

on the application of our growing knowledge of the process to agricultural productivity and control. Roughly one-third of the papers presented are concerned with this aspect of the problem, and this constitutes at least one unique quality of the present collection. It not only brings together the fundamental workers and their work on the understanding of the process of energy conversion by plants, but also focuses on the way in which knowledge of this fundamental process of energy conversion may eventually be of some assistance in the improvement and control of agricultural productivity.

A list of the principal groups into which the eighteen contributions have been subdivided will give an impression of the content. These are: biochemical aspects of photosynthesis, carbon metabolism, chloroplast structure and genetics, water and carbon dioxide transport, and photosynthetic limits on crop yield.

An introductory address by Sterling Hendricks which is devoted principally to the various ways in which light is used by plants, that is, not only as an energy source but also as a control device, and a summary paper by Martin Kamen in which he speculates on the future of photosynthesis research, constitute two special essays very much worth devoting time to.

In a collection of as many different papers as this, it is clearly impossible to comment on each one; however, I think I may be forgiven for focusing particularly on the section on carbon metabolism.

For many years efforts have been expended in trying to prepare isolated chloroplasts capable of carrying out the entire process of photosynthesis, perhaps including carbon reduction at something approaching the rate found in intact plants. While announcement of success in this effort was made rather more than a year ago, it remains for this group of papers to describe in detail the nature of the preparation and some of the successful studies that are now possible with it. Among them is the discovery by Basham and his associates of a light regulated enzyme activity control in the carbon reduction cycle. There is no doubt that this will open a new chapter in our understanding of the dynamic regulation of metabolic processes.

MELVIN CALVIN

## DEVELOPMENTAL BIOLOGY

### Current Topics in Developmental Biology

Vol. 2. Edited by A. A. Moscona and Alberto Monroy. Pp. xiii+298. (New York: Academic Press, Inc.; London: Academic Press, Inc. (London), Ltd., 1967.) 112s.

THE articles in this volume deserve to be widely read, for by their variety and approach they go a long way to establishing the field of developmental biology as distinct from the more traditional field connoted by embryology, with all its unfortunate associations. For example, in most of the papers the deadening hand of inductor theory is not too evident, and it was a pleasure to read in the paper by Thorp and Dorfman, which ranges over the whole field of connective tissue differentiation, that the "... role of induction as a discrete event in connective tissue differentiation becomes more and more nebulous. It is obviously clear that differentiation is a continuous, regulated process and that no cell differentiates alone, but depends for the next direction on dialogue through its own synthetic products with the milieu and other cells". In this volume, most of the papers concentrate on differentiation in a very broad sense, rather than the dialogue, and the spatial aspects of developmental biology are relegated to a minor role compared with the temporal aspects. This reflects the current fashion which will surely change: the concept of polarity is not mentioned in any paper, yet it is probably as fundamental as protein syn-

thesis. In fact, Gross, in a stimulating and provocative paper, considers just how fundamental protein synthesis is in relation to differentiation, using the studies on sea urchin development as his model. It may be noted that he casts considerable doubt on the general view that gene action is not significant during the cleavage stages prior to gastrulation. Brown gives a masterly review of the genes for ribosomal RNA and their transcription during amphibian development, considering particularly the potentiality of it providing a model system for studying the regulation of transcription. The ribosome and enzyme changes during maturation and germination of the castor bean seed are reviewed by Marré. The approach of Yamada on Wolffian lens regeneration uses the full battery of techniques now available to the cell biologist and a picture begins to emerge relating ultrastructural changes to macromolecular synthesis and charting the time course: is this the new morphological embryology? Pierce contributes a fascinating account of teratocarcinoma, using it as a model for a developmental concept of cancer. He suggests that carcinogens may act on differentiated cells in a manner analogous to inducers on embryonic cells. This is particularly attractive, if the concept of an inductor were replaced with more general ideas on cellular interactions and responses.

The direction in which we may look for such ideas might be found in the papers that deal with some aspect of the "dialogue" between the cell and its environment. Stoker provides a badly needed review of the rapidly expanding field dealing with contact and short-range interactions affecting the growth of normal and tumour cells in culture; here there are a number of tantalizing phenomena involving the cell surface and cell growth the mechanism of which is still obscure. One particular aspect of this is explored by Sachs: the mechanism of neoplastic cell transformation which may induce a change in the cell surface and result in a change in the contact inhibition of growth.

This is an excellent volume which completely fulfils the editors' intentions to overcome the "interdisciplinary information gap". Only the very good paper on the Ig A antibody system seems a little out of place.

LEWIS WOLPERT

## CHEMICALS IN WATER

### Chemical Environment in the Aquatic Habitat

(Proceedings of an I.B.P. Symposium held in Amsterdam and Nieuwersluis, October 10-16, 1966.) By H. L. Goltzman and R. S. Clymo. Pp. 322. (Amsterdam: N. V. Noord-Hollandsche Uitgevers Maatschappij, 1967.) 70s.

THIS International Biological Programme symposium was held to discuss chemical methods of analysis and the effect on biological growth of the substances present in water. A manual of recommended methods useful to both chemists and biologists is to be published separately.

The first chapter contains general papers, dealing with oxygen, carbon dioxide, iodine, pH, rH, alkalinity, oxidizability and some specific ions. An interesting account is given of the highly eutrophic inland waters of the Netherlands.

The second chapter on silicon, phosphorus and nitrogen compounds contains an excellent review on the determination of orthophosphate. Another paper describes the use of tetraethyl silicate as a source of "molybdate unreactive" silica for diatoms. A warning is given about the dangers of sample preservation by freezing to  $-20^{\circ}\text{C}$  when dissolved silica becomes insoluble. To recover the reactive form the sample must be kept for 3-5 h after thawing. The measurement of molecular nitrogen fixation is discussed and the use of nitrogen-15 described. The arithmetical mean of Kjeldahl nitrogen determinations