

yet quite unexplained) way: similarly in regenerating flatworms, depressants alter the size and form of the morphogenetic gradient-field as a whole. Curiously enough, no mention is made of the continuous gradients revealed by the growth of molluscan shells or of localized areas of excessive proliferation (as in rhinoceros horns), or of the change from positive to negative allometry, with consequent deformation of the whole growth-gradient, during evolution as in the antlers of roe-deer, or during ontogeny as in the limbs of ungulates.

There is no mention of Witschi's demonstration that moderate delay of fertilization in *Anura* deviates the sex-determining mechanism, while greater delay upsets the growth-balance and leads to tumorous proliferation. Indeed, the chapter on growth could profitably have included a section on abnormal and cancerous growth.

I realize that reasons of space must have precluded the inclusion of many of these subjects. However, I hope that in any future revision the size and scope of the work will be enlarged to permit their inclusion.

The discussion of embryonic induction is, as one would expect, both thorough and illuminating. But it left me wondering whether it, or at least its terminology, was not somewhat bedevilled by the history of the subject. Should not the term 'organizer' now be dropped? Again, should not 'evocation' and 'competence' be assimilated to comparable phenomena in other stages of developmental physiology? Is there, for example, any essential difference between the 'induction' of neural tissue by the evocator of the blastopore lip and the 'modulation' of the basal layer of the epidermis into mucous epithelium by vitamin A, or the development of the sexual apparatus of the two sexes under the influence of the appropriate sex-hormones? Here, as in many other places, epigenetics is entering new domains. For example, the facts concerning viruses, plasmagenes, and transduction (admirably though rather briefly discussed by Waddington), together with the proof recently given by Medawar and his associates that many tissues are constantly discharging nucleoprotein particles into the circulation, are opening up wholly new vistas of genetic and epigenetic interaction.

Let me conclude by again expressing my gratitude to Prof. Waddington for this valuable and stimulating book, and my hope that he will in the not too distant future supersede it by a new and even more comprehensive work on the "Principles of Epigenetics".

JULIAN HUXLEY

## PRIMEVAL MICROBES

### Biochemistry of Autotrophic Bacteria

By Dr. Howard Lees. Pp. viii+112. (London: Butterworths Scientific Publications, 1955.) 21s.

THE autotrophic bacteria may be considered as survivors of the first living organisms to appear on Earth; like the green plants they assimilate carbon dioxide, but they show great variation in the mechanism of assimilation, which perhaps indicates that they are trial pieces in the evolution of more efficient and successful types of metabolism than they themselves possess. Some use light as a source of energy; others, lacking pigment, use the oxidation

of a specific inorganic compound. Other species oxidize organic compounds for energy, but cannot assimilate them; and finally there are species which normally are heterotrophic, but can carry out certain autotrophic reactions.

The autotrophic bacteria, however, are important not merely as picturesque survivors, or for studies in comparative biochemistry. They have great practical importance. Without the nitrates made by autotrophic nitrifying bacteria, farming would be impossible; and other autotrophs produce sulphur, and purify the air by assimilating carbon monoxide. On the debit side are the activities of species which cause stone and concrete to decay, corrode buried iron pipes, and produce hydrogen sulphide in standing water, and even sometimes in the sea.

Dr. Howard Lees has now written a short book on the biochemistry of these bacteria, in which most of the available knowledge is collected from very scattered sources. It covers the field very well, and the varieties of metabolism are lucidly explained. He is more interested in the philosophical than the practical aspects of the subject, and writes on evolution with far more conviction than on ecology. There are some faults of style, notably a fondness for words like 'overall' and 'subsume'. Careless proof-reading must account for the appearance of 'oxidized' in one place where 'reduced' is obviously meant, for the curious double plural 'flagellæ' which has crept in on p. 35, and for the explanation of the Calvin cycle in the appendix, which is a year out of date though the diagram is contemporary.

JANE MEIKLEJOHN

## AUXINS AND PLANT GROWTH

### Auxins and Plant Growth

By Prof. A. Carl Leopold. Pp. xi+354. (Berkeley and Los Angeles: University of California Press; London: Cambridge University Press, 1955.) 37s. 6d. net.

AS the title indicates, this book is concerned only with auxins, namely,  $\beta$ -indolylacetic acid and the many compounds (natural and synthetic) which are related to it chemically and which exert the same remarkable growth-controlling actions in green plants. Prof. A. C. Leopold introduces the reader to his book by expressing alarm at the widespread lack of knowledge of the fundamentals of auxin physiology among research workers concerned with the uses of these compounds in agriculture, and the book is intended to alleviate this unfortunate state of affairs. Prof. Leopold has attacked the problem with vigour and has succeeded in laying before the reader the auxin situation in all its puzzling complexity.

The book falls naturally into two parts. The first half (eight chapters) deals with the fundamentals of the action of auxins and includes their chemical nature, occurrence, metabolism and biochemical mechanisms, the whole being preceded by a clear, if somewhat limited, historical introduction. A chapter on extraction and measurement techniques should form a useful basis for practical exercises by the student. Two chapters are devoted to physiological, anatomical and developmental effects, and a balanced, though restricted, picture emerges of the many parts natural auxin may play in plants. The second half (ten chapters) is concerned with auxins in agriculture