

by providing several examples of how similar mature structures may form by different developmental pathways. In the final chapter, Gleissberg provides a brief review of "Evo-Devo" and proposes a plan of future research in this field.

Williams and Humphries provide a brief introductory chapter to the Phylogenetic Analysis section by analyzing the concept of homology from a historical and contemporary perspective. Endress provides a thorough review of the kinds of morphological data that have proven useful in phylogenetic studies and makes the point that "...our present morphological arsenal is very incomplete." Hufford and McMahon turn tradition on its head by using phylogenetic analyses, *a posteriori*, to dissect patterns of morphological diversity within groups. They further define five parameters which morphospace, the existing morphological diversity.

Much of the final section deals with the ecological adaptations of particular structures. Barthlott et al. analyze epicuticular waxes, Hess examines the structure and function of pollen walls, and Baas et al., cover secondary xylem. These chapters tended to be more specialized than the others in the book, yet each provides a wealth of examples of useful morphological characters for phylogenetic analysis. In their chapter on plant biomechanics, Speck et al., have a different perspective on the importance of ontogeny and developmental anatomy by concentrating on the functionality of structure as growth proceeds - essentially the physics of Evo-Devo. In the final chapter of the section, Givnish suggests that a better understanding of ecological adaptations (Eco-Evo-Devo) will provide additional power to phylogenetic analyses.

In the book's final chapter, Stussey draws upon each of the preceding chapters to discuss the broad potential of future morphological investigations to provide a rich source of information, complementary to molecular data, for phylogenetic analyses. While the book is a series of treatises that can stand on their own, the editors and the authors have done a good job of integrating with each other to make the work a coherent whole. It would serve as an excellent text for a graduate seminar and be a good reference to stimulate researchers in one area to consider broader implications for their own work as well as to suggest possible collaborations. Marshall D. Sundberg, Department of Biology, Emporia State University.

Cacti of the Trans-Pecos and Adjacent Areas. A. Michael Powell and James F. Weedin. 2004. ISBN 0-89672-531-6. US \$60 (cloth; 7 x 10" format). xv + 512 pages + 314 color plates. Texas Tech University Press: Lubbock.

Powell and Weedin's *Cacti of the Trans-Pecos and Adjacent Areas* is a beautifully compiled regional taxonomic treatment, in the old-fashioned tradition, but with a few modern twists such as chromosome counts. Their book is filled with details that only people with long-term love of and association with a group of plants could write. It is also filled with the largely unpublished wisdom of Dave Ferguson and Allen Zimmerman, who rival Powell and Weedin in their expertise of the cacti of the southwest U.S.

Three things make this book shine. First, for each species and variety, the authors provide a detailed distribution map. In light of the virtually non-existent thumbnail maps in the recently published treatment of cacti in volume four of the *Flora of North America* (2004) and Lyman Benson's thorough but idiosyncratic taxonomic treatment in *The Cacti of the United States and Canada* (1982), Powell and Weedin's maps are virtually worth the price of their book. Second, unlike many previous authors, Powell and Weedin provide data on seemingly all existing chromosome counts. With polyploidy being such an important force in cactus evolution, this data is invaluable. At least for the Trans-Pecos of Texas, this book saves us from having to piece together chromosome count data from a diffuse and often obscure cytological literature. Third, Powell and Weedin are careful to enumerate juvenile characteristics of all taxa. For example, theirs is the first published assertion that, of the prickly pears in Trans-Pecos Texas, only *Opuntia engelmannii* and *O. polyacantha* *sensu stricto* have hairy seedlings. Juvenile characters are important for diagnosis of taxa and should also prove valuable for studies of heterochrony in cacti.

This book is filled with many charming details, some of I will highlight in this and the next paragraph. Apparently *Opuntia ellisiana* [syn. *O. lindheimeri* var. *ellisiana*] is the only prickly pear in Trans-Pecos Texas that lacks sensitive stamens. All other Trans-Pecos Texas prickly pear species (as well as *Lophophora williamsii* and *Coryphantha echinus* var. *robusta*) have thigmotropic stamens, i.e. stamens that when touched fold in around pollinating insects or the style. Powell and Weedin provide evidence that *Peniocereus greggii* is obligately cross-pollinated and state that pollination syndrome and floral morphology strongly indicate that *P. greggii* should be pollinated by hawkmoths (*Manduca* spp.). However, they then report that nobody has ever reported seeing hawkmoths at *P. greggii* flowers.

