POSPÍŠILOVÁ, J., SOLÁROVÁ, J. (ed.): WATER-IN-PLANTS BIBLIOGRAPHY. VOLUME 4, 1978. — Dr. W. Junk bv Publishers, The Hague—Boston—London 1979. 156 pp. Dfl. 80,—; US $ 42.15.

Water-in-Plants Bibliography represents a picture of a documentation fund of the known Czechoslovak institution engaged in this research branch. The fourth volume of this bibliography embraces more than 1500 papers concerning both theoretical and practical questions of plant-water relations, which appeared in 1978. All publications documented are given with complete bibliographic data. They are arranged alphabetically according to the authors' names, designated with numeral addresses and provided with: Author, Plant and Subject Indexes. Very detailed indexes improve the efficiency of this bibliography as concerns rapid orientation in search of information and the structure of the research field itself. The Plant Index, where items denoting plant genera (560 altogether) predominate, shows that the authors concentrated chiefly on *Triticium*, *Zea* and *Hordeum* (each of them treated in 60 to 150 papers). Further 30 genera were subject of 20 to 60 papers, while the others (more than 500) only of 1 to 10 papers,respectively. The items in Subject Index (about 400) consisting of more than one word often allow to find a detailed information without combination with other items. Almost 300 items bring less than 10 numeral addresses, about 60 items 10 to 25, 40 items less than 90, and only the most frequent 10 items (*e.g.* Water content, Water saturation deficit, Water potential, Transpiration rate in natural conditions, Effect of irrigation or Effect of soil moisture on plant productivity) 90 to 250. Of course, the significance of the items increases in combination of several items. Consecutive addressing of references can be also used in transfer of the data to other information systems (*e.g.* on punch cards).

The fourth volume of Water-in-Plant Bibliography is a very valuable source of information and at the present time it belongs to the essential aids of all researchers interested in physiological and ecological aspects of plant-water relations.

J. ČERMÁK (*Brno*)

DAVENPORT, D. C., HAGAN, R. M., GAY, L. W., KYNARD, B. E., BONDE, E. K., KREITH, F., ANDERSON, J. E.: FACTORS INFLUENCING USEFULNESS OF ANTITRANSPIRANTS APPLIED ON PHREATOPHYTES TO INCREASE WATER SUPPLIES (Completion Report for Project C-6030). — California Water Resources Center, Davis 1978. 181 pp.

Vegetation growing along streams and lakes transpires a large amount of water which would otherwise remain in the ground and surface water system. However, removal of this vegetation can cause ecological imbalances and be environmentally and aesthetically unacceptable. The purpose of this research project was therefore to obtain detailed information about water-relations of phreatophytic vegetation and to find possibilities for an effective use of foliar antitranspirants. The measurements of transpiration rates, diffusive resistances, plant water potentials, photosynthesis rates and so on of *Tamarix chinensis*, *Populus fremontii*, *Elaeagnus angustifolia*, *Prosopis juliflora* and *P. pubescens* were made not only in laboratories, greenhouses or small research plots but also in natural stands; different methods were compared and the influence of ecological and biological factors were evaluated. The antitranspirants (Folicote and Mobileaf FG) selected for field testing on phreatophytes and bioassays on wildlife were non-toxic wax emulsions diluted with water and were sprayed by a backpack mistblower or by helicopter. Concomitantly, 14 other antitranspirants and 6 growth retardants were screened in laboratory and greenhouse tests. The results obtained are presented in 124 tables and 92 figures. Although the reduction of evapotranspiration of phreatophytes could not as yet be solved by application of antitranspirants (high cost of material, low efficiency of application, possible side effects on wildlife) this project is a perfect example how plant physiological research is engaged in the preservation of nature.

JANA POSPÍŠILOVÁ (*Praha*)

BARBER, J. (ed.): PHOTOSYNTHESIS IN RELATION TO MODEL SYSTEMS. (Topics in Photosynthesis — Volume 3). Elsevier Scientific Publishing Company. Amsterdam—New York—Oxford, 1979. 434 pp., 116 figures. US $ 80.00, Dfl. 180.00.

