studying metabolism and had developed the concept of the dynamic state of body constituents. Shemin had undertaken a study of the turnover of plasma proteins by feeding ^{15}N-glycine (which he synthesized himself) to a rat. Next, he administered the glycine to himself, swallowing a 1-gram sample every hour for 66 hours. Blood was withdrawn at intervals, and the ^{15}N concentration in various proteins was measured. The data were consistent with Schoenheimer's concept, and the half-life of the total plasma proteins was found to be about five days. The hemoglobin was isolated also; the ^{15}N content of the hemin reached a maximum about 20 days after the start of the experiment and stayed constant for nearly 80 days, in total disagreement with the concept of the dynamic state. The experimenters accused each other of mixing up the samples and of using the mass spectrometer incorrectly. Finally, when they analyzed the data they deduced that the half-life of the erythrocyte is about 127 days and that glycine is the nitrogenous precursor of heme. Next they turned their attention to the carbon skeleton and found that 2-^{14}C-glycine labeled the heme as expected. While this work was in progress, Kamen's laboratory reported that carboxyl-labeled glycine did not label heme. From these and some other results, Shemin was able to formulate a biosynthetic pathway for heme.

This section occupies about one-seventh of the book and is neatly balanced by an appendix of about the same length in which 15 of Kamen's papers are reproduced. As one progresses through these papers, including the one that influenced Shemin, one goes, indeed, from cyclotrons to cytochromes. The earliest papers are from *Physical Reviews* in 1937, 1938, and 1941. For biological scientists, the most interesting of the three is a six-page article "Long-lived radioactive carbon—^{14}C." All of the "biological" papers merit the description "quantitative." Perhaps the most remarkable of these is a paper with Hershey, Kennedy, and Gest on the mortality of bacteriophage containing radioactive phosphorus, which combines nuclear chemistry, virology, statistics, and excellent experiments.

Since science is the result of human endeavor, one ought to consider the scientist along with the science. It is unlikely that an industrial designer would start his planning for a leader in many branches of science with an avid fan of the Chicago White Sox who worked in a laboratory called the "Rat House," who knew the words of many rather obscure Methodist hymns, and whose discussions with his colleagues are described thus: "They treated each other's ideas with brutal respect, replete with the strong language of Comiskey Park." Another recollection refers to the handling of ^{11}C and other, short-lived radioisotopes: "I seem to remember that Kamen wore gloves for some of these manipulations, although pictures . . . that have survived do not show this. As additional protection, Kamen wore an old and rather dirty lab coat. [His clothing] was so heavily contaminated . . . that he was not permitted in the lab . . . until the counting was finished."

In the fall of 1944 Kamen, Barker writes, "in a state of shock and bewilderment . . . told us that he had just been summarily dismissed from his position . . . because he had had dinner in a San Francisco restaurant with a Russian consular official under circumstances that an overzealous FBI agent considered to be suspicious." In spite of the official banishment, Lawrence continued to have confidence in Kamen and permitted him to visit and work in nonsensitive areas of the Radiation Laboratory. Consequently, he spent much of his spare time with Barker, applying ^{14}C to the investigation of several bacterial fermentations. The dinner in San Francisco continued to haunt Kamen. During the McCarthy era, he had booked passage for a trip to Europe, but when he went to board the ship he was not allowed to do so and his passport was taken away from him. He instituted legal action to recover the passport, which was restored only after several years. Kamen often played his viola at musical gatherings at FASEB meetings, and on one such occasion I was able to ask him some questions about his continuing problems. He explained that the Russian consular official had asked to talk to him because a relative was suffering from leukemia and he wanted to know about the possible use of ^{32}P as a treatment. A delightful vignette of the centrality of music in Kamen's life is presented by Jekisiel Szulmajster in his paper "Saint Agnes, music, and sporulation."

Carlyle's dictum that "the true university of these days is a collection of books" is no less true a century and a half after he wrote it. This book should be on the shelves of every college, university, and research institute that is engaged in the training of scientists and science educators.

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Insect Biology

Bark Beetles in North American Conifers. A System for the Study of Evolutionary Biology. JEFFRY B. MITTON and KAREEN B. STURGEON, Eds. University of Texas Press, Austin, 1982. xii, 528 pp., illus. Cloth, $30; paper, $17.50. Corrie Herring Hooks Series, no. 6.

Ecologists and evolutionary biologists are becoming increasingly aware of the problems associated with attempts to test theory using species whose basic ecological and genetic properties have been only superficially examined. In addition, pest management specialists have become more aware of the importance of a detailed understanding of population, genetic, and community processes for the development of management programs. Because such knowledge does not usually come to us without a considerable investment of time and money, it is a pity that applied ecologists and population biologists have shown so little interest in cutting their costs by studying the same organisms.

Lack of communication may be one factor in this situation. Mitton and Sturgeon must therefore be complimented for their attempt to bridge the communication gap. In this book, they and 11 colleagues with a variety of backgrounds present a coherent summary of the enormous literature on bark beetle species. Seven of the 10 chapters describe the general ecology and taxonomy of bark beetles, their hosts, mutualists, and natural enemies. One chapter addresses pest management, and in two chapters the editors explore some of the evolutionary aspects of bark beetle life systems. The reference list of over 1000 publications, mostly dealing with the ecology of economically significant bark beetle species, can be used as a rough index of the effort that has already been invested in this system. Population biologists could argue about the lack of analytical rigor in some of the studies described or the limited understanding of concepts such as group selection and coevolution displayed by some authors. On the other hand, one cannot help but be impressed by the detailed descriptions of interactions between biotic components of bark beetle life systems, which are as complex as they are intriguing. To illustrate this point, let me use the biotic interactions involved in initial host attack by *Dendroctonus pseudotsugae* as described by Borden. The first female that begins boring into a tree releases a number of "aggregation" pheromones. Some of these pheromones are unaltered secondary plant com-

