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PLANT SCIENCE

The Botanical Society of America: The Society for ALL Plant Biologists

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Where is Botany Going?

You will note later in this issue that the Centennial Planning Committee of the Botanical Society of America is gearing up for 2006. One hundred years of botanizing is quite an achievement, especially when multiplied by the thousands of individuals who have contributed to the growth of our knowledge of plants. However, a perusal of the nearly 50 years of this publication (in the process of being scanned to the BSA website thanks to Bill Stern's contribution of the early volumes of the run) makes clear a continuing problem which caused Bill to ask:

Quo Vadis, Botanicum? (Stern, 1969).

Since that time a number of articles have appeared in the PSB documenting a disturbing trend of the dissolution and diffusion of botany programs in colleges and universities throughout the country. The one ironic difference is that 30 years ago zoology was seen as the treat driving the trend; today, zoologists share our fate. In the words of one dean, who orchestrated the demise of two outstanding botany departments in two universities within the past 10 years, "botany and zoology are no longer valid terms." Unfortunately, this misconception is shared by many administrators.

Again the question, where are we going? To help answer this question we surveyed university catalogs of 147 institutions around the country, both large and small (Fig. 1). Fifty-nine research universities were examined, including 40 of the 44 schools described by Eshbaugh (1983) and updated by Sundberg (2000). The sample included

Figure 1. College and University catalogs sampled: red (medium gray), research Universities; blue (dark), comprehensive universities; green (light) liberal arts colleges.

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an additional 49 comprehensive state universities and 49 liberal arts colleges. In addition to noting which institutions offered botany courses, we tallied the courses offered within the relevant department (s). This provides some broad brush strokes to identify botany or plant biology (vs biology) departments. It also gives a quick picture of what courses are "hot," and which courses "are not."

Botany departments appear to be restricted almost exclusively to research universities (Table 1). Of the universities sampled, about half still have a botany department, but the declining trend noted previously continues. Since we gathered the data, for instance, the botanists at Iowa State University lost their autonomy. Certain disciplines remain well-represented, such as plant anatomy, plant ecology, and especially plant physiology. Other areas are becoming a "white hole" in the table – notably traditional taxonomy. What is surprising is that the decline of taxonomic offerings is equally severe in botany and biology departments. Also surprising is that most institutions continue to offer a general botany course, although the trend is toward a one or two-semester sequence of general biology.

The situation at comprehensive universities mirrors the pattern observed at the research universities, but the trends are more evident (Table. 2). The majority of departments still offer general botany, but plant physiology is the only upper-level course offered by most institutions. One pleasant surprise is that plant taxonomy is still taught at half of the institutions - - a slightly higher percentage than at the research universities (Table 4)!

Botany offerings are notably thinner at liberal arts colleges (Table 3). General botany and plant physiology are the most commonly offered courses with upper division offerings limited to the interests of the one or few botanists on staff.

Course offerings by departments at various sized institutions are summarized in Table 4, which quantifies the general trends evident in the preceding tables. The data generally reflect the different sizes and missions of the institutions. Research universities typically have larger departments with more individual faculty members actively focused within a specific sub-discipline. Smaller departments are more dependent on the ability of a few individuals to provide breadth of coverage to the program. But another strong driving force at research universities is the potential for external funding. A good indication of this pressure is a comparison of traditional taxonomy with modern systematics. There is good support for molecular approaches to systematics, but support for traditional taxonomy is weak, as evidenced by the threat to museums and herbaria at some institutions. It is also notable that merged biology departments are more likely to be offering plant molecular biology at the upper level than are traditional botany programs.

What was not evident at first is that comprehensive universities are more likely to offer traditional plant taxonomy than are research universities. This is particularly noteworthy given the expressed need of federal agencies, such as the USDA Forest Service, for individuals trained in plant identification (*Plant Science Bulletin* 48(4)). This may be a strength upon which comprehensive universities could focus - and government agencies could notice..

Table 1

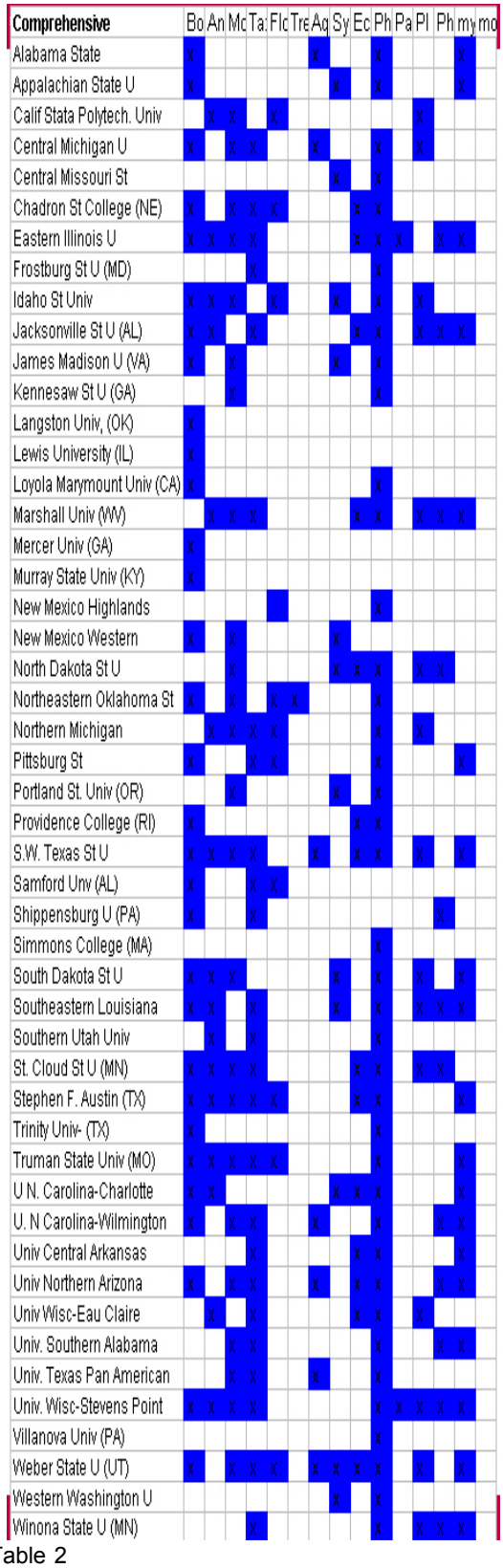

Table 2

Tables 1-3. Fields (in order): General Botany, Bo; Anatomy, An; Morphology, Mo; Taxonomy, Ta; Flora, Fl; Trees & Shrubs, Tr: Agrostology, Ag; Aquatic Plants, Aq; Systematics, Sy; Economic Botany, Ec; Physiology, Ph; Paleobotany, Pa; Plant Ecology, Ec; Phycology, Ph, Mcology, My; Plant Molecular Biology, Mo. Color: Green (light), Botany; Blue (dark), Biology.

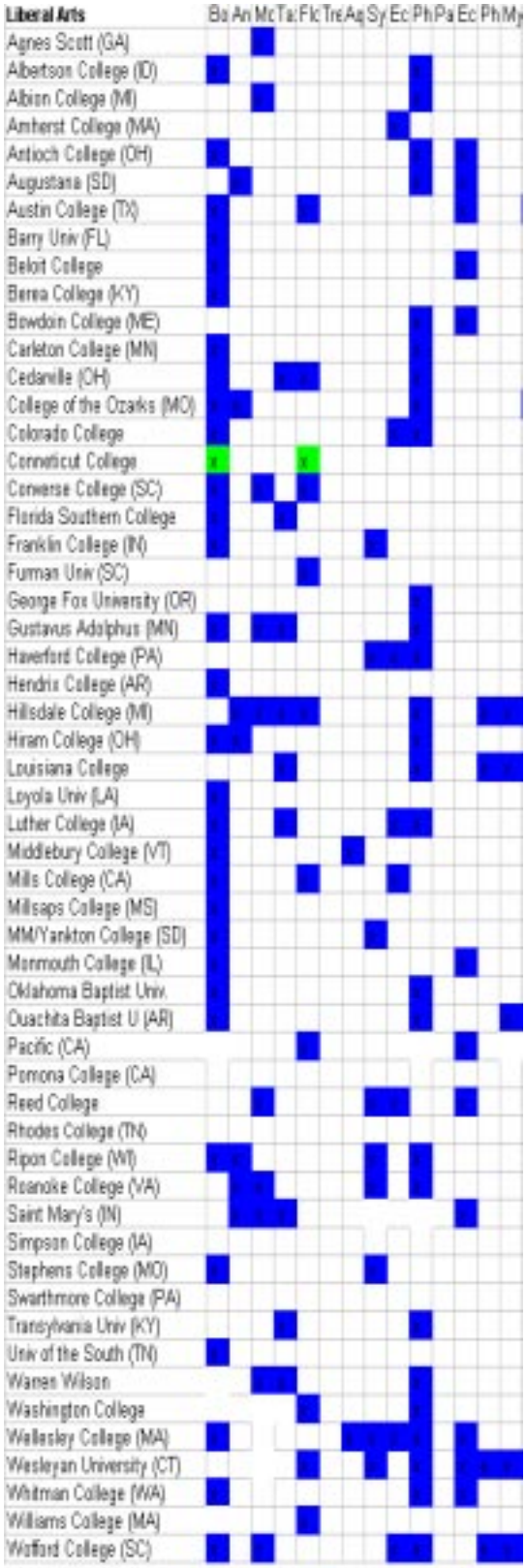

Table 3

	Research		Comprehensive Liberal Arts			
	Number	%	Number	%	Number	%
Botany	46	**0.78**	31	**0.63**	30	**0.61**
Anatomy	40	**0.68**	16	**0.33**	6	**0.12**
Morphology	31	**0.53**	24	**0.49**	7	**0.14**
Taxonomy	25	**0.42**	25	**0.51**	5	**0.1**
Flora	21	**0.36**	11	**0.22**	8	**0.16**
Trees/shrubs	8	**0.14**	1	**0.02**	0	**0**
Aquatic Botany	17	**0.29**	7	**0.14**	2	**0.04**
Systematics	31	**0.53**	12	**0.24**	9	**0.18**
Economic Botany	32	**0.54**	14	**0.29**	8	**0.16**
Pl Physiology	52	**0.88**	41	**0.84**	23	**0.47**
Paleobotany	6	**0.1**	2	**0.04**	0	**0**
Pl Ecology	42	**0.71**	15	**0.31**	10	**0.2**
Phycology	18	**0.31**	12	**0.24**	4	**0.08**
Mycology	32	**0.54**	19	**0.39**	5	**0.1**
Pl Molecular	29	**0.49**	0	**0**	2	**0.04**

Table 4. Comparison of botany course offerings at institutions of different size and mission.

Of course, data from university catalogs is not an entirely accurate indicator of actual course offerings. Although it was usually clear from the catalog description into which of the above categories a particular course should be tallied, this was not always the case. Furthermore, catalog listings do not indicate how frequently courses are offered (if at all) and they do not provide any information on impact – how many students are enrolled in a particular course.

It was in response to that need for this kind of information that we requested feedback from the membership in 2002. Your responses, initially summarized in *Plant Science Bulletin* 49(1), are expanded in Table 5. In some cases a single individual could provide information for an entire department, but in some cases only partial information was reported. At larger institutions information was frequently gathered by department secretaries, either by semester or by year. As a result, the data only can be considered a best approximation. Nevertheless, some trends are clear and frequently anecdotal information was forwarded along with numerical tallies that provided additional detail to the interpretation.

Taable %. Course Enrollment.

	Bot.	Ana.	Mor.	Tax.	Flo	Tree	Agro	Aquatic	Sys.	Econ	Grow& Dev	Phys	Pal	Ecol	Phycol	Mycol	Bryo&Lich	Pl Gen.	Cell Biol
Research																			
Illinois State Univ			23	12						24				20	15		8(alt)		
Louisiana State				17				45				23		196(gen)	13	8			36
Miami Univ	420	5	51	28	120	10				450		21		120+*					
Mich St Univ	293	5			28			14	40	8			14	32					
Ohio Univ	45	4(alt)	6		15	18			22			10	2	100+*	13(alt)	11		15	
Univ. Calif. Davis		31	15		30+	X	X		22	30	100	60		50+	X	X	X	X	58
Univ. Colorado		30	24						20			30		67					
Univ. Conneticutt	55	10	17-26		10			12(alt)	18(alt)	10(alt)				12	10(alt)		10(alt)		
Univ. Florida	X	X	X	50+	X			X		X		X	X	X					
Univ. Minnesota	200	42								26									
Univ. Rhode Island	200	45	35	25				36				31			14	13			
Univ Oklahoma	920		15									10		10					100
Univ. Tennessee	350	8	10		30							30							8
Univ Vermont		X		X					X			X		X					
Comprehensive																			
Adams St (CO)			X(alt)						X(alt)			X(alt)		X(alt)					
Cal St-San Bern	24				24					24									
Cal St Polytechnic	180	20(alt)		150	45	24			15			150		54	20	100+		55	
Delaware St U	8								10			5							
E. Kentucky	200					15		15	15										
E. Michigan	16	5(alt)				16		10(alt)	5(alt)					3(alt)	5(alt)	5(alt)			
Emporia St	70		4(alt)	10	10(su)	10	6(alt)			12(alt)		3(alt)				3(alt)			
Humboldt St**		12	12	100			12			24		24		24	24	48*			
Millersville (PA)	160	22							24			18							
N. Colo.		18(alt)		20						24		27						20(alt)	
N. Iowa		33	15						23	25		33							
Old Dominion	40			10(alt)	15							24(alt)		15					
U.W.LaCrosse	130	5		15		12		18		24		27							
UW Stevens Pt	500	12(alt)	12(alt)	120	24		28	20				70	12(alt)	24	16	16	16(alt)	12(alt)	
UW Whitewater	125		15(alt)	16(alt)										60(gen)					
Liberal Arts																			
Cedarville (OH)	35			3(alt)	7(alt)							3(alt)							
Gustavus Adolphus	150***		10	15								10							
Pacific					10														
St Mary's (IN)		14(alt)	14(alt)	16(alt)						24(alt)									
Warren Wilson			17	17								17							
Washington C.					11							3							
Community Col																			
Allan Hancock (CA)	X				X														
Santa Barbara	X		X																
Cuesta College (CA)	X									X									

* sum of multiple courses
**based on # labs, 12/lab
*** split w/zoology

One of the first trends evident is that if general botany is offered at an institution, it is still part of a core curriculum and sees high enrollment. It is an opportunity to attract students to botany that we cannot ignore. Andy Nell notes that at his community college, when general botany had to be dropped because of low enrollments, he developed a Plants and Society course that quickly filled to its capacity of 25. "This class is attractive to a large pool of non-majors requiring science electives for AA and AS degrees….I hope a few non-majors get inspired to become plant science majors."

