for 3.2 billion years but have been studied for less than 200. Their place in the literature of microbiology is incommensurate with their importance to the biosphere. Knowledge of them is scattered, of varied quality, and difficult to collate. The authors succeed well in tying recent advances to the prescient observations and speculations of older workers in the field. This is especially so in the discussion of cellular structure, a subject of current excitement stemming from the replacement of inadequate optics and instrumentation by the electron microscope and adequate analytical tools. The reader is able to assess interpretations of electron photomicrographs in the light of the classical observations and experiments pertaining to the prokaryotic nature of the blue-green algae. The discovery and description of the gas vacuoles and vesicles as well as the new insight into the structure and function of heterocysts make absorbing reading.

With respect to physiology and biochemistry, the authors have provided an easily assimilated digest of current knowledge about photosynthesis, chemosynthesis, heterotrophy, respiration, and nitrogen metabolism and have skillfully related data from other organisms to data peculiar to the blue-green algae. This section, however, requires careful attention and may be considered heavy reading by all but experts.

In the sections dealing with the ecological impact of the blue-green algae in marine and freshwater environments, the volume adequately illuminates problems that are unsatisfactorily resolved. Far too little is known about the individual species—which number over 1500 in the Cyanophyta—to permit total understanding. What information is summarized does nothing to dispel the impression that these organisms play a far greater ecological role than previously suspected.

A reviewer is hard put to find any significant contribution to the field that has been omitted from the over 1000 references in the bibliography. Readers will be disappointed by the absence of an author index, and the inclusion of so much literature has made unavoidable the cryptic style so annoying in the *Annual Review* series. This is nevertheless relieved by a wealth of insight into the problems and frequent reference to unpublished data. Occasionally contradictions between observations and accepted interpretations are inadequately explored—as in the case of the location of the phycobilins in the thylakoids—but such flaws are rare. The authors treat contradictory information in an objective fashion without denigrating the contributions of those whose views have been superseded. By rejecting erroneous hypotheses of their own, they treat conflicts with a good humor rare in scientific writing. For the phychologist or student this is a thoroughly competent and graceful text. The professional phycologist will want it at his elbow.

ROBERT W. KRAUSS
College of Science,
Oregon State University, Corvallis

Invertebrates

Biology of the Turbellaria. Papers from a symposium, Chicago, Dec. 1970. NATHAN W. RISER and M. PATRICIA MORSE, Eds. McGraw-Hill, New York, 1974. xxviii, 530 pp., illus. $25. McGraw-Hill Series in the Invertebrates.

This compilation is designated "Libbie H. Hyman Memorial Volume" and consists of amplified versions of papers read at a symposium held in her memory at the AAAS meetings in 1970. Thirteen of the 23 authors are European.

Seldom has a zoological symposium been organized with such concern for broad, scholarly, and thorough coverage. Rather than being simply a review of past research, this volume contains an abundance of new material. Karling properly sets the pace with an introductory chapter on the anatomical affinities of turbellarian orders. Detailed anatomy is at its best in a remarkable chapter by Bedini and Papi on the electron micrography of the turbellarian epidermis. Other anatomical material is contained in chapters on sperm biology and fertilization and on copulatory organs in the Polycystididae.

Physiology is represented by a chapter bringing comparative digestive physiology up to date and accounts of the nerve plexus in polyclads, neurosecretion (*sic*) in freshwater planarians, and inhibition of planarian regeneration.

The largest portion of the volume is ecologically oriented, with chapters on such topics as salt-marsh Turbellaria, Texas cave flatworms (fascinating reading!), Black Sea littoral species, polyclad reproductive ecology, distribution of Japanese freshwater species, competitive planarian ecology, and an impressive long chapter by Ball on the phylogeny and biogeography of freshwater triclads.

Three chapters are devoted to phylogenetic curiosities and descriptions of new taxa: Rieger on Kytorhynchidae, a new typhloplanid family; Sterrer and Rieger on Retronectidae, a new catenulid family; and Poulter on *Pericelis hymanae*, a new polyclad species from Hawaii.

