

and the chemical and physical characteristics of leaf surfaces and cuticular membranes are described, with the aid of very good electron micrographs of leaf surfaces. Then leaching from plants, modification by pollution, and microclimate of leaf surfaces are discussed.

Nine papers on saprophytes that are found on leaf surfaces constitute the second section. They describe methods used to estimate the number of microorganisms and the varied populations of bacteria, yeasts, and fungi that reside on leaves and buds of some agricultural plants.

Pathogens on leaf surfaces are the subject of the third and largest section, comprising 16 papers. The dispersal and trapping of spores by leaves, the microenvironment and the chemical environment in relation to growth of fungi, and interactions of bacteria are discussed. The only paper on viruses reviews data that ectodesmata are involved in infection sites of tobacco mosaic virus. Three papers concern development, sporulation, and structural changes in mildew infections. This section includes many electron micrographs and vivid descriptions of the infection process and the changes that accompany it. Only one chapter concerns control of leaf pathogens.

Six papers in the fourth section deal with senescing leaves. One considers biochemical aspects, the others the microbiology of leaves as they senesce, fall, and decompose.

The last and perhaps the most significant section is devoted to interactions on the leaf surface. It includes papers on the effects of leaf exudates on fungicides and on appressorium formation, photoalexins and restriction of fungal growth, and antagonism between pathogenic and saprophytic microorganisms. An interesting paper on the grass sheath as a site for nitrogen fixation describes the widespread occurrence of nitrogen-fixing bacteria on leaf surfaces and how they act as a "factory" for the production of organic nitrogen.

This book emphasizes that leaves are more than just a site for photosynthesis. They provide a surface on which many microorganisms reside, and the interactions of these microorganisms with each other and with the leaf have an important bearing upon the growth of the plant. Research workers and students in plant pathology, microbiology, botany, agriculture, and general biology will find much of interest in these

papers. The editors are to be commended in bringing together 64 experts from five continents and in so well organizing their papers into this excellent book with author, systematic, and subject indexes.

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Physiological Adaptations

Responses of Plants to Environmental Stresses. J. LEVITT. Academic Press, New York, 1972. xiv, 698 pp., illus. \$32.50. *Physiological Ecology*.

To write a book on frost resistance or water stress in plants would be a sizable undertaking in its own right, but to combine both these and other environmental stresses into a single volume represents a mammoth effort which very few lone authors would be willing or qualified to undertake. It is clear not only from the preface but from the content of this book that the author has tackled this task in order to present an integrated view of the physiological and chemical mechanisms by which plants avoid, adapt to, and respond to the environmental stresses water deficit, temperature extremes, and high salt concentrations, as well as radiation. Pollution, which is featured on the dust jacket, is however only a minor consideration. The responses dealt with are by and large the extremes of stress that may cause injury or death, and this is not an attempt to cover all aspects of temperature response or the water relations of plants. The exclusion of nutrient deficiencies, except where they interact with the other stresses, is not only understandable but a wise decision for the sake of clarity. The central thread, or recurrent theme, in this presentation is the importance of sulfur bonding and sulfhydryl groups in regulating the response of proteins and membrane structure to stress. The literature coverage is excellent, with close to 2000 references, and it must be said that although there is often a bias in favor of the "SH hypothesis," which may in fact be quite justified, other explanations of stress response are fully documented and discussed to give a balanced presentation. However, the further the author digresses from his own specialty, that is, the molecular basis of stress

responses, the less critical become his views on the data presented. One aspect that comes through rather clearly is the continuing search for meaningful tests that can be used in predicting the tolerance of plants to frost, water, and salt stresses, and this underlines our as yet incomplete understanding of the nature of stress and stress responses.