Beyond the introductory course there is a significant drop off in enrollments. Somewhat surprising is that course enrollments in upper division courses has little association with school size. While these numbers may have held steady during recent years at the comprehensive and liberal arts schools, anecdotal evidence suggests there has been dramatic decline at the research schools. This may relate to a declining interest in traditional service areas as much as to a decline in interest in botany *per se*. David Longstreth noted: "The traditional plant courses are now mostly filled with our majors as opposed to Ag majors. The number of Ag majors has declined …" Yet, as Scott Ruhren notes, at some institutions "Students are hungry for plant electives! …I have witnessed the dwindling offerings yet not a correlated dwindling interest as suggested by upper level administrators - - less botany offerings largely because of retiring botanists with no replacement." At many institutions, including my own, you cannot depend on a retirement opening remaining in the department, much less a specific discipline. In our current climate, justification is in terms of headcount.

Low enrollment numbers may be particularly critical at comprehensive universities where many offerings are already on an every-other year rotation as a limited number of botanists attempt to maintain the breadth of coverage. Gary Hannon reports that with the exception of general botany for non-majors and a winter trees and shrubs for majors "The other courses are offered only every other year, and

sometimes they do not have enough enrollment to avoid being cancelled (at the Dean's insistence)." Unfortunately, when low enrollment forces cancellation, it is the students who are interested in botany that are hurt. In such cases it is important that we examine scheduling carefully to avoid as many competing courses as possible - including math and chemistry as well as other biology.

It is clear from comments by contributors that student interest is there, but we may have to work harder to nurture it. "If UNC (Northern Colorado) is indicative of the US in general, undergraduate students still seem very drawn to plant taxonomy and enjoy working in the herbarium…In all cases these students came to me requesting these activities… In short, active herbaria lure students into independent studies and research projects very readily. This is important because a student who can take ownership to some degree in his or her program of study will almost assuredly…become enthusiastic about their course of study."

The data suggest that several institutions continue to do a good job of stimulating student interest and enjoy a viable program with "good numbers" at all levels. One of these, Michigan State University, was highlighted by Frank Ewers (2000) in our first volume of the new millennium. The next issue of PSB will focus on a few of the more successful programs identified above.

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ANOTHER OPINION : UP WITH ALPHABETICALLY ARRANGED HERBARIA (AND WITH FLORISTIC LISTINGS TOO FOR THAT MATTER).

I clearly remember the feeling of relief and elation when I first joined the staff of Field Museum and discovered that its almost two million angiosperm specimens, after a division into monocots and dicots, were arranged alphabetically by family. The genera, too, were in that same arrangement. Within genera, species were divided into eight major geographical regions and then, they too, were in alphabetical order. Over the ensuing thirty-eight years, I cannot recall having ever yearned for a "phylogenetically arranged" collection.

Perhaps it was the terrible abuse I suffered as a graduate student that prompted such a euphoric reaction. As herbarium assistant at the Missouri Botanic Garden, I spent many miserable hours looking up Della Torre and Harms "genus numbers" for just about every damn sheet being added to the herbarium —and having to scribble those same dumb numbers onto each sheet so that we'd know where to file it. Of course, this miserable employment helped keep me alive through graduate school, but it seemed like such a huge waste of effort for a benefit I never really appreciated.

While I very much enjoyed the opinion piece by Vicki Funk (2003) and agree with a number of her points, I can't resist getting on a soapbox of my own. Here are a few counter-arguments for some of the points presented by synantherologist Funk.

First point: **phylogenetic systems are much easier to use for identification purposes**. This may be true if you already have a good idea of the family or order to which an unidentified specimen belongs. Obviously, an alphabetical arrangement is not helpful for identification, but other artificial arrangements can be very effective in helping people identify plants whose family they do not recognize. Linnaeus had so huge an impact because his system was utterly artificial and eminently practical. With the Linnaean system, people could put names on their specimens; arranging them according to their real affinities came later. While in Ethiopia, I spent more than a year trying to find the family for a very unusual plant. This strange organism had a greenish trunk about a foot thick and three feet tall; from the top of that trunk emerged green vines with tendrils! The long slender greenish flowers had a tubular perianth with five stamens. So far so good, but then came the real problem. This plant's flowers had an itty bitty pistilode with no clue to locule

number or placentation. Clearly, it was a male plant. Of course, misinterpreting the position of the tendrils did not help in my search for a family. But I often thought: "if only we hadn't given up on Linnaeus's sexual system I might find the name of this strange thing!" It took well over a year, searching through miles of arid thornbush, before I found a female plant in flower. Would you believe a stalked ovary having a single locule and parietal placentation? I had been dealing with a species of Adenia in the Passifloraceae!

Yes, phylogenetic systems enhance identification, but only if you have a very good idea of where it is you're at. Dichotomous keys that really work in identification use easy-to-see and require easy-to-interpret characters —not subtle phylogenetic dichotomies. User-friendly keys rarely follow phylogenetic patterns. Why should they? Their purpose is to identify taxa, not organize them. Roger Tory Peterson, who helped make our birds recognizable, arranged his wildflower guide by flower color, and it still outsells those arranged by families. For beginners, artificial systems are the only way to go. Phylogenetic arrangements work best for those who already understand them.

Second point: **One learns when one files in a phylogenetic herbarium.** Sounds great; but since when are people filing plants as a learning experience? My job as an herbarium assistant was to file as much as possible, as fast as possible. In those earlier times, the noxious stench of napthalene and paradichlorbenzene helped accelerate our filing efforts. After a couple of hours, one needed to find fresh air to revive oneself. Filing is a good way of getting to recognize some lineages, but it doesn't make clear the more subtle features (floral details, placentation, pollen morphology, etc.) that distinguish most families. In large herbaria or small, filing specimens alphabetically or phylogenetically is a similar learning experience. Either way, the specimens will be arranged into families before filing begins.

Dr. Funk's third point —**working in a phylogenetic herbarium makes systematic work easier** — is right on the mark. This is especially true when working in large, genera-rich, families. But how many people are doing this kind of "work" in the herbarium these days? From what I see, everybody's in front of their computer screen or in the DNA lab.

Fourth point: **It is easier to work with undetermined specimens in a phylogenetically arranged herbarium**. This is true if you have a good idea of the family you're dealing with. But I would rephrase this idea to read: it is easier to work with undetermined specimens in as small a herbarium as possible. Nothing beats a small local herbarium for the quick and effective identification of a species. It took about twenty minutes in our little herbarium in eastern Ethiopia to compare a new collection with all our grasses or all our legumes. That little herbarium had been put in alphabetical order before I got there, and I saw no reason to change. The size of a herbarium is the biggest factor in how quickly you can find a match, regardless of the arrangement of species and genera. And that's why so many herbaria have small "special collections" to deal with the identification of plants in small regional areas.

One of the huge problems in current identification is that some large Neotropical genera do not have effective phylogenetic classifications. And it's not because earlier workers didn't try. In the neotropics Piper, Croton, Miconia, Eugenia and many others are difficult to work with because these genera do not have clear-cut divisions, and they lack effective recent treatments. For these it's the old "herbarium crawl" to try and find a match. In these genera; that crawl is just as effective in an alphabetical system as it is in a so-called phylogenetic one.

Fifth point: **Phylogenetically arranged herbaria are great for teaching**. Who in the world teaches in a herbarium? The first thing most people do when visiting our herbarium is to complain about the smell. And that's ten years after we stopped using nasty chemicals. I cannot imagine people scrunched into a narrow herbarium aisle becoming acquainted with the characteristics of a plant family. Seems to me that lots of color slides, lots of illustrations of vegetative and floral morphology, floral dissection under a stereo microscope, and studying a wide variety of herbarium sheets under bright light is how you teach plant families.

Sixth point: **Lumpers, splitters and the arrangement of herbaria**. I would guess that whether one likes to lump or to split is largely a function of personality or early training. The advantage of being a splitter in the description of species is that an over-split species is usually pretty easy to put into a more realistic larger entity. An over-lumped species, however, may be more difficult to disentangle. That's a problem at the species level, regardless of how your herbarium is arranged.

When it comes to generic and family splitting we run into one of the most serious problems in modern classification: taxonomic inflation. There seems to be an innate tendency to make one's own work more impressive by (1) elevating the rank of the taxon under study, (2) discovering that what was once a genus is "actually" several, or (3) overturning as much earlier nomenclature as possible. Each of these activities allows the investigator to expand their self-esteem, while moistening the hydrant of published wisdom anew. The debacle of what was once the "Liliaceae" is a recent example. Meanwhile,

Senecio, Eupatorium, Cassia, Eucalyptus and other large genera have been attacked by "experts" who fail to explain why the rank of subgenus is incapable of providing meaningful arrangements in larger genera. Clearly, it seems that human nature, emboldened by the discovery of new knowledge, is the driving force in these trends, not the nature of herbarium organization.

Another point: **Alphabetically arranged floras and checklists**. Phylogenetically arranged identification manuals are surely more useful for the trained student. No argument here. However, there are other texts where an alphabetical listing is more practical. Here in the Chicago region we are blessed with a very unusual book: Plants of the Chicago Region, by the late Floyd Swink and Gerould Wilhelm (1994). This 921 page manual does have keys to families, genera within families, and species within genera. However, a lack of descriptions and illustrations limit its use for identification. What this book does have is county maps, flowering times, and (get this) lists of plants commonly found associated with each species. In addition, the book has something very unusual: a "species conservatism index" on a scale of 1 to 10. This scale rates highly adaptable species that can live under most any condition very low, and gives a high rating to those native species that are particularly sensitive to habitat disturhance or require very special environments. This rating allows a natural area to be evaluated for "floristic quality," critical to many conservation efforts. The index is also useful in monitoring remediation efforts, as "sensitive" species become reestablished. Clearly, this volume is one terrific source for a lot of local information. Better yet, the book is entirely alphabetical! Families, genera, and common names are all in the same alphabetical sequence. Here is a reference that I've used hundreds of times —taking only seconds to get to the information I was after. For such an encyclopedia-like volume, as well as for many checklists, the alphabet is unbeatable.

Final point: **Phylogenetic "trees" cannot be transformed into linear rows of cases or pages in a book**. Evolution has produced complex multi-branched "trees" of descent. In fact, if we include many differing features in the evolution of lineages we need to construct multidimensional vectors in hyperspace (I think I read that somewhere). Such complex multi-dimensional concepts, or even simple two-dimensional "trees," cannot be translated into a linear sequence. After reaching the end of one evolutionary branch, you've got to go back within the tree to pick up the next closest branch. Whether the sequence is a row of herbarium cases or the pages of a book, a linear sequence cannot mimic a deeply branched tree. The tree needs first to be cut into many linear sections, and these sections must be arbitrarily forced into a single sequence. Here's where books work so well, allowing one to compare several families by simply flipping back and forth between them.

Convergence and parallelism have been rampant in the living world. In fact, recent DNA data has revealed a number of areas where superficial morphology has misled us in the past. Remember the blue green algae? Unfortunately, new DNA phylogenies are ripping apart some families and orders that seemed to make sense for over a hundred years. Now they're putting Buxus and Gunnera next to the Caryophyllales. The latest arrangement has Aquifoliales standing between the Apiales and Asterales —not bad alphabetically if you're filing by order, but who does that?
Huge herbaria, and little ones as well, are mostly used for information retrieval: do we have a specimen, where does it grow, what does it look like? Answering such questions quickly can best be done with a simple ordering sequence that doesn't need to be referred to over and over again. Apart from matching specimens, botanical systematics is not done in the aisles of a herbarium. In order to "shuffle the sheets" you need space, light and a lot of time.

Nowadays, with increasing emphasis on conservation and biodiversity, our herbaria have become the primary "data base" for many scientific activities outside of systematics. Ecologists, conservationists, and local naturalists come to use our collections for verification and for distribution records. These are biologists for whom phylogenetic relationships are of little concern. And, as we serve these people more and more, we're finding that our alphabetical system works just fine.

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News from the Society

CENTENNIAL YEAR – 1906-2006

The Botanical Society of America will be celebrating its Centennial during 2006, and particularly at the 2006 Annual Meeting. A Centennial Planning Committee (CPC) was established late last fall, and has begun the initial phase of planning for the Centennial. To insure that the entire BSA membership has an opportunity to help plan for this once-in-a-lifetime event, the CPC is asking each of you to provide ideas that could help enrich this unique celebration.

At this point, the CPC has identified and is pursuing these ideas:

- Written history of the BSA, particularly the last 50 years
- Articles that represent past milestones in botanical research
- Articles that identify future, significant areas of research in botany
- A theme for the centennial
- A commemorative US postage stamp(s)
- A Centennial medallion
- Special symposia and talks
- Display(s) of BSA memorabilia
- Establish a special centennial fund

Obviously, there are more things that can be done to celebrate 100 years of botany. This is why each of you is being asked to contribute ideas that extend the list of ideas just presented. *One item of immediate importance is creating an* ***appropriate theme for the Centennial*** *that could go on the medallion, and possibly the BSA letterhead*.

To help you contribute your ideas, the names and emails of the present CPC are listed. Please email any of them with your ideas, and they will be seriously considered. Thank you for your help in planning the Centennial!

Greg Anderson <mailto:ander@uconnvm.uconn.edu>
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BSA Seeks Editor for Plant Science Bulletin

Plant Science Bulletin needs a new editor to begin with Volume 51 (March, 2005).

Are you interested in desktop publishing? Would you like to correspond with botanical colleagues in many disciplines about books, articles, and matters of interest to the BSA? Are you looking for a meaningful way to serve the Botanical Society of America? Need more information?

If your answer to ANY of these questions is yes, please communicate your interest to Dr. Andrea Schwarzbach (Chair, BSA Publication Committee). Department of Biological Sciences, Kent State University, Kent, OH 44242; telephone 330-672-3370, E-mail mailto:aschwarz@kent.edu). Applications are welcome any time and no later than July 1, 2004. The BSA Publication Committee will begin reviewing interested candidates during summer of 2004.

For a description of the Plant Science Bulletin see http://www.botany.org/newsite/publications/ -pubpsb.

