some dogged experimental work and with the help and urging of an ambitious prospective father-in-law. Grosvenor and Wesson wisely home in on the scene of Bell's famous demonstration at the 1876 Philadelphia Centennial Exhibition as a kind of pivot point in their invention story—here, we can see the invention in real, workable form, powerful enough to convince even the professional skeptics.

This work pays careful and extensive attention to the early years of the telephone—to its corporate career under a number of managers and overseers, before ending up in the hands of the AT&T of Theodore Vail and J. P. Morgan. The early commercialization of the telephone and the creation by AT&T of the U.S.'s greatest and longest lasting monopoly constitute a good story, which is judiciously told. It is even nicely illustrated. But I think, for most readers, it will be seen primarily as filler, because Bell and his family are the stars of the book, even as he himself moves farther and farther away from the center of the telephone story.

In his later years, Bell's technical enthusiasms went in many directions, with a passion for flying machines being the most spectacular of them. His wife, Mabel, turns out to have been every bit as eager in experiments as her husband, and the photographs reveal that the passions that led to giant kites, the invention of the hydrofoil, and numerous other less showy adventures were very much part of a family affair. That image of Bell as the tender grandfather, surrounded by offspring, or reaching out to a deaf child, is still the one that sticks.

PALEOBOTANY

How the Land Turned Green

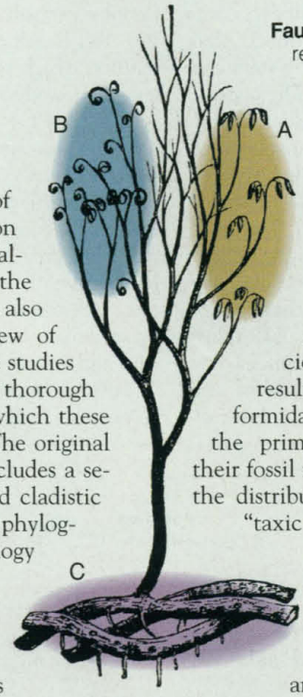
Richard Olmstead

The Origin and Early Diversification of Land Plants. A Cladistic Study. PAUL KENRICK and PETER R. CRANE. Smithsonian Institution Press, Washington, DC, 1997. xiv, 441 pp. $55, ISBN 1-56098-730-8; paper, $27.50, ISBN 1-56098-729-4.

As a field concerned with phylogeny, paleontology has been eclipsed in recent years by the molecular revolution in biology. A paleontologist often is perceived as the person in the back of the room waving his or her hand to ask "But what about the fossil record?" after a molecular phylogenetic presentation by a speaker who barely knows the organisms about which he or she has been talking—let alone is aware of the implications for phylogeny of the many lineages that no longer exist. Well, what about the fossil record? Even if we can reconstruct the phylogenetic tree for living land plants with DNA sequences, it will tell us rather little about the steps in the evolution of the plants around us today. This is because so many of the lineages that exhibit intermediate forms or unique combinations of forms are extinct today. Yet knowledge of phylogeny is critical to the understanding of morphological evolution—and so paleobotany continues to play a critical role in phylogenetic studies of land plants.

The problem of extinct lineages, of course, is greatest for questions of the most ancient diversifications. Paleobotanists Kenrick and Crane devote their book to exploring the pattern of evolutionary diversification among the earliest branchings of land plants. They were not content simply to present another series of phylogenetic trees based on new or revised data sets (although such trees form the heart of the book), so they also compiled a scholarly review of the history of phylogenetic studies of land plants as well as a thorough discussion of the data on which these studies have been based. The original research presented here includes a series of hierarchically nested cladistic analyses of early land plant phylogeny based on the morphology and anatomy of fossil and living plant groups. These analyses are combined with a thorough review of previously published results of both morphological and molecular studies. What I find most refreshingly novel about this approach are both the honest and evenhanded manner in which the authors present their results alongside those of other researchers and the explicit caveats they issue where data may be wanting or conclusions weak.

For each level in the hierarchy of early land plants, the authors present the background of ideas on relationships, including reproductions of cladograms from previously published studies. By this means, they frame the critical questions at each level before presenting their new analysis. For each taxonomic group included, they justify their choice of exemplar taxa, and describe the characters and states as they interpret them (data matrices are reproduced in appendices). This presentation is followed by the results of the analysis and their implications. The authors take care throughout to assess the stability of their trees and, hence, the strength of their conclusions. In some analyses, the limited number of species included yields unanticipated results. The book concludes with a formidable summary chapter, in which the primary monophyletic groups and their fossil records are reviewed, along with the distribution and interpretation of the "taxic homologies" (characters often cited as important in land plant classification) as well as an interpretation of important land plant "transformational homologies" (evolutionary series connecting putatively homologous structures in different groups).



Faulty reconstruction. Dawson's 1870 restoration of the early land plant *Psilophyton princeps* based on fossils from Gaspé Bay, Quebec. This is now known to be a composite of three remotely related taxa: (**A**) the trimerophyte *Psilophyton*, (**B**) the zosterophyll *Sawdonia*, and (**C**) *Taeniocrada* [H. P. Banks, S. Leclercq, F. M. Huber, *Palaeontogr. Am.* **48**, 77 (1975)].

MODIFIED FROM J. W. DAWSON, *NATURE* **2**, 85 (1870)

The authors do a good job of bringing order to a chaotic field, in which disparate studies, often with contradictory results, have led to a large number of conclusions that are difficult to reconcile with each other. They present a new phylogenetic classification of green plants (green algae and land plants) that integrates their findings with other published results. The book includes a table of synapomorphies for each major clade, as well as a table that identifies the commonly recognized paraphyletic groups (such as "green algae," "bryophytes," and "gymnosperms") and clarifies their relationship to monophyletic groups recognized in the authors' classification. The book also includes a particularly useful appendix with descriptions of the extant and fossil groups that are critical to understanding land plant diversity. I suspect that this volume will become a landmark in the literature on land plant evolution and remain so for many years to come.

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