pounds produced by the host tree, and others are host tree compounds that have been metabolically altered by the beetle with the probable assistance of specific microorganisms harbored by the beetles. Males, attracted to these pheromones and stridulatory clicking of the female, emit chirps that cause the female to produce an "antiaggregation" pheromone. The male, then, also produces antiaggregation pheromones. Other females in the area, attracted to the aggregation pheromones but repelled at close distance by the antiaggregation pheromones, begin boring into the tree trunk at a suitable distance from other females. This continues until the suitable areas of the trunk are occupied. The beetle attack often induces a defense response in the host tree that involves production of higher quantities of resin. The larger the beetle density on a tree, the greater the individual beetle's chances are of overcoming this defense. In turn, some parasites and predators of the beetles described by Dahlsten use the aggregation and antiaggregation pheromones as kairomones for locating their own hosts. This naturally evolved host-seeking mechanism of the bark beetle enemies frustrates efforts of forest pest managers, who find that the synthetic aggregation pheromones they use to trap beetles sometimes capture almost as many beetle parasites and predators. Recent investigations by Sturgeon indicate genetic substructuring in beetle populations on the basis of host tree species, perhaps due to genotype-specific host selection. Since beetles do mate on their host trees, the opportunity for host race formation is certainly enhanced.

Mitton and Sturgeon conclude, in the last chapter, that we are still lacking many pieces of information that will be needed to effectively manage these beetles and test hypotheses regarding their evolution and coevolution with their hosts, enemies, and mutualists. This could probably be said about any system. The important question is whether there is any hope that this information will ever be obtained. If basic population biologists were alone in investigating this system, the answer would probably be no, and they would be wise to seek other, more tractable systems. Given the economic significance of bark beetles and the accompanying research resources, however, Mitton and Sturgeon are probably correct in offering this system to population biologists as one with unique biological properties that promises to offer some answers to questions about speciation, coevolution, and population dynamics.

This volume presents the bark beetle system as one example of the many economically important ecological systems that offer opportunities for answering basic ecological and evolutionary questions. Regardless of their interest in the social relevance of their work, population biologists must face the fact that the basic biological information and the resources necessary for answering such questions may often be associated with economically significant organisms.

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Cetaceans

The Ecology of Whales and Dolphins. D. E. GASKIN. Heinemann, Exeter, N.H., 1982. xii, 460 pp., illus. $45.

A proliferation of popular books and articles has inspired and sustained a wishful, often uncritical belief in the sentience, sociability, and gentleness of whales and dolphins. David Gaskin, perhaps in response to a long line of students who have enrolled in his classes already believing, or at least predisposed to believe, in the exceptional qualities ascribed to this group of animals by the media, has gone out of his way in this book to give such beliefs a drubbing. Fair enough; they deserve it. At times, however, I wonder if he hasn't overreacted to some of the anthropomorphisms and sentimentalisms, in the process becoming not only provocative but defeatist. After all, breaching (jumping) behavior may well be something more than "just another method of generating a recognizable sound," and serious questions about cetacean intelligence and social structure do not deserve to be dropped entirely just because a few investigators have approached them irresponsibly.

Gaskin and his graduate students at the University of Guelph have, since 1969, focused most of their efforts on studies of the productive inshore marine ecosystem in the lower Bay of Fundy. The small, locally abundant harbor porpoise *Phocoena phocoena* is a prominent part of that ecosystem, and Gaskin's familiarity with this species informs much of the book. For example, in the chapter on metabolic rates and energy budgets, the harbor porpoise provides a fascinating case study. Gaskin suspects that female harbor porpoises rarely produce more than four offspring in a lifetime and that the average could be as low as two or three. Energy budget calculations suggest that harbor porpoises are not adequately insulated for living in waters colder than 5°C, yet they appear regularly in waters with a temperature as low as 1.9°C. The existence of these animals seems precarious indeed, especially considering the heavy mortality imposed by fishing activities and the degree to which much of their nearshore habitat has been exposed to industrial contaminants.

The promise on the dust jacket that this book contains "much original research" is misleading. It is in fact a survey of the literature, organized as a series of extended lectures for graduate students and advanced undergraduates. The author plunges into "some difficult, and often controversial topics," from academic questions about the origins and systematic relationships of cetaceans to the political or moral question of whether whales should be "harvested" at all. He challenges or reinterprets the conventional wisdom on many fronts, revealing how weak the evidence is in support of some of the most basic truisms in cetology. His synthesis is creative; it should be fertile ground for students seeking fresh ideas and approaches. Informed by a broad range of first-hand experience with the animals in nature and by an acquaintance with much of the disparate, unwieldy literature on cetaceans (available as of January 1980), the book is a useful reference for those with a serious interest in cetacean ecology.

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Neurophysiology

Axoplasmic Transport. D. G. WEISS, Ed. Springer-Verlag, New York, 1982. xiv, 480 pp., illus. $62. Proceedings in Life Sciences.

Axoplasmic Transport in Physiology and Pathology. D. G. WEISS and A. GORIO, Eds. Springer-Verlag, New York, 1982. xii, 196 pp., illus. $32. Proceedings in Life Sciences.

The phenomenon of axoplasmic transport attracts investigators with a variety of interests. For those studying mechanisms of cell motility, axoplasmic transport offers a dozen theories, considerable data, and no hard conclusions. For those interested in cytoskeletons, studies of slow axonal transport offer insights into structure and function of intracellular frameworks. For those who prefer