They have extremely diverse oxygenative capabilities and may provide one of the primary routes for oxygenation in bacteria. They all seem to employ two-iron, two-sulfur structures at the active site and also require ferrous ion to catalyze the oxygenations. It is curious that this active site can catalyze both mono- and dioxygenations. The bacterial enzymes have high turnover numbers and take part in reactions typical of P-450 systems, monooxygenases largely found in eukaryotes.

Other papers cover various heme proteins, including P-450, peroxidases, heme oxygenases, and indoleamine oxygenases. Bleomycin and its oxygenase activity on DNA are covered, as are regulation and mechanistic studies for the pterin-requiring phenylalanine monooxygenases.

This collection of timely, generally high-quality papers should be of interest to a broad audience of biochemists.

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Mathematical Ecology

Stability of Biological Communities. YU. M. SVIREZHEV and D. O. LOGOFET. Translated from the Russian edition (Moscow, 1978) by Alexei Voinov. Mir, Moscow, 1983 (U.S. distributor, Imported Publications, Chicago). 320 pp., illus. $9.95.

Svirezhev and Logofet are, respectively, head of and researcher in the Mathematical Ecology Laboratory of the Computer Center of the U.S.S.R. Academy of Sciences. In this book, which is revised from the original 1978 Russian edition, they "attempt to convert ecological modeling from an art into a science based on powerful mathematical techniques developed lately and, in particular, on the well advanced stability theory for dynamic systems." The general layout and tone of the book are squarely in the idiom of Russian applied mathematics texts; to a monoglot like myself, casual inspection cannot distinguish the Russian edition from similar texts on fluid mechanics, astrophysics, or electrical engineering.

The book is useful as an encyclopedic collection of analytic results for the dynamical behavior of a variety of models for single populations, for species interacting as predators and prey or as competitors, and for "ecosystem" assemblies of species. The material is organized well and the translation is adequate (since much of the text is mathematics, the connective tissue of prose is less important than might otherwise be the case). The annotated bibliographies at the end of each of the nine chapters are helpful and fairly comprehensive up to 1977; after this they are very spotty. The authors' habit of reproducing large chunks of material, including figures, without acknowledgment (except in very general terms in the bibliography: "The reasoning in this section follows X") would be frowned on if practiced by an undergraduate at Princeton.

Although most of the book covers familar ground, there are some interesting studies previously published only in Russian. Sections 1.6 and 1.7 sketch results for the average lifetimes of populations affected by various kinds of random perturbations (a topic subsequently explored more thoroughly by Turelli). Section 3.10 outlines the way parametric resonances can be excited in predator-prey systems by random environmental variations. Chapter 5 contains some interesting ideas about communities with vertical structure and the stability properties of the consequent linear trophic chains (in both open and closed systems).

The material recapitulated in this book is useful to anyone planning an applied mathematics course and seeking good mathematical problems that bear some metaphorical relation to ecology. But as a step along the road toward transforming the modeling of real ecosystems from an art into a science I find the book unsatisfying in at least two ways.

First, the structure of, and predictions from, the models are related to data in the most perfunctory way, if at all. The entire book contains only five figures or tables with data (and only two of these are related in a concrete way to the model under discussion).

Second, too much attention is given to elegant mathematical results simply because they are elegant. Thus, for example, section 6.6 presents a detailed account of some nice tricks whereby contour integrals can be used to evaluate the minimum eigenvalue of a competition matrix. Although I yield to none in admiration of this result (it is mine), by 1978 it was clear that the model is, in several respects, too special to be generally useful; Svirezhev and Logofet cite some of the relevant works of criticism in their bibliography, but in the text they express no reservations about this or other mathematical models for limits to niche overlap. I think that an understanding of how an ecosystem works, and how it will respond to a specified disturbance, requires many kinds of carefully documented observations about natural history, and thoughtfully designed experiments in the field. Mathematical models can be useful in helping to form testable ideas about which of the myriad complications play an essential role and which do not. If these models lead to beautiful mathematics (as do "chaotic" difference equations), that is a pleasing fringe benefit. Simplicity and elegance cannot, however, serve as a guide to truth in ecology, as arguably they sometimes do in physics.

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