by Hessler entitled 'The Structure of Deep Benthic Communities from Central Oceanic Waters" compares major community changes in standing crop, diversity and trophic structure of the benthos of deep ocean gyres, and shallow inshore waters.

Most informative and enjoyable is the concluding paper "One Hundred Years of Pacific Oceanography," by Hedgpeth. His extensive knowledge and wit provide the reader with an excellent survey of advances in Pacific oceanography since 1872. Students of oceanography should place this paper on their reading lists.

The Biology of the Oceanic Pacific is best suited for students with a background in ecology or oceanography. High school instructors will find some papers of use for their classes, but most benefit will be gained by individuals at the college level.

Christina M. Biela
Manchester Community College
Manchester, Conn.

ECONOMICS OF ENVIRONMENTAL IMPROVEMENT, by Donald T. Savage, Melvin Burke, John D. Coupe, Thomas D. Duchesneau, David F. Wihry and James A. Wilson. 1974. Houghton Mifflin Co., Boston. 210 p. $4.50 (softback).

Teachers of environmental education, economics, environmental resources, and similar courses, as well as students interested in the diverse problems encountered while studying about the quality of the environment, should find this book to be of value. Whether used as a basic textbook, resource book, or for general supplemental reading purposes, this book, interdisciplinary in scope and philosophy, is most useful in supplying a basic understanding of the many economic intricacies involved in the process of ameliorating the nation's environmental problems. Since the true definition of environmental education is a most encompassing one and should include a basic understanding of many disciplines, including economics, this book should help to fill the economics void created so often in the vast array of published material that deals with environmental topics. One senses the urgency for a closer working relationship between experts in all fields for the purpose of devising solutions and preventative schemes in examining environmental insults, as a result of reading this book.

Although basically the book is centered around economics theory and principles, the authors have supplied relevant background information about the causes of pollution (though sometimes simplistic) in order to give the reader a reasonable understanding of the interrelationships involved in analyzing environmental problems. The examples used are representative of some of the nation's most pressing industrial problems; the treatment given to the relationship between various industries and newspaper production is illustrative of the book's theme of relevance and its succinct presentation is easily understood. The interdependence of producers and consumers in this example emerges as an unmistakable reality when one looks at today's economy. Unmeasurable factors resulting from environmental degradation, such as aesthetics, personal feelings, and the various adversities attributed to psychological manifestations suffered by diverse segments of society, are given just consideration throughout the book. These oftentimes unmeasurable parameters of environmental insults are rarely considered (but should be) when assessing the true nature of the environmental problems faced by humankind.

The chapter on costs involved in pollution abatement directs itself to the problems of air and water. The explanations of state and federal rules and regulations, combined with economic ramifications, are excellent. Regardless of the time period cited, the data presented are highly significant in terms of the overall impact on the economy. The authors stress that pollution abatement analysis is only one step that should be used in setting environmental improvement standards, and a separate chapter more than adequately covers the basic policy alternatives—regulation, user charges, effluent charges, and subsidies—that follow initial analyses.

Environmental improvement and preservation as related to compensation theories and practices are adequately discussed in conjunction with political ramifications and influences on employees and business management. The reader is presented with both sides of the arguments, and it is pointed out that, given enough time, most industries should be able to meet certain standards leading to improved environmental qualities. The role of the consumer as the enforcer of regulations is stressed throughout the book.

In terms of the total implications and broad meaning of environmental awareness and education, this book adequately serves as a basic primer in leading one to understand the so-called hidden micro- and macroeconomic effects that are prevalent in the struggle between economic growth and environmental improvement. The bibliographical notes and index make this book highly usable and most valuable as a ready source of information. A number of lessons, using economics as a vehicle leading to a better understanding of environmental problems, can be derived from this book. It should prove to be a welcome addition to the reference shelf of any teacher or student seriously concerned with the environment.

Arthur W. Edwards, Jr.
Cook College, Rutgers University
New Brunswick, N.J.