There are unusual chapters on the genetics of fissioning in planarians and on reproduction as a function of age in *Dugesia*, and a short history of the study of Turbellaria in North America. Riser concludes with an epilogue consisting of brief comments on significant items not discussed in the volume, as well as speculations about future turbellarian research, especially on marine species.

Some of the original manuscripts submitted were too long for the volume, and the editors worked diligently to bring them down to reasonable length. There are only a few typographical errors, but the publishers apparently "forgot" the frontispiece and "lost" figure 12 on page 267. On the other hand, they have produced a volume that contains only the finest illustrations. Line drawings, graphs, and electron micrographs are all excellent.

Appropriately, this book contains a short biography and a complete bibliography of Libbie Hyman. She would have been graciously pleased to know that this outstanding work is dedicated to her.

ROBERT W. PENNAK
Environmental Biology,
University of Colorado,
Boulder

Bases of Salt Tolerance

Structure and Function of Plant Cells in Saline Habitats. New Trends in the Study of Salt Tolerance. Translated from the Russian edition (Moscow, 1970) by A. Mercado. B. Gollek, Transl. Ed. Halsted (Wiley), New York, and Israel Program for Scientific Translations, Jerusalem, 1973. vi, 284 pp., illus. $30.

Intensified water use has led to deterioration of water quality, evidenced in irrigated areas by marked increases in salinity. Agriculture would benefit greatly if the salt tolerance of crop plants could be increased significantly, for saline waters could then be used more efficiently. To improve salt tolerance we need to know the mechanisms by which salinity injures plants, the

subject of this book. Authors of chapters are not identified in this collectively authored book and, strangely, the Russian authors (B. P. Strogonov, V. V. Kabanov, N. I. Shevyakova, L. P. Lapina, E. I. Komizerko, B. A. Popov, R. Kh. Dostanova, L. S. Prikhod'ko) and editors (A. L. Kursanov and P. A. Genkel') are not even named in the English translation.

The book describes in detail many experiments on the effects of salinity on plants. By comparing the effects of isosmotic solutions of sodium chloride, sodium sulfate, and the inert osmoticum dextran, the authors conclude that toxic, rather than osmotic, effects are responsible for growth inhibition by salinity. Salt damage leading to necrotic lesions and even death is attributed to disturbances of plant metabolism, including proteolysis, the accumulation of some toxic amino acids and diamines, and the oxidation of sulfhydryl groups. Phosphorus and nucleic acid metabolism appear to be affected by salinity only at the final stage of translation of genetic information into protein as evidenced by the reduced numbers of polysomes. Electron micrographs indicate mitochondria to be relatively resistant to salinity, whereas nuclei are affected somewhat and chloroplasts are severely affected. Cell cultures of the halophyte glasswort were found to be no more salt tolerant than those of salt-sensitive species. Salt tolerance in this case seemed to be a property of the intact organism rather than of the isolated cells. Yet the authors retain the hope that salt-tolerant plants may be produced by selecting salt-tolerant cells.

The authors emphasize their own findings and do not attempt a balanced evaluation of all facts and theories regarding salt tolerance. One should, therefore, contrast their conclusions with those of others, that osmotic rather than toxic effects of salinity predominate and that protein contents and photosynthetic rates may be normal in salt-stunted plants, among others. Possible reasons for the acute toxicity observed by Strogonov *et al.* include the high salinity levels employed in most experiments (7 atmospheres and higher) and the high phosphate level of the Knop solution used (1.5 mM), which recently has been shown to cause phosphate toxicity when salinity checks growth. Despite these questions, readers will appreciate this volume, which brings together coherently the Russian views on the biochemical, cytological, and physiological bases of salt tolerance. References to 333 Russian papers (plus 371 non-Russian) are particularly helpful. The quality of reproduction is excellent.

LEON BERNSTEIN
U.S. Salinity Laboratory, Riverside, California

Spin Polarization

Chemically Induced Magnetic Polarization. ARTHUR R. LEPLEY and G. L. CLOSS, Eds. Wiley-Interscience, New York, 1973. x, 416 pp., illus. $19.95.

