

ALUMNI NEWSLETTER



FROM THE CHAIR'S OFFICE...

Greetings to all. Another year has gone by and, as usual, we've seen a lot of activity in Birge Hall. Most prominent has been a series of the personnel changes and lab moves. On a snowy evening in late January, colleagues, friends, and grad students past and present met at a "retirement dinner" to

salute Prof. Tom Sharkey's contributions during his 20 years at UW-Madison and wish him well in his new role as Chair of Biochemistry and Molecular Biology at Michigan State University. On a snowy day a few weeks earlier, we welcomed **Prof. Ken Cameron**, who came to us from the New York Botanical Garden, and took over the reins as Director of the Wisconsin State Herbarium. **Prof. Simon Gilroy** arrived a little over a year ago. He and his group are now a solid presence on the B1 floor, and were recently joined by the Otegui Lab, who migrated down from the second floor.

We welcomed new academic staff members **Marie Trest** and **Dr. Sarah Swanson** at the beginning of the academic year. Both have been invigorating additions to the department and now have a year of accomplishments under their belts: Marie as lab manager for the Phycology, Mycology, and Botany 100 courses, and Sarah as Director of the Plant Imaging Center. Long-term staff members **Claudia Lipke** (Multimedia Media Center), **Dr. Mo Fayyaz** (Greenhouse and Gardens), and **Mark Wetter** (Herbarium) received promotions during the past year. Congratulations to them all—their promotions were well-deserved and overdue. Last but not least,

we welcomed **Julie Olson Paul** to the office staff at the end of June. She replaced Sherry Stuart as the Payroll and Benefits Coordinator.

I will not even attempt to summarize all of the teaching and research efforts of departmental members that continue to make Birge Hall a productive and exciting place. I invite you instead to turn the pages of this newsletter to see what everyone has been up to!

*Donna Fernandez
Out-going Chair*

After 4 years, Donna Fernandez stepped down as Departmental Chair. She is spending her academic year on well-earned sabbatical. Prof. David Baum became Chair in August 2008. □



Birge Hall



UPDATES

New Faces



DR. KEN CAMERON
Director of the Wisconsin State Herbarium

Dr. Ken Cameron joined the Department of Botany as an Associate Professor and Director of the Wisconsin State Herbarium in January. For nearly ten years prior, he was

employed as a Curator at The New York Botanical Garden in the Bronx, where he was also Director of the Cullman Program for Molecular Systematics Studies. In addition to his active program in field, herbarium, and laboratory research at the Garden, Dr. Cameron was affiliated with several universities in the greater New York City area, including Columbia, NYU, CUNY, Cooper Union, and Sarah Lawrence College, where he worked closely with students and offered regular courses in General Botany, Economic Botany, and Field Botany. Prior to working in New York, Dr. Cameron served as an Assistant Professor of Biology at Guilford College in Greensboro, NC from 1996–1998, after obtaining his Ph.D. from the University of North Carolina at Chapel Hill in 1996.

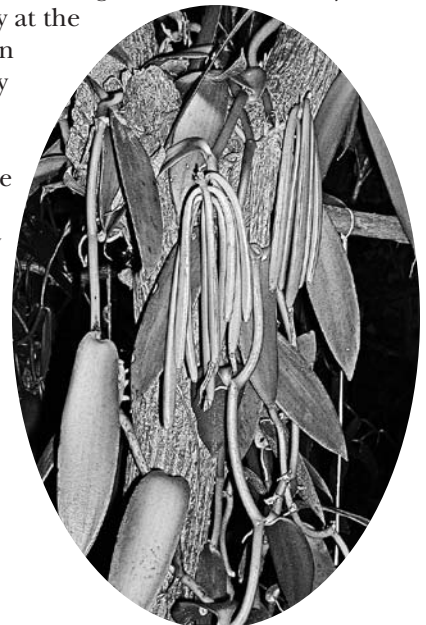
Dr. Cameron's research interests focus on orchid systematics, at all taxonomic levels from the family down to species' populations. He has continued to refine his early use of molecular data to reconstruct phylogenetic relationships across the entire Orchidaceae, and a few years ago he produced what is recognized currently as the most up-to-date system of classification for one of the largest families of plants on Earth. At the subfamily level, Dr. Cameron is recognized as the leading authority on the biology of *Vanilla* and its relatives, known informally as the "vanilloid" orchids. Because few of these plants are cultivated, Dr. Cameron has collected plants extensively throughout South America, Australia, New Caledonia, West Africa, and Southeast Asia. In addition, the few genera of vanilloid orchids found in eastern North America (*Pogonia*, *Cleistis*, and *Isotria*) have extended Dr. Cameron's floristic interests beyond the tropics. He has also published systematic studies on the orchid tribe Malaxideae (*Liparis*,

