Phytochemistry, 1979, Vol. 18, p. 1257. Pergamon Press. Printed in England.

BOOK REVIEWS

Genetic and Molecular Basis of Plant Pathogenesis: by J. E. VANDERPLANK. Springer, Berlin, 1978. 167 pp. DM 48.

This book is an extended essay in which a distinguished plant pathologist puts forward a new molecular hypothesis for disease resistance in plants. In the opening chapter, the author discusses variation in resistance and also in the pathogenicity of micro-organisms, defining resistance as either vertical or horizontal. Vertical resistance, i.e. Flor's gene-for-gene resistance, is the major topic of the book, although horizontal resistance, that resistance which is not lost through adaptation of the parasite, receives some mention towards the end.

In the hypothesis, the basis of gene-for-gene resistance is said to lie in protein interactions through copolymerization at hydrophobic sites of a specific plant protein, coded for by a resistance gene, with a specific microbial protein. Briefly, the hypothesis as defined on p. 64 runs as follows. In resistance, the protein specified by the gene for avirulence in the pathogen is excreted into the host, where it is unable to polymerize with a host protein. Instead, it stays inside the host cell as a foreign body 'eliciting' phytoalexin synthesis or other related defense processes. By contrast in susceptibility the same microbial protein is able to copolymerize with host protein and this process causes continued protein synthesis in the host cells and hence—a supply of food for the multiplying pathogen.

Much of the rest of the book is taken up with elaborating this theory and considering the largely circumstantial evidence available in favour of the hypothesis. The well known modifying effects of increasing temperature on the expression of disease resistance, for example, are in favour of the theory. Towards the end the author returns to horizontal resistance and fits this into his hypothesis referring particularly to eye spot disease of sugarcane and Victoria blight of oat.

Although Vanderplank argues his case most persuasively, I am not sure that I accept his hypothesis in its entirely. One flaw in his argument, to my mind, is that he dismisses lectins as potential carriers of genetic specificity, not realising perhaps that a greater variation is possible in the oligosaccharide units of glycoproteins than in pure proteins. Thus, while amino acids are all linked together in the same way by peptide bonds, sugar units can be joined together at least theoretically by either α- or β-linkages and through a variety of hydroxyl groups. Some of the best parts of the discussion are those covering genetic aspects and I was particularly struck with his logic that susceptibility genes must be useful to the plant and are not deleterious as is usually thought.

The book is well written throughout. Each chapter is divided into a series of connected sections which is just as well since it makes 'concentrated' reading. The effort is well worth while and I would like to recommend it to all plant biochemists working on aspects of plant resistance to disease.

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Photosynthetic Oxygen Evolution: edited by H. METZNER. Academic Press, London, 1978. vii + 432 pp. £18.

This book is made up of thirty-one papers presented at the symposium on "Photosynthetic Oxygen Evolution" held at Tübingen in September, 1977. The first thing that should be pointed out is that it is not of the heroic proportions suggested by the page numbers. Its length is due to the fact that it has been produced directly from typescript by an offset-lithographic process, as a result of which there are only some 250–350 words per page. The publishers, in their wisdom, have retyped all the contributions so that the typeface and layout of the articles are uniform throughout.

The book is the first summary of the work done on light-induced oxygen evolution, and includes much that is new and previously unpublished. Its editor has marshalled an impressive list of contributors; indeed adequate coverage of the subject matter could hardly have been achieved otherwise, but their very number (sixty-six) make a detailed review impossible.

The articles are segregated into six sections. The first section, Photoreactions in Aqueous Systems—Physicochemical Aspects, contains three short reviews which deal with the structure of water, photochemical redox reactions and photosynthetic oxygen evolution as an energetic problem. Between them these articles provide a good, lucid introduction to the physicochemical aspects of photosynthetic oxygen evolution. In the second section, Structural Aspects, the topography and structure of the thylakoid membrane are considered. The section opens with a short review in which a 3D model of the thylakoid membrane is constructed from the structural data obtained by electron microscopy and X-ray diffraction. This is followed by three research papers which report on: the use of serological techniques to determine on which side of the membrane carotenoids and a photosystem II-associated polypeptide are located; the use of thylakoid membranes from a thermophilic bacterium to investigate O_2-evolution in relation to the lipid composition of the membrane; and a comparison of the O_2-evolving system in agranal and granal chloroplasts of maize. Section III, Electron and Proton Transport, is made up of seven articles which reflect the research interests of the authors. The topics covered include the use of absorbance and fluorescence spectroscopy to study the donor side and oxidizing side of photosystem II, the reduction of phaeophytin, the light-

dependent binding of *p*-nitrophenol to photosystem II and proton release during the photolytic cleavage of water. In addition, there is a paper on a possible function for phylloquinone in the electron transport chain between the two photosystems. Section IV, Oxygen Evolution, opens with two papers which deal in theoretical terms with the functional and structural aspects of photolytic water cleavage. These are followed by two papers on the possible function of bicarbonate ions in photosystem II activity, and the section is concluded by a research paper on the study of photosystem II, with a modulated oxygen electrode. Section V, Role of Manganese: Model Systems, has four papers devoted to work carried out with model systems, i.e. molecular oxygen, light and metalloporphyrins; photoredox reactions of manganese; photosensitization by titanium oxide and zinc oxide; cathodic reduction of oxygen on chelates. The remaining four papers in this section describe biochemical and photochemical studies with thylakoid membranes and manganese-containing proteins on the roles played by manganese and chloride in photosynthesis. The book is completed by Section VI, Ontogenetic Evolution of Photosystem II, which consists of four papers dealing with the development of photosystem II activities on exposure to light of etiolated tissues of angiosperms.

Overall the book gives a good, well-balanced coverage of the state of knowledge with regard to photosynthetic oxygen evolution and the experimental approaches that have been used to gain this knowledge. In particular, the theoretical aspects are well presented and should be intelligible to all who might be drawn to read the book. The picture which emerges is that, despite all the data accumulated by biochemists working with chloroplasts and thylakoid membranes and by photochemists and electrochemists studying model systems, the details of the reactions of photosynthesis concerned with the evolution of oxygen still remain to be elucidated.

The book is very well produced and adequately indexed. It is certainly worth a place on the bench of anyone who is involved in research into photosynthesis, and it could be read to advantage by final year students taking courses in photosynthesis, photobiology or photochemistry.

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