PURPLE BACTERIA AS SYMBIONTS OF A LICHEN

THUS far lichens have been considered as being fungi with which are associated certain algae, and it is supposed that at least in certain species both may live to common advantage.

It seems, however, another symbiosis is possible, which I have observed on a lichen thus far known as *Chiodecton sanguineum* (Sw.) Waino. It is a very conspicuous and attractive species, which I have found abundantly in Florida and in some parts of the island of Cuba. One encounters it especially in the damp hummocks growing against stems of *Quercus virginiana, Magnolia grandiflora* and of some other trees.

It is a crustlike lichen which is nearly round or irregular in shape and may develop a diameter of from half a centimeter to about two decimeters. Its characteristic is its center of a grayish to bluish gray color surrounded by a deep red margin, which is as far as I am aware never absent. On the grayish parts of the upper side of the lichen some red-colored blotches may appear in streaks or in small spots. Whereas the upper surface is thus almost gray, the lower one is deep red.

When this lichen is observed under high power of the microscope it is at once evident that the red color is caused by small organisms, which surround the hyphae of the fungus.

It is generally accepted that the algal symbiont of *Chiodecton* is a species of *Trentepohlia.* This is, however, not the case with this species of lichen. The red organisms have not a single characteristic in common with the *Trentepohlia.* In fact, they are not green algae nor blue-green algae; but these are purple bacteria.

They are oval and vary from 1.5 to 2 microns in length; they possess no flagella but show a vivid Brownian movement, as the same is present when they are dead. The bacterial cells contain the well-known bacteriopurpurin.

Cultures and subcultures and various other investigations with these bacteria have been made by the writer, which have proved that they belong to the genus *Rhodobacterium.* The name of the lichen has consequently been changed into *Rhodobacteriophora sanguinea,* and this new species of purple bacteria has been given the name of *Rhodobacterium lichenophora.*

An extensive account of my research of this interesting lichen will appear soon in one of the botanical periodicals.

J. C. TH. UPHOF

ORLANDO, FLORIDA

LIBRARIANS AND SCIENTIFIC RESEARCH

THE following statement was accidentally gleaned from the "Report of the Librarian of Congress," Washington, Government Printing Press, 1923, Page 205. (On reclassification of Library Service).

9. To hold the staff permanent, a maximum of less than $6,000 is unsafe, and in a library, permanence in the staff positions is essential. A scientist engaged in intensive research can readily pass over his work to his successor, who will take it up where he leaves off. The specialist leaving a library takes with him an accumulated knowledge of the particular collections and the apparatus, and an acquired experience in interpretation, which can not be replaced.

The librarian of Congress would be a better librarian if he understood better the conditions of scientific research.

B.

SCIENTIFIC BOOKS

The Fauna of British India, including Ceylon and Burma. Oligochaeta. By J. STEPHENSON. London: Taylor and Francis. 1923.

ABOUT seventeen years ago Col. Stephenson began to devote himself to the study of Indian earthworms. Laboring with extraordinary zeal, he published thirty-five papers, and described 126 new species and a number of varieties. He has now gathered all his results, combined with those of other workers, into a volume of 518 pages, treating the subject as exhaustively as the present state of our knowledge permits. This book is something more than a collection of descriptions of families, genera and species; it includes many reflections on the general aspects of the subject, on such topics as evolution and geographical distribution. It readily appears from a study of the tables and descriptions that specific (and even generic) characters have arisen by meristic variation in many instances. This variation is going on at the present time, as Beddard has well shown in the case of a common Indian species, *Perionyx excavatus* of E. Perrier. There is no reason why changes of this type should not occur independently in a number of places, and consequently doubts arise as to the phylogenetic integrity of some of the genera. The probable lines of descent have been worked out with some apparent accuracy, but the author has been led to suggest that of the large genus *Megascolex,* some species are derived from *Notoscolex,* others from *Perionyx,* and others probably from *Spenceriella.* Moreover, those derived from *Notoscolex* have had their origin "at different times and places." From such considerations one may be led, according to his bias, to either propose a series of new genera or lump those already recognized. By referring all these worms to a single

