## Karl Niklas. **The Evolutionary Biology of Plants.** 1997. (ISBN 0-226-58083-0, pbk) The University of Chicago Press, 11030 South Langley Avenue, Chicago, IL 60628. $24.00. 449 Pp.

As stated by the author in Chapter 2, "The concept that individuals can be grouped into populations and that populations can be grouped into discrete biological units called species is a central tenet in biology." Niklas is to be commended for a treatment of both micro- and macro- evolutionary theory that combines basic elements covered in the classic works on biological and evolutionary species, (Carlquist, Cronquist, Dobzhansky, Erhlich, Gould, Grant, Stebbins, et al.) with those of the phylogenetic school, (Eldredge, Cracraft, Wiley, Mishler, et al.), in a refreshingly new, synthetic way. The book is divided into four parts, including a comprehensive review of "evolutionary basics", "life's chronicles: the fossil record," adaptive walks: a hypothesis," and "long-term trends." The book is the first I have seen that has a strong botanical morphogenetic and paleobotanic emphasis, as well as a presentation of the adaptive walk concept.

The first part, dominated by a discourse on population genetics, is aimed at the advanced undergraduate or beginning graduate student, and is written in a clear, concise manner. I found relatively few omissions, with the exception of a discussion of character displacement vs. the Wallace Effect. However, the early introduction of phylogentics is to be applauded, as is the historical review of Sewall Wright's and others' work with fitness. His introduction to species and speciation, with emphasis on heterochrony are rare in textbooks of this kind. While I would have liked to see more detail regarding morphogenetic abbreviations and additions (sensu Takhtajan and later, Funk and Brooks), the relationship of those concepts to that of the puctuated equilibrium hypothesis offer a balanced review. The concepts of hybridization, polyploidy and introgression are dealt with in a particularly straightforward manner.

The second part deals with the origins and early events in plant evolution, concomitant with the invasion of land and air. Using molecular evidence, paleobotanical evidence, and morphogenetic evidence, Niklas strings together a picture of early land plant evolution that brings the student through the basics of molecular, cellular, histological, vascular and reproductive evolution, first in their historical, then in their modern contexts. It presupposes that the student possesses a firm grasp of the comparative morphology of land plants, but it is, nonetheless, a synthesis that does not exist elsewhere.

The third part of the book, dealing with adaptive aquatic and terrestrial "walks" is the most unique because of its physiological aspects. It is far from light reading, because it contains some of the most complicated of subjects, including physical, physiological and morphogenetic principles rarely discussed in an introductory text. However, it is written so that one logically progresses from the unicellular to multicellular, then the aquatic to the terrestrial habitat, with extensive discussion of the physiological, ontogenetic and anatomical changes necessary to make those transitions. The only oversight I detected is a consequence of my preference to present discussions of genetic spirals and contact parastichal sets simultaneously when teaching phyllotaxy.

The final portion of the book covers long-term trends, including divergence vs. convergence, and tempos vs. events. In the section on divergence and convergence, homology and analogy are clearly differentiated, with examples ranging from the classic paleobotanical and modern morphogenetic. While most texts in this area are dull and boring, the many illustrative examples, and the quotations from Ernst Mayr and Yogi Berra certainly make it entertaining as well as instructive. While the discussion contains more inductive than

deductive reasoning than the chapters that preceded it, the synthesis of evidence from paleobotanical to modern examples informs the student of the historical bases for modern opinions. The final chapter, including explanations of cpDNA, mtDNA and nDNA, rates of genomic evolution, molecular clocks, species orogeny and demise, followed by the fossil record of speciation and extinction, offers another unique synthesis of information normally scattered between micro- and macro-evolutionary course texts.

In summary, this book is an excellent choice for any one-semester course in plant evolution. It is a bargain that should not be missed. With supplementary reprints from pertinent works in population genetics, morphogenesis, and phylogenetic theory, it could easily serve as the backbone of a two-semester graduate course in plant phylogeny. I heartily recommend it to any university biology instructor or student of evolutionary biology. —*John J. Pipoly III.*