

LI, P. H. (ed.): *POTATO PHYSIOLOGY*. — Academic Press, Inc., Orlando—San Diego—New York—Austin—London—Montreal—Sydney—Tokyo—Toronto 1985. 586 pp., US \$ 85.00, £ 73.50.

Under the brief title a monograph is hidden which is devoted not only to growers and breeders of potato, this relative newcomer among the world's major food crops. A group of 27 authors was successful in creating a book dealing with modern methodology and new results from most diverse fields of plant physiology investigations: photosynthesis, regulation of formation of the products of the primary and the secondary metabolism, nutrition, growth and development controls, energy metabolism. And all that in a single, comparable "model material" naturally with emphasis on its specifics, particularly on tuberization. More than half of the book is devoted to the problems of tuber physiology — to the study of chemical, ecological and induction factors, to the course of the tuberization process from the viewpoint of cytological, anatomical, and biochemical characters. Such chapters as, for example, "Tuber initiation in *Solanum tuberosum*: effect of phytohormones and induced changes in nucleic acid and protein metabolism" or "Molecular approaches to the study of the major tuber proteins" simultaneously represent theoretically very interesting and experimentally based papers on the molecular-biological principles of functional and structural differentiation of plant cells, tissues and organs. In contrast, the chapter "Development and structure of tubers" which is documented by excellent, beautiful micro- and macrophotographs may be considered their methodological antipole, and the chapter "Potato rest" contributes to general knowledge of the mechanism of plant dormancy. Chapters of the type of "Physiological disorders of potato tubers" or "Potato frost hardiness" will certainly be appreciated by specialists. However, not the specialists alone will be excited when reading the closing chapter "Potato tissue culture and its application in agriculture". As it does not only document the very advance in utilizing the tissue culture methodology for virus disease eradication, plant propagation and breeding of this crop, but is simultaneously a mini-textbook of the basal tissue culture techniques including the protoplast ones. As far as the content and form are concerned, the book is an extraordinary work, which also convincingly documents the possibility of the fusion of basic and applied researches.

Z. OPATRŇÝ (*Praha*)

VASIL, I. K. (ed.): *CELL CULTURE AND SOMATIC CELL GENETICS OF PLANTS. VOL. 2. CELL GROWTH, NUTRITION, CYTODIFFERENTIATION AND CRYOPRESERVATION*. — Academic Press, Inc., Orlando—San Diego—New York—Austin—London—Montreal—Sydney—Tokyo—Toronto 1985. 330 pp., US \$ 49.50, £ 42.50.

This second volume of the book on cell cultures and somatic cell genetics of plants sharply contrasts with the first one in its form, extent, and content. It is represented by a relatively slim booklet consisting of no more than seven chapters written not in the style of "cookery books" as is the first volume, but rather in the style of comprehensive papers dealing with the above problems. The editor showed a high managerial skill in asking Prof. Gautheret, one of the founders of and still living nestors in this scientific branch to write the introductory chapter on the history of tissue and cell cultures. Both the layman and the specialist when reading these dedicated reminiscences hardly remains unmoved and devoid of admiration for the persistence of the first experimenters, for the connections and relationships of the development of various branches of experimental botany. In this respect the chapter is not only a set and compilation of historical data, but also a textbook-style essay on "how science is made". The chapters "Dynamics of Plant Cell Cultures" (Lindsey and Yeoman), "The Mass Culture of Plant Cells" (Scragg and Fowler), and "Cytodifferentiation" (Fukuda and Komamine) form a logical set of contributions though considerably overlapping each other in their subjects. As a matter of fact, all of them discuss the problems of "cell differentiation" — structural, metabolic, functional, relationships between various roles and positions of the plant cell in the cell cycle and its metabolic characteristic, ways of detection of different "differentiated" states and connections between all these problems and practical biotechnological applications, for example, in plant propagation or in commercial production of secondary metabolites in cell cultures. This last problem is explicitly dealt with in the contribution by Scragg and Fowler. The Japanese authors demonstrate the results of a complex analysis of their "differentiation model", i.e. isolated leaf cells which are able to differentiate directly to tracheids; and simultaneously also the necessity to carry out such a detailed cytological-biochemical analysis in other models, and to precisely follow the

subsequent events in the course of differentiation processes. The paper by Lindsey and Yeomann fully corresponds to the authors' long-term acquaintance with this problem; written rather in the form of a critical review, it reveals weak spots in our contemporary knowledge (including non-critical handling and utilization of the very term "differentiation"), and stresses the necessity to consider cell cultures as dynamic systems, structurally and biochemically heterogeneous in logical relation with developmental changes in the cell population.