Malaxis, *Oberonia*, etc.), subtribe Prescottiniinae (high elevation orchids from the Andes), and most recently on the ladies' tresses orchids (genus *Spiranthes*). Earlier this year, he published *Orchid Biology Reviews and Perspectives*, Volume IX, which is a 575-page book co-edited with J. Arditti and T. Kull. He is currently preparing the book *Natural History of Vanilla Orchids*, which will be published by Timber Press in 2010.

In addition, Dr. Cameron published research on the systematics of the cactus family (Cactaceae), Barbados cherries (Malpighiaceae), carnivorous plants (Lentibulariaceae, Droseraceae, Sarraceniaceae, etc.), catbriers (Smilacaceae), and other plant groups. He is currently a co-Principal Investigator for "Tree-BOL", a long-term, international, barcode-of-life initiative to collect and sequence DNA from the world's tree species. This research is being supported by a grant from the Alfred P. Sloan Foundation. The resulting database of DNA barcode sequences will allow future researchers the ability to accurately identify specimens at any stage in their life cycle, sterile or fertile, or from fragments of specimens such as seeds, leaves, and roots, using genetic information.

Dr. Cameron's work has been featured in The New York Times, Wall Street Journal, Natural History Magazine, on BBC radio, Home and Garden Television, and the PBS television series NOVA. He is frequently invited to speak at regional orchids society meetings (most recently at the Chicago Botanic Garden in July), and is currently an Associate Editor for the journal Systematic Botany, Chairman of the Esau Award Committee of the Botanical Society of America's Structural Botany Section, and an officer in the American Society of Plant Taxonomists.

Welcome to UW–Madison, Ken! □



Vanilla



JULIE OLSON PAUL
Payroll and Benefits
Coordinator.

Julie Olson Paul joined the Botany Department in late June 2008. Prior to joining us, Julie spent 20 years in the School of Medicine and Public Health, starting as

a student hourly and working her way up to a Payroll & Benefits Specialist. In addition to her work at the University, Julie brings a wealth of administrative and accounting experience from many years working with local non-profit organizations, which she continues to do on her days away from us. In her free time, Julie enjoys computers, reading, and spending time with her 7-year old daughter. □

Lab News

Baum Lab

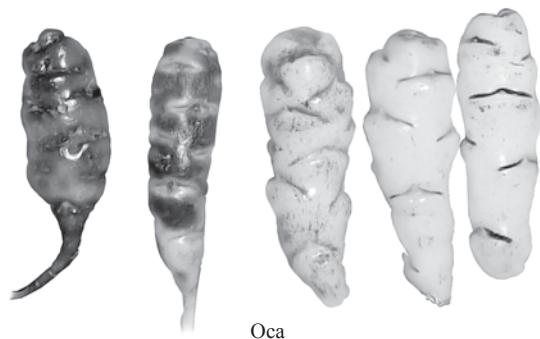
Life in the Baum Lab has been busy and exciting, with a lot of news and new members. David is back from a productive sabbatical in England, and to his relief his lab is still up and running pretty well! We are soon to be moving to a new space, and welcome Ken Cameron's lab as our neighbor. **Dr. Ning Liu** started as a postdoctoral fellow this past October, working on the evolution of floral architecture in Brassicaceae. **Margaret Koopman** graduated in August, and moved to Louisiana State University to work as a postdoc with Bryan Carstens. **Ivalú Cacho** is in her final year and has generated an exciting story about a potential ring-species in the Caribbean. **Talline Martins** has been tracking down the genetics underlying the production of pigments present in *Clarkia gracilis* petals and their spots. **Raul Correa** is making promising inroads in a novel approach, an evolutionary transgenomic screen, which aims to identify genes of developmental interest that differ between species. **Stephanie McFarlane** has started a family, and **Eli Kuhman** keeps her busy; she is working on the Malvaceae, breaking the Bombacoid backbone and shedding light on species relationships and biogeography of the group. **Abigail Mazie** joined the lab to pursue her PhD in Botany fall 2008 (welcome!) □

