in that these may be seen to form ontogenetically from a cell, but no one has yet observed the ovum developing by the division of chromidia. Indeed, one of the most obvious criticisms of Bernard's book is that it shows throughout a remarkable disregard of the facts of ontogenesis and histogenesis, so much so that it sometimes describes processes as its author supposed them to occur according to his theory, rather than as they actually occur. Further the same disregard has led the author to phylogenetic conclusions which, if they are to be regarded as essential conclusions from the theory under exposition, can only serve to render the reader skeptical as to its sanity. For instance, one is surprised to find that the Alcyonaria form a phylum altogether distinct from the other Anthozoa and related to the platyhelminths, that ctenophores are medusæ with the margins of the bell fused together, that *Sagitta* represents most accurately the primitive annelid and that the leeches may be regarded as representing the invertebrate types from which the vertebrate phylum has arisen!

Much more suggestive than the first is the second main thesis of the work, namely, that there has been a rhythm in evolution, each heightening of which corresponded with the appearance of one of the recognized grades of personality, that is to say, with the establishment of colony-formation of a higher grade. The differentiation and adaption possible for a cell-person is limited, but with the establishment of cell-colonies the potentialities become greatly increased. The author's treatment of this part of his subject is however again marred by a tendency to transcendentalism. Throughout all his grades of personality he finds continuity of structure combined with colony formation, and this theory demands continuity also in the colonies formed by his highest grade of persons, mankind. It is the linin-filaments that serve for the continuity; they are conducting paths

for stimuli. But after all it is the stimulus that is the important item and not the material basis of transmission, and in human colonies we find transmission of stimuli without material continuity (telepathy), so that they too fall into line with the theoretical demands. This is much like eliminating the Cheshire cat and leaving only the grin, and why ant-colonies by the same process of reasoning should not be placed with man in the highest grade of persons, it is difficult to understand.

The book is interesting as a study in speculation, but it is doubtful if the speculations will find acceptance at the hands of biologists.

J. P. McM.

The Silva of California. By WILLIS LINN JEPSON. Memoirs of the University of California, Vol. II. Berkeley, 1910.

This magnificent folio volume does credit to the author and to the university which issues such a sumptuous account of the trees of California. It comprises 283 pages of text with 11 figures, 85 full page plates, 3 folded maps, subject and geographic indexes.

After a short preface, the author considers the geographic distribution of California trees, dividing the state into a number of provinces enumerated below. The Sacramento and the San Joaquin valleys form one province, which are essentially treeless, except for five stands or groves of the valley oak, or the interior live oak, while the banks of streams are lined with willows and cotton woods. The south coast ranges with an average height of 2,000-5,000 feet, are forested near the ocean with redwood, Douglas fir, tan oak, madroña and inland with other species, such as live and blue oaks, while Monterey pine and cypress are confined to an isolated arboreal island, constituting the Monterey peninsula. The north coast ranges are considered as to their climatic and floristic aspects with the redwood most prominent and the Douglas fir, tan oak, lowland fir, coast hemlock, Sitka spruce of secondary importance. The forest flora of the Sierra Nevada Mountains is enumerated, as well as that of