ated daily in Washington, D.C., would cover the Mall to nearly half the height of the Washington Monument. According to my calculation, this would make the monument about 5 inches tall. These are just a few examples of statements that destroy the book's credibility.

To Rifkin's credit, unlike many advocates of solar energy, he warns that society may be quite different with solar energy as a major source. The transition to a solar-energy–based society will be painful, perhaps revolutionary. Costs will be enormous and it cannot be done quickly. He makes the interesting point that 75 percent of the buildings that will exist in the United States in the year 2000 have already been built, so most would have to be retrofitted for solar energy. On the other hand, life in the "entropic" society would not have to be as dull, almost medieval, as Rifkin pictures it, as we could retain computers, communications, and other features of society that use little energy or resources.

This is a very disappointing book. Thermodynamics, and the second law in particular, can be used quite effectively in dealing with many problems of our society and has been by several authors, notably Alvin Weinberg, Stephen Berry, and Barry Commoner. There is a need for continued efforts to awaken citizens, politicians, and scientists to the need for changes in our uses of energy and other resources. But bringing about such changes will require careful, quantitative evaluation of the alternatives that a simplistic antitechnology approach does not provide.

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Behavioral Ecology

Behavioral Mechanisms in Ecology. DOUGLASS H. MORSE. Harvard University Press, Cambridge, Mass., 1980. xii, 384 pp., illus. $25.

During the last decade behavioral ecology has emerged as an exciting field of study, so named because the way in which behavior contributes to survival and reproduction depends on an animal's ecology, the food it eats, its predators, the architecture of its habitat, and so on. Present methods of field observation and experiments are really just extensions of the descriptive approach to behavior of the early naturalists and the studies by Tinbergen and others of animals in their natural environment. The recent excitement has arisen from advances in theory, particularly the development of optimality theory and ideas about the evolution of social behavior, together with the realization that it is possible to test precise, quantitative predictions about animal behavior in the field. We can now attempt to explain why it is often male fish but female mammals who exhibit parental care, why in ant societies there is more cooperation between sisters than between brothers, and why the male dungfly copulates for 41 minutes.

Morse provides a useful textbook reviewing the field, particularly foraging and antipredator behavior, habitat selection, competition for resources (mates and territories), and social groups. The book is attractively produced and well written, but, for me, it does not convey the excitement of behavioral ecology because the examples of behavior discussed are not related in any critical way to evolutionary or ecological theory. For example, in the chapter on food selection the results of several patch-choice experiments are described, but there are no details of the underlying theory (marginal value theorem); in the section on communal breeding there are only brief discussions of the concepts of kin selection, inclusive fitness, and coefficients of relatedness; data to test a threshold model of territoriality are given, but the model is not described so we do not know its assumptions or predictions; several examples of individual differences in competitive behavior within a population are given but no theory of alternative strategies.

Of course, there is always the danger of becoming carried away by theoretical arguments. A few years ago, if we saw an animal behaving in a way different from the majority of the species we would probably have said it was abnormal; now we are perhaps too quick to label anything different as a "strategy." However, I think this book goes to the opposite extreme; unless there is some critical presentation of theory it will be difficult for the student reader to understand exactly why the observations are interesting.

In the final chapter, Morse gives a sensible list of future directions for the subject. Since the book went to press (it covers the literature up to 1978), several of these ideas have already been explored, such as quantification of the genetic payoffs from helping versus breeding in communally breeding groups and consideration of goals other than energy maximization in foraging models. However, Morse is surely right in emphasizing that many of the data are weak, even on fundamental problems like the costs and benefits of group living. Perhaps it is up to the fieldworkers to make sure that the theoreticians restrain their models by anchors firmly embedded in natural history. If so, then it is the theoreticians who would profit most by reading this book.

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Stellar Oscillations

Nonradial and Nonlinear Stellar Pulsation. Proceedings of a workshop, Tucson, Ariz., Mar. 1979. H. A. HILL and W. A. DZIEMBOWSKI, Eds. Springer-Verlag, New York, 1980. viii, 498 pp., illus. Paper, $33.60. Lecture Notes in Physics, vol. 125.

The sun is now being welcomed back into astronomy after a considerable interval of neglect by most astrophysicists. This is an exciting time for solar physics, and a principal cause of the excitement is the recent observation of solar pulsations with periods ranging from a few minutes up to 2 hours 40 minutes. In these proceedings the observational evidence for and theoretical implications of solar oscillations are enriched by discussions of oscillations in other kinds of stars.

Much of the interest in and excitement surrounding the study of solar oscillations is due to the possibility of learning through them about the interior regions of the sun that are not accessible to direct observation. This is now of particular interest because the flux of solar neutrinos observed in a lead mine in South Dakota is less by a factor of 3 than had been predicted from standard solar models, calling into question our understanding of solar (and stellar) structure. A recent flurry of interest in a solution to this problem related to a finite mass of the neutrino seems now to be dying down.

A mode of solar oscillation in which the entire visible solar disk or a large fraction thereof is moving in phase has a period equal to twice the time required for a sound-like wave to travel from the solar core to the surface. Studies of this wave give information about the density and temperature of the solar interior. Another type of wave having many nodes on the solar surface gives information about the outer layer of the sun. The solar rotation produces a splitting of this mode so that it is possible to measure the