Of the two, then, Jacobs's book would be my choice for recommendation to students, although it still falls short, in my opinion, of the earlier book by K. V. Thimann (*Hormone Action in the Whole Life of Plants*; University of Massachusetts Press, 1977) which fulfils all Jacobs's criteria concerning the development of ideas. It is just as rigorous, objective and stimulating but is better in that it maintains just about the right balance between molecular biology and developmental physiology. □

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Biological "wheres"

Paul A. Colinvaux

Biogeography: An Ecological and Evolutionary Approach. 3rd Edn. By C. B. Cox and P. D. Moore. Pp.234. (Blackwell Scientific/Halsted: 1980.) £7.50, \$19.95. *Biogeography*. By E. C. Pielou. Pp.351. (Wiley-Interscience: 1980.) £13.30, \$31.30.

THESE are two books about the new biogeography, one a survey for undergraduates with little background, and the other a provocative series of essays touching on the state of the art.

Biogeography was the founder subject of both evolution and ecology. In Alfred Russel Wallace's *The Geographic Distribution of Animals* of 1876, evolution was triumphant and Sclater's six zoogeographic realms, each full of animals partly evolved in isolation, became evidence for evolutionary theory. The circumpolar zones of Allen, which recognized ecological realities — boreal forest, temperate forests, rain forests in rings of latitude on every continent regardless of ancestry — were ridiculed by Wallace as the study of mere adaptation. The Sclater-Wallace classification lasted until fairly recently, through to the plant geography of Good. In the intervening years, ecologists almost avoided the word "biogeography" and talked instead of life in the great formations, roughly corresponding to Allen's old zones, later to be known by Clements' unnecessary and regrettable term, biome.

But with ecology taken away, biogeography could be little more than the study of relationships towards the goal of a better phylogeny. True, a speculative fringe found excitement in continental drift and land bridges, but they made few geological converts.

For half a century, evolutionary biogeographers on an Earth of fixed continents proceeded to fill in details. At the last, Darlington in *Zoogeography* (Wiley, 1957) told us of endless radiations from the heart-

land of Africa (the Old World Tropics), perhaps feeling the ghostly presence of a rejected Gondwanaland.

Then came renewal. Remnant magnetism and plate tectonics gave us back Wegener's drifting continents; Pangaea and Gondwanaland lived. But even more vibrant was the incursion of ecology, as theorists of the Hutchinsonian school taught us to look at colonization, dispersal and speciation as ecological processes on a geographical scale. MacArthur and Wilson gave us *The Theory of Island Biogeography* (Princeton University Press, 1967).

Cox and Moore, in their third edition, press on with their successful look at this new biogeography through ecologists' eyes. Not only does the species equilibrium on islands stand with drifting continents as a central theme, but prime ecological concepts like Lindeman efficiency, niche and resource-partitioning find their places also. A possible worry is that ecological concepts that really require a mastery of competition theory have to be handled with the logistic hypothesis and its derivatives left out — competition is taken for granted rather than debated. Yet Cox and Moore make a brave show of giving modern ecology to students with no training in it, all the same.

Pielou's book is a survey by a master ecologist to be used by, as she puts it, "Senior undergraduates, and interested biologists and earth scientists of all kinds". She says that she is "probably rash" to attempt such a thing, but she was not. She has done what she said she would so well that no scientist of a related discipline can now be excused ignorance of the possibilities of the new biogeography.

Each of the ten chapters of Pielou's

work will stand by itself as an essay, so you can really begin to read the book where you like. I recommend starting with the third, "Evolution, Phylogeny, and Geographic Spread". This sounds conventional enough; the title could be in a book from the 1930s. But you will instantly be drawn into a splendid analysis of modern systematics controversy that I just could not stop reading, even though in bed with 'flu at the time. Have you wondered what was behind the guerrilla war between Halstead and the Natural History Museum (*Nature* 288, 208; 1980)? — read Pielou on cladistics, phylogeny and the evidence of biogeography.

She is a little hard on geologists who would not accept the biogeographic evidence for continental drift before the advent of plate tectonics — the honest truth was that it did not seem parsimonious to move a continent in order to accommodate a fossil. She puts island biogeography somewhere in the middle of the book, as a subject appealing to sectional interests, then follows that by a chapter on "Geographical Ecology". From then on the book wields the Hutchinsonian ideas of the evolutionary play in the ecological theatre, until we bow out with thoughts on the fundamental mechanisms of polyploidy and gene flow in the last chapter. It is a book both to read and refer to, highly modern but based on profound understanding of the history of an ancient subject. Many a graduate student will have both thoughts and work shaped by it. □

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Understanding ecosystems

I. J. Linn

Ecology: A Textbook. By H. Remmert. Pp.289. (Springer-Verlag: 1980.) Pbk DM 37, \$21.90. *Ecology*. 2nd Edn. By R. E. Ricklefs. Pp.966. (Chiron/Nelson: 1979.) Hbk \$22.95, £20; pbk £12.50. *Principles of Ecology*. By R. Brewer. (Holt, Rinehart & Winston/Holt Saunders: 1979.) \$22.95, £10.50.

WHEN I was a student, many years ago, my early ecological diet was firmly founded in L. A. Borradaile's *Animal and its Environment* (Frowde, 1923) and A. S. Pearse's *Animal Ecology* (McGraw-Hill, 1926). Both of these books devoted much space to a detailed examination of the fascinating ways in which animals are adapted to survive in a wide range of habitats — the sort of thing which nowadays *Scientific American* does rather well. It is pleasing to note that in the new

edition of Robert Ricklefs' standard work, despite some changes, he continues to open his argument with a solidly evolutionary approach to the adaptation of organisms to their physical and biotic environment. Of course he goes far beyond that — much has happened in half a century — and for me Ricklefs' *Ecology* is still the basic ecological reference book that no biologist (ecologist or not) can afford to be without. The jargon is all there; if you are not sure what is meant by "character displacement", or of the precise difference between "exploitation" and "interference" competition, the lucid explanations in text and glossary will help you out. For the numerate, there is liberal use of the necessary descriptive equations; and for those, like myself, whose command of matters mathematical is somewhat patchy, there is help in succinct English.

There are faults in the book, of course,