REVIEWS

FARBLOSE ALGEN. Ein Beitrag zur Evolutionsforschung. By E. G. Pringsheim. Fischer Verlag, Stuttgart. 1963. Pp. 471. Price DM 64.

Scattered among the chlorophyll-pigmented algæ of every group—and also the flagellatæ and bacteria—are scores of colourless races which require organic sources of nutrition. From his vast knowledge Dr Pringsheim here describes these races exhaustively, their structure and classification, their requirements of growth and habitat.

Genetically there would appear to be little to say about the colourless algæ since only one form, in the genus *Polytoma*, is known to undergo sexual reproduction. Yet for the evolution of these plants—both their past and their future evolution—this itself is highly significant. Without sexual reproduction we should not expect the colourless algae to evolve new species. And, in fact, outside the special group to which *Polytoma* belongs, there is no evidence that they ever have done so. For each colourless race is paired with a coloured species from which by loss of chlorophyll it may be supposed to have been derived—the reverse process, it would seem, never occurring.

The experimental evidence that certain races of *Euglena gracilis* treated in various ways can lose their chloroplasts (or chromatophores) and become in form and function very like the natural colourless species *Astasia longa* agrees with this view.

A genetic problem of quite a different kind is raised by evolutionary change in the colourless algæ. It is that of the genetic continuity of organellæ. Not only the plastids but the determinants of fibres or flagella are probably irreplaceable when lost. This surprises Dr Pringsheim who thinks in terms of tissue-regeneration rather than of cytoplasmic inheritance. But it may well encourage others to begin with these problems where he has left off.

C. D. DARLINGTON.

NEW PATTERNS IN GENETICS AND DEVELOPMENT. By C. H. Waddington. Columbia University Press. 1962. Pp. xv+271. \$10.00.

The aim of this book, which is based on the Jesup lectures that the author gave at Columbia University in 1961, is to consider the origin of new patterns of structure in developing cells and tissues in the light of the new patterns of thought arising from recent advances in biology, particularly microbiological genetics and ultrastructural biology of tissues. The book is timely, for many biologists are now realising that advancing knowledge of gene structure and nature, and of gene-protein relationships has put us in a position to look in new ways at one of the oldest, least understood but most characteristically biological of the problems of biology: the problem of the organisation and development of form.

The author begins by discussing differentiation at the biochemical level, for “one can hardly discuss new patterns without devoting a good deal of attention to new substances”, in terms of “gene-action systems” which he divides into “gene-protein” and “protein-phenotype” phases. Jacob and Monod’s work on induction and repression of enzymes of *E. coli* provides “a good example of the type of conceptual scheme required”, and leads to discussion whether differentiation, initiated by gene-cytoplasm

interactions, may involve control at different levels in the gene action system, and how sets of repressor systems may interact, thus leading to a chapter on the kinetic organisation of gene action systems. Through chapters on Types of Morphogenetic Process, Morphogenesis in Single Cells, and Multicellular Morphogenesis we are led to the final chapter on Biological Patterns in which the most complex problems are considered.

The conception of the book is excellent and the treatment has the breadth we have come to know as characteristic of its author. Naturally, therefore, each reader will find some things missing, others with which he is inclined to disagree.

The present reviewer found it surprising that the author did not deem it worthwhile to include some discussion of polymorphism, for surely some of our contemporary knowledge of the role of modifying genes, which influence the efficacy of the segregational or environmental switches involved in polymorphisms, is relevant to our understanding of differentiation generally. This is perhaps one aspect of the tendency of the author rather to play down the value of segregation as able to throw light on the basic problems of development, despite the profitable conclusions that have been drawn from such studies. It is probably true that the purely descriptive embryology of mutants has already contributed most of the general conclusions it can, but the study of genetic differences with other techniques such as those of experimental embryology will surely bring great profit wherever suitable material can be used. Another reason for his limited consideration of polymorphism may be a tendency of the author to view segregations too simply. In discussing the shell patterns of *Theodoxus fluviatilis* (p. 202) he concludes that it is "probable that the realisation of the pattern is controlled by a rather simple hereditary mechanism, possibly involving only one or two major genes". This is surely misleading. The switch mechanism may well involve only one or two major genes, just as in this case it can be operated by simple environmental changes. But we know that the *effects* of a switch in determining a polymorphism, genetic or epigenetic (or an event of differentiation), are themselves affected by many other genes. The techniques of quantitative genetics are developing to a stage where some of these "modifying" genes may be handled with sufficient precision. Study of their action will surely help to throw light on developmental problems.

These are the reviewer's own personal criticisms. They do not detract from the value of the book. Waddington has laid down most of the terms of reference for what is surely to be one of the next great phases in the advance of biological knowledge. Every biologist should read this book, and whatever faults they may find, all who do so will find reasons to be grateful to the author for bringing so much together in such a stimulating form.

J. M. THODAY.

THE PATHOLOGY OF DEVELOPMENT. Hans Grüneberg. Blackwell Scientific Publications, Oxford. 1963. Pp. xiv+309. 70s.

Most animal geneticists have at some time been approached by a general medical practitioner or a pædiatrician who has developed a theory about some class of human congenital abnormality and seeks approval for it. Not infrequently the theory, which is necessarily based on observations of end-point material such as still-born babies, goes against all experience with