The book is completed by an article (Brown and Smith) on metal ions in biological systems—inorganic chemistry is not neglected—and an assessment by Keith Suckling of the effect of enzymological ideas on seemingly unrelated areas of biochemistry.

For a multi-authored book, the style and standard of presentation is unusually even. The authors communicate their affection for the subject and display a refreshing awareness of the benefits to chemistry that flow from enthusiastically embracing the study of enzymes, as well as the metabolites they convert. A significant criticism is that the references terminate in mid 1982 so that, for example, much of the current achievement of the molecular biological approach, let alone its potential, goes unrecorded. Biology is without doubt well placed to repay chemistry.

The Chemistry of Enzyme Action is part of the series entitled *New Comprehensive Biochemistry*. It is a large book (15 chapters) and includes most of the ground covered by *Enzyme Chemistry*, but goes well beyond it both in the range of topics and the depth in which they are treated. The principal aim of the book is to describe the physical and organic basis of enzyme action. Because the approach is mechanistic, the opening chapters concentrate on the energetics and substrate interactions of enzymes (Page, Kollman, Williams) and the use of kinetic (Engel, Douglas and Wilson) and isotope (Williams) methods in exploring mechanisms. Several systems are then selected for a detailed chemical scrutiny: enzyme reactions that utilize imine formation (Hupe), enzymes that require pyridoxal phosphate (Akhtar, Emery and Robinson), folate and bipterin cofactors (Benkovic and Lazarus), glycosyl transfer (Sinnott) and vitamin B₁₂ (Brown). Biomimetic systems are represented in the concluding chapters on micelles and similar aggregates (Brunton), cyclodextrins (Komiya and Bender) and crown ethers (Stoddart).

Despite its size, the book therefore remains selective in its coverage. The complementary part of this story, the participation of the enzyme protein and its structure in the enzymic reaction, is consciously left very much on one side. Thus, individual chapters will be read with profit by specialists but I fancy that the average undergraduate would find the rigour and detail too demanding. The logical place for such a book is the departmental library and the shelves of enzymologists with relevant interests. Typographical errors, while they do not abound, pop up from time to time, but the overall presentation is not unpleasing. All the authors can be congratulated on the comprehensive reference lists they have compiled. □

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An independent view

John H. Lawton

The Ecological Web: More on the Distribution and Abundance of Animals.

By H.G. Andrewartha and L.C. Birch.
University of Chicago Press: 1985.
Pp.506. \$40.25, £33.25.

SCIENCE is most exciting when two alternative views of the world clash. The battle in population dynamics is between those who believe that density-dependent processes play a significant part in determining the distribution and abundance of animals, and those who do not. Andrewartha and Birch have led the density-independent school, ever since their book *The Distribution and Abundance of Animals* appeared in 1954. Their views have not changed significantly over the past 30 years, although the arguments have become more sophisticated and the controversy has recently enjoyed new vigour.

The central theme of *The Ecological Web* is a "theory of environment" based on "envirograms" — dendrograms whose branches trace pathways of influence impinging upon study-species. There are four directly acting components, resources, mates, malentities (that is, hazards) and predators, all of whose actions can be influenced by a cascade of steps in other parts of the envirogram. Andrewartha and Birch's views of population dynamics are therefore particular and detailed. They dismiss general, analytical models in two sentences: "We cannot see many testable hypotheses emerging from such abstract models. . . . So we say no more about them" (p.187). Approximately the first two-thirds of the book is devoted to describing and establishing their theory of environment; there follow in the final third several case-histories, on rabbits, two birds, marine fish (briefly), three species of insects and man. Only the spruce budworm, fish and man are not Australian examples.

I ought now to make my own position clear. Unlike Andrewartha and Birch, I find abstract general models of ecological processes useful, and I do think that density-dependent processes are largely irrelevant in understanding population dynamics. However I set out to read *The Ecological Web* with an open mind, but in the end found it lacking in many ways.

The theory of environment is largely verbal and pictorial, but is used to attack more formal, mathematical theory. The result is rather like comparing apples and oranges. The weakness of predominantly verbal arguments is best illustrated by an example. In the section "Competitive Coexistence and Displacement" the authors conclude, after reviewing several case-histories, that species can live together "because they are alike — not identical Conversely, when two species fail

to coexist it is usually because they differ with respect to their success in professing a niche that they have in common". They seem not to notice that this conclusion is tautological; nor does it take us any nearer to a general understanding of competitive coexistence or exclusion.

Perhaps more seriously, Andrewartha and Birch often do not seem to understand many of the theories they either attack, or so lightly dismiss as futile. Moreover, they too often pass over evidence that contradicts their view of the world. Consider, for example, their efforts to explain population cycles in animals such as snowshoe hares or lemmings. They use neutrally stable Lotka-Volterra models (p.255) yet claim that "oscillations decline and finally disappear"; they do not. More interesting and realistic general models are ignored, as are efforts to test them^{1,2}. Alternatively, take cases of "apparent competition" via shared enemies, or the role of spatial heterogeneity in population dynamics. They have much to say about both, but all their points are covered in more rigorous ways by existing general theoretical models. A small number of other examples will suffice to make my point. Great tit populations³ are not limited by nest sites, as claimed. Population density does have important effects on the dynamics of tsetse flies⁴, spruce budworms⁵ and carabid beetles^{6,7}. Sadly, I have to conclude that Andrewartha and Birch often develop their arguments by ignoring counter-evidence.

It appears that most of the confusion in this area of ecology centres on whether or not people are more impressed by population fluctuations, or by the fact that, despite such fluctuations, numbers of many species remain within comparatively narrow limits. Clearly not all populations are well regulated, but many are. It is important to know whether there are systematic patterns in the relative contributions of density-dependent and density-independent processes to the population dynamics of species from different taxa and habitats; but you will not find the answer to such questions in this book. Much has happened in population biology in the 30 years since the publication of *The Distribution and Abundance of Animals*. Because its treatment of these developments is so inadequate, *The Ecological Web* does little to advance the case for density independence. □

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