News from the Sections

Northeast Section Joint Field Meeting

The 2004 Joint Field Meeting of the Northeast Section of the Botanical Society of America will take place June 13 to June 17 on the Bruce Peninsula in Southern Ontario. Housing will be at the Wildwood Lodge in Red Bay. The Bruce Peninsula is noted for its rich flora, and particularly for orchids and ferns. Field trips are planned to several locations on the Niagara Escarpment, to Flowerpot Island, and to locations on the shores of Lake Huron. There will also be evening programs. The registration fee for the meeting will be $335.00 per person, double occupancy. This includes the field trips, evening programs, some local transportation, a boat trip to Flowerpot Island, and meals from Sunday dinner through Thursday breakfast. Everyone interested in native plants is welcome to attend. Space is limited and pre-registration is required. For additional information, contact Chairperson Nancy Williams, 36 Brown Road, Rowe MA 01367; phone 413-339-5598; email NNWROWE@aol.com.

Announcements

Stunning Prints from Rare Book Collection

The Chicago Botanic Garden, on the one-year anniversary of its rare books acquisition from the Massachusetts Horticultural Society, introduces the first series of prints based on illustrations from the collection.

Limited numbers of these stunning prints, taken from Timothy Sheldrake's *Botanicum Medicinale*, published in 1759, are for sale in The Garden Shop,

just in time for Valentine's Day.

This introduction is part of a long-range plan to make these botanical treasures more available to bibliophiles, historians and gardeners," said Ed Valauskas, manager, Library and Plant Information Office, Chicago Botanic Garden.

The prints are created through a cooperative arrangement with two firms, Octavo, Oakland, Calif., and Editions Alecto, United Kingdom. Octavo photographed the complete book at a resolution of 10,000 dots per inch. Alecto used the digitized images to create matted prints of 15 images in two editions.

The first edition, limited to no more than 250 copies of each image, is an exact, full-scale reproduction of the hand-colored engravings. The second, unlimited edition is mechanically colored, with each plate reproduced at two-thirds the original size. Unframed, limited edition prints, which are matted, sell for $300 each. Unlimited edition prints sell for $30 each. The images, which are primarily of fruits and vegetables, can be viewed on the Web at www.chicagobotanic.org.

Prints of additional images from *Botanicum Medicinale* can be viewed and special-ordered on the Web at www.chicagobotanic.org. Images from other books in the Garden's rare book collection will be released in 2004.

For more information on purchasing prints, contact Cynthia Palmer, manager, The Garden Shop, at (1-847) 835-6804, or at cpalmer@chicagobotanic.org. For more information on the Garden's rare books collection, contact Ed Valauskas at (1-847) 835-8202, or at evalauskas@chicagobotanic.org.

Specimen Label Database

The University of Colorado at Boulder database of vascular plant specimen labels from Colorado housed at Herbarium COLO is now searchable online at "http://cumuseum.colorado.edu/Research/Botany/Databases/search.php". Approximately 70,000 records of the ca. 90,000 Colorado specimens have been entered to date.

Tom A. Ranker
Associate Professor & Curator
University of Colorado Museum
265 UCB - Bruce Curtis Building
Boulder, CO 80309-0265

Plant Pathologists Express Need for Plant Pathology-Related Microbial Culture Resources

St. Paul, Minn. (December 5, 2003) - Microbial culture collections have played a crucial part in accelerating the progress of research in the biological sciences, but a collection dedicated to plant pathogens is still needed, say plant pathologists with the American Phytopathological Society (APS).

While many collections of relevance to plant pathology do exist, there is a need for a comprehensive repository of plant pathogens for the preservation of materials used in plant pathology research, said Kevin McCluskey, Research Assistant Professor, Department of Microbiology at the University of Kansas Medical Center. "Collections have a specific focus, and the long-term preservation of the diversity of plant pathogens is one area that is generally overlooked," he said.

Collections of plant pathogens have often been generated and maintained by individual researchers, and when those individuals retire or change their research emphasis, the collections may be neglected or discarded, said McCluskey. "Resources have certainly been lost over the years, and this process is continuing," he said. "A specific repository, dedicated to preserving and distributing plant pathogenic organisms would be a valuable tool advancing the goals of plant protection for the United States and the world," said McCluskey.

More on this subject, including funding opportunities for collections, the variety of collections in existence, and trends in organization, is available in this month's APS feature article that can be found on the APS website at http://www.apsnet.org. The American Phytopathological Society (APS) is a non-profit, professional scientific organization dedicated to the study and management of plant disease with 5,000 members worldwide.

14th Congress of the Federation of European Societies of Plant Biology August 2004.

The Congress will be held at the Cracow University of Economics Conference Centre. Cracow is a stunningly beautiful city of considerable academic and historical significance. With a population of nearly one million it is one of the most frequently visited cities in Europe and a vibrant centre of scientific, economic and social life. These are the abundance, uniqueness and variety of cultural values that make the city offer highly appealing to its guests.

The key objective in planning the scientific programme was to ensure that the event would achieve the highest levels of scientific interest and topicality. Hence, the programme combines scope and depth underpinned by a record number of acknowledged speakers. It allows plenary session lectures, mini-symposium sessions, as well as poster session. It would give a comprehensive overview of the most recent development in field of plant biology and would surely stimulate fruitful discussions between attendees anticipated in the amount of 1000.

The 14th FESPB Congress seems to be the exceptional one, at least by two reasons. The first one is of great importance for Poland. This will be the biggest scientific assembly of plant biologists that has ever been organized in our country. Apart from Poland's accession to the European Union the Congress will be an excellent occasion for Polish scientists both to present their scientific attainments and to affiliate scientific collaboration with their European colleagues. The second one is of great importance for the Federation. It will be the first Congress of the Federation under its new name. Undoubtedly, it was a decision not deprived of great consequences as the Federation remarkably disseminated its scientific field of interests and activities. Against this background the scientific programme of the Congress has been expanded to reflect the vigorous development of present-day plant biology in Europe and beyond.

Symposia themes include then areas as varied as seeds, plant growth and development, genomics and post genomics, root development, plant breeding and improvement, fruit development and ripening, respiration, water relations, photosynthesis, mineral nutrition, biotic and abiotic stress, plant cell biology, pollination and flowering, high throughput technologies, secondary metabolism, tissue culture and plant microbe

interactions. Furthermore, I expect that the workshop on transcriptomics and session on didactics and teaching in plant biology will be of interest too. I care of these in particular for the sake of young scientists who will certainly bestow upon plant science a new dimension in the future.

I hope very much that you will fill able to attend the 14th FESPB Congress in Cracow and enjoy meeting with colleagues whose names so far was known to you only from literature. I look forward to seeing you play a full part in making the 2004 Congress our most successful yet.

For More information see: www.fespb.org or www.ifr-pan.krakow.pl/konf/

Positions Available

Teaching Postdoctoral Position

The Department of Botany and Microbiology at the University of Oklahoma announces a teaching postdoctoral position beginning in August 2004. A Ph.D. in biology is required (exceptional ABD candidates will be considered). This position is for one year with the option for renewal of an additional year based on job performance.

Responsibilities include teaching an Introductory Botany course (taught using the inquiry method of instruction), other botany courses depending on background, and supervising teaching assistants for introductory level courses. The successful candidate should be highly computer literate and able to help maintain laboratory computers, probe wear, and class web-based material.

The successful candidate will have the opportunity to learn and hone inquiry skills and should be interested in the scholarship of teaching and learning biology. The 9-month salary is approximately $23,000 (with benefits) with option of teaching in summer for additional funding.

Interested candidates should send a cover letter, curriculum vitae (with teaching philosophy), a brief description of skills, a list of possible courses that could be taught, and three letters of reference to Dr. Gordon Uno, Department of Botany and Microbiology, George Lynn Cross Hall, 770 Van Vleet Oval, University of Oklahoma, Norman, OK 73019-0245. Direct inquiries to: guno@ou.edu. Review for this position begins in March and will continue until the position is filled.

(The University of Oklahoma is an equal opportunity, affirmative-action employer.)

PLANT SYSTEMATIST
Millersville University

The Department of Biology at Millersville University invites applications for a tenure track position at the Assistant Professor level beginning in the Fall term 2004. The ideal candidate can a) teach undergraduate courses in introductory botany, introductory biology, and plant systematics (with emphasis on vascular plants of Eastern U.S.) plus another course in either plant population biology or plant ecology, b) supervise undergraduate research, and c) serve as curator of the James C. Parks Herbarium.

Required: Ph.D. in botany /biological science with specialization in vascular plant systematics or related field; a strong commitment to undergraduate teaching and to liberal arts education; a good general knowledge of biology; some undergraduate teaching experience, expertise in field identification of vascular plants of eastern U.S., publications or manuscripts accepted for publication in refereed scientific journals, evidence of expertise in molecular systematics, successful interview and teaching demonstration. Preference will be given to candidates with postdoctoral experience, presentations at scientific meetings, and/or curatorial knowledge or experience. It is desirable that the candidate have interests that complement existing programs, in a department currently consisting of 17 full-time faculty and over 450 undergraduate majors.

Millersville University, founded in 1855, is one of 14 institutions of the PA State System of Higher Education. Located in historic Lancaster County, this 250-acre campus is within three hours drive of numerous cultural and recreational opportunities in the cities of Baltimore, Philadelphia, Washington, New York, the Pocono Mountains, and the Atlantic Ocean beaches. For additional information about the university and department, visit our Web-site at www.millersville.edu

Full consideration given to applications received by **March 2, 2004**. To apply, please submit 1) statement of teaching and research interests/goals, 2) current curriculum vitae, 3) recent published reprints or submitted manuscripts, and 4) three current letters of reference (at least one of which addresses teaching skill or potential), sent separately, to:

Dr. David Dobbins, Chair, Search Committee
Biology Dept./**PSB0204**
Millersville University
P.O. Box 1002
Millersville, PA 17551-0302

An EO/AA Institution

Award Opportunities

GRANTS FOR BOTANICAL GARDENS AND ARBORETA

The Stanley Smith Horticultural Trust invites applications for grants up to $20,000 for education and research in ornamental horticulture. Not-for-profit botanical gardens, arboreta, and similar institutions are eligible. The deadline for applications is August 15, 2004. For current guidelines, contact Thomas F. Daniel, Grants Director, SSHT, Dept. of Botany, California Academy of Sciences, Golden Gate Park, San Francisco, CA 94118, USA (email: tdaniel@calacademy.org; tel. (415) 750-7191).

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NATIONAL TROPICAL BOTANICAL GARDEN COLLEGE PROFESSORS' COURSE KENAN FELLOWSHIP

Program Operation: July 7-14, 2004
Deadline to Apply: April 23, 2004
Notification of Acceptance: May 7, 2004

COURSE DESCRIPTION
The National Tropical Botanical Garden (NTBG) will host another very exciting course for college professors of introductory biology from July 7-14, 2004 in Kaua'i, Hawaii. College professors accepted to the fellowship will become Kenan Fellows at the National Tropical Botanical Garden.

The goal of the NTBG Kenan Fellowship is to improve the quality of teaching in introductory biology classes at the undergraduate level. Facilitated by Professor P. Barry Tomlinson of Harvard University and the Dr. Paul Alan Cox of the Institute for Ethnobotany of the NTBG, the course is designed to show instructors how to use examples from tropical plants in discussing issues of form and function, evolution, and conservation. Fellows will develop teaching modules to be shared and implemented in the introductory biology classroom. Basically, we are looking for the very best biology faculty, those who can fire the imagination of major and non-major biology students. Although botanists will be considered, we also welcome applications from faculty who lack previous botanical experiences as well as those who have not previously worked in the tropics. The fellowship will be limited to 10 Kenan Fellows.

Applications must include:

- -Two letters of recommendation
- -Complete Curriculum Vitae
- -Copy of the most recent teacher evaluation
- -A non-refundable $USD30 application fee in the form of a check or money order made payable to the National Tropical Botanical Garden.

The Kenan Fellowship will cover the most economical roundtrip airfare, accommodation and meals in Kaua'i, Hawai'i, tuition and fees, texts, equipment, and ground transportation

Requests about the NTBG Kenan Fellowship must be directed to:Namulau'ulu G. Tavana, Ph.D., Director of Education, National Tropical Botanical Garden, 3530 Papalina Road, Kalaheo, HI 96741

The Herbage CD-ROM, Third Edition

Tim Johnson

Preview URL: http://www.web-of-life.org/herbage/
Mirror: http://www.ecocopia.com/herbage/herbage/

The Herbage CD-ROM contains a database of over 28,000 concise monographs of medicinal plant species characteristics - and an inventory of claimed attributes and historical uses by cultures throughout the world - the result of more than a decade of independent research.

Monographs are linked to millions of articles and images via the world wide web, providing an exhaustive tool for in-depth global her research. The arrangement of this material wil be of interest to those all over the world who study plants and their uses.

The Herbage CD-Rom, Third Edition was released on April 23rd, 2003. It is web-browser based, compatible with any Windows of Macintosh computer.

Books Reviewed In this issue:

Arthropods of Tropical Forests: Spatio-temporal Dynamics and Resource Use in the Canopy. Basset, Y., Novotny, V., Miller, S. E. & Kitching, R. L. (eds.) 2003. ISBN 0-521-82000-6 (Hard cover US$110.00) 474 pp. Cambridge University Press, 40 W. 20th St., New York, NY 10011-4211. – Most of the biological activity in tropical rainforests is concentrated in the upper canopy rather than the understorey. Also, tropical forest canopies may be the most species-rich habitat on Earth. Nevertheless, despite increasing interest in their study, the fauna of tropical canopies remains largely unknown. Canopies of tropical forests have been justifiably called 'new frontiers' or 'last frontiers' of current ecology (Mitchell et al. 2002, Moffett 1993). Accessibility, diversity, and temporal variability could be major challenges by themselves, but it is their combination that makes study of tropical forest canopies extremely difficult. However, arthropod ecologists and taxonomists do not seem to be scared any more. This volume is the best prove! Written by 79 authors from 18 countries, the book aims to provide a balanced overview of recent studies in Australia, Africa, Asia, and the Neotropics. The editors themselves are experienced tropical researchers from Australia (Kitching), Czech Republic (Novotny), and Panama/USA (Basset and Miller).