The remaining three chapters discuss completely independent subjects. The contribution "Nutrition of Plant Tissue Cultures" does not bring anything new, it rather non-critically compiles known facts on the composition of cultivation media, without much effort to interpret their physiological roles or their specificity in cell culture systems. In contrast, the extensive review by prof. Hüseman "Photoautotrophic Growth of Cells in Culture" is very interesting, absorbing, and optimistic. It could directly serve as an advertisement of the possibilities of using cell cultures for the investigation of photosynthesis in higher plants, and thus also gives a belated satisfaction to Prof. Haberlandt, the founder of the problematics of plant tissue culture, whose experiments with leaf cells were mostly unsuccessful. The book is closed with the paper "Cryopreservation of Cultured Cells and Meristems" (L. A. Withers) which is perfect both methodically and didactically, owing to practical experience of the author with this very significant application of plant biotechnologies.

To summarize: When compared with the first volume, the second volume will be appreciated rather by a specialist, but a beginner or any plant physiologist will find valuable information presented in full detail in this publication.

Z. OPATRŇÝ (*Praha*)

KERSHAW, K. A., LOONEY, J. H. H.: QUANTITATIVE AND DYNAMIC PLANT ECOLOGY. Third Edition. — Edward Arnold, London 1985. 282 pp., £ 17.50.

Shortly after the publication of the third edition of the Greig-Smith's classic book, "Quantitative plant ecology", third edition of another classic, Kershaw's "Quantitative and dynamic plant ecology" has appeared, now with J. H. H. Looney as the second author. The basic structure of the book has remained rather similar to that of the earlier editions. Relative to the second edition, the chapter on computer simulation has been omitted, and new chapters on numerical techniques for vegetation study (dealing mainly with programs of the Cornell group) have been added. This edition thus includes 12 chapters (The description of vegetation, Sampling, tests of comparison, application of quadrat measures, Vegetation change, plant succession and climax, Cyclic vegetation change, The causal factors of positive and negative association between species, Plant population dynamics, The Poisson series and the detection of non-randomness, The causal factors of pattern, The detection of natural groupings of species: classification methods, Ordination methods I, Ordination methods II: the limitations of component analysis as an ordination technique, Ordination methods III: Detrended correspondence analysis and TWINSpan).

Apart from the chapters added to the book, most of the old text has not been changed too much and remains basically the same as in the first or second edition. In some "classical" chapters, it certainly does not impair the value of the text, but others would have required more additions and/or rewriting. For instance, the chapter on pattern analysis fails to mention the thorough analysis of the subject by Hill (J. Ecol. **61** : 225–235, 1973), who proposed several new approaches to the problem, or other papers from the 1970'. Such omissions are most critical in chapters dealing with vegetation dynamics, since this field has undergone a dramatic development in the last two decades, what is only partly reflected in this book. Many recent ideas are not discussed (e.g. in chapter Cyclic vegetation change, see Newman, E. I.: Plant community as a working mechanism. Blackwell 1982), which makes these parts of the book rather obsolete.

I find the final chapters on numerical techniques of vegetation the most satisfactory (though e.g. the details of the Bray-Curtis ordination are surely only of historical significance).

Recent boom in plant population biology and dynamic phenomena in vegetation has diverged greatly from the vegetation description and analysis and the need for a good synthesis is felt strongly. Though this book provides much useful information on both subjects, it fails to outline such a synthesis of both recent trends.

T. HERBEN (*Práhonice*)

BERLIN, A., DRAPER, M., HEMMINKI, K., VAINIO, H. (ed.): MONITORING HUMAN EXPOSURE TO CARCINOGENIC AND MUTAGENIC AGENTS. — IARC Scientific Publications No. 59. International Agency for Research on Cancer, Lyon 1984. 457 pp., £ 25.00.