Emshwiller Lab

The Emshwiller lab has seen remarkable growth in its second year. We have had one post-doctoral research associate, four graduate students, and eight undergraduate students working in the lab. Research topics have expanded beyond crop evolution of

the Andean tuber "oca," (*Oxalis tuberosa*) to include studies of domestication and evolution of other crop plants, such as cassava or manioc (*Manihot esculenta*), and an extinct North American domesticated seed crop of the genus *Chenopodium*. Phylogenetic systematic studies include a genus-level study of the large genus *Oxalis* of the Oxalidaceae and a study of North American members of *Chenopodium*. Ethnobotanical and biochemical studies of oca and of the traditional Chinese medicinal herb *Fritillaria cirrhosa* are also ongoing.

In 2008 this research took three graduate students abroad for research ventures. Doctoral student **Jane Bradbury** completed a semester working with Dr. Doyle McKey at the National Center for Scientific Research in Montpellier, France, thanks to funding from the French American Cultural Exchange. There she collected preliminary data on the potential genetic differences between sweet and bitter cassava through comparison of microsatellite loci. She is writing up her interesting results on cassava, while simultaneously collecting DNA



Oca

sequence data to revisit the question of origins of domesticated oca. Jane received the Eldon Newcomb Teaching Award.

Doctoral student **Andy Gardner** returned from Mexico where he collected *Oxalis* species for his studies on the phylogenetic systematics of the bulb-bearing *Oxalis*. His trip was fantastically successful, collecting samples of almost half the species he needs for the phylogeny. This year Andy is extracting and sequencing DNA from his collections while preparing for another field trip next year. Andy has been developing his skills as a mentor by leading a group of undergraduate students (see below) through the processes of extracting and sequencing DNA for use in phylogenetic studies.

Katie Konchar (MS student) spent most of her summer in northwestern Yunnan province in China on a collection trip for her studies of the medicinal herb *Fritillaria cirrhosa* of the Liliaceae, in collaboration with Dr. Yang Yongping of the Kunming Institute of Botany, thanks to funding from the UW China IGERT program. Her investigative focus is the biochemical differences between *Fritillaria* populations grown in cultivation and those that are wild-harvested, as well as bulbs harvested from different ecological zones and at different seasons. By studying the variation in the content of the alkaloids that make this plant an effective cough remedy, she hopes to improve understanding of non-timber forest product management to help conserve this important medicinal plant.

Some readers may be familiar with “quinoa,” the Andean seed crop that is a domesticated species of *Chenopodium*. It can sometimes be found in natural food sections of stores in the USA. Even those familiar with quinoa might not know there was a crop like quinoa that was cultivated in the eastern half of North America thousands of years ago, but which is now extinct. **Brian Walsh** (doctoral student) is investigating the origins of the extinct domesticated form of *Chenopodium* in North America, in collaboration with archaeobotanist Dr. Bruce Smith of the Smithsonian Institute. He plans to analyze ancient DNA of archaeological remains of the crop to determine if it represents a separate domestication event from that of the extant varieties that are still cultivated in Mexico. His ancient DNA work is in the context of studying the phylogeny of the genus *Chenopodium*, focusing primarily on those species native to North America, in collaboration with Dr. Rick Jellen of Brigham Young University.