There are few review articles on chemically induced magnetic polarization. This is the first book that is fully dedicated to this subject.

Seven of the eight chapters are confined to chemically induced dynamic nuclear polarization (CIDNP). One deals with electron spin polarization.

For those of us who followed the development of CIDNP, the book is of extreme interest. For those who want a quick reference on the subject, it can save a lot of literature search. Newcomers to the field, however, are strongly advised to regard it as a pioneering effort rather than a complete, up-to-date survey of the field.

The book is highly uneven with respect to the representation of the various topics. Most of the authors relied on S. H. Glarum, the author of the first chapter, for a detailed, balanced presentation of the theoretical background behind the polarization phenomena. Unfortunately, he presents his own theory in terms that are difficult to understand for those who lack the essential mathematical background. To this reviewer's knowledge, this is the first publication of Glarum's theory, although it was first presented about four years ago at the Houston meeting of the American Chemical Society. Regardless of the validity of his approach, it certainly cannot serve as a sole basis for understanding the other chapters, which base their interpretation on different approaches.

As far as CIDNP is concerned, the book does not provide any information about the experimental setups that are required. Very little space is given to the use of CIDNP in photochemistry.

Most of the book is slanted toward the organic chemist. Four out of the eight chapters are essentially detailed collections of organic reactions in the various categories of compounds that show CIDNP spectra. The short chapter by H. Fischer, "Aroyl peroxide decompositions," is brilliant because, rather than presenting his numerous contributions to this field, he concentrates on a highly relevant, specific debatable point, and demonstrates in detail an experimental approach to solve it. It is unfortunate that the book does not provide the necessary theoretical background for a full appreciation of this chapter.

MICHA TOMKIEWICZ
IBM Thomas J. Watson Research Center, Yorktown Heights, New York

Books Received

Adsorption and Adsorbents. No. 1. D. N. Strazhesko, Ed. Translated from the Russian edition (Kiev, 1972) by A. Barouch. Halsted (Wiley), New York, and Israel Program for Scientific Translations, Jerusalem, 1974. viii, 237 pp., illus. $24.50.

Atmospheric Electricity. Vol. 2, Fields, Charges, Currents. H. Israël. Translated from the German edition (Leipzig, 1961) by D. Ben Yaakov and Baruch Benny. Israel Program for Scientific Translations, Jerusalem, 1973 (available as TT 67-51394/1 from National Technical Information Service, Springfield, Va.). xvi + pp. 318–796, illus. + maps. Paper, $6. Problems of Cosmic Physics, vol. 29.

Biological Nomenclature. Charles Jeffrey. Edward Arnold, London, and Crane, Russak, New York, 1973. x, 70 pp. $6.75. Special Topics in Biology Series.

Control of Air Pollution in the U.S.S.R. N. F. Izmerov. World Health Organization, Geneva, Switzerland, 1973 (U.S. distributor, Q Corporation, Albany, N.Y.). 158 pp., illus. Paper, $3.15. Public Health Papers, No. 54.

Craft and Consciousness. Occupational Technique and the Development of World Images. Joseph Bensman and Robert Lilienfeld. Wiley-Interscience, New York, 1973. x, 370 pp. $13.95.

Drug-Protein Binding. Papers from a conference, New York, Jan. 1973. Aaron H. Anton and Harvey M. Solomon, Eds. New York Academy of Sciences, New York, 1973. 362 pp., illus. Paper, $30. *Annals of the New York Academy of Sciences*, vol. 226.

Earthwatching. A Collection of Scripts from the First Year of Earthwatch/Radio. University of Wisconsin Sea Grant College Program, Madison, 1974. x, 224 pp. Paper, $1. Public Information Report 16. Institute for Environmental Studies, University of Wisconsin-Madison, Special Report, No. 1.

Electron Spin Resonance in Chemistry. L. A. Blumenfeld, V. V. Voevodski, and A. G. Semenov. Translated from the German edition (Leipzig, 1973) by H. M. Assenheim. Halsted (Wiley), New York, 1974. xii, 322 pp., illus. $32.50. Monographs on Electron Spin Resonance.

(Continued on page 1099)