The material is well presented in short, clearly headed sections, which do however result in some repetition. Students, and I suspect many others, would be well advised to read carefully the definitions in the two opening chapters in order to master such terms as "direct elastic dehydration strain," "poikilotherm," and "homoiohydric." More than half the book is concerned with temperature stresses, with the next largest section that on water stress. Radiation and salt stresses, each with about 40 pages, have a much smaller but still significant coverage. Each subject is presented in an orderly fashion, under headings that deal with the nature of the stress, avoidance, tolerance, and so on, with comments on the possible mechanisms of injury and resistance. Although the experts may argue on points of interpretation, the excellent literature coverage of this volume makes it invaluable as a reference for both students and those undertaking research in the field of environmental stress.

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Books Received

Advances in Creep Design. The A. E. Johnson Memorial Volume. A. I. Smith and A. M. Nicolson, Eds. Halsted (Wiley), New York, 1972. xx, 486 pp., illus. \$42.50.

Advances in Experimental Social Psychology. Vol. 6. Leonard Berkowitz, Ed. Academic Press, New York, 1972. xiv, 310 pp., illus. \$12.50.

Advances in Heterocyclic Chemistry. Vol. 14. A. R. Katritzky and A. J. Boulton, Eds. Academic Press, New York, 1972. x, 408 pp., illus. \$27.50.

Africa and the Islands. R. J. Harrison Church, John I. Clarke, P. J. H. Clarke, and H. J. R. Henderson. Wiley, New York, ed. 3, 1972. xviii, 542 pp., illus. Paper, \$22.50.

Air Sampling Instruments. For Evaluation of Atmospheric Contaminants. American Conference of Governmental Industrial Hygienists, Cincinnati, ed. 4, 1972. Various pages, illus. \$12.50.

Biodegradation of Materials. Vol. 2. Proceedings of a symposium, Lunteren, the Netherlands, Sept. 1971. A. Harry Walters and E. H. Hueck-Van Der Plas, Eds. Halsted (Wiley), New York, 1972. xii, 514 pp., illus. \$49.50.

The Biology and Utilization of Grasses. A symposium, Riverside, Calif., 1969. V. B. Youngner and C. M. McKell, Eds. Academic Press, New York, 1972. xx, 426 pp., illus. \$22.50. Physiological Ecology.

La Capacité d'Appréhension Verbale. Stéphane Ehrlich. Presses Universitaires de France, Paris, 1972. 218 pp., illus. Paper, 49 F. Psychologie d'Aujourd'hui.

Catalysis in Chemistry. A. J. B. Robertson. Methuen, London, 1972 (U.S. distributor, Harper and Row, New York). viii, 56 pp., illus. Paper, \$2.75. Methuen Studies in Science.

CDP Review Manual. A Data Processing Handbook. Roger A. MacGowan and Reid Henderson, Eds. Auerbach, Princeton, N.J., 1972. viii, 632 pp., illus. Paper, \$10.

The Chemical Structure and Thermal Characteristics of Polymers. V. V. Korshak. Translated from the Russian edition (Moscow, 1970) by J. Schmorak. Israel Program for Scientific Translations, Jerusalem, 1972 [U.S. distributor, Halsted (Wiley), New York]. viii, 460 pp., illus. \$37.50.

Chemical Zoology. Vol. 7, Mollusca. Marcel Florkin and Bradley T. Scheer, Eds. Academic Press, New York, 1972. xxii, 568 pp., illus. \$37.

The Chemistry of Tobacco and Tobacco Smoke. Proceedings of a symposium, Washington, D.C., Sept. 1971. Irwin Schmeltz, Ed. Plenum, New York, 1972. x, 186 pp., illus. \$16.50.

Combustion Aerodynamics. J. M. Beér and N. A. Chigier. Halsted (Wiley), New York, 1972. x, 264 pp., illus. \$24.50.

Computing Problems for Fortran Solution. Robert Teague. Canfield, San Francisco, 1972. x, 246 pp., illus. Paper, \$4.95.

Core Text of Neuroanatomy. Malcolm B. Carpenter. Williams and Wilkins, Baltimore, 1972. x, 270 pp., illus. Paper, \$9.75.