Although *P. greggii* plants are notoriously cryptic in nature, several populations are well-known and many people have gone out in the desert to witness the virtually synchronous flowering of many clones in a population. Lack of hawkmoth sightings is therefore noteworthy and in need of study. Finally, Powell and Weedin report a curious way to get rid of warts in humans using glochids and spines from *Opuntia polyacantha*. Cut the wart, place the glochids and spines in the cut, and then burn the spines. Unfortunately, they do not report the obvious control of whether cutting and burning *without the glochids and spines* would have the same effect.

I was especially intrigued by Powell and Weedin's assertion on page 38, that "polyploid taxa in *Opuntia* and *Echinocereus* (Trans-Pecos Texas) generally have a greater biogeographic distribution in multiple plant communities (mountains, grasslands, desert) than do diploid taxa, which are most often found in single-plant communities. In *Opuntia*, approximately 70% of polyploids occur in multiple communities, whereas 100% of *Echinocereus* polyploids are found in multiple communities." This provides some hints as to the ecological and evolutionary implications of polyploidy, which are especially important in light of nascent theories explaining how polyploidy may create greater phenotypic plasticity and cause radiations into a greater number of ecological niches. However, I wish that Powell and Weedin had supplied more data or had supplied any citations to support their fascinating assertion. Even though they provide the data given in the above quotation about polyploids, they do not provide the corresponding data (controls) for diploids. Furthermore, is their data for polyploids limited to tetraploids, hexaploids, octaploids and higher ploidy levels, while excluding triploids that might respond differently? Does their data generalize to all genera, and not just to *Echinocereus* and *Opuntia*? Do the three segregate genera of *Opuntia* (*Opuntia*, *Cylindropuntia*, *Grusonia*) show similar patterns with respect to polyploids radiating into multiple communities? Powell and Weedin open up a fantastic door by very roughly correlating ploidy level with ecological radiations. Hopefully further data will be forthcoming from Powell and Weedin – or from others.

In general, I found this book parochial, but that is probably the concession one must make in order to have a great old-fashioned regional treatment of a family. Powell and Weedin assert without justification the conventional wisdom that the genus *Pereskia* is primitive (ancestral, basal) in the cactus family, even though one of their former students has been adamant that *Pereskia* is highly derived (M.P. Griffith, 2004, *Taxon*). Powell and Weedin also seem parochial in not having jumped on the modern

bandwagon of segregating the genera *Cylindropuntia* and *Grusonia* from *Opuntia*. Powell and Weedin seem to adhere to the biological species concept and thereby are willing to distinguish species solely based on different ploidy levels, e.g. *Echinocereus pectinatus* and *E. dasyacanthus* (but antithetically, they consider *Mammillaria prolifera* and *Coryphantha vivipara* to each form a single species, even though both taxa contain diploid and polyploid individuals and have enormous geographic ranges). Although the biological species concept may make sense for some animal taxa, most contemporary botanists seem to have largely ignored this species concept. For example, virtually no botanists consider the diploid, tetraploid, and hexaploid populations of creosote bush, *Larrea tridentata*, to be anything but a single species. Finally and most peculiarly, Powell and Weedin continue with the parochial mantra of protesting polyphyly in systematic treatments, even though they seem as acutely aware as anyone (except maybe for Don Pinkava and his former students) of the role of introgression and allopolyploidy in cactus evolution (see for example their discussion of the messy taxa *Opuntia phaeacantha* and *Echinocereus x roetteri*). Once one admits that reticulate evolution is important, why stress polyphyly, which really only makes sense within the framework of a tree topology? Stating that this book is parochial is not meant to be pejorative. Rather, Powell and Weedin see cacti of Trans-Pecos Texas from one of many possible perspectives, one that is very useful so long as the reader does not forget the authors' perspective.

This book, however, has several minor problems and omissions. The authors make the classic mistake of assuming that the Trans-Pecos only includes those portions of Texas – and not also New Mexico – between the Pecos and Rio Grande. The title of the book should state explicitly this, as does Schmidly's 1977 *Mammals of Trans Pecos Texas*, especially since Powell and Weedin themselves use the phrase 'Trans Pecos Texas' (e.g., pages 38 and 320). It would have been helpful to have included a list of newly described taxa and combinations at the start of the book, as is done in the abstract of all modern journal articles. Some of the distribution maps are ambiguously or improperly labeled. For example, the key to the distribution map for the genus *Ancistrocactus* should have a black circle, rather than a black rectangle, for *A. tobuschii*. The relative lack of illustrations is unusual in this modern era of publishing, although this omission undoubtedly keeps the price of the book down. Powell and Weedin do however include color illustrations of all taxa, but these suffer from not being integrated with the text, containing too much blank space between the color photos, and

containing many images that are too dark or with too many shadows. Several of the color plates fail to adequately depict diagnostic characters, such as the peg-like spines in *Coryphantha minima*. Powell and Weedon only list herbarium records for new taxa and new combinations published in this book. It would have been extremely helpful had Powell and Weedon also listed representative herbarium specimen examined for those taxa for which experts disagree on species or generic limits or disagree on relative relatedness of taxa.

