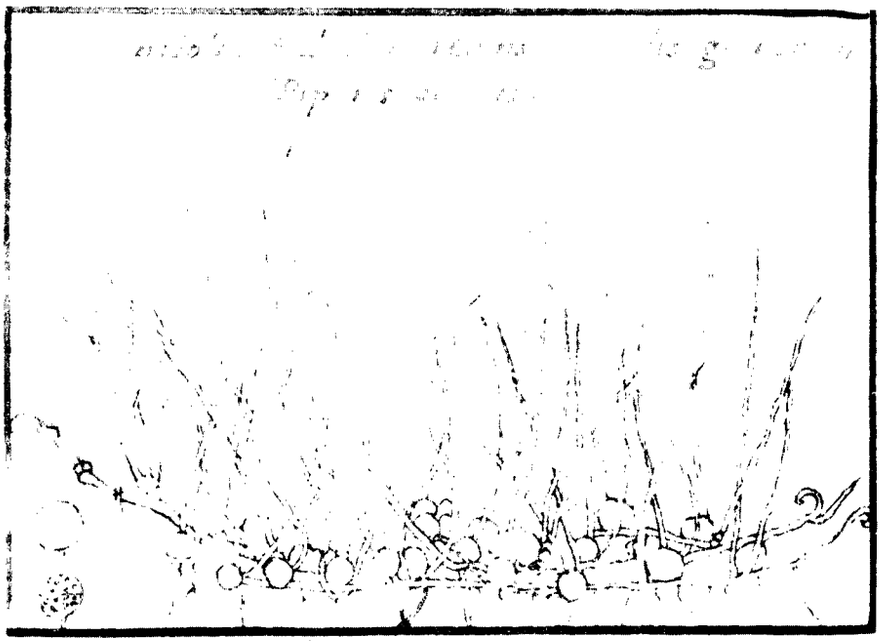

"Unpublished illustration of *Pilularia* by John Martyn, preserved in a bound manuscript Flora in the library of the Botany School. Note the cumbersome pre-Linnaean name." [From *The Shaping of Cambridge Botany*]

teach materia medica and carry out experiments in horticulture and "the principles of vegetation."

But in 1735 Bradley's successor, John Martyn, gave his last lectures in botany still "labouring under great disadvantages for want of a Botanic Garden." Only in 1762 did the university succeed in founding "a public Botanic Garden," complete with a curator, heated greenhouses, and lectures on the Linnaean system by the third professor of botany, Martyn's son, Thomas. In 1831, J. S. Henslow—by all accounts one of the most sympathetic figures in the history of Cambridge science—persuaded the university to move the garden to a much larger site, better suited "to the demands of modern science." (Henslow prepared the first guidebook to the new garden on the occasion of an excursion by 200 of his parishioners to see the sights of Cambridge.) The "New Botanic Garden" and the plant sciences at Cambridge have flourished ever since.

This fine "short history of whole-plant botany in Cambridge," by the present director of the Botanic Garden, celebrates the 150th anniversary of Henslow's garden. Walters emphasizes the interplay between two major traditions of plant science—the observational, systematic botany originally fostered by the demands of medicine, and the experimental and applied physiology favored by Bradley and Henslow—and shows how the proposed and actual gardens at Cambridge accommodated both. He tells the story very well, using unpublished archives to good effect, and illustrates it handsomely. This would be the ideal book to take along to the garden but for one astonishing omission: there is no plan of today's garden.

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A Framework for Systematics

Systematics and Biogeography. Cladistics and Vicariance. GARETH NELSON and NORMAN PLATNICK. Columbia University Press, New York, 1981. xiv, 568 pp., illus. $35.

Ask systematic biologists to summarize their studies, and most will likely draw branching diagrams. Such diagrams work as summaries because not only characters of organisms but also relationships between them are best understood in hierarchical terms. Though methodological schools may be characterized by what their diagrams summarize—similarity in phenetic dendrograms, genealogy in Hennigian cladograms, and the full glut of historical miscellany in a Darwinian traditionalist's tree—these differences perhaps hide a basic unifying theme. This observation is hardly novel, but in this book Nelson and Platnick provide probably the first study of its implications: If all branching diagrams are summaries, how do the various kinds summarize? Is there a general framework for thinking about branching diagrams? If so, might it permit evaluation of the effectiveness of the kinds of diagrams as summaries? In addressing these questions, the authors are led to examine the fundamental nature of the systematic process.