Post-doc **Terra Theim** generated a large data set of AFLP fingerprints to compare oca samples that Eve and colleagues had collected from rural farming communities all over the Peruvian Andes, as well as

from several populations of wild, tuber-bearing *Oxalis* that might be the progenitors of oca. These data will help to determine the effects of the so-called “seed flows” that result from the exchange of tuber planting material between traditional Andean farming households. In addition, Terra provided training to most of the graduate and undergraduate students in the lab, and helped get the lab up and running in its first year. We all congratulate Terra on the birth of her first child, Maya Jean Jadhav, in summer 2008.

Additionally, undergraduates **Anna Dierking**, **Mary Sagstetter**, **Tim Smith**, **Emily Hatas**, **Brittany Nanzig**, **Joslyn Mink**, **Emily Houtler**, and **Brian Pellatt** have all generated DNA sequence data for the phylogenetic studies of *Oxalis*. These data bolstered the preliminary data for two grant proposals submitted to NSF, with the intention of producing the first genus-wide, world-wide, phylogeny of *Oxalis*. Three of these students completed their senior theses in the lab. Anna based hers on a survey about the paucity of botany in high school curricula; Tim added a sixth chloroplast locus to the lab’s dataset for phylogenetic studies of *Oxalis*, and Emily Hatas used chloroplast DNA to shed light on the origins of domesticated oca. We thank this fantastic team of undergraduates for all their work in the lab! □

Givnish Lab

Over the past year, Tom Givnish gave invited talks on plant ecology and evolutionary biology at the University of California at Santa Barbara, University of Connecticut, University of Minnesota–Twin Cities, and University of Wisconsin–Whitewater, as well as at CSIRO in Canberra, the Greater Everglades Ecological Restoration Conference in Naples FL, and the Monocots IV conference in Copenhagen. He also spent a week in Ecuador and the Galápagos, visiting orchid reserves and several islands as part of an expedition organized by recent UW–Botany graduate **Dr. Catherine Woodward**, president of the Ceiba Foundation. Givnish also conducted field research in California and eastern and western Australia.

Two new graduate students joined Givnish’s lab. **Emily Butler** is studying the phylogeny and physiological adaptations of the wood ferns



(*Dryopteris*) of North America, one of the largest and ecologically most diverse groups of pteridophytes in our flora. Emily participated in a course on tropical fern biology in Costa Rica in January, co-authored a paper on a new life-cycle for the ferns (!), and held a research fellowship this summer at the Smithsonian, where she collaborated with Liz Zimmer, Jun Wen, and Carl Taylor on *Dryopteris* evolution. **Stephanie Lyon** is examining possible coevolution of the *Corybas* alliance—tiny orchids with spectacular, fungus-mimicking flowers, native to Australia and islands of the south Pacific—with their fungus-gnat pollinators and fungal mycorrhizal partners. She was awarded an NSF Graduate Fellowship and a Newcomb Research Fellowship to support this work, which she began in summer 2008 in collaboration with Dr. Mark Clements in Canberra. Clements is the leading researcher on the phylogeny of Australian and south Pacific orchids.

Phil Gonsiska continued his PhD research on the phylogeny and ecology of the bromeliad genus *Catopsis*, one of only two groups among flowering plants in which both carnivorous and non-carnivorous species are known to occur. Phil won a Newcomb Research Fellowship to continue his field studies of *Catopsis* in Mexico.

