

plants; and Bunting, Kuckuck, Gordon, Poissonet, and Henry explain how ecological data can most efficiently be recorded. The problems of quarantine, sanitation, evaluation, storage, and maintenance of seeds and cultures are discussed in a series of articles.

This volume has exceptional value for two reasons: it gives many cogent reasons for devoting more time, money, and human energy to exploring, making inventories of, and conserving our genetic resources of crop plants, and it is an invaluable encyclopedia of methods by which these goals may most efficiently be achieved.

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Mitochondria and Plastids

Control of Organelle Development. Society for Experimental Biology Symposium No. 24, London, Sept. 1969. Published for the Company of Biologists by Academic Press, New York, 1970. viii, 524 pp. + plates. \$17.50.

The stress in this collection of papers, from two dozen research groups, is on the development, the nucleic acids, and the transmission from parent cell to daughter of mitochondria and plastids. There are also brief discussions of protozoan killer particles, ciliate macronuclei, and cytoplasmic influences on the nuclei of protozoa, *Acetabularia*, and amphibians. Except for consideration of protozoan cortical patterns, only passing attention is paid to centrioles and basal bodies, and very little is said about the development of cilia and flagella or endoplasmic reticulum. There are relatively few surprises in choice of authors, and only two or three of the papers are of questionable quality. With occasional exceptions, the photomicrographs range from the adequate to the mediocre. This appears to be a matter partly of space constraints and quality of reproduction; some of the pictures have obviously been reduced excessively so that structures of interest are almost invisible. More annoying is the separation of photographs from text and from legends. The way the book is laid out, one must go to the end of each article to find the electron micrographs referred to in the text and then sometimes make a further search for the

detailed explanation of the figures.

There emerges from the book a portrait of a lively and intriguing field that has recently passed a major take-off point. In little more than a decade, the focus of study of the development and transmission of cytoplasmic organelles has shifted substantially away from formal genetic analysis of "cytoplasmic inheritance" and spirited arguments about hypothetical "de novo" or "self-duplication" mechanisms. Important details are becoming clear about the actual modes of assembly of macromolecules into the enzyme-laden membranes within mitochondria and chloroplasts, and there are some intriguing leads concerning the assembly of other intracellular structures. But by far the most dramatic advances have been made in the analysis of nonnuclear hereditary machinery—notably the DNA, ribosomes, and related systems of chloroplasts and mitochondria. Ten years ago the existence of such components was in doubt. Now, the "bacterial-like" ribosomes of mitochondria and chloroplasts and the circular DNA of animal cell mitochondria are standard items of discussion in the better undergraduate texts. As reflected in the present book, the questions that now are central and are beginning to yield to experimental analysis include the following: How much hereditary information is there in a mitochondrion or chloroplast? Is there evolutionary or functional significance to the fact that mitochondria of higher animals seem to have less DNA-borne information than mitochondria of lower forms? Is there more than one linkage group per individual cytoplasmic organelle, and do the plastids or mitochondria in a single cell normally differ significantly in their nucleic acids? Does the apparent genetic recombination between organelles result simply from fusion of the organelles, or does it also involve the formation of recombinant DNA molecules? Which mitochondrial or plastid proteins are synthesized within the organelles and which come from outside? How does the transfer of proteins from "ordinary" cytoplasmic ribosomes to the mitochondria or plastids come about? How many separable steps in chloroplast morphogenesis can be distinguished by study of mutants or of material in which protein synthesis or nucleic acid metabolism has been experimentally

manipulated? Do the inner and outer mitochondrial membranes differ in origin? Is there exchange of messenger RNA's or genetic regulatory molecules among the nucleus, the chloroplasts or mitochondria, and the rest of the cytoplasm? What does it mean that some chloroplast ribosomal RNA's can hybridize with nuclear DNA? What sorts of steps might be involved in the evolutionary transformation of a symbiotic microorganism into an organelle?