The relatively minor problems with *Cacti of the Trans-Pecos and Adjacent Area* should not overshadow the wealth of information and years of experience that went into this traditional book. The cacti of Trans-Pecos Texas have been overlooked for many decades, largely because these cacti are not as large nor as spectacular as cacti of the Sonoran Desert or central Mexico. Anybody seriously interested in North American cacti should acquire this book and treasure its good points, while understanding its relatively minor shortcomings. Powell and Weedon have done an exemplary job, in the fine natural history and taxonomic tradition of my youth. I sincerely hope that we are still fostering and mentoring such dedicated naturalists and hope that we can look forwards to similar sorts of work from subsequent generations.

Root Gorelick, School of Life Sciences, Arizona State University, Tempe, AZ 85287-4501.

The Moss Flora of Britain and Ireland. Ed. 2. A. J. E. Smith. 2004. ISBN 0 521 81640 8: cloth (US\$180) ISBN 0 521 54672 9: paper (US\$85). 1012 pp. Cambridge University Press, Cambridge, UK.

The moss and liverwort floras of Britain and Ireland are probably known better than any area of similar size in the world. Consequently, this revision of a widely admired book about moss diversity and identification, first published in 1978, is a major event. MFBI builds on a durable tradition. The mosses of Ireland were first enumerated by Dawson Turner (1804), and not long after that appeared *Muscologia Britannica* by William Jackson Hooker (Turner's son-in-law and recipient of his herbarium) and Thomas Taylor (1818). The latter book went through three editions in the 1800s. However, anyone thinking that the 19th century must have seen the complete documentation of the rich and complex moss flora of this geologically and topographically varied part of northwest Europe will

be sobered to learn the following. About 10% of the 763 species treated in the MFBI has been added since the first edition was issued 26 years ago: 8 new species with type localities in the treated region, 25 other mosses not previously collected in Britain and Ireland, and, as the result of taxonomic monography, an additional 51 newly recognized species for those countries. Used in conjunction with volumes 2 and 3 of *Atlas of the Bryophytes of Britain and Ireland* (Hill et al., 1992, 1994), an unrivalled amount of bryological detail is available to students of the British and Irish floras.

The book presents introductory material and an illustrated glossary (both of which will help beginners); a key to genera (potentially applicable over much of the Northern Hemisphere); keys to species; descriptions, chromosome numbers (when known); synonymies; identification, ecological, and distributional notes (including rarity status); and serviceable stippled line drawings for each species recognized. The illustrations were prepared with camera lucida and drawing tube and show features that are useful in identification, including drawings of leaf cross sections. The plants themselves are only sometimes rendered. The printed format is attractive and easy to use, particularly the large type size. My copy is the soft cover version, and the binding seems sturdy. This book of over 1000 pages stays open near the beginning, in the middle, and toward the end on a microscope bench in the laboratory where it is most likely to be consulted while identifying mosses.

The classification scheme followed is modern and reflects the status of knowledge through about 2000. (The author's preface is dated March 2003, and the text and bibliography cites taxonomic papers as recent as 2000.) Many of the numerous taxonomic innovations published in the 1980s and 1990s have been adopted, but when rejected the author is careful to provide a reason. For example, Lars Hedenäs's taxonomic concepts and redistribution of species in the Amblystegiaceae and other pleurocarpous families are followed, as are those of R. H. Zander for the Pottiaceae. Species on the British Red List, i.e., protected under the Wildlife and Countryside Act of 1981, are noted. British mosses receiving governmental stewardship under the Act are required to have common names, and a list of these are given, although Smith disavows their use because most are little applied (and therefore meaningless) beyond Britain and Ireland.

Almost all of the book is a distillation of the taxonomic experience of one author, but several other bryologists contributed treatments, including M. O. Hill (*Sphagnum*, 35 spp.), M. C. F. Corley (*Campylopus* Brid., 13 spp.), and D. F. Chamberlain