JOHNSON, C. B.: PHYSIOLOGICAL PROCESSES LIMITING PLANT PRODUCTIVITY. — Butterworths, London—Boston—Sydney—Wellington—Durban—Toronto 1981. 395 pp. £ 25.00.

Twenty contributions published in this book represent the proceedings of the Thirtieth University of Nottingham Easter School in Agricultural Science, which was held at Sutton Bonington in April 1979. Research workers of different specializations and experiences joined their efforts to determine the contributions of single physiological processes in plants to crop production. These efforts resulted in deep analyses of photosynthesis, photorespiration, transpiration and water use and energy conversion efficiencies as they underlie plant growth and dry matter accumulation. Partial phenomena such as *e.g.* photochemical and carboxylation processes, CO_2 and water vapour conductances, water potential of leaves, *etc.*, are estimated, taking into account *e.g.* chloroplast structure and development, stomata responsivity and leaf ontogeny. The limitations set by the effects of radiant energy (adaptation to shade, photoperiodism, diurnal and seasonal changes in plant irradiance), water supply (short- and long-term effects of drought), temperature (*e.g.* frost injury) and salt stresses, air pollution and nutrient deficiency are quantified with respect to vegetative and generative growth and development, and dry matter production of plants and their organs. Where available, the responses of C_3 and C_4 plants are considered separately and relevant genetic aspects are stressed.

It is to be highly appreciated that each contribution brings not only detailed knowledge but also extensively reviews the up-to-date information on interactions between the above-mentioned processes in their complexity. This well arranged and printed symposial volume supplied with numerous figures and tables of the summary character is recommended to specialists working in plant physiology, biochemistry, ecology, genetics, and bioclimatology and agrometeorology as well.

DANUŠE HODÁŇOVÁ (*Praha*)

GATES, D. M.: BIOPHYSICAL ECOLOGY. — Springer-Verlag, New York—Heidelberg—Berlin 1980. 611 pp. Cloth DM 79.50, approx. US $ 43.80.

This book reviews the up-to-date knowledge of the relationship of plants (and animals as well) to their ecological environment. The interactions between the biological and physical events are the problem of many variables. Basing on information supplied by single disciplines of biology, physics, chemistry, meteorology, climatology, *etc.*, the author pays attention to the primary factors which determine the energy status, gas exchange and, partly, the chemical kinetics of plants. It was necessary to specify the physical nature of processes such as the photosynthesis, evaporation and transpiration by plant leaves and concomitant phenomena such as optical properties of leaves, resistance to CO_2 and water vapour transfer, water potential of leaves, *etc.*, in relation to the effects of radiation, CO_2 and water-vapour concentration and temperature. To this purpose, the author gives a complete picture of spectral composition of solar radiation and radiation climate (including its geographical, diurnal and seasonal changes), explains the radiation laws, analyzes in detail the latent heat transfer by conduction and the free and forced convection with laminar and turbulent flow, respectively, over the surfaces of different size and shape and characterizes gas diffusion processes in plant leaves. The descriptive as well as phenomenological and synthetic approaches allow the author to determine the mass and energy budget of plants (and/or leaves) with respect to steady-state conditions, transient effects and long-term changes. Limitations given by the above-mentioned physical factors are considered taking into account plant adaptation to various environmental conditions: In view of this, *e.g.* cold and heat resistances leading to the survival of plants under temperature extremes are well explained. Finally, models of photosynthesis and respiration developed on the basis of biophysical principles are discussed.

The objective of this book is to make analytical methods amenable to students of ecology. In the effort to show the practical use of theoretical knowledge numerous examples of the application of biophysical theory to plant responses and concrete problems are given at the end of each chapter. The book will be a useful aid not only to students but also to researchers in various fields of science. Its high value as a first-rate educational and information source is supported by 163 illustrations, a survey of symbols used, four appendices (introducing the conversion factors to SI Units and cgs equivalents, some physical constants, physical properties of the air, water vapour and carbon dioxide, and characteristics of Sun-Earth geometry) and a comprehensive subject index.