Despite the book's subtitle, Nelson and Platnick do not find their general framework for systematics in classical Hennigian cladistics. Their system is similar and uses the same terms, but it is fundamentally different in being nontemporal and without historical predicates. Cladograms become diagrams that "depict structural elements of knowledge," rather than show the sequential order of speciation events; synapomorphies are not shared derived characters but instead are pieces of information that define a group of taxa. For the authors, systematics is the resolution of conflict among definable groups on the hypothesis that the world is ordered and only one self-consistent set of groups (nameable in classification) exists for a given collection of taxa. If this hypothesis is true, then conflict results from groupings of taxa that are mistaken, either because different characters in some taxa have been called the same or because the presence of a character has been overlooked in other taxa. This simple view of systematics as a careful sifting of evidence should appeal to practicing taxonomists, since it corresponds to what they spend their days doing.

In their review of the history of systematics, Nelson and Platnick find pre-Darwinian taxonomic practice to fit their view of the discipline despite the disparate theoretics. They examine more thoroughly how suitable their model might be for understanding post-Darwinian practice. Using straightforward examples as much as formal argument, they treat the relationships between cladograms and phyletic trees for two, three, and four taxa (they suggest that problems involving more taxa can be reduced to series of three-taxon problems). The choice of a tree that best summarizes a given set of data turns out to depend on the same factors used in choosing a best-summarizing cladogram; "cladograms and . . . trees, therefore, seem merely to imply alternative strategies for arriving at the same result" (pp. 214–215). Most realistic situations, with conflicting information on group membership, seem to require for resolution assumptions about the future sampling of characters. To resolve conflicts between trees, for example, is to assume that the relative frequency of characters present in two or

more taxa will be stable in samples of future data sets. Phenetic summaries, though, seem to depend as well on the stability in sampling of characters unique to each taxon. This concern with the results of future studies on the same taxa is not unique to the authors' view of systematics, but their treatment is refreshingly realistic and productive. Other systematic issues discussed include the roles of parsimony, fossils, and ontogenetic sequences in systematic inference, how the results of different studies might be combined, and "gradistic" classification.

Nelson and Platnick arrive at their general view of systematics by removing it from a historical perspective. They are no more willing to leave systematics timeless than will be many readers, but they are not prepared to allow paleontology its usual large role in assigning dates to branching points. Instead, they suggest the possibility of dating speciation events by relating cladograms to geotectonic events. The second half of the book deals with the complexities of such an enterprise. The authors present interesting arguments against the feasibility of determining how particular distributional patterns arise and advocate looking instead for patterns of distribution common across taxa. A historical sketch details the authors' contention that this was, indeed, the dominant approach to biogeography before Wallace and Darwin led it off in other directions. A treatment of biogeographic component analysis is the core of Nelson and Platnick's argument that the historical relationships among areas of endemism can be predicted from the cladistic relationships of the resident faunas. Such predictions are endangered by incomplete sampling of taxa, but a bigger problem for cladistic biogeography may be that posed by widespread taxa. Indeed, one of the more intriguing possibilities suggested by Nelson and Platnick's treatment of biogeography is that biogeographers might be divided into schools more fundamentally by how they choose to treat widespread taxa than by which mechanisms they prefer for their historical scenarios. It would be a mistake to pass off this cladistic approach to biogeography as simply the latest statement of the vicariance school; it is too innovative a treatment, clarifying too many basic issues, to permit easy labeling. But the authors are hampered by a lack of data that might illustrate their approach. It is sobering to realize that only Brundin's classic study of austral midges is complete enough.

Nelson and Platnick have attempted an ambitious program here, and I find it generally successful. They articulate a fundamental view of what systematics and biogeography are about, a view that helps place in perspective past approaches to these subjects. They depart from previous treatments in many ways, but perhaps most in suggesting that the continued and principled evaluation of evidence is an integral part of both biogeography and systematics. Another major departure is the tone of the book; the authors only rarely slip into the contentious and partisan voice of recent systematic literature. The book's major fault is its relatively scanty bibliography. Critically lacking are references to similar ideas in the literature, especially those of Estabrook and Throckmorton. Nor are references given for the portions of this book that have been previously published. This, together with some passages that are overly cryptic (such as the discussion of how probabilities are calculated), will diminish the usefulness of the book for the novice. Advanced students and professionals, though, will find here the first truly fascinating treatment of systematics and biogeography to appear in years.

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