Extragalactic Astronomy

The Evolution of Galaxies and Stellar Populations. Proceedings of a conference, New Haven, Conn., May 1977. BEATRICE M. TINSLEY and RICHARD B. LARSON, Eds. Yale University Observatory, New Haven, Conn., 1977. xii, 450 pp., illus. Paper, $12.

A rather simplistic picture of the structure of galaxies developed during the 1960's. Galaxies were viewed as entities relatively unaffected by their environment and composed of dynamically separate stellar populations with rather unique "metal" (that is, all elements with $Z > 2$) abundances.

Recent data and theories concerning the stellar content of galaxies and the dynamical processes that influence their evolution have changed this picture. Galaxies are influenced by their environment, not only through interactions between galaxies, but also through the loss of residual gas resulting from "sweeping" by a gaseous intergalactic medium. In addition the boundaries that were thought to exist between stellar populations are becoming blurred as we find variations in the elemental abundances throughout galaxies.

This book is a collection of timely review papers and discussion comments from a conference on the large-scale structure and evolution of galaxies and the form and age distribution of their stellar populations. The papers are divided into four sections dealing with the systematic properties of galaxies, star formation in galaxies, chemical and stellar evolution in galaxies, and the origin and dynamical evolution of galaxies. The papers, which are by most of the "big science" pundits in the field, often contain quite recent data that have not been published elsewhere.

Some of the new results that could have an important bearing on future research are the wide range of stellar mass-function slopes found in young Magellanic Cloud globular clusters (Freeman), the large disparity between the ages of the oldest disk stars and the globular clusters (Demarque and McClure), and Butcher and Oemler's quite unexpected discovery of blue galaxies in distant clusters (Spinrad).

Much of the emphasis in the book is on the many unsolved questions raised by the new data. For example, an introductory article by King lists his "dirty dozen," 12 major questions that need observational and theoretical attention. Of these, the question of how and why stars form is of crucial importance. The lack of any clear understanding of the processes involved in star formation, of the critical factors that initiate star formation, and of how these factors determine the efficiency of star formation and the resulting stellar mass function is a serious obstacle to discussion of the origin and evolution of galaxies.

Though conference proceedings often date rapidly, much of the discussion here will be valuable for some time, partly because of the relevance of the papers, but mainly because of the very slow observational progress in this field. Additionally, this useful book was published only three months after the conference at an affordable price, something that cannot be said about the usually slow-to-appear and overpriced proceedings of International Astronomical Union symposiums and colloquiums.

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Terrigenous Sediments

Sedimentation in Submarine Canyons, Fans, and Trenches. DANIEL JEAN STANLEY and GILBERT KELLING, Eds. Dowden, Hutchinson and Ross, Stroudsburg, Pa., 1978 (distributor, Academic Press, New York). xvi, 396 pp., illus. $39.50.

There was a time when it was thought that sediments shed from the land never reached beyond the edge of the continental shelf. We now of course recognize that terrigenous sediments are flushed down submarine canyons, largely by turbidity currents, to create submarine fans and continental rise prisms that are the grandest sedimentary accumulations on earth—and are the subject of this book. The treatise is appropriately dedicated to the late Ph. H. Kuenen, who initiated the modern understanding of these deposits. His turbidity-current hypothesis of the 1950's has been fully sustained over the years, but understanding of the general process is further refined and interpreted in this volume. It is a sign of the times and of the acceleration of science that Francis P. Shepard, an even earlier pioneer of the study of submarine canyons and continental shelf processes and widely recognized as the "father of marine geology," is a principal contributor as an active scientist to this book.

The volume contains some 25 papers, which are grouped under the following headings: Bottom Currents and Biological Processes in Submarine Canyons, Gravity-Induced Processes (mass transport, turbidity currents, traction flow) in Submarine Canyons and Fans, Turbidite and Hemipelagic Deposition Processes in Submarine Fans, The Tectonic Setting of Some Submarine Canyons and Fans, Tectonics and Sedimentation in Arc and Trench Basins, and Synthesis and Prognosis. The 50 authors are a mix of marine geologists from academia, oceanographic laboratories, oil companies, and government agencies, notably the U.S. Geological Survey and the National Oceanic and Atmospheric Administration. The new and active participation of the Geological Survey and the oil companies in research on marine repositories of terrigenous sediments is especially in evidence and reflects an appropriate interest in these giant, although deep, structures as potential sources of oil and gas. Perhaps some measure of this importance is reflected in the recent appointment of H. W. Menard, a marine geologist, as the director of the Geological Survey. In any event the Survey-contributed papers to this volume, for example one on thin-bedded turbidites, are especially worth reading. There is also a good subset of papers treating the deep-water cone of the Nile Delta.

