rangement decreases. This makes stasipatric speciation even more unlikely. Chromosomal rearrangements would still be important in evolution and speciation, to be sure, but the mechanisms determining their fates would be quite different from the stasipatric model envisioned by White.

Many of the contributors to this volume not only disagree with White but disagree with each other as well upon a great many issues. For example, John also addresses the question of phenotypic effects raised by Bush. He makes a distinction between the "exophenotype" (the traits resulting from the pattern of development and metabolism) and the "endophenotype" (the factors regulating the genetic composition of gametes and zygotes produced by an individual) and argues (p. 30) that "chromosome change is not sensibly related to exophenotype change" but rather is related to endophenotype change. This view is in direct opposition to the view portrayed in Bush's essay. Both authors buttress their arguments with much documentation; Bush refers to specific cases in which chromosomal rearrangements alter sex determination or enzyme levels, and John gives examples in which meiotic properties are altered with no exophenotypic change; John points out that in many groups morphological change is not correlated with chromosomal change, but Bush counters that the adaptive significance of the rearrangements is often not morphological but physiological; and so on. The reader can only conclude that sometimes rearrangements do influence the exophenotype and sometimes they do not. The critical question then becomes, which type plays the more important role in evolution and speciation—that is, is the primary evolutionary significance of karyotypic evolution to be found in the endophenotype or in the exophenotype? Perhaps there is no single answer to this question. As is well known, a particular type of chromosomal rearrangement might have very different endophenotypic consequences in different groups: for example, inversions that act merely as crossover suppressors in *Drosophila* can create unbalanced gametes in mammals. Could not the same be true for exophenotypic consequences? In addition, there might be interactions between the type of chromosomal effects and the exact mode of speciation. One of the principal contributions of White's stasipatric model to general evolutionary theory was to reintroduce pluralism into the explanation of speciation. White never regarded stasipatric speciation as a replacement for geographical speciation, but rather as an additional mode. Moreover, he emphasized that certain groups, because of their population structure and type of cytogenetic constraints, would be more predisposed toward stasipatric speciation than others. In general, as White himself has argued, there is no reason to suppose that different modes of speciation behave identically with respect to chromosomal evolution. Such a pluralistic view is also called for in resolving the apparent conflict between the views of chromosomal evolution put forth by John and Bush: they do not need to be regarded as alternatives.

The way in which chromosomal change affects evolution is but one of several issues discussed in this volume upon which sharp disagreements are evident. I do not regard this as a weakness of the volume, but rather as its principal strength. I took great delight in (and learned much by) juxtaposing the many well-written and well-documented but diametrically opposing arguments and conclusions that appear among the essays of this volume. The volume is therefore not only informative but stimulating as well, for the essays conjure up more questions than answers. The reader cannot help being made aware of the excitement and flux of ideas that characterize current evolutionary theory and models of speciation—an excitement and flux stirred up in no small part by the writings of Michael White.

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Marine Invertebrates

Advances in Marine Biology. Vol. 18, The Biology of Mysids and Euphausiids. JOHN MAUCHLINE. Academic Press, New York, 1980. x, 682 pp., illus. $93.

Euphausiid biology is currently a topic of considerable interest, and Mauchline's new book is accordingly well timed. The prospect of millions of dollars being spent on the study of the Antarctic krill *Euphausia superba* through such large multinational projects as BIOMASS and FIBEX and the possibility of euphausiids entering our lives as frozen shrimp tails for the rich and shrimp pastes and flour for the poor ensure that this updated book on the biology of euphausiids (and incidentally of mysids) will find a ready market of grateful readers. Mauchline's task was to review the literature on euphausiids that has appeared since his earlier (1969) treatise, written with L. R. Fisher; that volume dealt exclusively with euphausiids and was published as volume 7 of the *Advances in Marine Biology* series. Literature surveys often tend to be dull, in part because authors attempt the impossible task of making sense of a spotty, often incoherent array of publications. Occasionally Mauchline's interesting style fades when he considers works that should never have been published but nevertheless must be cited in a catholic if not eclectic review. His ire shows in an occasional acknowledgment that "it is difficult to see the usefulness of these experiments, but . . . ." If the book suffers any shortcoming, it is this attempt to consider all the literature. Mauchline's knowledge of mysids and euphausiids would seem adequate to allow him to present a synthesis of how these animals live, an approach that would give him an opportunity to point out gaps and directions in research. He has instead chosen the format of a comprehensive review of the literature, and as a consequence his account of the biology lacks the snap of conciseness.

Though Mauchline's first love is euphausiids, he has published several papers on mysids, and he has used the occasion of this book to present a review of the mysid literature as well. The contrast of these two sections is interesting because they represent science for satisfaction and curiosity (mysids may be important in the ecological economy of the sea but are unimportant in the dollar economy of either grantees or food producers) versus big-dollar science (there may be enough *Euphausia superba* in the Antarctic to sustain a fishery—krillery?—that would surpass the 60 to 70 million tons that is the total catch of all the world's fishing fleet). Mauchline writes of mysids for his own satisfaction, and the result is an excellent, welcome compendium that supplants and extends the earlier 1951 work of the Tattersalls.

