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.

GARTH ILLINGWORTH
Kitt Peak National Observatory, Tucson, Arizona 85726

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