nomena may be extrapolated directly to higher levels. Recognition of the existence of species as discrete entities in effect contradicts the vision of change in gene content and frequency—whether or not affected by natural selection—as a continuous process from the population on up through the phylum." It appears that the entire thesis of this book rests on species concepts.

If one can accept that species are the discrete units of space and time that this book demands, one can learn a lot about the ways in which differential origination and extinction of species lead to phylogenetic patterns. There are many pages of useful analysis, although a serious flaw of the entire book is the apparent fervor of the authors and their need to repeat the central ideas over and over. The book could have been half as long.

Readers will search in vain for any meaningful discussion of the origin of adaptations. Nor will they find many references to molecular data or methods of analysis. Such authors as A. C. Wilson, Romero-Herrera and co-workers, Goodman, and Zuckerkandl are ignored. Even modern accounts of speciation theory by White and Endler are ignored, and this is most curious because this topic plays such a dominant role in the book. Thus much of the excitement of modern comparative biology is viewed as not relevant to this misleadingly titled book.

Is there anything new in this book? For those who have not followed the arguments in *Systematic Zoology* during the past decade and who have not read Steven Stanley's book (*Macroevolution*, Freeman, 1979), the answer certainly will be "yes," and I urge you to read this book to bring yourselves up to date concerning one important view. For me, a series of familiar arguments are here brought together in one place, in a rather novel and entertaining presentation. But there is little that is new. The most important lesson for me was the realization that a concept of discrete species is critical to cladistics theory. The authors essentially argue that macroevolution can be reduced to a problem of cladistics. Though I am in firm agreement with them that we must struggle to untangle the history of taxa before we speculate about evolutionary patterns, I am equally firm in my belief that there is much more method and theory of evolutionary processes and phylogenetic patterns than one could learn from this book.

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Implications of Parasitism

Evolutionary Biology of Parasites. PETER W. PRICE. Princeton University Press, Princeton, N.J., 1980. xii, 240 pp., illus. Cloth, $17.50; paper, $6.95. Monographs in Population Biology, 15.

The author of this monograph has two goals. The explicit goal is to develop generalizations of significance for evolution and ecology from a comparative study of parasites. The implicit goal is to convert the reader to his own enthusiasm for parasites. The two goals combine unhappily.

Price seeks proselytes among those who say that parasites are essentially predators, among those who glorify mammals and birds as testaments to evolutionary progress, and among those who argue that parasitism is an evolutionary dead end. It is important to him "to establish that no group of organisms on this earth can surpass the parasites in their potential for continued adaptive radiation."

Enthusiasm can be the source of useful inspiration, but here it distorts suggestions and conclusions that have merit. Early in the book Price presents arguments that the majority of insects are parasites—70 percent of British insects, for example. Since three-quarters of all species are insects and nematodes, mites, protozoans, and bacteria are parasites as well, the significance of predators, of nonparasitic herbivores and carnivores, and of saprophages becomes, to him, trivial. This view is a consequence of a definition that includes as a parasite any species in which the individual obtains all of its nourishment from an individual of another species. Hence most of the insect defoliators of plants become parasites, not herbivores. The resulting diversity of life forms is so great that Price's "generalizations" are dominated by exceptions. He is forced to define a generalization by a kind of majority vote: If a conclusion applies to more than 50 percent of the species, then it becomes a generalization. But also Price's desire to convince the reader of the great abundance and diversity of parasites leads him to conclude that examples could be found to defend any thesis. What, then, are the rules for disproof? What are the precisely defined conditions within which a principle is appropriate?

The irony is that Price's basic conclusions are derived from examples drawn from a narrower spectrum. That spectrum is characterized by small animals that search for discrete patches from which an individual obtains its nourishment for a significant part of its life. Even then, subcategories exist that generate apparent exceptions. Those subcategories include insect parasitoids of other insects as well as internal parasites of vertebrates, such as helminth parasites. For those organisms search processes are different, as are conditions within the hosts. As a consequence, both adaptive and competitive pressures are different. If Price had made even a modest effort to define strategic classes of parasites, his conclusions would have been much more focused and significant.

But if the reader can place the missionary zeal in perspective and can erect a classification of his or her own, then the book offers suggestions that are important and a rich set of examples that are useful for testing alternative ideas.

Those animals that search for patchy, transient resources are faced with difficulties that Price argues must lead to low probabilities of colonization and high probabilities of extinction. The result is systems dominated by instability. Hence the extensive body of literature that emphasizes a fixed point equilibrium and damped oscillations around the equilibrium hardly seems appropriate. It represents an essentially static view in which the underlying structure cannot evolve. Price labels such conditions as equilibrium ones and everything else as nonequilibrium. Even the developers of equilibrium models view those models only as instructive metaphors of a tiny part of reality, stepping-stones to a richer set of metaphors that have a closer relation to reality. Hence Price sets up a situation where anything of interest in nature must fall into his second, "nonequilibrium" category. There are different causes and kinds of stability and instability behavior within that category that generate different classes of variability, however, and it is these kinds of variability that underlie the evolution of structures. But at least Price joins that growing number of natural and social scientists who see instabilities as a center of interest. And his emphasis on within- and between-patch dynamics contributes examples for useful understanding.

