to abandon deterrence based on retaliation; the Europeans believe their security and freedom of action rest on the vulnerability of the superpowers to nuclear attack. The SDI requires abrogation of the Anti-Ballistic Missile Treaty; the Europeans insist the treaty be preserved. Daalder is an excellent guide through complicated territory. He knows how to lay the analytical groundwork for the reader and when to step aside and let the flavor and color of European opinions emerge from the words of Europeans themselves. This is a first-rate book.

DONALD L. HAFNER
*Department of Political Science, Boston College, Chestnut Hill, MA 02167*

## Star Systems

**Stellar Populations**. COLIN A. NORMAN, ALVIO RENZINI, and MONICA TOSI, Eds. Published for the Space Telescope Institute by Cambridge University Press, New York, 1987. x, 245 pp., illus. $32.50. Space Telescope Institute Symposium Series, 1. From a meeting, Baltimore, May 1986.

In 1979 the International Astronomical Union held a colloquium on scientific research with the Space Telescope. At that time, the expected launch date was 1983; it is now late 1988 or early 1989. *Stellar Populations* contains the invited review papers from a meeting on that subject held at the Space Telescope Science Institute in May of 1986. This is an area of research in which the Space Telescope is sure to make great contributions and exciting discoveries. One's first impression on comparing this volume with the proceedings of the 1979 symposium (*Scientific Research with the Space Telescope*, U.S. Government Printing Office) is that tremendous progress has occurred within the past decade, even though astronomers have been largely limited to observations with ground-based telescopes. Because of the continuous improvement in the quantum efficiency of detectors and in the speed of computers, which in turn affects the ability of astronomers to analyze, interpret, and model their data, many of the problems outlined in 1979 have begun to be resolved. Further rapid ground-based progress is sure to occur, given recent projects for the construction of ever larger telescopes and the improvements in "seeing" that have been achieved by proper attention to thermal characteristics inside telescope enclosures and by the location of astronomical observatories at sites with extremely stable atmospheric properties.

The concept of stellar populations was most clearly enunciated by Walter Baade in the mid-1950s. The papers by Searle and by Sandage provide excellent summaries of the history of this idea. Baade divided the contents of stellar systems into two major classes, the regions of active star formation where the mean age of the stellar constituent is very young (perhaps only a few hundred thousand years) and the tranquil old system of stars in which nothing significant has happened for the past ten billion years (beyond the gradual aging of the individual stars). In our own Galaxy, the Galactic disk with its extensive gas clouds and its clusters of hot, massive, and very young stars is the prototypical example of Population I, whereas the collection of globular clusters that resemble for our Galaxy a system of small artificial satellites orbiting the earth is the archetype of the much older Population II objects.

This now seems simplistic; real galaxies contain a continuum of stars with related kinematic properties, chemical abundances, and age. The details of the relationships are still obscure, and fierce debates rage about whether any particular component is discrete or the tail of one of the three more or less standard and universally accepted constituents of galaxies: a flattened disk, an approximately spherical halo, and a central bulge. It is unfortunate that in many of the areas of greatest controversy, only one of the combatants was actually present at the May 1986 meeting. In the case of the question of the "thick disk" whose existence within our own Galaxy was proposed by Gilmore a few years ago, neither of the strongest proponents for or against this idea was present at the conference.

The papers by Mould, by Aaronson, and by Sandage present useful summaries of our current knowledge of the stellar content of the central bulge and halo of our own Galaxy, that of our nearest neighbors (the Magellanic Clouds), the dwarf galaxies (rather puny satellites of our Galaxy), and our nearest neighbor of a size comparable to typical luminous galaxies, M31 (the Andromeda nebula). They illustrate the immense difficulties faced by astronomers working in this field—we still do not know the distance to our closest neighbors, the Magellanic Clouds, within an uncertainty of 25 percent in spite of decades of work by many people. The theoretical uncertainties in stellar evolution (the modeling of the properties of a star, its luminous output, its radius, and so forth from the time it condenses out of a cloud of gas until its nuclear fuel is exhausted) are gradually beginning to yield to persistent efforts but remain a serious problem, as is summarized by O'Connell. Even worse, and far less tractable, are the uncertainties in the relative number of stars of different masses that are formed at a given time (the initial mass function), a subject reviewed by Larson, where the theory is so complex and there are so many variables that little progress can realistically be expected without guidance from observers, and observations are extremely difficult, since they require star-by-star counting and age dating within our own and other galaxies. The initial mass function may well be dependent on local conditions, complicating things still further, yet it is an essential parameter in trying to characterize galaxies that are so distant that only the composite light of all their stars together can be measured. Even with the power of the Space Telescope, it will be impossible to see stars as faint as our own sun, even in a galaxy as close as the Andromeda nebula.

I found this book a useful summary of current knowledge. In it one encounters the many questions that will undoubtedly dominate the study of the subject for years to come. The papers present thoughtful reviews of recently published work and of studies in progress by the authors and their collaborators. Unfortunately, the book does not include any of the numerous interesting results that were presented in the poster sessions.

JUDITH G. COHEN
*Department of Astronomy, California Institute of Technology, Pasadena, CA 91125*

## Modern Zoophytology

**The Growth and Form of Modular Organisms**. J. L. HARPER, B. R. ROSEN, and J. WHITE, Eds. Royal Society, London, 1986. 250 pp., illus., + plates. £43. First published in *Philosophical Transactions of the Royal Society of London*, series B, vol. 313, no. 1159. From a meeting, London, June 1985.

**Modular Organisms: Case Studies**. Papers Relating to a Discussion Meeting [London, June 1985] on Growth and Form in Modular Organisms. Royal Society, London, 1986. 116 pp., illus., + plates. Paper, £12.75. *Proceedings of the Royal Society of London*, series B, vol. 288, pp. 109–224.

Although his *scala naturae* had no place for evolutionary convergence, Aristotle commented at length on the often striking similarity of marine invertebrates and plants. Indeed, until 1740, when Abraham Trembley demonstrated that the green hydra (*Chlorohydra viridissima*) was in fact an animal, colonial marine invertebrates were collectively referred to as "zoophytes." The remarkable architectural similarity of plants and clonal animals, beautifully illustrated on the frontispiece of the first of these sympo-