sity, spatial and temporal heterogeneity, and succession. As with the parts of the book dealing with consumers and competitive interactions, a traditional approach is taken that stresses methodology and select case studies. The cases presented are all recent and generally well explained, but in contrast to the treatment of ecosystem-level processes the discussion of community-level processes is uninspiring. The current controversies concerning nonequilibrium communities, disturbance-maintained communities, and the application of island biogeography theory to marine communities are largely neglected.

In spite of these limitations readers are in most cases directed, in a bibliography over 70 pages long, to current literature reflecting a wide variety of perspectives on how marine systems are viewed. On balance, this book has much to offer as a textbook. As a comprehensive treatment of marine ecology at this level it really has no predecessors, and would-be marine ecologists would be well served by reading it. Its distinct systems ecology flavor will be less acceptable to some potential users than to others. Nonetheless, I expect that the book will find a grateful readership, particularly among biological oceanographers, and that its compilation of literature will be widely appreciated.

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Lichen Biology

Biology of Lichenized Fungi. JAMES D. LAWREY. Praeger, New York, 1984. x, 408 pp., illus. $39.95.

The some 25,000 known species of lichen-forming fungi and their algal partners constitute the classical textbook example of symbiosis. As the only fungi with "chloroplasts," the lichen-formers flourish where few other organisms can—on boulders above the timberline, on soil in burning deserts, on maritime cliffs sprayed with salt, even inside translucent rocks in Antarctica. Lichens are also epiphytes of higher plants in all parts of the world that we have not spoiled by air pollution (their sensitivity in this regard is even used as a measure of pollution). The fungus-alga relationships that coevolution has so finely tuned are still only sketchily known. Lichens, you might think, must consequently fascinate biologists to distraction—but they do not. They are generally considered to be too difficult taxonomically for field research and too intransigent for laboratory manipulation. To improve the lichens' scientific reputation is Lawrey's ambition in his admirable new book.

Lawrey draws upon a bibliography of more than 900 references, many from obscure and unlikely sources. A large percentage of the papers that he cites are not included in other recent surveys of lichenology. He summarizes the major points known about the lichen thallus (scanning electron microscopy reveals structures useful in refining taxonomies), asexual and sexual reproduction (yet not a single chromosome number is known), in vitro culture for experiments (hard, yes, but an increasing number of workers are succeeding), physiology (imagine daily photosynthetic cycles governed by the availability of *water*), secondary-product chemistry (hundreds of the compounds are unknown elsewhere in nature), growth and demography (what is an individual?), and ecology (are the many chemical races ecotypes or cryptospecies?).

Lawrey juxtaposes sets of data that we have not previously been forced to compare. Not content to leave it to us to formulate new hypotheses, he strews his text with tables bearing such titles as "Questions concerning the biological basis of lichen growth," making up lists of research projects, most of which are entirely feasible today. "This hypothesis needs to be tested experimentally" becomes the chorus that concludes one section after another. The book is an invitation—actually a challenge—to research.

In the chapter on the ecological significance of secondary products Lawrey is at his best, explaining the field of his own research. Although most lichens have only momentary periods of photosynthesis, they still spend vast sums of hard-won photosynthate to elaborate their bizarre extracellular secondary compounds. Lawrey explores the evidence that these substances have allelopathic effects on bryophytes and higher plants and act as deterrents against a wide range of invertebrate grazers. In all, the lichen is remarkably immune to micro- and macrobiological predators. This aspect of lichen ecology is in its infancy, but Lawrey is its chief researcher and most imaginative spokesman.

From an editorial perspective, the book is a botch. Most of the many photographs, which looked fine in the papers of their provenance, are now so overexposed as to be uninterpretable. The line drawings, which could have been made presentable with some reduction, are published at what must be original size and look hopelessly crude. An eye blind to the beauty of the printed page selected the typography. (Were copies with defective bindings intentionally used for review?) Scientific authors in search of a publisher might well want to consider what Praeger did to Lawrey.

The verso of the title page tells us that *Biology of the Lichenized Fungi* is printed on acid-free paper. This precaution was unnecessary. Long before time will be able to erode it, the book will be obsolete thanks to the broad range of research that it is certain to inspire.

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