The volume is divided into five sections: I. Arthropods of tropical canopies: current themes of research; II. Vertical stratification in tropical forests; III. Temporal patterns in tropical canopies; IV. Resource use and host specificity in tropical canopies; V. Synthesis: spatio-temporal dynamics and resource use in tropical canopies. The first section provides a general introduction, the following three cover a broad range of case studies, and the last one attempts to make syntheses and summaries of interpretable patterns. One of the major problems in canopy science is high pseudoreplication, caused by physical constrains on sampling designs. The editors' intention was to overcome this pitfall by comparing datasets from different biogeographical regions and exploring whether detected community patterns hold at different scales and geographic locations. The volume is packed with an amazing volume of new data. Inevitably, it is not easy to evaluate long-term importance of individual results. Just a few highlights as I see them: (1) Analysis of arthropod assemblages across a chronosequence (300 years to 4.1 million years) in the Hawaiian Islands (Gruner & Polhemus): overall diversity steadily rises, although major groups analyzed separately show individualistic trends. (2) Host specificity of phytophagous beetles and expected number of beetle species in a dry forest in Panama (Ødegaard): the forest, which may include 300-500 species of canopy plants, was estimated to harbor 1600-2000 species of phytophagous beetles. (3) Comparison of Collembola and oribatid mite fauna in the suspended soils in the canopy and in the soil on the forest floor (Prinzing & Woas): the faunistic difference between the canopy and the forest floor is larger in a tropical rainforest than in a temperate deciduous or coniferous forests. (4) Insect herbivores feeding on conspecific seedlings and trees (Barrios): contrary to one key assumption of the Janzen-Connell hypothesis, it seems that insect herbivores rarely colonize saplings from parent trees in rainforests! (5) Tree phylogenetic relatedness and the similarity of insect assemblages (Kitching, Hurley & Thalib): there is a clear decline in similarity as the inter-tree phylogenetic distance increases, but little support for the high level of host specificity implied in some earlier studies. The editors in their concluding chapter elaborate on this last point.

Recent studies in wet tropical forests indicate relatively low proportions of highly specialized herbivores. It seems that the proportion of insect herbivores that are specialized is decreasing from savannas through dry to increasingly wetter tropical forests. Possible explanations include (1) the increasing dilution of hosts in diverse wet forests and the resulting constrains on host location, and (2) the increasing number of taxonomically related hosts in wet forests, favoring host switches. Low host specificity of tropical herbivores has serious consequences for global estimates of arthropod species richness. Earlier extrapolations (up to 31 million) seem to be seriously inflated (Novotny et al. 2002). Another potential consequence, however, is that tropical rainforests that seem to be much less invaded by nonnative plant species than many other vegetation types (Rejmánek 1996), may be resistant due to the low host specificity of resident herbivorous insects (Novotny et al. 2003).

Where are major gaps? First, current knowledge of canopy arthropods is strongly biased towards beetles and ants. Second, studies from the Neotropical region are more frequent (12 case studies out of 28 in this volume), African canopies are understudied. Third, arthropods in epiphytes definitely deserve more attention (Stuntz et al. 2002, Yanoviak et al. 2003). Forth, rigorous studies of food-webs in tropical forest canopies are still in the stage of their infancy (Bluthgen et al. 2003, Floren et al. 2002, Van Bael et al. 2003).

We must to congratulate to the editors and authors. *Arthropods of Tropical Forests* is a milestone publication. It will be of great value to many tropical invertebrate zoologists. Moreover, it also has much to offer to a broader audience, including plant ecologists and conservation biologists. -Marcel Rejmánek, University of California, Davis.

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Introduction to California Plant Life, R. Ordnuff, P.M. Faber, and T. Keeler-Wolf. 2003. ISBN 0-520-23704-8. (paper, $). University of California Press, Berkeley and Los Angeles. 341 pp. This revision is an enlarged, refined edition of the late Robert Ordnuff's 1974 contribution of the same name. Sixty-ninth in a series of California Natural History Guides, we wonder what took them so long. The book is a delight. Easily hand-held, sturdily bound, and lavishly illustrated, this Introduction will suit all levels of student of the California flora. Whether the reader is a casual traveler, curious about what grows on a scenic hillside, or an ecology student interested in invasive plant species, this book is bound to be rewarding. The language is accessible and precise. The technical descriptions of the six largest plant families in California read clearly and are thoroughly understandable. Likewise, the discussions of nomenclature, classification, and rarity and endemism at the beginning of the book are certain to provide newcomers to the flora with a foundation they can use over and over. The chapter on California's topography, climate, and soils outlines the abiotic selective pressures that influence the California flora. We are reminded in the third chapter that the diversity of the California flora is a product of evolutionary forces, and our excitement about the plants we observe is allowed to grow as we see them as dynamic players in a changing landscape. California is a giant evolutionary laboratory, and the intervening chapters allow us to apply our understanding of evolution to specific regions and plant communities. We are treated to highlights of history both evolutionary and intellectual, and this adds depth to the book. There are discussions of modern, miocene, and madro-teriary floras, and the book equips readers to observe and interpret all these components. A full chapter invites us to look into the history of botany in California, a romance if ever there was one. Falling in love with the plants of California is easy. Their diversity, endemism, and the stories they tell about evolution are an inspiration to scientists and non-scientists alike. This book guides us through the tunnel of love, and it gives readers some cold hard facts to latch onto. The bibliography is not exhaustive but appropriately comprehensive. It offers up some titles now out of print but not forgotten. Tables, maps, and line drawings complement the stunning photography. As a mycologist I was encouraged by the short discussion of fungi, although the fascinating world of mycorrhizae is a bit underplayed. More specifically as a lichenologist, I would have liked to see mention of the nitrogen-fixing activities of lichens that enhance the soil environment with the help of their cyanobacterial symbionts. But the warts are few on this incisively written, authoritative account. I recommend it highly. Samuel Hammer, College of General Studies, Boston University.

Primary Succession and Ecosystem Rehabilitation. Walker, Lawrence R. and Roger del Moral. 2003. ISBN 0-521-52954-9 (paper US$50.00) 442 pp. Cambridge University Press, 40 W. 20th St., New York, NY 10011-4211. – The title of this book attracted me immediately. Ecosystem rehabilitation, an unfortunate reality and a crisis discipline, has been receiving recent coverage in technical and popular press. Rehabilitation is a more general goal than restoration (Urbanska et al. 1997); the choice of the word by Walker and del Moral may not be accidental. Though primary succession is often associated with volcanic eruptions and glaciations, those exciting but not-so-close-to-home disturbances, the authors quickly point out there is much more to primary succession and its relationship to rehabilitation. Their fascination and experience with "…natural disasters and how natural processes or regeneration follow…" drove Walker and del Moral's rationale for *Primary Succession and Ecosystem Rehabilitation*. Continuing their Preface the authors admit, "The next logical step was to extend our studies to disturbance of human origin…" Unfortunately (fortunately for the authors?) there are abundant examples of human disturbed ecosystems. Both natural and human disturbances are discussed and as with much of the restoration literature, this book merges science and management, the degradation and the remedies.

Walker and del Moral are self-confessed terrestrial plant ecologists yet they go out of their way to include many other taxa and systems. The geographic coverage is extensive as well, from Alaska to the Alps and the Bahamas to Bangladesh. These are some of the top features that impressed me and would lead me to recommend *Primary Succession and Ecosystem Rehabilitation* to other readers. I am a terrestrial plant ecologist who, via researching and teaching, has wandered and wondered about ecosystems that do not get as much restoration attention. For example the legendary rocky intertidal communities that have yielded some of Ecology's foundation principles are rarely (never?) mentioned in the major ecological restoration journals. Does the low representation in the restoration literature of these fascinating high-energy habitats reflect limitations of the difficult work environment? Literature on the role of algae in restoration and community dynamics as a whole is lacking. Walker and del Moral mention micro- and macroalgae and disturbance at least eight times. Microalgae are mentioned as members of the important yet poorly understood soil biota, probably more involved in nutrient cycling than terrestrial ecologists comprehend. The authors highlight the role of macroalgae as facilitators of succession in marine ecosystems and as components of the sequence of intertidal species. Even cyanobacteria are given a brief mention.

Random samplings of additional topics treated within the successional and rehabilitation context are invasive species, landfills, landslides, bacteria, biodiversity, deserts, detritivores, urban habitats and volcanoes... wow! Once again it is easy to realize the breadth of this book and is a credit to the authors' efforts. Particularly strong sections deal with soil development and the influence of environmental and biotic factors and a current review of successional theories. Abandoned paved roads and mines of many shapes and sizes help illustrate the complexity of human-disturbed systems. These are but a few snippets illustrating the authors' success in conveying the diversity of disturbed systems available for rehabilitators.

Primary Succession and Ecosystem Rehabilitation is formatted with a traditional ecological restoration textbook sequence (Jordan et al. 1987; Urbanska et al. 1997) with a bit more emphasis on successional theory and examples of succession. The application of primary succession to rehabilitation sets this book apart from similar books. True to their rationale and introduction, Walker and del Moral fill the book with in-depth discussions of disturbance, succession theory, soil processes, life histories, interactions, and patterns of succession, applications and finally the future of the field. The format is safe and effective yet I was left wondering if there was another way to tell the story to make this book stand alone? This is a subjective evaluation and in no way a fatal flaw, merely harmless ruminations.

The authors discuss succession over a wide range of scales and species involvement coming to the same conclusion with each example; succession is neither a linear nor an equilibrium process. Directionality implied by some models should not be overdone; rather the beauty is in the deciphering of the variable trajectories of succession. Restoration readers and practitioners have long appreciated the wavy, wobbly and warped path from implementation to maintenance to conclusion (if there is a conclusion!). If only succession followed the models!

Primary Succession and Ecosystem Rehabilitation is illustrated liberally with black and white photographs (largely of case studies), line drawings, figures from primary literature and tabular data. Illustrations are well placed and adequate for this type of book. There is a short but helpful glossary preceding the extensive Reference section. The Index is not divided into taxa and subject which could enhance future editions of the book.

I cannot see this book being used by beginning undergraduate students particularly in the more technical sections (e.g., holism, neo-holism, reductionism and neo-reductionism). More advanced students in ecology elective classes, graduate students, researchers and restoration practitioners would all benefit from *Primary Succession and Ecosystem Rehabilitation*. It is an excellent, up to date reference.

Sadly, anthropogenic disturbance, habitat degradation and ecological restoration *are* hot topics, fertile ground for research and discussion. *Primary Succession and Ecosystem Rehabilitation* is an excellent addition to the timely discourse. This book should be welcomed into the growing library of disturbance and restoration publications. – Scott Ruhren, Department of Biological Sciences, Ranger Hall, University of Rhode Island, Kingston, RI 02881. (ruhren@etal.uri.edu)

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Urbanska, K.M., N.R. Webb and P.J. Edwards, eds. 1997. *Restoration Ecology and Sustainable Development.* Cambridge University Press, New York, N.Y

Weed Ecology in Natural and Agricultural Systems. Booth, B.D., S.D. Murphy and C.J. Swanton. 2003. ISBN 0-85199-528-4 (paper US$60.00) 303 pp. CABI Publishing, 44 Brattle Street, 4th Floor, Cambridge, MA 02138. – Booth, Murphy and Swanton should be congratulated for writing a readable text that does not sacrifice substance. My one and only reservation or perhaps sympathy for the authors is the choice of the title. I have no problem with the forthright title, *Weed Ecology in Natural and Agricultural Systems*. However, I hope readers who may avoid applied topics or the word "weed" or perhaps not realize the breadth and depth of the book will give the book a chance. Reluctant readers will be rewarded for their perseverance. This is not a weed control manual; the authors admittedly leave that to the plethora of books that come before them. However this is not a rehashing of the ecology of invasions. This is a modern synthesis of current concerns about invasive plants and well established ecological principles.

In the Preface, Booth, Murphy and Swanton offer a convincing rationale for the book. *Weed Ecology in Natural and Agricultural Systems* is "a link between the fields of weed science, plant invasion and ecology." Such an intriguing and bold claim is supported in every chapter. The audience, though stated to be undergraduate-level (note the teaching emphasis), could encompass invasive plant researchers and conservation biologists.

The general format of "Weed Ecology" is reminiscent of a traditional ecology textbook, moving from organisms to populations then branching off into interactions and community ecology. Many of the examples and figures will be familiar to readers of ecology. However, in no way does this book seem redundant or superfluous. The intriguing part of this volume is how seamlessly the background information flows into application. So many questions are addressed by the authors. What is a weed? An invader? A colonizer? How do phenologies affect plant invasiveness? How does seed movement and fate of propagules influence plant success? How can current estimators of diversity be applied to invasion ecology? Toward the end of the book there is a chapter titled "Plant Invasions." Much of the thesis is summarized here and Booth, Murphy and Swanton effectively summarize current views, successes and shortcomings of theory and application. It is a sobering fact indeed that "we are becoming proficient at explaining invasions; we are not very good at predicting them."

Though most satisfying as a whole, individual chapters would be wonderful launching points for classroom discussions. "Weed Ecology" could be used in an undergraduate course without the additional cost of ecology textbooks. However the audience should/could be much broader. Ecological principles are well described once again with an attention to lucid and thorough writing. Metapopulations, conservation biology, sexual and asexual reproduction, pollination, to name a few topics, are presented in a consistent manner. The foundations of the principles are explained followed by application to weedy plants. For example the authors cite how herbivores may affect growth and allocation of a common invasive species, Japanese honeysuckle (*Lonicera japonica*). Or consider the fact that weeds exhibit all abiotic and biotic seed dispersal methods. Or imagine planning controls for weed species that exhibit phenotypic plasticity in the face of environmental heterogeneity (e.g. dandelion [*Taraxacum officinale*], jimsonweed [*Datura stramonium*] and wild oats [*Avena fatua*]). These are just a few of the helpful supporting examples found within this book. "General References" and "Literature Cited" complete each chapter. The "Glossary", "Species Index" and

"Subject Index" are accurate and complete.

There are many useful features in "Weed Ecology" such as an excellent summary of the scientific method something that cannot be reviewed too often in science classes. Treatment of foundation topics is lucid and accessible without a hint of condescension. Summary tables within the chapters are clear, concise and indispensable. The equally clear and helpful figures include line drawings and graphical data taken from primary literature. If I had to choose the most distinctive feature of Booth, Murphy and Swanton's work it would be the "Questions" section at the end of the chapters. Rather than summary and review this section is designed for readers to answer "a series of questions related to a species of your choice.'" "Knowing the enemy" has never been more relevant than in the research, prevention and control of invasive species. The step-by-step approach created by the authors is effective in this endeavor. Finally, in addition to the outstanding writing, the book is well edited and produced.