A science is only as good as its instrumentation and tools, and one searches a volume like this one for the impact of new methods and techniques—box corers, side-scan sonars, subbottom acoustic resolution sounders, and so on. Most impressive to this reviewer is the apparent coming of age of minisubmersibles as research vehicles. For the past two decades these DRV's (deep research vehicles) have captured much public interest but produced few tangible results, accounting for, as one oceanographer has stated, 95 percent of the funding and publicity but only 5 percent of the results. Now several papers in this book extensively utilize observations and measurements from both minisubmersibles and scuba diving.

The subject matter of the book is not confined to recent marine sediments in modern oceans. About half the papers treat the more accessible uplifted ancient canyon, back-arc basin, and fan deposits now preserved on dry land. The areas described are located in Great Britain, southern Europe, South America, the United States, and New Zealand. There is an obvious new sophistication applied to understanding turbidites in terms of such factors as sand-to-shale ratios and modified Bouma sequences. It would seem that not only is the present the key to the past but the past is also the key to

the present. The story of back-arc basin deposition would seem especially to need further sorting out, as does trench deposition, for these deposits are highly tectonized where they appear on dry land. As in other fields of geology, the imprint of plate tectonics as the ultimate control is clearly apparent in studies of sedimentation.

The book is well organized and nicely illustrated. Balance has been achieved by the addition of a few papers not presented at the original symposium. K. O. Emery has provided a foreword, and the editors have written both a preface and a final summing up—called by them an "appraisal and augury." One does question, however, why the publishers chose to print this tome in coffee-table format on thick paper stock, thus making it overly large for its content. As a scholarly and specialized source book that updates one aspect of marine geology, it should find space not on a coffee table but rather on the shelves of those interested in sedimentology, oceanography, and petroleum geology.

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Plant Growth

Controlling Factors in Plant Development. HIROH SHIBAOKA, MASAKI FURUYA, MASAYUKI KATSUMI, and ATSUCHI TAKIMOTO, Eds. Botanical Society of Japan, Tokyo, 1978. x, 278 pp., illus. Paper, Y4100. Special Issue No. 1 of the *Botanical Magazine*.

This paperback volume is the first of a new "special issue" series from the Botanical Society of Japan designed for botanists and advanced students. The 14 papers are somewhat arbitrarily grouped into four sections. The first section, overoptimistically entitled Major Developmental Stages in Plant Life, begins with a theoretical discussion by P. F. Wareing of the application of the concept of determination, that is, progressive specialization through the restriction of developmental potential, to the development of plants. K. V. Thimann's paper "Senescence" is a comprehensive and well-documented treatment of a subject that he has played an important role in developing.

In the second section, Metabolic Control, I. Takeuchi and colleagues describe their recent use of fluorescence-labeled antiserum as a marker of cell differentiation in roller tube cultures of the slime mold *Dictyostelium discoideum*. N. Yanagishima presents evidence for a peptide "pheromone" that induces agglutinability in mating types of common yeast. A great deal of attention has been focused on the interaction of gibberellic acid A_3 with aleurone cells of grains in the hope that insight will be gained into the mechanism of action of this major plant hormone. R. L. Jones and J. V. Jacobsen review the post-1970 work, baring the great complexity of a subject that at first seemed quite tractable.

In section 3, Hormonal Control, papers by Y. Masuda and by R. E. Cleland and D. L. Rayle review our current understanding of the long-sought mechanism by which auxins promote cell wall growth. Here again one is impressed by the complexity exposed by the data. In an especially lucid treatment, M. Katsumi and H. Kazama provide a rationale for the unification of the two seemingly disparate major roles of gibberellic acid. The final paper in this section, by E. Miginiac, presents support for the frequently overlooked importance of interorgan correlation in the control of flowering.

