BOOK REVIEWS

Galaxies Nearby

The Magellanic Clouds. BENGT E. WESTERLUND. Cambridge University Press, New York, 1997. xvi, 279 pp., illus. $69.95 or £50. ISBN 0-521-48070-1. Cambridge Astrophysics Series, 29.

The Magellanic Clouds are the nearest major external galaxies. They can therefore be observed in much greater detail than any other systems outside our galaxy. Such studies show a number of important differences between the Magellanic Clouds and our own Milky Way System. Many of these differences can be understood in terms of the fact that the clouds are less evolved, and have lower metallicities, than our own galaxy. However, these new observations have raised as many problems as they have solved. In particular, it is not understood why both the Large and the Small Cloud contain numerous "populous star clusters," with characteristics intermediate between those of the globular clusters and the open clusters in the Milky Way System. Another mystery is why the rate of star and cluster formation in the Large Cloud (but not in the Small Cloud) suddenly increased about 4 billion years ago. In fact, not much is known about the "dark ages" between 4 and 10 billion years ago, when very little seems to have happened in the Large Magellanic Cloud, even though the Large Cloud had undergone a major burst of star formation between 10 and 15 billion years ago. The Magellanic Clouds are irregular galaxies that do not exhibit well-defined spiral structure. This shows that not all star formation requires the existence of spiral density waves. The Magellanic Clouds also differ from spiral galaxies like the Milky Way System in that they are not centered on nuclei that contain massive black holes.

In this book Bengt Westerlund has undertaken the monumental task of gathering, and ordering the enormous volume of published material on the Magellanic Clouds into a single coherent picture. This project is rendered more difficult by the fact that the Magellanic Clouds are so near that just about anyone with a small telescope can study them, whereas observing time to study more distant galaxies with large telescopes is granted only for carefully selected peer-reviewed proposals. Westerlund handles this problem well by occasionally making gentle suggestions about more observations, or observational checks being required before certain claims or conclusions can be accepted.

The volume has clearly been prepared with great care and is virtually free of errors of detail. My only complaint is that the terms "inclination" and "tilt" are used interchangeably, when tilt is in fact the complement of inclination. Also, it is unfortunate that the more than 700 references, which densely cover the two decades after 1975, seem to peter out in mid-1995.

In summary this is an important book that will be an indispensable guide and a source of references for the next generation of observers of the Clouds of Magellan.

Top, the Small Magellanic Cloud [Royal Observatory, Photo Researchers]. Bottom, the Large Magellanic Cloud [Luke Dodd, Photo Researchers].

Sidney van den Bergh
Dominion Astrophysical Observatory, Victoria, BC V8X 4M6, Canada

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Evolutionary Basics

Molecular Evolution. WEN-HSIUNG LI. Sinauer, Sunderland, MA, 1997. xvi, 487 pp., illus. $52.95 or £32.95. ISBN 0-87893-463-4.

Molecular evolution is as eclectic a discipline as there is in biology. Participants include molecular biologists using sequence comparisons to investigate function, phylogeneticists trying to reconstruct the history of life, population geneticists concerned with the role of genetic drift in natural populations, and, most centrally, molecular evolutionists describing the process itself. As the field itself lacks cohesion, an author of a general account of molecular evolution is faced with the exciting, if nearly impossible, task of providing a framework where none currently exists. Small wonder that until now there have been no comprehensive molecular evolution texts. Wen-Hsiung Li, the author of the book under review, is uniquely qualified to write such a text, as he has in fact contributed to the four areas listed above.

Molecular Evolution is remarkable in the breadth of its coverage. The first two chapters are introductory treatments of molecular and population genetics. The next three describe the basic methodology of molecular evolution studies, including the estimation of the number of substitutions on a lineage and the reconstruction of phylogenies. Those familiar with *Fundamentals of Molecular Evolution*, Li's earlier textbook coauthored with Dan Graur, will feel right at home with these four chapters, as they are taken almost verbatim from that book. With tools in hand, the next three chapters attack the classic concerns of molecular evolution: phylogeny inference including examples like the always popular apes and whales; rates and patterns of nucleotide substitutions; and molecular clocks. From here the book becomes topical, with chapters on molecular population genetics, evolution by gene duplication and exon shuffling, concerted