"Weed Ecology" offers what was missing in many weed textbooks where the emphasis was on the rogue gallery of species and their control. Booth, Murphy and Swanton's book has much broader appeal however. It bears repeating that in spite of the title, *Weed Ecology in Natural and Agricultural Systems* is so much more than a weed book. I will turn to Booth, Murphy and Swanton's book for examples, case studies and applications when teaching courses in general biology and ecology. The authors more than satisfy their goal of linking weed science, plant invasions and ecology and do so with an eloquent and lively style. Please, if the word weed scares you away look past the cover. – Scott Ruhren, Department of Biological Sciences, Ranger Hall, University of Rhode Island, Kingston, RI 02881. (ruhren@etal.uri.edu)

Chinese Medicinal Herbs: A Modern Edition of a Classic Sixteenth-Century Manual. Li, Shih-Chen. F. Porter Smith and G. A. Stuart [Editors]. 2003. ISBN 0-486-42801-X (Paper US$21.95) 508 pp. Dover Publications, 31 East 2nd Street, Mineola, New York 11501. One of the grandest and most comprehensive Chinese medical works is *Pen Tsao Kang Mu* (The Great Herbal) compiled in the Ming dynasty (1368-1644 AD) by Shizhen Li (1518-1593 AD). Li's highly respected Materia Medica includes descriptions of 1,892 varieties of herbal drugs; the compendium took 26 years to complete, was based on over 800 medical reference books, and has 52 volumes.

F. Porter Smith and G. A. Stuart, both medical doctors, translated the *Pen Tsao Kang Mu* and using it as a working base, added their own annotations based on their observations, to the text. Their translation was first published in 1973, making these ancient Chinese remedies accessible to the English-speaking world, and this Dover edition is an unabridged republication of their work. The arrangement of the species is alphabetical, by Latin binomial.

There are, without question, many fascinating reports of plant uses as well as popular beliefs. For example, concerning apricot, *Prunus armeniaca*, we learn that the kernels are used to prepare a number of nostrums and a fatty confection, in which ginger and licorice are combined with the kernels. The root is said to be antidote to the poison of the kernels, illustrating a popular belief of Chinese doctors who regard the root of a plant as the polar antagonist of the stem and all that is borne upon it. If one is poisonous, the other will furnish the antidote. As the preceding example illustrates, the list of plants included is not limited to native Chinese species.

Evaluation of the veracity of treatments is problematic, partly because much of the source information was based upon folklore, but also because the plant descriptions were unclear, or amalgams. This reviewer consulted the original *Pen Tsao Kang Mu* more than two decades ago, to learn about Chinese usage of sesame in healing, during her dissertation research. At that time she was unaware that an English translation was available, and persuaded a Chinese colleague, Steve Lin, to translate the original Chinese text. However, it became apparent during that exercise, that there was certainly confusion in the text, wherein the species description conveyed inaccurate details, actually referring to other species. The account in the original *Pen Tsao Kang Mu* thoroughly confounds *Sesamum*, *Linum* and *Cannabis*; much is said about its use as a fiber plant, and a translation

of one of its Chinese names is 'Barbarian hemp.' This translation reports that "the fruits [of sesame] are dark brown, or black, four-angled capsules, two valved, and about one quarter of an inch long." That measurement is totally inaccurate, although colleague Steve Lin's translation did not supply those dimensions.

A critical difficulty with this text is that the editor-translators consistently blur the boundaries as to where the original Chinese text ends and their interpretations begin. The editor-translators' comments are interspersed throughout the text at random as regards every entry, without delineating where their additions commence, leaving the careful reader puzzled about whether any particular fact was derived from the ancient Chinese pharmacopoeia, or from the editors' supplemental notes. For example, the entry about *Nicotiana tabacum* opens with this statement: "This is one of the evil gifts of the new world to the old," leaving open the question whether that opinion was written by Li in the 16th century. Dorothea Bedigian, Research Associate, Washington University, St. Louis and Missouri Botanical Garden.

A Color Handbook of Biological Control in Plant Protection. Helyer, Beil, Kevin Brown, and Nigel D. Cattlin. 2003. ISBN 0-88192-599-3 (Cloth US$39.95) 126 pp. Timber Press, 133 S.W. Second Avenue, Suite 450. Portland, OR 97204-3527. A Color Handbook of Biological Control in Plant Protection arrives as the Timber Press printing of a book from the UK intended to be a general reference on the use of various organisms, not just beneficial insects, for control and/or elimination of various plant pests. The book succeeds admirably in this goal, providing a wide range of excellent information and illustrations for this purpose.

The authors state in their Preface that they had tried "to produce a handbook containing profiles and colour photographs of as many examples of biological control organisms representative of as wide a global area as possible" (p.5). To this end they have organized Section 1: Crop Environments in a practical fashion, dealing with the merits of integrated pest management (IPM; using biological controls) in general and means of monitoring populations of these beneficial organisms. They then consider the use of IPM in various settings, including in fruit production and in greenhouse settings. The material discussed takes away somewhat from the authors' aim of providing a global perspective, but not irretrievably—readers from outside the UK should be able to extrapolate from this part of the text to their own situations.

Then, Helyer et al. turn to the organisms themselves. Section 2: Pest Profiles opens with an illustrated key, based on damage symptoms, to various pest insects common around the world. This is followed by articles on each of the pest organisms. The authors then turn in Section 3: Beneficial Arthropod Profiles to articles on the insects and other arthropods useful for IPM and in Section 4: Entomopathogens, nematodes and various microbes which harm the organisms from Section 2. Throughout, A Color Handbook of Biological Control Organisms presents a large number of excellent photographs which very clearly illustrate the organisms described—there will be no mistaking pests or IPM organisms using this book.

A list for Further Reading, since this intended to be a general guide and is supposed to be accessible to home gardeners as well as professionals. Then a brief but useful glossary precedes the taxonomic and subject indices. All-in-all, this volume is a useful work which meets its stated goals

A Color Handbook of Biological Control in Plant Protection does, however, have some weaknesses. The type used is quite small, perhaps to reduce the cost of such a heavily illustrated color publication by reducing the number of pages, making the text swim before the readers eyes at times. Also, the pages contain bright borders which detract from the photographs and compound the problem with readability due to the small type. Probably the blame for these faults belongs with the editor rather than the authors.

Who should buy a copy? Certainly it belongs in college and university libraries, and A Color Handbook of Biological Control in Plant Protection would be a valuable resource in introductory courses dealing with applied plant biology, such as basic horticulture or courses in plant biology which deal extensively with economic botany. Douglas Darnowski, Department of Biology, Indiana University South

Crop Production in Saline Environments: Global and Integrative Perspectives. Goyal, Sham S., Surinder K. Sharma, and D. William Rains [Editors]. 2003. ISBN 1-56022-097-X (Paper US$69.95) 427 pp. Food Products Press, 10 Alice Street, Binghamton, NY 13904-1580. All over the world, fresh water is becoming increasingly scarce and agricultural areas are becoming brackish. This justifies greater attention to crop production in saline conditions. Domestic, industrial and agricultural uses of fresh water are increasing so quickly that water shortages are anticipated throughout much of the world.

Emanuel Epstein, a well-known plant physiologist who devoted much of his career to investigating crop production in saline environments, wrote the two-page foreword to this volume. He deems the use of the tools of genetics and molecular biology to engineer salt tolerant crops as 'incontrovertibly doable.' He also urges selection and modification of halophytes to yield edible seeds, oil, pharmaceuticals, feedstocks and biomass. He believes that the "coastal deserts of the world, with their ample light, high temperatures, long growing seasons, and unlimited supplies of sea water may become the plantations of a new kind of farmer: the shorecropper."

Other scientists have their doubts. According to R. A. Jones (1993), "Few topics in recent times have captured the attention and dedication of researchers than the quest to reduce the impact that saline environments have on limiting agricultural productivity." "Considerable optimism was promoted on the possibility of breeding crops relatively resistant to saline conditions (Epstein et al 1980) as an economic solution to the dilemma. Unfortunately, this optimism was not shared by most plant breeders (Jones and Qualset, 1984)." It may be that the zealous enthusiasm over success rates might be tempered if scientists were to complete more detailed measurements at all stages of plant development.

Each article is an independent report. The first piece: Strategies for managing crop production in saline environments: an overview, was written by two of the editors, D. W. Rains and S. S. Goyal, affiliated as Epstein is, with the University of California, Davis. The closing piece: Progress in plant salinity resistance research: need for an integrative paradigm, was also written by two of the editors, S. K. Sharma and S. S. Goyal.

The first part of the book includes articles by J. Bennett and G. S. Khush: Enhancing salt tolerance in crops through molecular breeding: a new strategy, and by G. E. Santa-María: Molecular approaches to improve salt resistance in crops: facts and perspectives. These provide the hypothetical underpinnings to their approaches, while most of the remaining articles provide examples about management at specific locations around the globe.

Authors report about varied geographic regions: China's Hyang-Huai-Hai plain; India and Pakistan; the Near East and North Africa region; Australia; southwestern Siberia; and the San Joaquin Valley of California. However, coverage from or about Latin America, Russia and the former Soviet republics, Afghanistan, Iran, Iraq, Syria, and sub-Saharan Africa is missing entirely from the 'Global Perspectives' announced in the book's title.

Co-published simultaneously as the Journal of Crop Production 7, numbers [1/2] (#13/14) 2003, this compilation might be useful as a Reader for a graduate seminar focused on International Agriculture, or addressing Plant Stress, where students and faculty critically examine published work. Dorothea Bedigian, Research Associate, Washington University, St. Louis and Missouri Botanical Garden.

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Flax: the genus *Linum* (Muir and Westcott, eds.) is a recent addition to the "Medicinal and Aromatic Plants — Industrial Profiles" series from Taylor and Francis. I don't know about other entries in the series, but the title of this one strikes me as a slight misrepresentation. The real subject of this volume is *Linum usitatissimum*, a cultivated source of fiber and seed oils for the past 10,000 years. Other members of the genus — which includes approximately 200 species variously distributed throughout the temperate regions of the world — are referred to only incidentally. Each of the twenty chapters of this book is a self-contained review (with extensive references) of some aspect of the biology, cultivation, or dietary/pharmaceutical applications of *L. usitatissimum*.

Marketed toward "all those interested in nutraceuticals, medicinal plants, pharmacy and agronomy," *Flax* covers topics ranging from the history of the use and cultivation of *L. usitatissimum* to modern pharmacological effects of the major components of flaxseed to market trends and economic importance of the crop. As a student of the genus, I found the chapter on the taxonomy of *Linum* to be a bit lacking; details are only provided for the various 'convarieties' of *L. usitatissimum*. However, the target audience and primary users of this book should find that it meets their needs, as will the other chapters. If you need to know the molecular formulae for all of the lignans (not to be confused with lign*i*ns) found in flax, check Chapter 3: Chemical studies on the constituents of *Linum* spp. What should you do if potato aphids infest your flax field? A single pesticide application at full bloom is best, according to Chapter 6: Principal insect pests of flax. Given chapters on the pests and diseases of flax (and their remedies), historical and modern cultivation practices, harvest techniques, germplasm conservation, and market trends and economic importance of flax, it seems like it *might* be possible to run a flax farm with only this book as a reference.

Chapters on the history of flax cultivation and the traditional uses of its fibers and seed oils (Ch. 1 and 13) describe the importance of the species to the social and economic development of human civilization. These chapters are probably of the greatest general interest, and provide a fascinating account of this slice of ethnobotany and history of agriculture. The specific epithet of the cultivated flax, derived from Latin roots meaning "most useful," belies the myriad uses that have been found throughout history for its products (seeds, seed oils, and fibers). Prized for their strength and absorbent properties, flax fibers were woven into ropes, nets, paper, and linen fabric used for mummy wrappings, carpets, clothing, and sails, among other things. The seeds of flax found even greater diversity of application, including their use in food and herbal remedies for maladies such as coughs, ulcers, and unruly hair (thanks to the mucilage that can be extracted through boiling the seeds). The unique drying properties of purified flaxseed oil, due to its fatty acid composition, made it a valued preservative component in embalming (mummies again), paints, protective varnishes, and a famous floor covering (linoleum). Flax is certainly one of the most important cultivated plants to the development of western culture: a component and protector of masterpiece paintings, a drying agent for Johannes Gutenberg's inks, and fiber for the canvas sails of ships that explored the world.

While the importance of flax as a textile fiber has diminished since the advent of cotton in the 19th century, the uses and importance of flaxseed continues to expand. Several chapters in *Flax* are devoted to the developing health-related applications of flaxseed components, especially fatty acids and lignans. Flaxseed is a concentrated source of alpha-linolenic acid, an essential omega-3 polyunsaturated fatty acid with potential for therapeutic and preventive use against cardiovascular diseases and cancer, and flax lignans are being investigated for their anti-cancer activities and effects on the progression of kidney failure. Here are detailed reviews of the promising, though sometimes controversial, research that has been conducted in these areas, including the nutraceutical value of consuming flax seed raw or processed into baked goods or cereals, and the possible benefit of consuming eggs or meat from animals given flaxseed in their feed. People interested in alternative medicine and the use of flaxseed for its nutraceutical properties might find these chapters of interest, but they'd better be prepared to wade through technical experimental descriptions.

Flax is adequately illustrated and includes many diagrams (such as those detailing metabolic pathways relevant for the seed oils and lignans) and graphs (summarizing results of experimental investigations of the effects of flax seed consumption on the development of atherosclerotic plaques, for instance). Color plate reproductions are provided for many of the photographs accompanying the chapters on the taxonomy and principal diseases of flax fields, but seem to be missing in instances where the picture caption refers to colors but the photograph is presented only in grayscale. The writing throughout is clear and concise, though many of the chapters are replete with acronyms and technical agricultural or biochemical/ pharmaceutical jargon that might be unfamiliar to many; a glossary would have been nice for easy reference. However, since this series is targeted

to people looking for such technical information, and are probably familiar with the jargon, this can't be a major detraction. *Flax* would most sensibly be purchased by college and university libraries, or by anyone actually responsible for growing flax, to serve as a concise and current reference on aspects of its historical and current cultivation and applications. –Joshua McDill, University of Texas, Austin.

***Primula*, Second Edition**. 2003. John Richards. 346 pp., 85 color photos, 19 illustration plates, hardcover. Timber Press, Portland, OR. ISBN 0-88192-580-2, US $39.95. The relationship between Botany and Horticulture reminds me of some siblings: Family friends see them as similar as peas in a pod; while the siblings perceive only their differences, and cannot believe that they come from the same planet, let alone the same parents. At my university, Botany and Horticulture are taught in different colleges, and I have encountered numerous undergraduates who were baffled by the seemingly arbitrary lines we draw between the two departments. Even in the great botanical gardens, which exemplify the common interests of Botany and Horticulture, the members of the two disciplines often remind me of armed camps, and not congenial colleagues working for a common mission.