In the third volume of Topics in Photosynthesis Jim Barber succeeded in keeping the exquisite standard laid down by the foregoing issues in this series. And what concerns the topical character of the subject he, perhaps, made even a step ahead. As Melvin Calvin puts it in his foreword, the book appears at a particularly appropriate time and with a particularly appropriate com-

bination of subjects. The aim of the book and its characteristic features are so perfectly formulated in this foréword and in the preface by the editor that I hope to be excused if I cannot more but quote or paraphrase what is written there.

At present not only the scientists but also broad public starts to realize that fossil energy resources are limited and will not support our civilizations for long. And that among the alternatives we shall have recourse to in near future non-conventional approaches to solar energy conversion will play an important role. This urges us to consider the potential of the photosynthetic apparatus to accomplish hitherto unexploited photochemical energy conserving reactions, or, alternatively, to look for the lesson we can learn from the detailed understanding of the photosynthetic process for the construction of entirely artificial systems that will mimic one or another part of the total process. These topics are often discussed without a satisfactory background concerning underlying principles and the technological feasibility of such projects. The present book has been designed to fill up this gap. It presents concise surveys of well selected basic principles and facts involved in constructing models of the photosynthetic act and it makes the reader acquainted with virtually every approach that has grown up in the last decade or so towards the development of practical devices of solar energy capture and storage.

Essential features of the photosynthetic apparatus that make it an exceptionally efficient solar energy converter are examined in the first three chapters of the book. In an original and enlightening contribution Borisov dissects the photochemical — or, as he puts it, the photoelectrical — part of the photosynthetic process. The construction of the light harvesting antenna and the delivery of the photoinduced excitations from antenna chlorophyll molecules to those in the reaction centers are the key steps that make the efficiency of the photosynthetic apparatus superior to other systems. From the position of a physicist Borisov formulates general conclusions on the maximum possible efficiency of these processes and suggests that the tricks invented by Nature might well be used in the construction of a novel photoelectric cell based on organic dyes. In a complementary chapter Blankenship and Parson analyse the design of the photosynthetic reaction center. They use the to date best known reaction center of photosynthetic bacteria to describe in detail the kinetics and thermodynamics of electron transfer reactions involving bacteriochlorophyll and bacteriophaeophytin, and examine how far the various theories of electron transfer fit this particular case. The low rate of back reactions resulting from the specific arangements of electron transfer steps is pointed out as the unique feature of the reaction center. The great number of variants in which different photosynthetic organisms have implemented the basic design principle of an efficient photochemical energy converting membrane is surveyed by Thornber and Barber. The authors present a concise and exceptionally well-arranged cross-section through current ideas of how the individual building blocks of the photosynthetic apparatus, particularly the pigment protein complexes. are arranged in the thylakoids and they discuss the most popular models accommodating the present state of our knowledge.

A most straightforward way to prove the correct understanding of the photochemical membrane function is to realize the elementary energy transduction processes in artificial systems. This endeavour has been recently crowned with success in several laboratories. Tien and Skulachev review the work performed in their laboratories; Tien describes experiments involving both planar bilayer membranes and liposomes charged with the extract of thylakoid pigments. Generation of a photopotential across the membrane was measured and its modification by various electron donors and acceptors, uncouplers, inhibitors and by "chlorophyllin" added to the bathing solution. With liposomes the response measured was acidification of the medium and oxygen consumption reactions aided again by electron donors. Furthermore, broken thylakoid material was incorporated into liposomes and oxygen evolved by the system upon illumination was detected. In conclusion Tien discusses the possible mechanisms of light transduction in pigmented lipid membranes and their relation to photosynthesis. Skulachev presents results obtained with diverse variants of the ingenious and useful method, which stems from the discovery made in his laboratory that liposomes containing reaction center complexes or directly chromatophores can be associated with various supporting planar surfaces and confer on them their photoelectrical properties. In this way systems more stable than the black lipid membrane and with a much larger surface are available for the measurement of photopotentials generated by bacterial $\Delta\mu_H$ + generators. A thick azolectin membrane, phospholipid impregnated teflon filters and collodion films were used as supports; apart from this photoresponses of chromatophores adsorbed on water / decane interphase were measured. Both planar lipid membranes and vesicles containing the recently discovered photochemical energy transducer, bacteriorhodopsin, are reviewed by Schreckenbach. Since Tien comments on some of this work with bacteriorhodopsin and Skulachev refers to experiments performed in his laboratory there is some overlap in these chapters. In view of the great present concern in bacteriorhodopsin