THE WHALE PROBLEM: A STATUS REPORT, ed. by William E. Schevill. 1974. Harvard University Press, Cambridge. 423 p. $12.95 (hardback).

Since many people have recently become alarmed by the decline of whale populations throughout most of their range, this book is obviously timely, perhaps late. It is a compilation of revised papers originally presented at the International Conference on the Biology of Whales, in June 1971, under the auspices of the Department of the Interior and others. The purpose of the meetings, called by Walter Hickel after he placed 8 species of whales on the endangered list, was to bring together cetologists from all over the world to discuss what was known of the biology of whales, and what further information was needed before a workable program of whale management could be constructed.

The book consists of 19 chapters, each by different authors. These have been combined into five sections which cover (i) the conference's major conclusions; (ii) the current status of whales in several geographical areas and how their distribution relates to oceanic productivity; (iii) the biology of sperm whales and the relationship between whale biology and management; (iv) sperm whales and the relationship between whale biology and management; (iv) whale management and conservation, including the role and history of the International Whale Commission (IWC), mathematical treatment of population dynamics and recruitment, sampling techniques, and a protectionist's reflections on past management; and (v) tagging and telemetric methods available or needed for direct study of whale movement.

The authors clearly show how difficult it is to properly manage a living resource when an understanding of its biology must be derived from indirect or questionable data sources. The "current status" section explains how the age or recruitment, birth rate, natural mortality, migration, social structure, and past and present stock (population) sizes are estimated from whaling and sight records and autopsies of dead whales. From these, the rate of recruitment, "sustainable yield" (s.y.) and "maximum sustainable yield" (m.s.y.) are calculated in section four. Proper management demands that only the "surplus" be taken, and determining this surplus (s.y.) requires precise understanding of population dynamics and age and social structure. Considering the limitations of the data, I was surprised at the accuracy of early 1960 s.y. predictions. My impression from sections 2, 3, and 4 is that modern population theory was being used to generate whale-management proposals from questionable data. Certainly more direct observations, and increased financial support are necessary if whales are to be understood and managed.

If population estimates were accurate by the early 1960s, then why is the present plight of whales so dismal, and what is being done to improve it? These questions are alluded to throughout the book, but are focused most clearly in J. L. McHugh's chapter on the historical roles of the IWC, and S. McVay's "Reflections on Management of Whaling." The picture that emerges is of an international "commons" (the Antartic) exploited by increasingly efficient—but no more enlightened—"commoners." No legal restrictions were placed on whaling until the 1940s. Then the IWC was established by the International Whaling Convention to seek the opposing goals of whale management and whaler economics. It first disregarded the recommendations of cetologists and erred badly in favor of whalers, then almost dissolved in the mid 1960s as whaling interests struggled over sharply-reduced quotas. But whale populations were even more greatly reduced, and for several years the catch failed to reach even these new limits. Eventually the struggling interests resigned themselves to quotas below the s.y., and many went out of business or moved their operation northward. By 1972, hard-learned lessons had led to postmature change in the management of remaining stocks. Quotas were assigned by species in northern or southern hemisphere. International exchange of observers made the observance of quotas and size limits more likely. Quotas had been reduced to below s.y. on all major stocks. Evidence presented in the book suggested that populations of at least some protected species were slowly rebuilding, and that quotas and restrictions were being observed. Hopefully these changes will save the whales not only from extinction, but for future harvest, since they are apparently the best means that we have of using the zooplancter biomass. Clearly, Hardin's "tragedy of the commons" applies to oceans as well as to land use, but in oceanic exploitation the tragedy is magnified by international politics.