Finally, **Bob Wernerehl** continued his studies of grass species dominance across the dry-wet continuum in Wisconsin prairies, and **Kate Gerndt** investigated the structural characteristics of forests inhabited by the endangered pine marten in Wisconsin. Recent graduate **Dr. Jonathan Coop** published several papers on the causes of reversed treelines, completed his post-doctoral fellowship at Colorado State University, and became Visiting Professor of Biology at Western College of Colorado. □

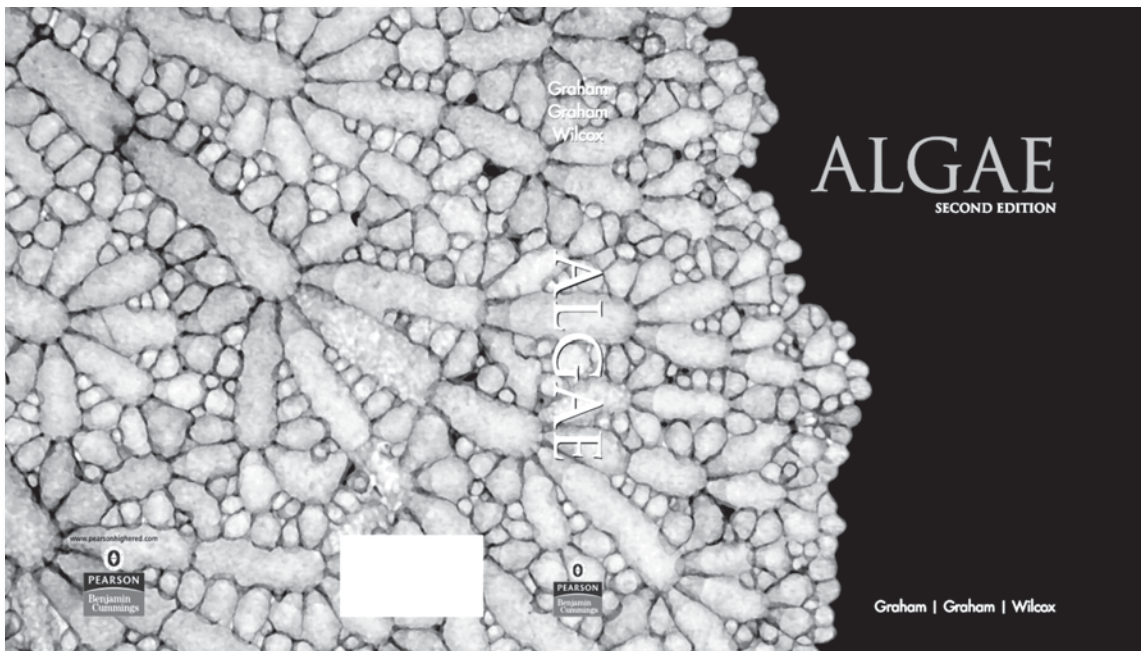
Graham Lab

It has been an exciting year for us. In January, we welcomed **Reese Zulkifly**, a new doctoral student from Malaysia. Reese has a Master's degree in microbiology. It was snowing when we picked Reese up from the airport and fun to watch him enjoy snow for the first time. Reese is investigating ways to use algae to abate water pollution and produce renewable energy at the same time, in a collaborative project that we have with several engineers.

Stuart Jones completed his PhD degree in the area of aquatic microbial ecology (co-advised by Trina McMahon in Civil and Environmental Engineering) and left for a post-doc at Michigan State's Kellogg Biological Station. **Alice Ecker** completed her Master's degree, taught the department's spring Mycology course, then left to take a position with a local computer software firm.

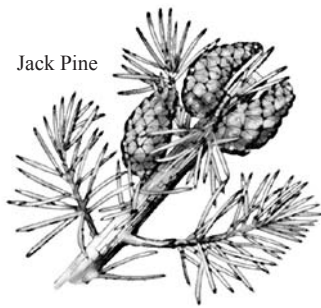
Early this summer **Shana Ederer** passed her prelims, then immediately wrote and submitted a grant proposal to support her work, left shortly thereafter for a period of intensive field work at The Ridges Sanctuary State Natural Area where she is studying nitrogen-fixing cyanobacterial associations with mosses, then gave a paper on her results at the Ecological Society meetings in Milwaukee, all in the space of a few weeks.