Schreckenbach's chapter is, nevertheless, most appropriate, all the more, that it gives an excellent brief review of bacteriorhodopsin properties and function in *Halobacterium* cells.

Chloroplasts and algal cells treated with cross-linking reagents are of dual interest. In basic research they can be used to inquire into the importance of thylakoid protein mobility for the photochemical function. Looking towards more practical goals, immobilization of proteins may represent one way of improving structural and functional stability of photosynthetic membranes *in vitro*, a question of utmost importance for the construction of photosynthetic solar energy transducers. Papageorgiou gives a comprehensive review of what is known about the nature of glutaraldehyde and bifunctional imidoester interaction with protein in general and in the thylakoids, and what are the chances to achieve improvement of thylakoid stability by this treatment.

Lack of functional stability is to date the crucial weak point of all model systems which have been designed to accomplish biophotolysis of water with the ultimate aim to develop a technology for storage of transformed solar energy in the form of molecular hydrogen. Various aspects of photochemical hydrogen (and oxygen) production form the central theme of the remaining chapters in the book. With respect to the stability problem and other technological difficulties the conclusion of most of these chapters recurs that, perhaps, in the ultimate form such systems would not be composed of building blocks derived from photosynthetic cells. Instead we have to search for completely artificial components that will satisfactorily mimic the function of their biological counterparts. Harriman and Barber examine from this point of view the photosynthetic water-splitting process. First, they describe its essential features and consider the chemical nature of the enzyme involved in water oxidation. In the second part of the chapter they consider in some detail the attempts to achieve photodissociation of water *in vitro* and extract from their analysis a number of important general conclusions, in particular the prediction of properties that should characterize the synthetic manganese complexes which might be capable to go through a cycle leading to water oxidation. A complementary picture of some of the topics dealt with by Harriman and Barber is provided by Krasnovsky in his general review on photoproduction of hydrogen by algae, systems containing chloroplasts of higher plants and artificial systems. The latter include reactions photosensitized by chlorophyll in solution, such as photoreduction of viologens by various donors with a more positive oxidation-reduction potential and coupling of this system to bacterial hydrogenase which will produce molecular hydrogen. Another example of artificial systems is photosensitization by inorganic photocatalysts (TiO_2, ZnO, WO_3) of reduction by water of various electron acceptors (Fe^{+++}, benzoquinone but also methylviologen) under concomitant production of oxygen. The reduction of Fe^{+++} was observed by Krasnovsky and Brin as early as in 1962. In all sections of his chapter Krasnovsky primarily describes the results obtained in his laboratory and gives many references to the work of other Soviet authors thus providing a valuable source of information for those less familiar with Russian journals.

A comprehensive review of hydrogen evolution systems involving isolated chloroplasts is provided by Rao and Hall. In the first part of the chapter they give a detailed information on properties of the three main components, relevant to the functioning of the system *i.e.* chloroplasts, hydrogenases and ferredoxins. The second part reviews the work of several laboratories aimed at improving conversion yields and system stability. This is attempted by fixation and embedding of the chloroplast material, by screening for oxygen insensitive hydrogenases and by immobilization of the enzyme and of ferredoxin. Technological problems and the possibility of using synthetic analogues to substitute individual components of the hydrogen evolving system are also discussed. Hallenbeck and Benemann have done a likewise honest piece of work in reviewing the most diverse facets of hydrogen production by algae and cyanobacteria. They start by classification and description of the various light and dark reactions of anaerobically adapted algae and then they characterize algal hydrogenases and review the available evidence indicating that electrons for hydrogenase reduction are in most cases donated by some reduced carbon compound to the intersystem electron transfer chain. In the section dealing with cyanobacteria those reactions which differ markedly from the processes in algae are emphasized and particular attention is paid to the fact that hydrogen evolution by cyanobacteria is catalyzed mostly if not entirely by nitrogenase. Since some organic compound is needed to donate electrons for H_2 production a two-stage system seems to be the most appropriate engineering solution for both algal and cyanobacterial systems; such design simultaneously solves the problem of separation of H_2 from O_2. The general conclusions in the last two chapters are very similar: with chloroplasts as well as with blue-green algae the principal feasibility of the process has been proved by model systems that have worked for reasonably long time intervals though with low efficiency. No engineering effort has been, however, applied to any of these processes and thus practical applicability cannot be judged as yet.