Severe chemical accidents or epidemics such as the dioxin accident in Italy, the polychlorinated biphenyls epidemics in Japan and in the USA *etc.* have emphasized the importance of chemical safety. The Finnish Institute of Occupational Health, jointly with IARC, IPCS and CES, has organized a seminar on monitoring the genotoxic effects of chemicals in our environment. The objective of the meeting was to assess the basic principles of monitoring for carcinogenic and mutagenic agents and to establish a set of criteria by which the monitoring, currently or potentially available, can be validated. Participants at the symposium reviewed the following methods for monitoring genotoxic agents: determination of chemicals and their metabolites in biological samples and determination of urinary thioethers, detection of mutagenic activity in excreta, detection of chromosomal aberrations, sister chromatid exchange, micronuclei, changes in sperm morphology, DNA repair in somatic cells and tumour markers. In addition, special methods, such as the determination of covalent adducts in proteins and nucleic acids, protein variants in blood and measurements of point mutations in lymphocytes were discussed. Several chapters are devoted to the genotoxic activity of special groups of chemical agents, *e.g.* polycyclic hydrocarbons, halogenated compounds, exogenous nitrosamines or to the metabolic activation of pregenotoxic compounds. The volume includes 3 reports on panel discussion: (i) Practical issues in the evaluation of monitoring techniques, (ii) Health significance of monitored chemical and biological endpoints, and (iii) Epidemiological research and occupational health practice.

This publication should be available in science libraries.

J. VELEMÍNSKÝ (*Praha*)

BÖGER, P. (ed.): PHYSIOLOGISCHE SCHLÜSSELPROZESSE IN PFLANZE UND INSEKT. — Universitätsverlag, Konstanz 1985. 220 pp., DM 24.80.

Chemists, biologists and agriculturists researching in plant protection are generally very interested in metabolic processes in plants and animals because their detailed knowledge may lead to a proposal of successful hits against plant and animal pathogens. Therefore a specialized seminar was organized by the Agricultural Research Station of the BASF A.G. in May 1984 in Dannenfels/Pfalz in the F.R.G., with the idea of information transfer between applied industrial and basic university researchers in this field; the reviewed book is a result of this seminar.

Seven chapters of the volume were written by university teachers and scientists from the F.R.G. (6) and France (1). P. Böger deals with the effects of physiologically active substances on plant metabolic processes, *i.e.* biosynthesis of pigments, photophosphorylation, ATPases, oxidation of proline, formation of polyamines, phytoalexins, hormones, calmodulin, assimilation of NH_4^+ , biosynthesis of amino acids, *etc.* U. Lüttge deals with substance uptake and transport in plants, among other questions with the diffusion through membranes, membrane potentials, carrier substances, xenobiotic substances and their activities, and water transport through membranes. The chapter of P. Dieter deals with the importance of calcium for regulatory mechanisms of plants (Ca^{2+} -homeostasis). The function of abscisic acid in regulating water content in plants (through stomatal transpiration or water uptake by roots) is discussed by K. Dörffling. Sterol biosynthesis in higher plant cells and the inhibition of the main enzymes of this process are explained in the chapter written by A. Rahier *et al.* H. W. Heldt *et al.* deal with the regulation of saccharides metabolism in plants, among other topics with their membrane transport and the respective translocators, functions of photorespiration and malate-oxalacetate shuttle, regulatory roles of enzymes of the carbon fixation cycle, saccharose and starch synthesis. The last chapter (H. Rembold) deals with the basic research of insect biochemistry (with several perfectly printed colour photographs).

The brief contents show that the majority (6) of the chapters deal with plant metabolism. In some cases also the recommended research methods are supplemented. Six of the seven chapters are written in German, one in English. A brief subject index and a bibliographic information on the leading authors are added at the end of this paperback volume.

The book will find its readers not only among plant pathologists, but also among plant physiologists, biochemists and agronomists. It also presents a good summary of facts for teachers and advanced students.

Z. ŠESTÁK (*Praha*)

HERZOG, H.: SOURCE AND SINK DURING THE REPRODUCTIVE PERIOD OF WHEAT. Development and its Regulation with Special Reference to Cytokinins. — Paul Parey Scientific Publishers, Berlin—Hamburg 1986. 104 pp., DM 58.00.