With the second edition of his book "*Primula*", John Richards bravely enters the gulf between the two disciplines. Richards, a Professor of Botany at the University of Newcastle-upon-Tyne, has decades of personal experience with the genus. Much of his research on plant breeding systems has focused on *Primula*, and as a gardener, he has grown at least 160 species. In addition, he has observed primulas in the field, and more recently, he has co-authored a molecular phylogenetic analysis of the genus. Thus Richards is extremely well-qualified to take on the challenge of producing a book that clearly is geared toward both botanical and horticultural audiences. How does he fare?

The first chapter, "A short history of the exploration, introduction and cultivation of *Primula*", should appeal to all readers. I would have liked to see more than the sparse references provided here, to give interested readers starting points into the literature on specific topics, e.g. how the "garden auricula" (*P.* × *pubescens*) became an obsession in Victorian England; while in Japan "sakarusou" *P. sieboldii* attracted (and still maintains in some places) societies of devoted growers, hybridizers, and exhibitors. The second chapter appears to provide a good introduction to growing, propagating, and keeping primulas healthy. Again, references to more detailed treatments of these topics would be helpful.

Chapter 3, "The evolutionary history of *Primula* and its relatives" is the most extensively revised relative to the first edition of this book, published in 1993. I was eager to see how Richards approached the challenge of conveying the results of a chloroplast DNA-based phylogenetic analysis to a readership that is largely unfamiliar with this approach. To his credit, Richards describes some of the limitations of an analysis based solely on organellar DNA. Unfortunately, he does not seem to take his own cautionary statements into account, later referring to the single presented chloroplast-only cladogram as a "rigorous examination by the DNA," despite incomplete taxonomic sampling. Furthermore, no explanation is given of the bootstrap values used in the figure nor the meaning of "/*Primula"* (the monophyletic lineage encompassing *Primula* and genera considered derived from it – all except *Sredinskya* are here maintained as distinct). I would have liked to see an effort to integrate the results of other published molecular phylogenetic studies of Primulaceae, rather than solely focusing on the study the author contributed to.

The text displays a lack of familiarity with the interpretation of phylogenetic hypotheses. One example: The cladogram contains a well-supported clade of representatives of seven sections including Crystallophlomis, Proliferae, and Petiolares. Richards states (p. 191) that DNA evidence "weakly supports the proposition that the nivalids [section Crystallophlomis] evolved from forerunners of species nowadays classified in the present sections Proliferae and Petiolares". In fact, DNA alone provides no support for this speculation! It would require incorporation of morphological data, and an estimation of the ancestral character states of this clade, to develop a hypothesis for the appearance of their common ancestor. Other evidence of phylogenetic naiveté includes a glossary that describes a cladogram as "… based on evidence of taxonomic distance", and a neologism, "homophyletic", when homoplastic is intended (p. 165).

Overall, Richards' revisions to *Primula* classification and his discussions of morphological trends and biogeography represent an unhappy union of over-reliance on a single molecular phylogenetic study coupled with traditional evolutionary taxonomy. (For a thoughtful exposition of how these two schools can be reconciled, see Knox, 1998). Something as simple as including key morphological characters and geographic distributions in the molecular phylogenetic analysis could have provided novel insights, and would have done a better job of

introducing the benefits of a molecular phylogenetic approach to a general audience.

The final introductory chapter is an authoritative and well-referenced overview of "heterostyly and homostyly" in *Primula*. Richards has also authored the standard reference on the topic of plant breeding systems (Richards, 1997), and his expertise in this area is reflected here. This material is also of interest to amateur primula breeders, as noted by Ed Buyarski (2003), the colorful and enthusiastic president of the American Primrose Society.

The heart of the book, over 260 pages, is taken up by a systematic treatment of 430 primula species, classified into 38 sections. New to this edition are keys to the species of each section, save one. However, arriving at a section can be a challenge, because the key to sections does not contain page references, nor are the sections listed in the index! The handy "summary of classification" found in the first edition and containing the page numbers, is oddly absent here.

The species accounts cite the original publication and synonyms, but type specimens (and any other herbarium specimens) are not cited (see Halda, 1992 for this information). A morphological description and the geographic distribution are given for all species, and the majority of accounts contain some cultivation information. Chromosome numbers, habitat, intraspecific variation, and evidence for hybridization are given when known, taxonomic notes and literature citations are occasionally provided. The morphological descriptions do not follow a single format, but rather vary greatly in their content and length. Many provide a complete portrait of the species, often enhanced by the author's experience with living plants; others only briefly list the characteristics that differentiate one species from another. Illustrations for approximately 190 species are included. These are generally excellent, comprising 115 watercolors by the artist Brigid Edwards, and 85 photographs primarily taken in the field. A very small number of well-executed line drawings are included in the text; one must rely on Halda (1992) for line drawings of most species.

The production is of the high quality we have come to expect from Timber Press. There are some editorial lapses, including the lack of an index to the illustrations, and the aforementioned difficulty in finding the sections (no, they are not arranged alphabetically). I was surprised to find the valid publication of a new subgenus, section, variety, and forma well-hidden in the text. These nomenclatural innovations should have been noted prominently in an appendix. At $39.95, the book is a very good value.

In conclusion, I think the book will appeal the most to gardeners who are already addicted to the pleasure of growing primulas, as well as to those who are just discovering their beauty, diversity, and conveniently compact growth form. Richards describes how rarely a day passes when he does not receive an email containing a primula image for him to examine. I suspect the volume of queries will continue unabated, for although he has answered many questions with this useful book, he has also demonstrated that there is still much to discover in the genus *Primula.* - Aaron Liston, Department of Botany & Plant Pathology, Oregon State University,Corvallis, Oregon 97331-2902

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Why are floodplain soils so rich?

Because they form by *bank deposits*!

Don Les

Pulmonaria and the Borage Family. Bennett, Masha. 2003. ISBN 0-88192-589-6 (Cloth US$39.95) 240 pp. Timber Press, 133 S.W. Second Avenue, Suite 450. Portland, OR 97204-3527. Pulmonarias and the Borage Family by Masha Bennett arrives as another horticultural monograph from Timber Press. In this truly outstanding work, the author presents a large family, which includes forget-me-nots and lungwort, which has great potential to provide additional plants for horticulture beyond those already planted in gardens around the world. Timber Press has produced many fine works on horticulture and botany, but of the many which this reviewer has handled for Plant Science Bulletin or simply read for his own interest, this is far and away the finest.

Bennett begins with an Introduction to the Boraginaceae, including all sorts of information from basic botany to biogeography and horticulture. She then turns to the species and hybrids of Pulmonaria, since this is by far the most commonly cultivated genus from this family when a worldwide perspective is considered. Again, information on a

wide range of topics, such as common names in the mostly widely spoken languages of Europe, is presented clearly and simply. The next chapter deals with other genera of the Boraginaceae which are cultivated more or less commonly, and the last chapter deals with genera that are rare in cultivation.

The author then provides a range of useful appendices. These include a complete list of the genera in the Boraginaceae, useful addresses, a glossary, a bibliography, the hardiness maps mentioned above, common names in English, and cultivars of Pulmonaria not mentioned in the text. All are presented in a straightforward way.

The text of Pulmonarias and the Borage Family could be a used as a primer for basic botany or basic horticulture. All sorts of topics, such as vegetative propagation and floral structure, are covered with great lucidity. Even though the aim is to present these topics as they are relevant for the Boraginaceae, this part of the text presents excellent general definitions and discussions which could be understood by gardeners and students new to plant biology.

Perhaps the best feature of this wonderful book is the figures. The line drawings are abundant, sharp, and to-the-point. The color photographs are stunning—always in sharp focus, full of vibrant color and highly informative. The distribution maps are gorgeous—brightly colored and, as a great novelty, they include relief. This may be useful since one can see whether a plant grows in mountains or on plains, information relevant for cultivation.

Perhaps the most valuable illustration is the hardiness maps in Appendix V. These maps show the USDA Hardiness Zones applied to the entire earth. Good books will often show USDA Zones for another continent or country where some plants may be found or where they are commonly cultivated, but to have maps for all of the continents is a wonderful surprise. Unfortunately, these maps contain one of the few problems in this book. While the colors indicating the different zones are quite clearly distinguished in the maps, those in the key with each map are hard to distinguish for middle zones (6-8). However, this is a very minor difficulty.

Who should buy a copy? Every college and university library should buy a copy, and for the basic botany and horticulture as well as the worldwide hardiness maps, anyone serious about horticulture, amateur or professional, should consider purchasing Pulmonarias and the Borage Family. It would make an excellent book to use in undergraduate courses on a supplemental reading list.- Douglas Darnowski, Department of Biology, Indiana University South.

Specialty Cut Flowers: The Production of Annuals, Perennials, Bulbs, and Woody Plants for Fresh and Dried Cut Flowers, Second Edition. Armitage, Allan M. and Judy M. Laushman. 2003. ISBN 0-88192-579-9. 586 pages. Timber Press, Portland Oregon. In the preface the authors indicate that the function of this book is "to help growers produce the fine flowers needed to be profitable". The term "specialty cut flower" had been defined in the first edition of this book as any crop other than roses, carnations and chrysanthemums. The second edition, in response to changes in the market and availability of plants, quotes the president of the Association of Specialty Cut Flower Growers, Inc. as defining a specialty cut flower as "something that isn't on the market on a regular basis or is there only for an exceptionally short time period...." The reader is first introduced to some of the issues of concern to the specialty cut flower industry including the role of imports (expanding), product mix (complement the non-specialty cuts like mums and gladioli), plant diversity (expanding), volume and price (avoiding losses), and grading (need for standards). For someone relatively unfamiliar with the specialty cut flower industry, this book seemed to provide a wealth of information, some of which might be of interest to a home grower as well. Following a fairly detailed section on postharvest care, Armitage and Laushman plunge right into over 500 pages of information, advice and opinions on a selection of plant genera. For each genus they include a description of various species and cultivars appropriate for cut flower production. There is information on propagation, growing-on, environmental factors, field performance, greenhouse performance, stage of harvest, postharvest, and pests and diseases. For some genera the authors include interesting additional insights. For example, for *Lysimachia clethroides* (Gooseneck loosestrife), there is a detailed graphic indicating schedules to follow for production in time for Valentine's Day, Easter Sunday, Secretaries' Day and Mother's Day.

The information provided is generally concise and usually several references are noted for additional detail. These reading recommendations for each genus are very current, usually referencing 1990 and later research papers on specific aspects of culture for that particular genus. There is also a list of more general references toward the back of the book. For several genera there are comments from professional growers throughout the country reflecting their experiences with the genus. These selections are valuable for their practicality. They include the name and location of one or more professional growers who are in a position to offer "hands-on" advice for dealing with different growth and harvest challenges as well as marketing know-how. These growers comments, when present,

often include an enthusiastic endorsements of a particular species or cultivar which worked well for them. Much of the genus information has also been reviewed by one or more experts on that genus and the names of the reviewers are available to the reader as well.

While alphabetical sequencing by genus name is a convenient way to organize the material, it would have been useful to also have a summary list of the selected genera, categorized according to habit (annual, perennial, woody) or whether grown for fresh or dried material. There is such a list in Appendix II for "additional plants" but nowhere is there a summary for the plants that are covered in the book. There is an appendix summarizing stage of harvest information, but this seems to mix genera covered in the book as well as others. There are some excellent color photos, but several of them (*Agapanthus* and *Belancamda*, for example) are of genera not described in the book.

The book is clearly oriented toward the American producer for the American market, and while it may not include quite everything you need to know to actually plow up a field or set up a greenhouse and go into business, it would certainly be a good start. Its emphasis on the economics of growing specialty cut flowers would certainly provide a "reality check" for someone who may be dreaming of turning that extra few acres into cash by growing and selling flowers. Peonies (*Paeonia* hybrids), for example, take a minimum of five years to become profitable, and almost a full page is devoted to reasons why they may not bloom. However, the increasing importance of the local farmers market as a successful outlet for small scale, very specialized flower production is an encouraging trend. This book would be an asset to any horticulture- oriented library. Its reasonable price would also make it a very worthwhile addition to the reference collection of anyone in the florist or nursery industry. Joanne Sharpe, Coastal Maine Botanical Gardens, Boothbay Maine, 72 Creek Lane, PO Box 499, Edgecomb ME 04556 USA.
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Encyclopedic Dictionary of Plant Breeding and Related Subjects. Rolf H.J. Schlegel. 2003. ISBN 1-56022-950-0. Food Products Press of the Haworth Reference Press, Binghamton, NY. 563p. Dr. Schlegel is to be commended for compiling such a comprehensive reference combining the disciplines of plant breeding, botany, agriculture, seed science, horticulture, cell & tissue culture, genetics, and statistics – over two dozen fields in all, from molecular to ecological. So often, such information is fragmented in highly technical, species-specific or discipline-specific references. Upon receiving the book, I first wondered if there might be a more accurate title than the somewhat ambiguous one it was given. Is it an encyclopedia, or is it a dictionary? Why not mention the "related subjects" in the title? I thought of several variations on the current title, but none of them described the book more completely without being overly verbose (*e.g.* A Dictionary of Plant Breeding, Botany, Biotechnology and Related Disciplines With Tables and Figures and a List of Crop Species – ugh!). After a more thorough examination, I concluded that the title indeed was appropriate.

Over 75% of the book is a dictionary of terms, written such that it is comprehensible to most botanists. There is extensive cross listing, as well as noting the particular discipline(s) with which each definition is associated. This cross listing is an important addition, since there are a number of terms that are defined differently in different contexts (*clone*, for example). A significant proportion of the terms are botanical, focusing largely on reproductive structures and processes, as would be expected, but there also are terms specific to methodologies, such as microscopy, biotechnology and experimental design. It's a comprehensive compilation, in that it includes historical terms found in the early plant breeding literature, as well as the current terminology of this age of genetic engineering and genomics.

The second section of the book is a 56-page listing of important crop plants and related species, alphabetized by common name. The listings include scientific names and descriptions and chromosome number/DNA content for some species. I find it particularly practical that it is organized by common name (with extensive cross listing of pseudonyms), giving it an applied focus. Many listings are rather brief, but globally important crop species are given more in-depth descriptions. It is interesting to note the diversity of crop species currently in cultivation, or with future economic potential. To round out this section, descriptions of a number of invasive and/or exotic species that are problematic to certain cultivated crops are included.