Few of these questions are answered definitively by the contributors to the book. But almost all are well posed, put in context, and presented in terms of relevant present knowledge and reasonable future perspectives. Thus, although like virtually all such books this one will soon be out of date, it seems to have come at a propitious moment and conveys a useful image of a field during a crucial and fascinating period of its history.

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A Non-Taxonomic Treatment

Principles of Paleontology. DAVID M. RAUP and STEVEN M. STANLEY. Freeman, San Francisco, 1971. xii, 388 pp., illus. \$11.50. A Series of Books in Geology.

Paleontology texts have traditionally emphasized the descriptive-taxonomic side of the subject. Raup and Stanley have broken out of this mold, to concentrate on biologic principles and on the application of paleontology to the general problems of science. *Principles of Paleontology* is to be read in parallel with, or subsequent to, a systematic descriptive course. It makes no attempt to deal comprehensively with any particular problem, but highlights a large number of diverse topics, selected mainly from the newer primary literature. Early chapters deal with the specimen, ontogeny, populations, and the species. A fine discussion of the nature of higher taxonomic levels leads to a brief but lucid exposition of numerical taxonomy. Subsequent chapters include treatments of adaptation and functional morphology (including a section on theoretical morphology and computer simulation), of evolutionary patterns, and of biostratigraphy, and the book ends with a discussion of applications of paleontology

to studies of sedimentology, rock deformation, and planetary phenomena.

The emphasis is on the megascopic invertebrates, as may be gauged from a rough census of illustrations: 140 of these deal with the larger invertebrates, 24 with vertebrates, 7 with algae, 6 with protozoans, and 4 with higher plants.

This adds up to a paleontological smorgasbord, enhanced by well-chosen and beautiful illustrations. Although isotope and trace element analyses of fossils have been consciously omitted, this book has no rivals as a view over the general problems and directions in paleontology.

Such breadth of coverage is bought at the expense of coherence: the topics covered are not linked by a continuous thread of thought. Also the discussion of many topics has been reduced to bare essentials, in order to keep the size and cost of the book within reasonable limits. That aim has been achieved, but at some sacrifice—not only in subject matter, but also in readability and in challenge. The flat style of simple sentence-statements, while clear and precise, rarely hints either at the riches remaining in the primary literature or at the challenges of discoveries yet to be made.

The treatment of ontogeny of colonies (p. 65) seems all too brief—hardly a beginning. The listing of bibliographic sources (p. 152) could have included a few more significant items, such as Sherborne and the abstract journals. I noted some inaccuracies, but all in all the book is remarkably free of errors.

Principles of Paleontology is an attractive book that fills a major vacuum in paleontology. Of two advance copies, one disappeared very shortly, and the other has been in constant demand by students and colleagues.

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Lithic Process

Rock Weathering. DOROTHY CARROLL. Plenum, New York, 1970. xvi, 204 pp., illus. \$15. Monographs in Geoscience.

Without rock weathering the earth could not support higher forms of life. Rock weathering helps produce the all-important soil cover on the continents as well as releases to the

hydrosphere critical nutrients for aquatic life. Rock weathering is, therefore, of interest not only to geologists and soil scientists, but also to limnologists, oceanographers, and most biologists. Dorothy Carroll has written her book with this wide audience in mind.

The strongest emphasis in the book is on the relation between rock weathering and soil formation. Although only 2 of the 12 chapters are devoted specifically to soils, the remaining chapters are integrated closely with this important topic. Numerous tables of chemical data are found throughout the book, and the bibliographic citations are relatively complete for the period covered. A very useful list of publications which pertain to the relationship between climate and weathering of various rock types is found in an appendix. Although the book contains many broad generalizations, it should prove useful to researchers in such fields as sedimentation, soil genesis, geomorphology, and water chemistry.

Dorothy Carroll died when her book was in the final stages of preparation. If she had lived, she would have been pleased with its attractive appearance. Also, I am sure she would have been able to correct a number of unfortunate errors. For example, on the first page we are told that shale is 16 times as abundant as limestone in the lithosphere. This figure is evidently based on Clarke's early calculations. Most modern estimates of the abundance of shale are much lower.