The journal "Zeitschrift für Acker- und Pflanzenbau" publishes irregular supplements in the form of paperbacks containing 53 to 127 pages, always dedicated to one specialized topic of agricultural importance. Vol. 8 of this supplement series called "Advances in Agronomy and Crop Science" (Fortschritte im Acker- und Pflanzenbau) presents the results of a detailed study of yield formation in wheat.

Five chapters of this monograph deal with the formation of yield potential, photosynthetic capacity during the reproductive period, transient storage of saccharides and nitrogen, development and growth of caryopses, and a summary of the source-sink relations. From the photosynthetic characteristics, chlorophyll amount, gas exchange, activity of ribulose-1,5-bisphosphate carboxylase, and growth analysis characteristics were analysed also in various cultivars and leaves of different insertion. The chapter on the development of the caryopse describes fertilization, embryo and endosperm development, accumulation of nucleic acids, fresh and dry matter, and the regulation of growth and development by temperature, irradiance, water content, nitrogen supply, cytokinins, gibberellins, auxins and abscisic acid, and by flower position within the ear. More than 400 references and a brief subject index are supplemented.

The booklet reviewed presents interesting information not only of the state of knowledge in this field, but also of the own research of the author (the majority of figures and tables is from his studies).

Z. ŠESTÁK (*Praha*)

FRANK, R.: ZWIEBEL- UND KNOLLENGEWÄCHSE. — Verlag Eugen Ulmer, Stuttgart 1986. 461 S. 121 Farbfotos, 35 Zeichnungen. DM 128,—.

Es ist für den Leser immer eine Freude ein schönes und interessantes Buch in die Hand zu nehmen. Das gilt in vollem Masse für das Buch von Reinhilde Frank. Sie bringt hier in alphabetischer Anordnung ausführliche Beschreibungen einzelner Gattungen und Arten der Zwiebel- und Knollengewächse mit Anweisungen zur erfolgreichen Pflege dieser Pflanzen im Garten und auch zu Hause. Eigene Kulturversuche und breite Erfahrungen waren dazu die Grundlage. Eine sehr ansprechende Komponente des Buches sind die 121 wunderbaren Farbfotos der beschriebenen Arten. Schade nur, dass nicht alle behandelten Arten auf diese Art und Weise vorgestellt werden konnten. Ein Verzeichnis der Fotos wäre in einer Neuauflage des Buches zu empfehlen.

Das Buch wird durch einige allgemeine Kapitel über Anatomie und Morphologie, Lebensäuserungen, Kultur, Geschichte und Symbolik, Verwendungsbereiche usw. der Zwiebel- und Knollengewächse eingeleitet. Es schliesst mit einem Literaturverzeichnis, Bildquellennachweis und Sachregister. Das Buch ist sehr sorgfältig zusammengestellt, gedruckt und ausgestattet worden. Es wird bestimmt von der grossen Familie der Pflanzenfreunde und -liebhaber sowie den Gärtnern und Pflanzenzüchtern begeistert begrüsst werden.

INGRID TICHÁ (*Praha*)

HARVEY, R. G. (ed.): POLYCYCLIC HYDROCARBONS AND CARCINOGENESIS. ACS Symposium Series 283. — American Chemical Society, Washington, D.C. 1985. 406 pp. US and Canada \$ 74.95, export price \$ 89.95.

Polycyclic aromatic hydrocarbons [PAH] have been studied for many years by researchers in disciplines related to toxicology, mutagenesis and carcinogenesis. Their current prominence as research tools derives from their widespread distribution in the environment as byproducts of the combustion of fossil fuels and other organic materials. The objective of the symposium held at the 188th Meeting of the American Chemical Society, Philadelphia, on which this volume is based, was to bring together investigators studying the effects of PAH on the molecular and cellular levels. The introductory paper, given by A. Dipple, presents an overview of PAH genotoxic effects. The remaining 14 chapters focus *e.g.* on dihydrodiol and diol epoxide metabolites of PAH, the bay region theory, effects of methyl and fluorine substitution, interaction of PAH with DNA, X-ray analyses of PAH, hydroperoxide-dependent oxygenation, PAH-DNA adducts,

mutational consequences of DNA damage, arylamines and arylamides *etc.* The individual chapters are not merely verbatim reports of the lectures given at the symposium but critical reviews with extensive references. Some chapters review topics not included in the symposium and were written especially for this book.