genus, it is possible to avoid the inconsistency of having polyphyletic genera, but only at the expense of considerable practical confusion. By going to the other extreme and dividing *Megascolex* into as many genera as there are probable lines of descent, we employ a logical method, but have before us a series of generic units which are extremely difficult to distinguish or define. We may suppose that posterity will on the whole prefer the second method, and will remove what would now be ambiguities by more intensive morphological and biological studies. In one case, Col. Stephenson states the dilemma very clearly. The genus *Plutellus* has given rise to a group called *Fletcherodrilus* by the fusion of certain paired structures. The morphological deviation is considerable, but if *Fletcherodrilus* is recognized, it has to consist of two species, which have arisen quite independently from *Plutellus* in India and Australia respectively. It is here assumed that *Fletcherodrilus* must be based wholly on the characters mentioned, but very likely some author will find other characters in the Indian species (*P. palniensis*), and will make it the type of a new genus.

It will be readily seen that the work is of interest to all biologists, whether they have occasion to study Indian worms or not. It contains a very excellent account of the general features of these animals, and full directions for their study. Were the reviewer possessed of adequate funds, he could think of no greater service than to make possible the publication of a Fauna of North America on the same lines as the Fauna of British India. We have the men who could write the volumes, given time enough. We certainly have the resources for publication, could they only be diverted into such productive channels. The volumes on the Indian Fauna, published by authority of the government, are reasonably condensed, yet full enough to supply the information desired. They are well printed and contain many illustrations. The style of publication is not extravagant and they are accordingly sold for a very moderate price. It is not unlikely that a North American series, thus conceived, would pay its way. It would, however, need an initial subsidy, as in the case of the much more condensed and far less adequate North American Flora, which is now or was recently self-supporting.

T. D. A. COCKERELL

UNIVERSITY OF COLORADO,
Boulder, Nov. 28, 1924

Maker, Man and Matter. Thread of Life Series I. By PIERSON WORRALL BANNING. International Book Concern, Los Angeles, California.

THIS is a volume of fantasy, purporting to deal with facts, of the type termed by Fechner, "cuckoos' eggs laid in the nest of science." It describes the development of the earth from the time when it was rolled out flat and inhabited by the first of the "four root races," invisible, boneless, sexless and ubiquitous, up to the year 7120 B. C. The period of the first root race (which followed the condensation of the whirlpool nebulae accomplished by electrons in the vortex of energy) lasted, we are told, 575,377,000 years. With the second root race, the hyperborean continent gradually extended towards the equator, forming, about 500,000,000 B. C., the continent of Lemuria inhabited 200,000,000 years by the third root race. The fourth root race began on the "lost Atlantis" nearly a million years ago, this continent breaking up, 100,000 to 200,000 years ago amid shocking episodes. It is to be succeeded by the new continents of Numerica and Nulantis, and so on. The book leans heavily on quotations from Blavatzky, Besant, Donnelly and other noted sciosophists treated as scientific authorities. Baron Münchhausen is, however, not even mentioned.

It is, in fact, an expanded fairy tale, conceived and told without genius or charm of any sort.

DAVID STARR JORDAN

STANFORD UNIVERSITY

SPECIAL ARTICLES

NOTES ON THE OLFACTORY AND OTHER PHYSIOLOGICAL REACTIONS OF THE CALIFORNIA HAGFISH[1]

POLISTOTREMA STOUTI is an interesting representative of the Marsipobranchii, the lowest of the vertebrates save amphioxus. The species is found in abundance in the waters of Monterey Bay and has held the interest of systematists (1), anatomists (2), morphologists (3), embryologists (4), and physiologists (5) since the opening of the Hopkins Marine Station of Stanford University in 1892 on the rocky Point Aulon on the south shore of Monterey Bay. No less than five young investigators of the station in the early years, all now prominent in science and in medicine, made extensive anatomical studies of the hagfish with drawings adequate for publication. Actual anatomical publication was first accomplished for the circulatory system by Dr. C. M. Jackson (2) under the inspiration of Professor Howard Ayers.

Nothing was known of the embryology of the hagfish until the eggs were found and identified in 1893. Even then many of the eggs obtained through an intelligent and shrewd Chinese fisherman, Ah Tak, were decomposed or partly digested. Ah Tak claimed

[1] From the Hopkins Marine Station of Stanford University and the University of Missouri.