The book is, unfortunately, not up to date. Important citations of the literature are largely from publications in the period from 1930 to 1960. Citations of the recent literature are scattered and poorly integrated into the text.

One of the weakest chapters of the book treats "Time and weathering." A vast body of data resulting from carbon-14 dating and modern Pleistocene stratigraphy could have been studied in order to give specific information concerning rates of weathering and soil formation. These topics are treated superficially in the book. In contrast, one of the best chapters is concerned with "Trace elements in weathering." Although lacking citations of many recent publications, it is still an interesting and useful summary of the topic.

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Books Received

Chemistry. Reactions, Structure, and Properties. Clyde R. Dillard and David E. Goldberg. Macmillan, New York, 1971. xvi, 654 pp., illus. \$10.95.

Classical Scientific Papers. Chemistry, Second Series. Papers on the Nature and Arrangement of the Chemical Elements. David M. Knight, Ed. Mills and Boon, London, and Elsevier, New York, 1970. xiv, 442 pp., illus. \$15.

Climates of Northern and Western Europe. C. C. Wallén, Ed. Elsevier, New York, 1970. xii, 254 pp., illus. \$35.25. World Survey of Climatology, vol. 5.

Coherent Light. A. F. Harvey. Wiley-Interscience, New York, 1970. xxxvi, 1330 pp., illus. \$47.50.

Comparative Spermatology. Proceedings of a symposium, Rome and Siena, July 1969. Baccio Baccetti, Ed. Accademia Nazionale dei Lincei, Rome, and Academic Press, New York, 1971. xii, 572 pp. + plates. \$22.50.

Computers and Brains. J. P. Schädé and J. Smith, Eds. Elsevier, New York, 1970. xii, 264 pp., illus. \$25.75. Progress in Brain Research, vol. 33.

Conductive Rubbers and Plastics. Their Production, Application and Test Methods. R. H. Norman. Elsevier, New York, 1970. viii, 278 pp., illus. \$13.75.

Cortisone. Edward C. Kendall. Scribner, New York, 1971. xiv, 176 pp. + plates. \$7.95.

Cybernetics for the Modern Mind. Walter R. Fuchs. Translated from the German edition (Munich, 1968) by K. Kellner. Macmillan, New York, 1971. 358 pp., illus. \$6.95.

Differential Forms on Electromagnetic Networks. N. V. Balasubramanian, J. W. Lynn, and D. P. Sen Gupta. Butterworth, London, and Davey, Hartford, Conn., 1971. xiv, 186 pp., illus. \$14.50.

Diseases and Pests of Ornamental Plants. Pascal P. Pirone. Published for the New York Botanical Garden by Ronald, New York, ed. 4, 1970. xii, 546 pp., illus. \$12.

Disordered Minds. The First Century of Eastern State Hospital in Williamsburg, Virginia, 1766–1866. Norman Dain. Colonial Williamsburg Foundation, Williamsburg, Va., 1971 (distributor, University Press of Virginia, Charlottesville. xiv, 208 pp., illus. \$5.95.

A Dissertation on the Poor Laws. By a Well-Wisher to Mankind. Joseph Townsend. University of California Press, Berkeley, 1971. viii, 86 pp. \$6.

Doctors in Hospitals. Medical Staff Organization and Hospital Performance. Milton I. Roemer and Jay W. Friedman. Johns Hopkins Press, Baltimore, Md., 1971. xiv, 322 pp. \$12.50.

The Drama of Man and Nature. Sanat K. Majumder. Merrill, Columbus, Ohio, 1971. viii, 136 pp., illus. Paper, \$1.95.

Dynamo II User's Manual. Alexander L. Pugh, III. M.I.T. Press, Cambridge, Mass., 1970. x, 74 pp., illus. Paper, \$5.95.

Electric Energy Systems Theory. An Introduction. Olle I. Elgerd. McGraw-Hill, New York, 1970. xxii, 564 pp., illus. \$16.50.

Electron and Ion Beam Science and Technology. Proceedings of the fourth