DANUŠE HODÁŇOVÁ (*Praha*)

CLAYTON, R. K.: PHOTOSYNTHESIS: PHYSICAL MECHANISMS AND CHEMICAL PATTERNS. — Cambridge Univ. Press, Cambridge—London—New York—New Rochelle—Melbourne—Sydney 1980. 281 pp. H/C £ 17.50, P/B £ 6.95.

The progress in the field of photosynthesis goes hand in hand with a deeper insight into the constituent biophysical and biochemical events. At the same time, persistently increasing information complicates orientation so that every study which facilitates it and helps to understand the complexity of photosynthesis has to be welcome. The monograph reviewed satisfies this demand. In four parts of the book, basic photosynthetic events on electron/proton and atom/molecule levels are not only individualized by single functional and structural aspects but they are also fully discussed in spatial and time-dependent relations. Besides the introductory chapter in which historical development of knowledge of photosynthesis to about 1960 is outlined, all attention is paid to the modern topics and conceptions of single steps of photosynthetic process: functions, structures and compositions of pigment-protein complexes (*e.g.* relations between absorption, fluorescence, and photochemistry, structure of thylakoids, antenna components, control of quantum distribution to Photosystems 1 and 2, energy transfer), photochemical charge separation, secondary transport of electrons and protons, and oxygen evolution (electron donors and acceptors, pattern of electron and proton transport), the formation of ATP and the assimilation of carbon dioxide (electrochemical gradients, energy efficiency of photosynthesis, carboxylation processes, *etc.*). The general features of photosynthesis are explained by comparing responses of the green plants, bacteria and, partly, of algae. These comparisons allow us to estimate the evolutionary diversity of photosynthetic mechanisms in different taxonomic groups.

The monograph is written concisely and some scientific background is needed for a full comprehension of the text. This is why it may be recommended mainly to advanced students and research workers specialized in particular fields of biophysics.

DANUŠE HODÁŇOVÁ (*Praha*)

JOHRI, B. M. (ed.): EXPERIMENTAL EMBRYOLOGY OF VASCULAR PLANTS. — Springer-Verlag, Berlin—Heidelberg—New York 1982. 273 pp., 81 figs. Cloth DM 98,—, approx. US $ 45.70.

In this volume, recognised investigators assemble the most important information on a wide range of topics of experimental plant embryology with particular emphasis on the rapidly advancing research of *in vitro* culture of cells and tissues of reproductive organs of Angiosperms. The culture of young floral primordia and flower buds affords a potentially useful tool for studies concerning the control of cellular differentiation and flower morphogenesis. The most important aspect of flower culture is related to callusing and plantlet production in various floral explants. Anther culture has become a topic of great interest focused on haploid plant production from microspores or young pollen grains and has been especially successful in the species of *Solanaceae* and *Gramineae* families. The culture of ovary, ovule, nucellus and embryo facilitated the understanding of factors that regulate the development of an ovule to a mature seed. It has also been successful in overcoming incompatibility barriers in hybridization, in preventing abortion of hybrid embryos from normally unsuccessful crosses and in inducing polyembryony, nucellar embryogenesis and parthenogenetic egg cell development. The endosperm yields in culture continuously growing callus in some species, while in others, triploid cell differentiation and the formation of triploid plantlets have been achieved. One of the main fields of experimental plant embryology is concerned with the complex interactions between the male gametophyte and the sporophytic tissues of the gynaeceum controlling the processes of fertilization which precede the syngamy. Significant progress in structural, physiological and biochemical research made on this topic during the last two decades is summarized and effective techniques to overcome sexual incompatibility are surveyed. The last of the 7 chapters devoted to Angiosperms gives an outline of protoplast culture and its potential applications in genetics and plant breeding. Although this topic does not pertain to experimental embryology, the processes of zygotic and somatic embryogenesis may be of common interest. Of the other vascular plants, attention is paid to Pteridophytes and Gymnosperms. The chapter on experimental embryology of ferns covers morphological, cytological and biochemical aspects of the development of sex organs, sperms and eggs and of the processes of fertilization and embryo formation, and the chapter on Gymnosperm embryology is focused on the culture of embryos and gametophytes at various stages of development.

The book has a plant and a subject index, all chapters have an extensive bibliography and are effectively illustrated. It will doubtless be welcomed by students and other investigators interested in an introduction to the various directions of research in experimental plant embryology.

J. TUPÝ (*Praha*)