

areas the link up with biochemical information was not given more prominence. For example, in the chapter on plant response to solar ultraviolet radiation, by M. M. Caldwell, the current theory that flavonoids or other phenolics concentrated in the epidermal cells have a role in protecting plants from damage by UV-B radiation was not discussed at any length. Agreed, the experimental evidence is still slim but it deserves consideration. Likewise, there are several chapters on plant response to temperature extremes, but the changes that have been observed repeatedly in fatty acid unsaturation of membrane lipids (see e.g. P. Mazliak, *Progress in Phytochemistry*, Vol. 6, pp. 94–97) were scarcely mentioned.

In other chapters, notably those in volume 12B, biochemical, especially enzymic, studies of adapted plants receive more attention. Thus, R. M. Crawford in a well balanced account of physiological responses to plant flooding, discusses in depth the different metabolic responses that have been encountered in anoxic plants. Equally, there is a very satisfying link up between biochemistry, physiology and ecology in the excellent

chapter on the functional significance of the different pathways of CO₂ fixation in photosynthesis, which is written by C. B. Osmond, K. Winter and H. Ziegler. In other areas of physiological ecology, the link up with biochemistry has yet to come. There are certainly many interesting and subtle aspects of plant adaptation discussed in these two volumes which deserve biochemical investigation. Heat tolerance is one area of great fascination. How do the enzymes in such plants continue to function without denaturation?

With the publication of these two excellent volumes, we now have available comprehensive, up to date and authoritative accounts of how plants respond to light and temperature, water and wind. The two later volumes will complete the picture, with accounts of ecosystems, mineral recycling, nutritional aspects, symbioses and allelopathic interactions.

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Plant Cell and Tissue Culture—A Laboratory Manual: by J. REINERT and M. M. YEOMAN. Springer-Verlag, Berlin, 1982. 83 pp. \$22.00

There are an increasing number of scientists who turn to *in vitro* cultured plant cells for solving a range of problems in different areas of the botanical sciences. Therefore, the teaching of basic principles and methods in plant culture work should be an essential part of the training program of undergraduates and technicians.

Now, another very useful laboratory manual has been produced by two experts in the field of plant tissue culture. This book is a valuable source of practical information and basic techniques covering complete details of material, equipment and technical procedures at the laboratory bench. Fully illustrated instructions, detailed protocols and schedules will help the student in acquiring the experimental techniques quickly and effectively. The topics are grouped into six sections: 1. Aseptic isolation of plant material and studies on growth and cell division, 2. Application of plant cell cultures in bioassays of cytokinins, 3. Morphogenesis *in vitro*, including embryogenesis, shoot and root regeneration, anther culture and the induction of haploid plants, vegetative propa-

gation of orchids, 4. Techniques for the isolation, culture and fusion of protoplasts, 5. Secondary metabolites in tissue cultures and 6. Embryo and organ culture including meristem culture. The section on secondary metabolites in tissue cultures has obviously been chosen to demonstrate the potential use of plant cell cultures for the production of those secondary compounds that are of interest for the biochemists, but it does not really involve a new basic method in cell culture technique. The appendix offers useful information concerning the sterilization procedures, the preparation of different culture media, cell number counting procedures and finally a list of commercial suppliers.

To my own knowledge, the experiments presented in this manual have been performed in the authors' laboratories as part of undergraduate training courses so that reproducibility and accuracy are guaranteed. In accordance with the authors' intention, this manual "should have its place on the laboratory bench in front of the student, open and ready to use". So it will be a valuable guide for those entering plant cell culture work.

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