Current Topics in Cellular Regulation. Vol. 5. Bernard L. Horecker and Earl R. Stadman, Eds. Academic Press, New York, 1972. xvi, 332 pp., illus. \$18.50.

Decision Tables. Keith R. London. Auerbach, Princeton, N.J., 1972. xvi, 206 pp., illus. \$9.95.

Demographic Analysis. Methods, Results, Applications. Roland Pressat. Translated from the French edition (Paris, 1961) by Judah Matras. Aldine-Atherton, Chicago, 1972. xxii, 498 pp., illus. \$14.50.

The Description and Classification of Vegetation. David W. Shimwell. University of Washington Press, Seattle, 1972. xiv, 322 pp., illus. + table. \$10.50. Biology Series.

Elementary Statistical Methods. G. Barrie Wetherill. Methuen, London, 1972 (U.S. distributor, Harper and Row, New York). 330 pp., illus. \$6.50.

Emissions from Continuous Combustion Systems. Proceedings of a symposium, Warren, Mich., Sept. 1971. Walter Cornelius and William G. Agnew, Eds. Plenum, New York, 1972. x, 480 pp., illus. \$25.

Energy and the Environment. H. R.

MacMillan Lectures for 1971. Ian E. Efford and Barbara M. Smith, Eds. University of British Columbia Institute of Resource Ecology, Vancouver, 1972. 220 pp., illus. Paper, \$2.50.

Environmental Archeology and Cultural Systems in Hamilton Inlet, Labrador. A Survey of the Central Labrador Coast from 3000 B.C. to the Present. William W. Fitzhugh. Smithsonian Institution Press, Washington, D.C., 1972 (available from the Superintendent of Documents, Washington, D.C.). xxii, 300 pp., illus. Paper, \$3.50. Smithsonian Contributions to Anthropology, No. 16.

Evolution in Plants. A symposium, Tihany, Hungary, Sept. 1970. G. Vida, Ed. Akadémiai Kiadó, Budapest, 1972. 232 pp., illus. \$9.10. Symposia Biologica Hungarica, vol. 12.

Family Therapy. A Triadic-Based Approach. Gerald H. Zuk. Behavioral Publications, New York, 1972. viii, 240 pp. \$12.95. Clinical Applications Series.

Simulation. Statistical Foundations and Methodology. G. Arthur Mihram. Academic Press, New York, 1972. xviii, 526 pp., illus. \$24.50. Mathematics in Science and Engineering, vol. 92.

Social Psychology and Social Relevance. Alan C. Elms. Little Brown, Boston, 1972. xiv, 448 pp., paper, \$6.50.

The Solar System. Frank W. Cousins. Drawings by Malcolm Chandler. Pica, New York, 1972 (available from Universe, New York). 300 pp. + plates. \$20.

Solid Lubricants and Self-Lubricating Solids. Francis J. Clauss. Academic Press, New York, 1972. xiv, 260 pp., illus. \$15.

A Spatial Analysis of Submetropolis Small-Town Growth. Claud M. Davidson. University of Texas Bureau of Business Research, Austin, 1972. xiv, 154 pp., illus. Paper, \$4. Research Monograph No. 35.

Spirits and Demons at Work. Alcohol and Other Drugs on the Job. Harrison M. Trice and Paul M. Roman. Cornell University New York State School of Industrial and Labor Relations, Ithaca, 1972. x, 268 pp. Cloth, \$6.50; paper, \$5. ILR Paperback No. 11.

Strengthening Methods in Crystals. A. Kelly and R. B. Nicholson, Eds. Halsted (Wiley), New York, 1972. xii, 628 pp., illus. \$42.50.

Surface and Colloid Science. Vol. 5. Egon Matijević, Ed. Wiley-Interscience, New York, 1972. x, 332 pp., illus. \$22.50.

Tertiary and Mesozoic Echinoids of Saudi Arabia. Porter M. Kier. Smithsonian Institution Press, Washington, D.C., 1972 (available from Superintendent of Documents, Washington, D.C.). iv, 242 pp., illus. Paper, \$3. Smithsonian Contributions to Paleobiology, No. 10.