Nitrate reduction is an example of photoreduction activity which does not involve CO_2 yet represents a substantial energy gain in the life of photosynthetizing cells. In the last chapter of the book Losada and Guerrero give an excellent and up-to-date review of the mechanism, energetics and regulation of this process as well as its localization in photosynthetic cells. The authors suggest that photosynthetic reduction of nitrate may find practical use not only for agricultural purposes but also because ammonia is a fuel whose advantages are comparable to those of hydrogen.

In conclusion I do not feel it exaggerated to say that everybody sincerely engaged in any field of photosynthesis research should get familiar with this book since it points towards the crucial problems that we shall have to solve in the next future.

I. Šetlík (*Praha*)

Taxonomy of Viruses. A series of 20 posters with explanatory booklet. (Prepared under supervision of J. P. H. van der Want.) — Pudoc, Wageningen, the Netherlands 1979. Dfl. 20.—.

The publication consists of 20 black-and-white posters 50 × 70 cm, containing many diagrams and over 120 micrographs, and showing how viruses are grouped and named. The posters were exhibited during the Fourth International Congress for Virology, held in The Hague, September 1978. The posters especially demonstrate bacterial viruses, invertebrate and plant viruses, present classification of animal viruses, tailed phages of enterobacteria, Ebola and Marburg viruses, Rhabdoviridae, Reoviridae, herpesviruses, the Geminivirus group, and the tobamoviruses. The posters represent a great help for students and research workers as well, despite the fact that they do not cover the complete field of virus taxonomy.

J. Brčák (*Praha*)

Schönharting ,M.: Colchicin. Untersuchungen zur Biochemie von Colchicin-Alkaloiden — Heft 104, Verlag Eugen Ulmer, Stuttgart 1980. 56 S., DM 12,—.

Diese Arbeit über Colchicin, das Hauptalkaloid von *Colchicum autumnale*, ist eine nahezu unveränderte Fassung der Habitationsschrift von M. Schönharting, die im April 1978 an der Universität Hohenheim eingericht worden ist. Die Bedeutung von Colchicin liegt in seiner vielseitigen Wirkung auf die Zelle, z. B. hemmt es den Transport der Chromosomen aus der Äquatorialebene zu den Spindelpolen und den Transport von Kohlenhydraten und Proteinen im Axon der Nervenzelle. Grosse praktische Bedeutung hat Colchicin bei der Züchtung polyploider Pflanzen. Im einleitenden Kapitel des Buches werden die allgemeinen Eigenschaften von Colchicin kurz beschrieben (Vorkommen, Struktur, Biosynthese, physikalische und chemische Eigenschaften). Der zweite Teil bringt Ergebnisse des Autors über den biologischen Abbau von Colchicin im tierischen Organismus *in vivo* (Goldhamster) unf *in vitro* (durch Lebermikrosomen verschiedener Tierarten), über Bindungsfähigkeit von Membranen für Colchicin und seinen Metaboliten Colchicein und über die Wechselwirkung mit zweiwertigen Kationen und mit Sulfhydrylgruppen. Ein Grossteil dieser Ergebnisse wurden schon in mehreren wissenschaftlichen Veröffentlichungen publiziert.

T. Gichner (*Praha*)