The last section includes 35 tables and 41 figures that convey a broad spectrum of information such as selection schemes, genetic ratios, segregation patterns, chromosome numbers and configurations, nutritional compositions, and genomic/ploidy relationships. The tables and figures are referenced in the dictionary section, thus making this book encyclopedic as well (hence the name). The figures illustrating a variety of breeding schemes and field plot designs make it particularly worth purchasing. One drawback to the figures, however, is that the halftones and dotted lines are somewhat faint. I think Schlegel's book would be even more useful if it were to include illustrations to

accompany several of the definitions, thus making it even more encyclopedic. For example, incorporating diagrams of the different flower morphologies would more completely describe them than simple definitions or tables.
The three-page bibliography at the end of the book includes some noteworthy references, but it is somewhat brief. Perhaps a "Suggestions for Further Reading" section that is subdivided to correspond to the disciplines represented in this volume could be included in a second edition, thus making it even more valuable as a reference tool.

In summary, I would recommend that this volume be on the bookshelf of every biologist involved in teaching and research in classical, as well as biotechnological, plant improvement. It would make a very useful reference to accompany standard plant breeding texts such as those by Allard, Briggs & Knowles, and Poehlman & Sleper. - Henry R. Owen, Eastern Illinois University, Charleston, IL 61920

Q. What kind of person laughs at sedge (Cyperaceae) jokes?

A. One with *achene* sense of humor!

-Don Les

Natural Growth Inhibitors and Phytohormones in Plants and Environment. Kefeli, Valentine I. and Maria V. Kalevitch. 2003. ISBN 1-4020-1069-9. (Cloth US$118.00) 323 pp. Kluwer Academic Publishers B.V. P.O. Box 989, 3300 AZ Dordrecht, The Netherlands. Almost everyone who is reading this review will have had a student with very great self confidence whose work is nearly incomprehensible—hard to follow, lacking in accuracy, poorly connected to the literature. Unfortunately, Natural Growth Inhibitors and Phytohormones in Plants and Environment by Valentine Kefeli and Maria Kalevich will remind you of that student. This book is not without redeeming features, however.

The authors state in the Preface that they wish to present a book which examines both hormones and inhibitors in plants and in the plants' environments. With this opening paragraph, the reader sees the unconventional way in which they classify plant growth regulators. While most everyone in writing about plant hormones uses the five classical groups (auxins, cytokinins, gibberellic acids, ethylene, abscisic acid; see any textbook) as a starting point and then discusses other, more recently discovered molecules (e.g. oligosaccharins, systemin) which are now accepted as hormones or at least as having some hormonal features, according to Kefeli and Kalevich, only auxins, cytokinins, and gibberellins are discussed as "hormones" while abscisic acid is called an "inhibitor" and ethylene is presented as an intermediate between these two classes. This way of grouping might be interesting—classification according to whether the molecular enhances or inhibits growth and development—but the normal scheme ought at least to be acknowledged. Even better would have been to talk about growth-promoting and growth-inhibiting characteristics of each hormone, since even auxins at high concentrations have herbicidal effects.
Other molecules are mentioned as having activity like that of either hormones or inhibitors. However, though the authors spend much time on a wide range of chemicals, many of the recently recognized hormones and molecules with hormonal properties, such as systemin and jasmonic acid, receive little or no mention. This points to the nature of the literature cited in Natural Growth Inhibitors and Phytohormones in Plants and Environment. The papers are mostly out-of-date, and a very high percentage of the works cited come from the authors of this book.

Other odd statements and omissions pepper Natural Growth Inhibitors and Phytohormones in Plants and Environment. For example, on p. 19 the authors state that "This characteristic, unique among some specialized plant cells is called the variable gene expression theory, or growth and differentiation theory." Given the general acceptance of differential gene expression as the driving force in the differentiation of cells in all organisms, the authors' statement is hard to comprehend at best. As another example, in section 2.3, the authors set out to discuss photomorphogenesis without mentioning once the work by Chory's group, among others.

In terms of editing and general appearance, this book is poorly prepared. Many of the figures are muddy and not easy to make out—for example Figure 1 on p.3 looks like a rephotocopied photocopy of a photocopy. The English usage is often awkward or inappropriate, and the proofreading is downright atrocious—the reviewer has never seen so many typographical errors in a book. Someone at Kluwer did a terrible job with this volume.

Who should buy a copy of Natural Growth Inhibitors and Phytohormones in Plants and Environment? Given the novel perspective and the access which its bibliography might give to some of the Russian literature, large research libraries and those working on hormones might consider a copy. However, it would be a inappropriate for most students and a waste of money for smaller libraries and those not working on hormones. Douglas Darnowski, Department of Biology, Indiana University South.

Atlas of the Vascular Plants of Texas. B.L. Turner, Holly Nichols, Geoffrey Denny and Oded Doron. 2003. Botanical Research Institute of Texas Press, Fort Worth TX. ISBN 1-889878-08-1 (Volume 1), ISBN 1-889878-09-X (Volume 2). The two volumes of the *Atlas* consist almost entirely of county-level dot maps showing the distributions of both vascular plant species and infraspecific taxa in Texas. The botanical work for the atlas was performed by the senior author, Dr. Turner, with the additional authors supplying technical help in production of the maps for the volumes.

The principal question to be asked of any work of this kind is: How was the presence of a given species in a given county determined? Was it by assembling species lists from published field surveys and species lists drawn up for their properties by agencies such as the Bureau of Land Management, National Park Service, etc.? Was it entered directly from the labels of herbarium specimens, and was that done with, or without confirmation of the identity of the specimens? A second question worth asking: Who is responsible for the information? Who made the decisions about which taxa to recognize? Who (if anyone) was responsible for pruning out erroneous county records?

The most succinct answer to all of these questions is that this work represents the opinions and observations of Dr. Turner. For most families, Dr. Turner prepared the maps based on his examination of herbarium specimens; he estimates having examined "several hundred thousand sheets" to confirm identifications for the *Atlas*. For several important families (Cactaceae, Orchidaceae, Poaceae) the maps were largely prepared by other botanists with detailed knowledge of these taxa in Texas. Even in these cases, it appears that the results must still be consistent with the opinions of Dr. Turner; he notes in the introduction that the *Atlas* incorporates the views of others "only when their systematic views are concordant with ours."

The dot-maps in the *Atlas* are not limited to a single dot per county for each taxon. For the most part, the density of dots approximately reflects the number of specimens that have been collected in that county. For the larger counties, the placement of the dots in different portions of the county additionally reflects the locations from which specimens were collected. In cases in which Dr. Turner has observed species with more-or-less continuous distributions alongside the highways he has driven, this is indicated by series of dots tracing the contours of the highways. This is perhaps the most telling sign that this work largely represents Dr. Turner's personal experience with the flora of Texas.

Clearly it must take both impressive botanical knowledge and tremendous tenacity to produce a work of this nature as a largely one-man project. In his introduction, Dr. Turner refers to the labor of producing this book as a "tedious enterprise." However tedious, projects such as this are clearly important. Accurate knowledge of the distributions of species is a prerequisite for meaningful studies in such areas as monitoring the spread of invasives or assessing the effects of climate change on species' ranges. This work is a valuable resource that will be of interest both for institutions and individuals involved in botanical fieldwork in Texas, and for institutions far from Texas with an interest in maintaining a comprehensive holding of floristic works from all parts of the world.

Daniel R.Taub, Southwestern University.

Q. Where do dugongs sleep?

A. In seagrass "beds".

-Don Les

The Color Encyclopedia of Cape Bulbs. Manning, J., P. Goldblatt, D. Snijman. 2002. ISBN 0-88192-547-0. Timber Press, Inc., 133 S. W. Second Avenue, Suite 450, Portland, Oregon, 97204. (Hardbound $59.95) 486 pp. Just before leaving for South Africa, I asked a botanist there if I should bring this book. Too late. He considered this such an important volume that had purchased his copy of *Color Encyclopedia of Cape Bulbs* as soon as it was published. After seeing the book I understand why. It is the definitive volume for anyone interested in this group of this incredibly diverse group South African geophytes.

The majority of the book–362 pages–is a treatment of species conveniently arranged alphabetically by genus. About half of the 1200 species are illustrated. The images are stunning with excellent color reproduction. For each genus the family is indicated—familial taxonomy is based on modern phylogeny—along with common names and technical descriptions of the plants. Particularly valuable are the copious notes on culture, natural history, and the many references. It is obvious to the reader that these people know what they are talking about and that they love these plants! Species treatments are short, concise, and consist of technical descriptions, phenology, and distribution.

Introductory material provides a short but cogent background in history of plant exploration and phytogeography. This is followed by a chapter on bulbs in the garden with clearly presented information on growing the plants both from bulbs and from seed. A helpful feature for the serious

gardener is a list of suppliers in South Africa, the United States, and Europe.

There are many different keys (to families, genera, and a key to all species) in the book and the practical utility of these, like dichotomous keys anywhere, is questionable. I find it hard to imagine that someone would collect a plant (collection would be necessary to determine if it were indeed bulbous) and then determine it through the keys. In any event, keys will be of use only to botanists who need to know that there are 2 to several ovules in each locule in order to key genera of the Hyacinthaceae as well as knowing other technical characters. A glossary is included; illustrations for some terms, especially relating to bulb architecture, would be helpful. The book appears to be well indexed by both scientific and common names.

Goldblatt and Manning as well as Manning and Goldblatt have done so much to raise awareness of the botanical treasures of the South African flora. I look forward to additional books from this prodigious pair and their colleagues. But it will be hard to outdo this production! Kudos to this pair and Snijman for bringing all this information together and to Timber Press for production of a volume worthy of their scholarship. *The Color Encyclopedia of Cape Bulbs* will be an invaluable aid for anyone working in South Africa, for students of the various families so well surveyed in the book, and for gardeners who are encouraged to select from a wonderful menu of species, many of which are spectacular but little known in culture.

A note on the price. At $59.95 this is a steal. I reckon there are about 800 pictures, this comes out to about seven cents per picture. While not produced for this purpose, this is a serious coffee table book sure to draw observers into reading and, ultimately, appreciating these plants.

According to the authors, ". . . the South African bulb flora easily ranks among the richest." "It is one of the main aims *The Color Encyclopedia of Cape Bulbs* to expose this wonderful variety." They have succeeded admirably. –Lytton John Musselman, Department of Biological Sciences, Old Dominion University, Norfolk, Virginia 23529-0266.

Q. What is the past tense of 'seagrass' (*Zostera*, etc.)?

A. '*Sawgrass*' (*Cladium jamaicense*).

-Don Les

Flora of North America North of Mexico. Volume 25: Magnoliophyta: Commelinidae (in part): Poaceae, part 2. Barkworth, M.E., K.M. Capels, S. Long, & M.B. Piep, eds. 2003. Oxford University Press, New York - Oxford. 783 p. Price: US$120.00 This is the seventh completed volume of the Flora of North America (FNA). Work on this volume actually predates the FNA project: it began in 1986 as part of a separate project to produce a revised and updated Manual for Grasses for North America. Progress on the Grass Manual was limited by a lack of financial support until arrangements were made for it to be incorporated into the FNA in 1999. This partnership has benefited both projects. A separate, stand-alone field manual for the grasses of North America will eventually be produced, using the treatments and illustrations first published in FNA volumes 24 and 25.

This is actually the second FNA volume devoted to grasses. As the editors explain: "Volume 25 is being published before volume 24, because volume 24 will contain a key to all the grass tribes in the Flora region and an artificial key to the genera. Because keys must be checked against the final descriptions for the taxa they contain, volume 24 cannot be completed until the tribal and generic treatments in both volumes have been finalized." This may also prove to be a shrewd marketing tactic, as owners of the very attractive second half of this set will be anxious to get their hands on the keys in the first volume in order to take full advantage of both books. In the meantime readers will have to make do with a comprehensive treatment of only half (733 species) the grasses in North America north of Mexico.

Each FNA volume represents a monumental collaboration of dozens of systematists, regional reviewers, and botanical illustrators, and this is no exception. It does differ from previous volumes in several regards. I have been pleased with the quality of most of the illustrations in the FNA. However, previous volumes limited illustrations to the top third of the page. The formatting in volume 25 allows for full-page reproduction of many of the figures, which makes them easier to examine (and appreciate!). This is particularly evident with graminoids – the habit illustrations of sedges in volume 23 had to be reduced so drastically as to render them little more than silhouettes in some cases. As in the sedge volume most of the species covered are illustrated.

Another improvement of this volume over previous efforts are the maps. The first five FNA volumes included a 3cm square map of North America with each taxon, shaded to illustrate their range. The sedge volume saw the same maps, but the shading had been replaced by a single dot for each state or

province where the taxon occurred. This may not represent too great a sacrifice for botanists in Rhode Island, but here in Quebec it seriously diminished their value. The editors of the grass volume have set a new standard, shading each county where a taxon is known to occur, and increasing the scale of each map to suit the range it represents. This allows them to produce a detailed distribution of *Tridens ambiguus* along the south-eastern coastal plain and a continent-wide map for *Phragmites australis* using the same 3cm square. Of course, this doesn't guarantee the accuracy of these maps, but it does allow the reader to more critically examine them. The editors plan to maintain updated distribution maps on the grass manual website: http://herbarium.usu.edu/webmanual/.

The editors of Volume 25 have taken an inclusive approach to deciding which species to treat. As in other volumes, all native and established exotic taxa from the region are covered. Additionally, species used in agriculture and horticulture, rare waifs, and potentially noxious weeds not yet found in the region have been included. This proactive approach should help land managers to detect newly invasive exotic species before they are beyond control.

The treatments from previous FNA volumes are available on the FNA website http://hua.huh.harvard.edu/FNA/. This makes the work accessible to students and researchers at smaller institutions. Volume 25 is available separately at the Grass Manual website http://herbarium.usu.edu/grassmanual/, but this is not mentioned at the FNA site. I hope that the FNA site will either provide a link to the Grass Manual site or include the grass treatments in the FNA online database. While I'm making requests, I'd also like to see the illustrations from volume 1 on the website. It's hard to appreciate the biogeography of North America without a single map on display!