Jim, Linda, and Lee finished the second edition of the *Algae* textbook, due out in mid-October (see photo of the cover). The image (top of page), by UW-Madison Botany PhD **Martha Cook** (Associate Professor of Biology at Illinois State University) is of a green seaweed that grows in the Caribbean. We are really happy to be done! □



Hotchkiss Lab

The Hotchkiss lab has been a busy place this year. **Sarah McGuire Bogen** completed her MS degree in the Environment and Resources program, with a thesis project on vegetation and fire history at Effigy Mounds National Monument. Sarah worked closely with park managers to incorporate an understanding of ecological history into vegetation management planning for the park, and her work contributed to a new vision for ecosystem management. Sarah is now working at the Wisconsin Department of Natural Resources.



Jack Pine

Michael Tweiten completed his PhD in Botany on the ecology and history of jack pine budworm outbreaks on the northwestern Wisconsin sand plain. Michael began postdoctoral research on disturbance ecology in Hawaiian wet forests.

Ongoing research on fire history in Hawaii and Wisconsin has the lab full of enthusiastic and accomplished undergraduates. **Aaron Hendrix** did a project and **Alex Kirkby Heeron** pursued senior thesis research on fire history in the Northern Highlands Lake District in north-central Wisconsin. **Sarah Styer** recently completed a senior thesis on fire history in Hawaii, **Julia Janicki** worked on Hawaiian fire history and pollen reference material before leaving for a year in Taiwan and Tokyo, and **Jordan Briggs** pursued research on charcoal morphology, fire history, and the application of fern sporangia as a new fossil record of vegetation history in Hawaii. **Charlie Dulberger** collected and prepared reference pollen samples to support studies of vegetation history that are paired with each of the fire histories.

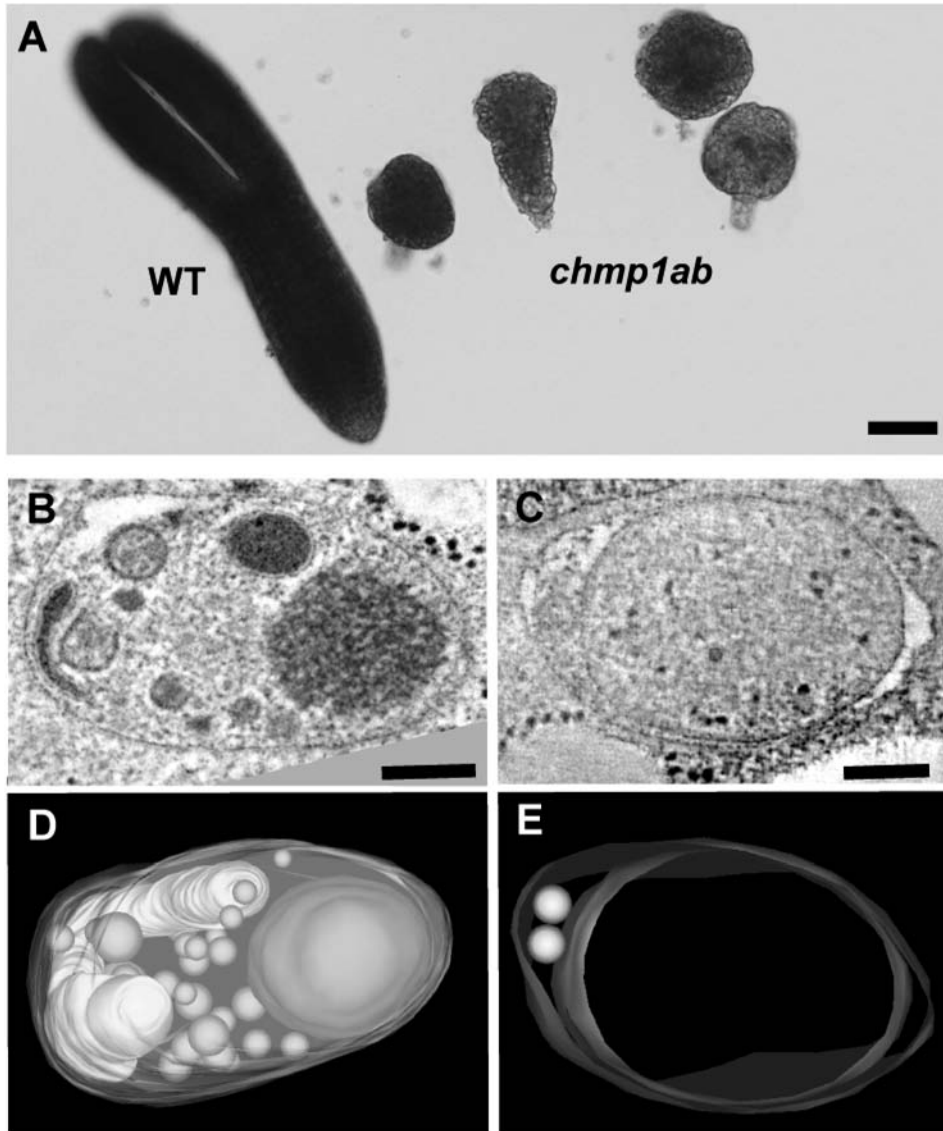
Our two current PhD students are working in northern Wisconsin and Hawaii. **Jennifer Schmitz** is studying the response of northern Wisconsin lake ecosystems to logging in the late 1800s and early 1900s, with an eye to predicting the effects of modern logging practices on lakes in western Africa. She spent some time this summer in Peter Leavitt's lab in Regina, analyzing lake sediment samples for pigments left by algae and other lake-dwelling organisms, to reconstruct the changes in their communities over time. **Shelley Crausbay** focused on the response of high-elevation ecosystems on Haleakal, Maui, to climate change over thousands of years in the past and into the future. This year she is analyzing vegetation across two perpendicular climate gradients near the upper forest limit and reconstructing the