The volume provides the reader with a rapid information on the results of current research into various aspects of PAH effects and gives a broad and balanced perspective of the chemistry and biology of PAH, which is both authoritative and up-to-date. Anyone interested in chemical safety, *e.g.* toxicologists, physicians and biologists will find the book interesting.

T. GICHNER (*Praha*)

DYER, A. F., DUCKETT, J. G. (ed.): *THE EXPERIMENTAL BIOLOGY OF BRYOPHYTES*. Experimental Botany: An International Series of Monographs. Vol. 19. — Academic Press, Orlando—San Diego—New York—London—Toronto—Montreal—Sydney—Tokyo 1984. 281 pp., US \$ 71.50, £ 47.50.

In several recent years there has been a real boom in synthetic publications on bryology. Apart from the new series *Advances in Bryology*, Clarke and Duckett's *Bryophyte systematics* and Smith's *Bryophyte ecology* were published, together with the new *Manual of bryology* edited by R. M. Schuster. Nevertheless, with very few exceptions all these publications covered the areas within bryology which are still considered more or less traditional, be it taxonomy in its broadest sense, ecology, or phytogeography, and remained thus of interest mainly to a professional bryologist. In contrast, the reviewed volume for the first time systematically explores all the fields (mainly genetics and physiology) which were not often included in the above publications and which may make bryophytes a group potentially interesting to a reader outside the strict bryological community. There are eleven chapters in the book, beginning with the introduction by Professor P. W. Richards. First three chapters deal with ecological morphology and genetics of bryophytes (Proctor: Structure and ecological adaptation, Wyatt and Anderson: Breeding systems in bryophytes, Newton: Cytogenetics of bryophytes), *i.e.* subjects which have already been reviewed for specialized bryological compendia and which are certainly of interest to a more systematically inclined reader as well as to a general biologist. Much attention is paid to the development of bryophytes (Paolillo: Cell and plastid cycles, Knoop: Development in bryophytes, Cove and Ashton: The hormonal regulation of gametophytic development in bryophytes, Hartmann and Jenkins: Photomorphogenesis of mosses and liverworts), which show the possibility to use bryophytes as model plants and certainly will make the book attractive to plant physiologists. Single chapters are devoted to mineral nutrition (Brown: Uptake of mineral elements and their use in pollution monitoring), photosynthesis (Valanne: Photosynthesis and photosynthetic products in mosses) and to culture methods (Lal: The culture of bryophytes including apogamy, parthenogenesis and protoplasts), the last of which forms a connection between the papers of the first and second part of the book.

The whole book forms a compact treatise on bryophyte physiology and genetics; the related areas which may seem to be missing (*e.g.* ecophysiology) are mostly covered by some of the above reviews. Editors, authors and the publisher are to be congratulated; only the rather high price of the book may make it less accessible to many interested readers.

T. HERBEN (*Práhonice*)

BARBER, J., BAKER N. R. (ed.): *PHOTOSYNTHETIC MECHANISMS AND THE ENVIRONMENT*. — Topics in Photosynthesis, Vol. 6. — Elsevier, Amsterdam—New York—Oxford 1985. 565 pp., US \$ 139.00, Dfl. 375.00.

The specific attraction of this book has been very well pointed out by the editors statement in the preface: "In recent years our understanding of the structure and organization of the photosynthetic apparatus and also the biophysical and biochemical details of the photosynthetic reactions have advanced considerably and scientists are now poised to apply such knowledge to resolve the nature of the interactions between plant and environment that determine photosynthetic performance in the field." I am not sure whether in all cases we can go as far as to actually resolve the problems. But, no doubt, the book summarizes the present working knowledge that enables us at least to analyze in an exact manner the majority of basic problems in the physiology of photosynthesis. Everybody thinking on these lines will really enjoy reading the

book and will find it stimulating new thoughts. The fifth volume of the series, dealing with chloroplast biogenesis must be considered as an important complement of the present monograph since a full analysis of the interactions with environment is impossible without understanding the regulation of genome expression by environmental factors.