Theory of General Economic Equilibrium. Trout Rader. Academic Press, New York, 1972. xx, 362 pp., illus. \$16.50.

Toward a Psychology of Art. Collected Essays. Rudolf Arnheim. University of California Press, Berkeley, 1972. viii, 370 pp., illus. Paper, \$3.95. Reprint of 1966 edition.

Tracer Methods for In Vivo Kinetics. Theory and Applications. Reginald A. Shipley and Richard E. Clark. Academic Press, New York, 1972. xiv, 240 pp., illus. \$13.50.

Transport and Accumulation in Biolog-

ical Systems. E. J. Harris. Butterworths, London; University Park Press, Baltimore, ed. 3, 1972. viii, 454 pp., illus. \$19.50.

Vocabulary Control for Information Retrieval. F. W. Lancaster. Information Resources Press, Washington, D.C., 1972. xiv, 234 pp., illus. \$17.50.

New Journals Received

Abstracts on Health Effects of Environmental Pollutants. Vol. 1, No. 1, Jan. 1972. Monthly. BioSciences Information Service of Biological Abstracts, 2100 Arch St., Philadelphia, Pa. 19103. \$95. Magnetic tape service, \$500 a year.

Bioresearch Today. Addiction. Vol. 1, No. 1, Apr. 1972. Monthly. BioSciences Information Service of Biological Abstracts, 2100 Arch St., Philadelphia, Pa. 19103. \$25.

Bioresearch Today. Cancer A—Carcinogenesis. Vol. 1, No. 1, Apr. 1972. Monthly. BioSciences Information Service of Biological Abstracts, 2100 Arch St., Philadelphia, Pa. 19103. \$25.

Environmental Health Perspectives. Experimental issue No. 1, Apr. 1972. Editor: Robert M. Namovicz. National Institute of Environmental Health Sciences, P.O. Box 12233, Research Triangle Park, N.C. 27709. Four experimental issues free. DHEW Publication No. (NIH) 72-218.

Human Ecology. An Interdisciplinary Journal. Vol. 1, No. 1, Mar. 1972. Semi-annually. Editor: Andrew P. Vayda (Columbia University). Plenum Publishing Corp., 227 West 17th St., New York, N.Y. 10011. Subscription to four issues; to individuals, \$14; to institutions, \$28.

International Journal of Computer and Information Sciences. Vol. 1, No. 1, Mar. 1972. Quarterly. Editor: Julius T. Tou (University of Florida). Plenum Publishing Corp., 227 West 17th St., New York, N.Y. 10011. To individuals, \$18.50; to institutions, \$30.

Journal of Physical and Chemical Reference Data. Vol. 1, No. 1, 1972. Quarterly. Editor: David R. Lide, Jr. (National Bureau of Standards, Washington, D.C.). Published by the American Chemical Society and the American Institute of Physics for the National Bureau of Standards (available from Subscription Service Department, American Chemical Society, 1155 Sixteenth St., N.W., Washington, D.C. 20036). \$60; to members, \$20.

Journal of Youth and Adolescence. A Multidisciplinary Research Publication. Vol. 1, No. 1, Mar. 1972. Quarterly. Editors: Daniel Offer (University of Chicago) and Joseph Adelson (University of Michigan). Plenum Publishing Corp., 227 West 17th St., New York, N.Y. 10011. To individuals, \$16; to institutions, \$24.

Mineralogia Polonica. Vol. 1, 1970. Editor: W. Zabiński. Mineralogical Society of Poland, Cracow, Aleja Mickiewicza, 30, AGH. 30 zloty.

World Animal Review. No. 1, 1972. Quarterly. Food and Agriculture Organization of the United Nations, Rome (available from UNIPUB, Inc., P.O. Box 433, New York, N.Y. 10016). Single issue, \$1. Annual subscription, \$3.