My reaction to this book is somewhat mixed. Many will find something useful in it: population biologists will be interested in seeing the application of tools of their speciality; preservationists will find numerical descriptions of whale exploitation and will be interested in the history of the IWC and factors that impeded it in bringing whale harvest in line with productivity; biology instructors wishing to objectively discuss the whale problem in class and cetologists will find international bibliographies and a description of the "state of cetological art." Unfortunately, this was the state of cetological art four years ago (except for McHugh's chapter which was written after the IWC meetings of 1972.) The book was remarkably free from errors: I found only 3 misspellings and one printing error. However, much of the writing was tedious to read. There were long tables of raw whaling statistics that could better have been presented in graphs or appendixes, repetitious qualifications of data, and variable writing quality. A more complete glossary would have made this book more readable for the layman. Most of the authors expressed faith that once the whale take was reduced to below the s.y., whale populations would begin building back up to the m.s.y. and the whale problem would be solved. They did not discuss the possibility that (i) whale populations might have been reduced to the point that either their genetic diversity or social structure might have been irretrievably altered; (ii) their concept of m.s.y. was derived from fish, and might be inapplicable to marine mammals; (iii) there might be economically sounder management goals than m.s.y. (maximal interest, for example). My criticisms must be tempered with the fact that the book was intended primarily for research cetologists and that the value of individual expression may outweigh quality in symposia. I recommend this book to anyone who seriously wishes to understand the whale problem. Surely even though he might find only a part of the book of interest, its relatively low cost will make its purchase worthwhile.

Harlo H. Hadow
Fort Lewis College
Durango, Colo.

General Biology

LIVING SYSTEMS: PRINCIPLES AND RELATIONSHIPS, by James M. Ford and James E. Monroe. 2nd ed., 1974. Canfield Press, San Francisco. 541 p. $11.50 (hardback).

This is a textbook well equipped to fullfill a complete semester of college instruction. The 12 modular units are well selected and include the study of science and biology; chemistry and life; cells; tissues, organs, and organisms; ecology and environment; energy relationships; metabolism and supporting processes; control mechanisms; behavior; reproduction; genetics; and evolution.

The excellent unit on behavior includes paragraphs on drugs and human sexual behavior. Both plant and animal reproduction are well done in the unit on reproduction. Enough historical information is included that should satisfy the traditionalist. Chemical principles are developed where appropriate in any unit and are quite detailed when necessary. The human organism is well correlated into the principles units.

The two-color contrast in part of the figures makes them more readable. Full-color plates in part of the book would have made it more appealing on first impression. Too much black-and-white gives a drab appearance. It is a little awkward to have to refer to a credit page for the opening photograph captions in each unit.

A very good phylogenetic outline appears in the appendix and is adequately illustrated. A useful glossary is included as well as an index. Supplemental readings are indicated following the list of thought-provoking review questions at the end of each unit. Summarizing statements precede each list of questions. A unit outline introduces the unit.

The language of the book is descriptive, reads smoothly, and maintains a college level of understanding. Scientific accuracy is upheld. Unfortunately the mechanics of the book, its traditional aspect of presentation, and its use of chemical detail may make it unpalatable to many.

W. G. Bennett
Iowa Central Community College
Fort Dodge

HANDS ON BIOLOGY, by John M. White and Robert D. Barnes. 1974. Hamilton Publishing Co., New York. Price not given.

Hands On Biology is a series of scripts for an audiotutorial learning system. The scripts are organized into a comprehensive whole which is designed for beginning undergraduates or advanced high school students. They include typical freshman-biology titles and some not so typical ones as "Origin of Man" and "Human Sexuality."

The scripts may be used collectively or individually as part of an on-going audiotutorial system or to buy time for developing such a system.

Hands On Biology freely exercises the strong characteristics of an A-T system: short segments of information transmission punctuated by direct visual and manipulative activities and colorful and integrated visuals with "instant replay" capabilities to enhance meaningful processing by learners. Selected laboratory techniques are presented as they are needed rather than being separated in time from their application. Immediate (not interactive) feedback on data, observations, and calculations is not used to maximum advantage. The authors' attempt to develop units easily modifiable to fit individual instructors or instructional requirements has apparently been successful.

The structure of subject matter is sound and balanced, although some units (for example, ecology) were so superficially treated as to be in need of serious revision.

Some of the terminology appears to have come from a group lecture ("The next subject I want to take up is..."; "See, you are now studying evolution."). The scripts are basically didactic presentations of accumulated knowledge