Perhaps our greatest achievement at the molecular level of photosynthesis in recent years was made in the understanding of thylakoid membrane architecture and functioning. This topic is dealt with in the first three chapters. Strangely enough, we have much less detailed and systematic knowledge of the lipids constituting the matrix of the thylakoids than of the proteins encompassed by them. And still the lipids are of paramount importance for the functioning of the membrane. P. J. Quinn and W. P. Williams review available information with particular emphasis on the role of membrane lipids in adaptation to various temperatures. They show that changes in fluidity are not the only and perhaps, not the most important factor in this adaptation and they point to the possible role in the temperature effects of the bilayer — non bilayer transition in the lipid phase. While lipids set the stage, the actors proper in the thylakoidal membrane are the supramolecular lipoprotein complexes bearing either the photosynthetic pigments or the electron (and proton) carriers or, finally, fulfilling other important functions. N. R. Baker with J. P. Markwell in the second chapter and J. Barber in the third present in a complementary and exhausting manner the latest news on the infrastructure of these complexes as well as on their topography and dynamics in the membrane.

The last decade has also seen tremendous advances in the disentanglement of the complicated network of enzymatic reactions involved in carbon dioxide fixation and reduction and in the understanding of the ingenious regulation mechanisms involved. No doubt the most powerful stimuli of new ideas in this field came from the discovery and detailed characterization of the dual role of ribulose-1,5-bisphosphate carboxylase-oxygenase and from the unique wealth of data accumulated on the structure assembly and molecular biology of this enzyme. In accord with its importance, the problem is dealt with in a separate chapter written by S. Gutteridge and A. J. Keys. We meet this enzyme again in the chapter on regulation of the Benson-Calvin cycle which reviews the regulatory properties of all enzymes in this cycle and deals with factors influencing their catalytic capacity and with possible routes of their adaptation to environmental factors. It was written by R. C. Leegood, D. A. Walker and Ch. H. Foyer. The supplementary cyclic mechanisms representing admirable solutions of carbon dioxide economy for two sets of specific conditions as found in the C₄ and in the CAM plants are dealt with in chapters written by G. E. Edwards, M. S. B. Ku and R. K. Monson and by K. Winter, respectively. The former represents a unique review of the multifarious light and temperature effects on C₄ photosynthesis, showing how great a diversity stems from a few basic principles. The latter, in addition to a similarly extensive approach, provides a refreshingly clear explanation of the often puzzling mechanisms of crassulacean acid metabolism. Appropriate balance between the photochemistry in thylakoids and carbon assimilation processes in the stroma is essential for efficient photosynthesis. The regulatory processes serving this purpose are reviewed by P. Horton. In addition to important data on rates and stoichiometries involved this chapter brings an excellent analysis of the induction phenomena and an up to date account of what variable fluorescence can tell about these processes. Very often the term "photosynthesis" is thought to comprise only processes leading to assimilation of CO₂ into carbohydrates. But chloroplasts are also able to synthesize, apart from other compounds, the amino acids and often they are the only source of the latter in the photosynthesizing cell. The reduction of nitrate supplying all the amino nitrogen needed occurs photochemically in the chloroplast. The chapter on photosynthetic nitrogen metabolism written by R. M. Wallsgrove and P. J. Lea brings again quite a few unconventional looks at the functioning of the photosynthetic apparatus. If molecular physiology has to be successfully used for exact analyses of plant photosynthetic production the exact treatment must extend up to the scale of the whole leaf. A systematic consideration of anatomical aspects of leaf photosynthetic tissue by P. S. Nobel and C. B. Walker belongs to those chapters that bring in a condensed form information that is otherwise difficult to acquire. The present picture of the laws governing leaf gas exchange and of the relative importance of various internal and external factors is coherently treated by S. P. Long. And, finally, T. A. Mansfield tries to find some firm ground in the oppressing complexity of the responses of stomata to the environment and in the multitude of controversial views on the control of stomata by endogenous factors.

All in all, volume 6 of *Topics in Photosynthesis* does not only keep the high standard set by J. Barber at the beginning but it also preserves the specific charm of the whole series. This consists in offering unbiased and condensed information on most recent experimental evidence in a pleasant balance with the personal views and approaches of those scientists who pave the way in various lines.

I. ŠETLÍK (*Třeboň*)