In the last section, Environmental Control, research with five rather diverse model systems is reviewed. Y. Oota and N. Nakashima summarize their efforts to elucidate the complex photoperiodic control of flowering in *Lemna gibba*, and M. Furuya documents our growing awareness of the complexity of the photocontrol of spore germination, protonemal growth, and cell division in ferns. Years of experience with mustard seedlings have provided H. Mohr and his co-workers with a good system for developmental studies. Here Mohr describes the formation of both temporal and spatial patterns of differentiation in cotyledon development in light and darkness. A. W. Galston summarizes the highly original and productive studies of leaf movements in legumes. Exploration of these unique plants has yielded insight into many of the important biological problems of our time and promises to enrich our understanding of the complex interactions of light with endogenous rhythmic processes. M. B. Wilkins, himself a major force in the study of geotropism, concludes with the welcome news that the statolith and Cholodny-Went hypotheses of the early 1900's are standing the test of time, at least as guiding concepts. All is not quicksand!

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Books Received

Adolescence. Transition from Childhood to Maturity. B. Geraldine Lambert, Barbara F. Rothschild, Richard Altland, and Laurence B. Green. Brooks/Cole, Monterey, Calif., ed. 2, 1978. viii, 376 pp., illus. $12.95.

Annual Review of Medicine. Selected Topics in the Clinical Sciences. Vol. 29. William P. Creger, C. H. Coggins, and E. W. Hancock, Eds. Annual Reviews, Palo Alto, Calif., 1978. x, 614 pp., illus. $17.

Annual Review of Neuroscience. Vol. 1. W. Maxwell Cowan, Zach W. Hall, and Eric R. Kandel, Eds. Annual Reviews, Palo Alto, Calif., 1978. xiv, 506 pp., illus. $17.

Annual Review of Pharmacology and Toxicology. Vol. 18. Robert George, Ronald Okun, and Arthur K. Cho, Eds. Annual Reviews, Palo Alto, Calif., 1978. x, 650 pp., illus. $17.

Annual Review of Physiology. Vol. 40. Ernst Knobil, Ralph R. Sonnenschein, and I. S. Edelman, Eds. Annual Reviews, Palo Alto, Calif., 1978. x, 604 pp., illus. $17.

Applications of Digital Signal Processing. Alan V. Oppenheim, Ed. Prentice-Hall, Englewood Cliffs, N.J., 1978. xii, 498 pp., illus. $23. Prentice-Hall Signal Processing Series.

Applied Mineral Exploration with Special Reference to Uranium. Robert V. Bailey and Milton O. Childers. Westview Press, Boulder, Colo., 1977. xx, 542 pp., illus. $65.

Aquatic Microbiology. Papers from a conference, 1976. F. A. Skinner and J. M. Shewan, Eds. Academic Press, New York, 1977. xii, 370 pp., illus. $30.25. The Society for Applied Bacteriology Symposium Series No. 6.

Biology in Transition. A Critical Inquiry. Harry Lehman. Exposition Press, Hicksville, N.Y., 1978. 176 pp., $8.50. An Exposition-University Book.

The Biology of People. Sam Singer and Henry R. Hilgard. Freeman, San Francisco, 1978. xiv, 546 pp., illus. $15. A Series of Books in Biology.

Biomolecular Structure and Function. Papers from a symposium, Columbia, Mo., May 1977. Paul F. Agris, Richard N. Loeppky, and Brian D. Sykes, Eds. Academic Press, New York, 1978. xxvi, 614 pp., illus. $25.

Coal Resources, Characteristics and Ownership in the U.S.A. Robert Noyes, Ed. Noyes Data Corporation, Park Ridge, N.J., 1978. xii, 606 pp., illus. $45.

Control System Design by Pole-Zero Assignment. Papers from a meeting, Cambridge, England, Sept. 1974. F. Fallside, Ed. Academic Press, New York, 1977. x, 240 pp., illus. $22.50.

Cosmic Catastrophes. Gerrit L. Verschuur. Addison-Wesley, Reading, Mass., 1978. x, 214 pp., illus. Cloth, $9.95; paper, $4.95.

The Courage to Be Imperfect. The Life and Work of Rudolf Dreikurs. Janet Terner and W. L. Pew with the editorial assistance of Robert A. Aird. Hawthorn Books, New York, 1978. xvi, 412 pp., illus. $14.95.

Creation. Frank Jakubowsky. Published by the author, 1565 Madison Street, Apt. 308, Oakland, Calif., 1978. iv, 106 pp., illus. Paper, $1.95.

Current Trends for the Developmentally Disabled. Papers from a conference. Atlanta, 1976. Margo S. Berkler, Gary H. Bible, Shawn M. Boles, Diane E. D. Deitz, and Alan C. Repp, Eds. University Park Press, Baltimore, 1978. viii, 232 pp. Paper, $9.95.

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