In this book, as in the earlier Mauchline and Fisher volume, the treatment proceeds from taxonomy and distribution (one new species of euphausiid described since 1969 and one synonymized to keep the total at 85), to larval morphology, to feeding (a topic treated anecdotally or qualitatively simply because quantitative studies of feeding of either mysids or euphausiids are almost nonexistent), vertical migration (still enigmatic), on through to growth and maturity. With regard to this last topic Mauchline departs from his role of reviewer to

postulate a growth curve for *Euphausia superba*. The population dynamics of this animal that may someday feed the world is so poorly understood that we do not know if it lives two years or maybe four. Obvious difficulties await those who would apply conventional fishery calculations to estimate maximum sustainable yield. Mauchline, employing regressions he developed earlier to express growth rates of other crustaceans, estimates that the life cycle may be two, three, or four years, depending on environmental temperatures and feeding conditions. It's a nice bit of speculation.

In general, this book, paired with its 1969 counterpart, will be indispensable to those newly interested in the biology of euphausiids, and the smaller group engrossed in the biology of mysids will be pleased that their animals have at last received the attention of a review.

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The Solar-Stellar Connection

Solar Phenomena in Stars and Stellar Systems. Proceedings of an institute, Bonas, France, Aug. 1980. ROGER M. BONNET and ANDREA K. DUPREE, Eds. Reidel, Boston, 1981 (distributor, Kluwer Boston, Hingham, Mass.). x, 592 pp., illus. $69.50. NATO Advanced Study Institutes Series C, vol. 68.

Within the last decade solar physicists and stellar astronomers have rediscovered that the sun is a star. Early in this century, astronomers often used the sun as a benchmark against which to compare their crude stellar observations, but after they had reached the limits of their technology and exhausted the possibilities of comparison with the sun and its spectrum our star was relegated to an occasional appearance as a dot in a published color-magnitude diagram. Meanwhile, solar physicists busied themselves with studies of minute photospheric and chromospheric features and research into the appearance and nature of the solar cycle—matters that were clearly of no interest to those who did their observing after sunset.

All that has changed now. This thick volume is the proceedings of a meeting on the subject of the many connections that now exist between solar and stellar research. The papers are divided into three sections, on solar and stellar variability; chromospheres, coronas and convective phenomena; and solar and stellar interiors. It is clear that in all three of these areas the reason for the sudden burst of research activity is that there have been various improvements in the technological level of astronomical instrumentation in recent years.

The book begins with an overview by R. W. Noyes, which lays a solid foundation for all the contributions that follow. Solar and stellar interiors are treated in two review papers, one theoretical and the other observational. The observational paper, by E. Fossat, is a clear presentation of the fundamentals of solar and stellar oscillations and their detection. Already work on these oscillations is beginning to tell us something about the interior dynamics of the sun, and there is hope that before long, by means of seismic-type probing, we will be able to learn a great deal about the interior structure and dynamics of the sun and other stars. This is one of the most exciting developments in astronomy in many years.

The recent interest in stellar chromospheres and coronas has been generated by recent satellite observations of ultraviolet and x-ray radiation from stars. Solar observers have had such data for many years from satellites. The importance of the magnetic fields for the existence and the heating of these outer regions of the stars and the sun is now quite evident, although the exact mechanism for the heating of the corona still eludes us. In a comprehensive review, J. L. Linsky outlines the nature of stellar chromospheres and coronas and their distribution in the Hertzsprung-Russell diagram and lists the important stellar parameters that determine their properties.

The section on solar and stellar variability is highlighted by a thorough review of the topic by A. Skumanich and J. A. Eddy. It is now well established that many stars go through "activity cycles" that are apparently identical to that of the sun. The periods of these cycles are not far from the 11-year period of the solar cycle. This was first shown in the work of O. C. Wilson, which covered a period of many years. The activity level of stars is judged from the amount of emission in the cores of the H and K lines of ionized calcium, which are formed in the chromosphere.

The volume will make a good reference book for students and scientists. Of course in a rapidly advancing field a volume such as this becomes outdated quickly, and it is true that a greal deal has happened since the meeting (especially in solar and stellar activity). Nevertheless the papers are, to a large extent, solid reviews of the fundamental aspects of the field, so the book reads more like a textbook than a symposium proceedings.

In his concluding remarks, E. N. Parker, who always chooses his words carefully, states, "This has been about the most rewarding meeting I have ever had the pleasure of attending." The assiduous reader will share this enthusiasm.

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Microbial Adhesion to Surfaces

Bacterial Adherence. E. H. BEACHEY, Ed. Chapman and Hall, London, 1980 (U.S. distributor, Methuen, New York). xii, 466 pp., illus. $69.95. Receptors and Recognition, Series B, vol. 6.

The number of recent books dealing with microbial adherence attests to the widespread interest in the subject. The present book concentrates on the adherence of bacteria to animal tissues, although there is a paper by Fletcher on adherence of marine microorganisms to smooth surfaces and one by Lippincott and Lippincott on microbial adherence in plants.

The idea that bacteria accumulate on solid surfaces because the highest concentrations of nutrients are found there is well accepted in marine microbiology and in oral microbiology, though it has received less attention in recent years. The use, initiated by marine microbiologists, of quantitative methods in the study of adherence has been exploited by oral microbiologists, as Gibbons and van Houte discuss. The application of quantitative methods has been instrumental in the development of the idea that adherence is often a specific process. This idea recurs in a number of guises throughout the book. The best-documented examples of specificity are those involving the nitrogen-fixing bacteria and plant pathogens, which are described by Lippincott and Lippincott. Extensive documentation of specificity in these organisms has been possible because the stability of the components involved allows the use of extraction techniques that would denature components involved in animal model systems. In addition, of course, plant cells can be grown and manipulated more easily than those of animals. The relationship between fimbriae (pili?) and epithelium in