

### Sulphur Bacteria

*Sulphur Bacteria: a Monograph.* By Prof. D. Ellis. Pp. ix + 261. (London, New York and Toronto: Longmans, Green and Co., Ltd., 1932.) 21s. net.

THE sulphur bacteria belong to that remarkable group of autotrophic organisms, the members of which have adopted eccentric modes of metabolism in which unusual sources of energy are tapped. In their case it is the partial oxidation of sulphuretted hydrogen, or perhaps rather of the HS' ion, with formation of free sulphur. At the same time, carbonic acid is reduced and made available as a source of carbon compounds. Nitrogen can be assimilated from ammonium salts. These materials and some mineral salts are all that is required for the continued growth and well-being of the organisms. The group is confined to organisms which have sulphur globules in their cells. The further oxidation of this sulphur to sulphate, which undoubtedly occurs, has not been proved to be connected with the vital activity of the cells. Sometimes the sulphur is excreted and undergoes oxidation outside the cell.

A feature of great interest in the group is the occurrence of coloured organisms (rhodo-thio-bacteria) and much discussion has taken place as to the nature and function of the colouring matter. The prevailing opinion appears to be that by its aid the organisms are enabled to utilise the energy of light in the assimilation of carbon from carbon dioxide. The sulphur metabolism of these coloured organisms seems, however, to be the same as that of the leuco-thio-bacteria, so that they have two strings to their metabolic bow.

Considerable practical difficulties arise in the study of the group; especially, perhaps, that pure cultures are difficult to obtain and have not yet in all cases been attained and that the organisms are highly pleomorphic.

The author pays great attention to the classification of this large and important group and adopts an original scheme based primarily on a division into the two groups of colourless and coloured sulphur bacteria. These yield between them eleven families, distinguished by differences in morphology and modes of reproduction and ciliation; these again are divided into 23 genera. A full and well-illustrated description is given of the known organisms, and numerous special points of interest are discussed in separate chapters:

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such as the intimate structure of the cell, irritability, the mechanism of ciliary motion, etc.

Finally, a very complete account is given of the work on the colouring matter of these organisms. This was first investigated by Ray Lankester in 1873, but the composition and relations of the two colouring matters which are present have not yet been settled.

The sulphur bacteria play an important part in Nature in the sulphur cycle, in which the combined sulphur of the amino-acids of the protein molecule is brought, through the stages of sulphuretted hydrogen and free sulphur, into the condition of a soluble sulphate assimilable by plants, to be reintroduced by them into the protein molecule.

All interested in this fascinating subject will find in Prof. Ellis's book a clear and well documented account of all that is known about it. A. H.

### World Civilisations

*The History of World Civilisation: from Pre-historic Times to the Middle Ages.* By Prof. H. Schneider. Vol. 1. Pp. xiv + 360. Vol. 2. Pp. vi + 361-908. (London: George Routledge and Sons, Ltd., 1931.) 42s. net.

THIS important and well-known book has been translated from the German, quite competently, though with a good many slips in proof correcting. It naturally suggests the still more famous book of Spengler, which it resembles in the wide sweep of its survey, the facility of its comparisons and the insistence on the rise and fall of civilisations. It is, however, a much weightier book for several reasons. In the first place, it is based on a thorough and scholarly study of the materials; Dr. Schneider's knowledge of the early history of all the civilisations he treats—Egyptian, Babylonian, Greek, Roman, Indian and Chinese—is amazing. In the second place, he is not obsessed by the fallacy which commended Spengler's work as a sensation but undermined its real value, namely, that we are in presence of the decadence of our own civilisation. In the third place, Dr. Schneider is a professor of philosophy and hence by his profession and habitual ways of thinking is always trying to see his subject as a whole.

Now, as human civilisation is one great connected process, this is a prerequisite of the highest importance. At the same time it has led the author