The Grass Manual team has produced the best FNA treatment yet. I don't need to recommend this volume to herbaria or botanical libraries, as they undoubtedly already have a copy. Likewise for grass systematists. The rest of us will have to weigh our options. The eventual publication of a field manual, which will include the keys, illustrations, and descriptions from this volume will serve the needs of most field biologists. The field manual will not include the comments, references, or synonyms provided here, but this information is probably only of interest to professional systematists and the most enthusiastic amateurs. The entire contents will be available online as well, so even with just the field manual in hand you can access the more arcane information of the full FNA treatments. On the other hand, completion of the first half of the FNA treatment (volume 24) and the field manual won't be possible until additional funds have been secured, so you could be waiting for a while – all the more reason to support the editors and authors by purchasing a copy of this very worthy tome for your lab. Tyler Smith, Plant Science, McGill University, Raymond Building 21,111 Lakeshore Road Ste. Anne de Bellevue, Quebec H9X 3V9.

Q. Why are waterweeds so friendly?

A. Because they always say *Elo-dea*

-Don Les

Genera Orchidacearum Volume 3 Orchidoideae (Part two) Vanilloideae. A. M. Pridgeon, P. J. Cribb, M. W. Chase, and F. N. Rasmussen., ed. 2003. ISBN 0 19 8507119 (Hard cover, $150) xviii+358 pp (plus two numbered pages). Oxford University Press. – As I have already indicated (Arditti, 2001, 2002) the editors of this series include a versatile and effective orchid scientist and editor, a prominent and controversial orchid taxonomist, the founder of orchid molecular taxonomy who is also an expert in other areas of orchids, and a Danish orchid scientist with expertise in the structure of orchids. Contributors to the current and previous volumes include some of the most active and best known orchid scientists in the world today. Given these facts it was and still is reasonable to expect an excellent series. The first two volumes easily met these expectations and so does the current one. In a way the current volume may be the most interesting of the three because it includes many less familiar genera, a relatively large number of which are not widely known or are rarely seen in cultivation.

The same format is followed in the descriptions of all genera: currently valid name (and synonymy); derivation and meaning of name (which is either well known and documented or requires speculation as in the case of the genus *Aa*); description (including line drawings and photographs); distribution (accompanied by maps); infrageneric treatment (when necessary); anatomy (only for some genera despite the fact that more extensive information is available); seed morphology (if known); palynology (when there is information); phylogenetics (for some genera); cytogenetics (if studied); phytochemistry (not for all genera); ecology (sometimes the information is limited); pollination (not always known); uses (not recorded for some, well known for others and in a few cases subject to careful investigations); cultivation (for genera which are cultivated); taxonomic notes (some more extensive than others) and taxonomic literature. Keys are presented for some entries. The information is often by several contributors (identified by initials), a practice which adds richness and

detail. Altogether there is much to be learned from this volume about the orchids is covers.

Pages 335-339 are devoted to an informative glossary. An especially useful feature of this glossary are terms relating to molecular taxonomy of orchids which is a relatively new field with new terminology. There are 105 excellent color illustrations in the book, grouped 5 or 6 per page; each figure is listed as a plate rather than as a figure. Like the previous volumes this one is well edited, designed and produced. If there are errors here and there I missed most of them.

Despite its excellence this volume does have a few shortcomings. One is that orchid physiology and development are missing completely (there are not even citations and references). This is unfortunate because these volumes will become a major source of information for many years to come. The phytochemistry section relating to *Spiranthes* lists several phenantherene derivatives. However it does not mention that a number of orchids produce phytoalexins which belong to this group of chemicals, a fact which suggests that at least some of the *Spiratnhes* phenanthrenes may have similar functions. The index to scientific names is very useful. However the subject index is less complete. (I hope that the final volume in this series will have a detailed subject index.) A Locator List of Generic Names (the two last, but unnumbered pages of the book) lists genera by number without indicating if the numbers refer to page or numeric sequence of each genus. This is confusing.

The shortcomings I have listed would have made a very good book even better, but they do not make this one less than an excellent reference. I look forward to the next volume in the series.– Joseph Arditti, Professor Emeritus, Department of Developmental and Cell Biology, University of California, Irvine.

Literature Cited

Arditti, J. 2001. Genera Orchidacearum, Vol. 1. General introduction, Apostasioideae, Cypripedoideae. *Plant Science Bulletin* 47: 74-76.

Arditti, J. 2002. Genera Orchidacearum. *The Quarterly Review of Biology* 77: 204.

Q. What's harder than playing 'taps' on a Bugleweed (*Lycopus*)?

A. Trying to Reed Canary Grass (*Phalaris arundinacea*).

-Don Les

Introduction to California's Mountain Wildflowers, revised edition. Munz, Phillip A., edited by Dianne Lake and Phyllis M. Faber. 247 pp. 2003. ISBN 0-520-23637-8(pbk). University of California Press, Berkeley, California. California Natural History Guides # 68, and **Introduction to Shore Wildflowers of California, Oregon, and Washington**, revised edition, Munz, Phillip A. edited by Dianne Lake and Phyllis M. Faber, 234 pp. 2003 ISBN 0-520-23639-4 (pbk.). University of California Press, Berkeley, California. California Natural History Guides # 67. Phillip A. Munz (1892-1974) was a leading botanist in California, professor of botany at Pomona College, and author of *A California Flora*. He wrote four popular books published in the 1960's: *California Mountain Flowers, California Spring Wildflowers, California Desert Wildflowers* and *Shore Wildflowers of California, Oregon, and Washington* which introduced many non-botanists to the distinctive wildflowers of the state. Now revisions that bring together the many changes in taxonomy, new range information, and new data that have been gathered are being published in the California Natural History Series by the University of California Press. .These changes are reflected in the use of the Jepson *Manual: Higher Plants of California* as the major reference instead of Munz's *Flora* and in the careful rewriting of plant descriptions by Dianne Lake. The two other titles of Munz's books will be revised and published next year. A section on the relevant plant communities by Robert Ornduff is included in the above books and will be in the next two also. I am basing my review of both books on a comparison of *California Mountain Wildflowers* and the new edition.

There are a number of changes in format and coverage that I presume are similar in both cases. The illustrations have been somewhat reduced in size to accomodate the new format but often a close-up or semi-close-up replaces a more general habitat shot found in the older book. e.g. *Mimulus tillingii, Castilleja nana, Pedicularis atttoleus*. The new edition describes 283 species, compared to 276 in the older book. Plants that are now considered rare have been excluded. In the first edition a central color photo section illustrated 95 species, and line drawings, the remaining 181, many by the accomplished artist, Jeanne R. Janish. Continuity of the whole text is much improved by elimination of this central section and interspersing new better color photos with the line drawings. Most of the original drawings are retained, some new ones added and many plants are now illustrated with both color photos and line drawings. Plants are still grouped by flower color to aid in identification. The new edition is thicker (247 pp.) but more of a pocket size (4x 7 inches) than the old (6 x 9 inches, 122pp.)

In both books, as in any field guide, one can always question the selection of the plants included (usually

a few hundred out of thousands). Mountain Wildflowers covers plants growing in all the mountain ranges in California (except the desert ones) from the yellow pine belt upward through the red fir, and sub-alpine zones to the alpine meadows and peaks above timberline. To select only 283 plants from this wide geographic range is a tall order. In Shore Wildflowers 268 species are described from all of those growing along the Pacific coastline: California, Oregon and Washington. Munz states in the introduction that he wanted to include those "that are striking because of unusual structure… and might arouse your curiosity" as well as those which are "pretty and conspicuous." Because so few trees and shrubs come down to the shore he has a section on these even though they are not wildflowers. The California Natural History Guides are often revisions of older, time-tested, successful, useful books now brought up to date in an extremely well-edited series under the direction of Phyllis M. Faber.. Mary M. Walker, New England Wild Flower Society, Framingham, MA.

A Utah Flora, 3rd ed., revised. Stanley L. Welsh, N. Duane Atwood, Sherel Goodrich, and Larry C. Higgins. 2003. Brigham Young University, Provo, Utah 84602. 912 pp. ISBN 0-8425-2556-4 (Hard cover US $85) The Third edition of *A Utah Flora* (henceforth UT3) represents the most recent summary of a productive research program begun in the 1950's by Welsh and his associates. As one who used the second edition (Welsh et al. 1993) extensively (Brasher 1996) and is currently working on a large interactive key for the Southern Rocky Mountain Region (Brasher & Snow 2003), the new edition is of considerable interest.

UT3 treats a total of 3930 taxa, 3515 species, and 151 families; of these 802 taxa, 792 species, and 34 families are introduced. This is an increase of 293 taxa or 7.9 % (3.5% introduced) over the second edition. Fortunately, no plant extinctions have been documented in Utah.

The summary of new taxa and combinations is somewhat hidden after the last species entry (p. 838). Nomenclatural innovations and new taxa include 15 new species (2 from NM), 1 new nothospecies, 31 new combinations, 6 change in combination and/or status proposals, 26 new varieties (1 each from CO and WY), and 3 subvarieties. Omitted from the (p. 838) list is *Ipomopsis congesta* (Hooker) V. Grant var. *goodrichii* S. Welsh *var. nov.* (see p. 487).

The taxonomic treatment remains traditional and perhaps somewhat provincial. The family classification is only slightly modified from Cronquist (1981, "*Integrated System…"*) despite the availability of Thorne (1992, *Botanical Review* 58: 255-348) and APG II (2003), which are apparently not even cited in UT3. Thus the demonstrably polyphyletic families Liliaceae, Scrophulariaceae, and Saxifragaceae are not separated into smaller monophyletic families, nor are the polyphyletic families Hydrophyllaceae and Chenopodiaceae submerged within broadly defined monophyletic Boraginaceae and Amaranthaceae.

Welsh's Compositae entry expresses disagreement with recent generic realignments in the family (p. 122). Correspondingly, the entry for *Aster kingii* is unchanged from the second edition, with the newer name, *Tonestus kingii* (G. L. Nesom, 1991, *Phytologia* 71: 125), not even included as a synonym. The nomenclature is highly conservative, but some changes in classification based on new data are included, such as submerging *Lesquerella* in *Physaria* (Al-Shehbaz and O'Kane, 2002, *Novon* 12: 319-329).

Conservation status is only sporadically included. None of the main four sensitive status Utah taxa that I have personally worked on (*Aster* (=*Tonestus*) *kingii*, *Ivesia utahensis*, *Jamesia americana* var. *macrocalyx*, and *Physaria garrettii*) were mentioned to be of conservation concern. I also surveyed the first six species listed under the category of "Federally Listed PT&E Species" in Atwood et al. (1991, *Utah Threatened, Endangered, and Sensitive Plant field guide*). For two of these there was no mention of special public policy status. Another was not even cited in UT3 as a synonym.

An excellent feature of this and previous editions is the 2-number annotation at the end of each species entry. This indicates how many specimens from Utah the treatment's author has seen and personally collected, providing transparency of methods used. It shows the author's familiarity with the taxon in the herbarium and field, and provides a general index of abundance. The numbers also guide collectors. Low numbers indicate more collections are needed, and this edition uses bold print to highlight numbers of specimens seen if greater than 100 to discourage redundant collecting.

Many of the newly described species and varieties are boldly described on the basis of one or few specimens, often not collected by the author of the treatment, without citing relevant fieldwork. Naming subvarieties of *Dodecatheon pulchellum* var. *pulchellum* by Welsh in UT3 is questionable. The species entry itself says the species is comprised of two varieties that are "separable somewhat arbitrarily into two intergrading phases", and the entry annotations indicate Welsh only saw 1-4 herbarium specimens each for the subvarieties,

collecting only one of the eight specimens himself. Additionally, having more than one infraspecific rank is questionable on theoretical grounds (Snow 1997). In another example Welsh describes *Arabis goodrichii* S. Welsh *sp. nov*., *A. perennans* var. *thorneae* S. Welsh *var. nov*., and *A. thompsonii* S. Welsh *sp. nov.* each from only one locality and one herbarium specimen each, these not collected himself. On a more positive note, these are cases where the annotations indicating numbers of specimens are helpful in analyzing the book's content.

Whether authors or treatments within UT3 get credit or "blame" (see UT3 introduction) for these new taxa is an open question; time will tell. In the short term, publishing them will cause a flurry of activity among those involved with rare Utah plants. Workers will study these proposed taxonomic hypotheses, perhaps in light of differing species concepts, then accept or reject them, and ultimately work to preserve the accepted taxa. Some of these taxa may displace other less-rare taxa currently categorized as sensitive, threatened, or endangered.

The varieties of *Tidestromia lanuginosa* (not published by any of the UT3 editors) accepted in UT3 are apparently differentiated only by pollen morphology and one county line. Welsh's case would be more convincing with additional explanation such as ecological differences, more geographical details, or chromosome numbers. As it stands, this is uncharacteristic of Welsh, running counter to the popular botanical species criterion that taxa should be "distinguishable by *ordinary means*" (Cronquist 1988, p. 72).

Several parts of the entry for *Papaver uintaense* S. Welsh *sp. nov.* indicate only the Uinta Mountains, but another part calls the species circumboreal. The list of Author Abbreviations lacks departure dates for some deceased authors (see R. C. Barneby, A. Cronquist, F. C. Gould, and R. C. Rollins). The text has its share of misspellings and production oversights (especially two words lacking an intervening space). UT3 is also slightly larger and heavier than the second edition. The estimated worldwide numbers of taxa and general geographic range of particular families and genera would be a useful addition for a hypothetical fourth edition.

UT3 species descriptions are complete but not as detailed as some floras (*Flora of North America,* 1993-2003; Cronquist et al., 1972-1997, *Intermountain Flora*). UT3 often omits microscopic character states pertaining to gynoecium and seeds. Still, the descriptions are a great advantage over floras that lack them (Weber and Wittmann, 2001, *Colorado Flora: Western Slope*; Dorn, 2001, *Vascular Plants of Wyoming*).

Much can be said about the strengths of this edition. Bibliographic citations for taxa, basionyms, and pertinent synonyms are included for the first time, adding to the scholarly credibility of the work. The author of each treatment is now clearly indicated, rather than being buried in the introduction. Taxon entries are now more accessible with more white space. Many discussions accompanying taxa are enlarged.

Unlike most floras, cultivated plants are included. This serves to better document biological invasions (Prather et al. 2004), and allows both beginners and scholars to identify any plant at hand with a single reference.

UT3 has been the effort of a relatively small and cohesive team of individuals – almost exclusively Welsh and his students. Individuals and small, tight-knit groups generally make more rapid progress than larger, more diffuse collaborations. The "small-team" strategy is also being followed in the Southern Rocky Mountain Interactive Flora (SRMIF) project (Brasher and Snow 2003).

In summary, the book has many compelling strengths and some opportunities for future improvement. UT3 will be a blessing to the consumers of botanical information in the West. I give it a grade of A.- Jeffrey W. Brasher, Department of Biological Sciences, University of Northern Colorado, Greeley, CO.

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