The remainder of the book concentrates on questions of adaptation and community structure. Price notes the prevalence of parthenogenesis among parasites and argues that genetic variation among them is likely to be richer than proponents of sexual reproduction would believe. That is a condition that would bolster his argument that parasites are highly adaptive, capable of rapidly tracking changes in host and environment. It speaks against his more con-

vincing analysis of community structure, where he concludes that parasite communities are generally young, with many niches that are unexploited. That is a consequence of the demands for specialization imposed by the tight linking of parasite and host. Such tight coevolution results in modest interspecies competition and loose species packing. Price's examples are drawn largely from helminths, and his conclusions are more convincing because they are constrained to a defined set of conditions. But extensions beyond that set of conditions—to parasitoids, insect defoliators, protozoans, and bacteria—are suspect.

The emphasis on variability as opposed to constancy, on parthenogenetic as opposed to sexual reproduction, and on mutualism and specialization as opposed to competition is pertinent. And Price's plea for an ecology of rare events and of the small is compelling. When that can be combined with generalizations applied to rigorously defined categories of conditions, drawn from pertinent examples, then the comparative study of parasites will, as he passionately wishes, become a fundamental building block for both ecology and the study of evolution.

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Marine Chemistry

Petroleum in the Marine Environment. Papers from a symposium, Miami Beach, Sept. 1978. LEONIDAS PETRAKIS and FRED T. WEISS, Eds. American Chemical Society, Washington, D.C., 1980. x, 372 pp., illus. $42. Advances in Chemistry Series, 185.

One might expect this book to be an expanded and updated version of the excellent systematic and basic compilation published by the National Academy of Sciences in 1975, which had the same title. Instead, the book is a nonsystematic coverage of the many analytical methodologies that are used in attempts to understand the fate and effects of petroleum in the marine environment. Some results from the applications of these methods are discussed, but the treatment is not exhaustive.

The book contains 16 chapters, all of them dealing with analytical techniques. After a good general overview in chapter 1, the remainder of the book deals with analyses and analytical methods applied to hydrocarbons in petroleum, organisms, water, and sediments. In fact, 11 chapters are devoted totally or in part to the polycyclic aromatic hydrocarbons that are thought to be the petroleum components that are the most hazardous to the environment. Chapter 12 discusses only aliphatic hydrocarbons; the analytical detail and coverage in this chapter seem archaic compared with the sophistication in methods and approaches of the other chapters. Two chapters (7 and 8) consider solubilities of hydrocarbons in water, and one chapter (9) looks into nonhydrocarbons. The reader will likely be surprised to learn that, at least by 1978, no studies had been made of nonhydrocarbons in biodegraded petroleum.

The editors say (p. x) that they wish to reach, in addition to active workers dealing with aspects of the subject, "persons contemplating entering the field and who may be in need of a cogent up-to-date review; administrative or legal personnel who may be dealing with questions of appropriate methodology in proposed work or forensic problems; persons interested in a general overview of the subject; and professors and students who may find the volume a good source of supplementary material in appropriate courses." Will the book adequately serve these persons? Only marginally. For those needing a review of the broad subject of petroleum in the marine environment, the best source is still the National Academy study cited above, if supplemented with chapter 1 of this book and many of the references cited in the other chapters. If an up-to-date review (1978) of analytical methods applicable to petroleum in the marine environment is needed, the book will suffice.

However, persons new to the field may get confused. In chapter 2 we are told that the complexity of petroleum precludes monitoring individual compounds, yet part of this chapter and all the other chapters deal with individual compounds. In chapter 4 selected-ion monitoring mass spectrometry is recommended against, but chapters 13 and 15 report very effective use of selected-ion monitoring. Equilibration methods of extracting low-molecular-weight hydrocarbons from water are touted as best in chapters 8 and 10, but stripping techniques are used in the work discussed in chapter 11. Soxhlet extraction is mentioned in many chapters, but a ball-milling technique (chapter 14) is said to work as well, except that chapter 16 says that ball-milling yields lower results.

Although the arrangement of chapters in the book is not particularly logical, each chapter begins with a thorough summary, and the index is most useful. The illustrations and tables are adequate.

The subject of petroleum in the marine environment is extremely complex and concerns two issues: the quality of our environment and the adequacy of the supply of petroleum to meet our energy needs. This complexity has made progress slow, but it is still disappointing to learn in this book that the development of analytical methods is incomplete, that no suitable standards and standardized procedures are yet available, that intercalibrations for quality control are generally lacking, and that the large existing data base has not in general been interpreted and evaluated because of problems in comparison of results from different laboratories.

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Mesons and Nuclei

Theory of Meson Interactions with Nuclei. JUDAH M. EISENBERG and DANIEL S. KOLTUN. Wiley-Interscience, New York, 1980. xii, 404 pp., illus. $39.95.

Mesons are the quanta of the strong interaction, the force that holds nuclei together. The study of meson interactions with nuclei would therefore seem to promise insights into the structure of nuclei and their internal forces. In recent years, "meson factories" have been built to produce the intense meson beams needed to conduct such studies, and considerable theoretical effort has been devoted to analyzing the many careful experiments that have been done. This book is an excellent introduction to these theoretical techniques.

The major theoretical tool for the study of meson scattering and reactions is multiple scattering theory combined with some sort of optical model. The book does a clear job of explaining the theory, how it is obtained, and how it is used to learn about nuclear structure.

The book is somewhat less successful in explaining why the simple ideas and simple first approximations that are normally used work so well. For example, it is not shown that there is some small expansion parameter that can be used to estimate corrections. Probably it is not so much that the complicated neglected higher terms are in some sense small, but rather that the first-order terms capture the essentially geometric nature of the processes and little is left beyond that of the dynamic details. Precisely because of this lack of sensitivity to dynamic detail,