history of the upper cloud forest vegetation over the past 5,000 years. Shelley received a Doctoral Dissertation Improvement grant from the National Science Foundation to further her research on changes in water stress in high-elevation trees over the past several decades. Both Shelley and Jennifer presented their current results at the annual meeting of the Ecological Society of America in August.

Three recent grants from the National Science Foundation are breathing new life into our research. A grant from the Biocomplexity panel entitled "Before globalization—pre-contact intensive agriculture and society in Kohala, Hawaii" continues our collaboration with archaeologists, soils scientists, and human demographers on what changes in Hawaiian agriculture, society, and ecosystems over time can teach us about how human societies experience and respond to changes in their influence on their environment. A grant from the ecosystems panel funds Michael Tweiten's postdoc and allows us to collaborate with Greg Asner and Jim Kellener (Carnegie Institute) to use high-resolution Lidar and hyperspectral imaging to study the structure and potential disturbance regimes of Hawaiian wet forests, and with Oliver Chadwick (UC-Santa Barbara) and Peter Vitousek (Stanford University) to study the changes in soil and ecosystem nutrient status with disturbance history. Finally, a new four-year project entitled "The effects of landscape context on the sensitivity of vegetation to climate change" will continue our work on the sensitivity of the pine and oak barrens of northwestern Wisconsin to changes in climate and disturbance regimes. We will incorporate site histories with an analysis of the distribution of soil types, water bodies, and topography to study whether landscape context can provide clues to the sensitivity of vegetation to climate change on the local scales at which we manage landscapes. □

Otegui Lab

The primary interest of the Otegui lab is to understand how proteins and membranes traffic inside plant cells and how that affects cellular functions and plant development. We are working on three different projects. The first one, supported by the National Science Foundation, aims to understand how plasma membrane proteins are degraded inside the cell and the role that endosomes play in this important cellular function. **Christoph Spitzer**, a postdoctoral researcher who received his PhD from the University of Cologne, Germany, is working on this project, more specifically on the endosomal trafficking and degradation of auxin carriers. **Maren Roe**, a graduate student who joined the lab last year, is working on plant-specific endosomal proteins.



(A) Wild type (WT) and *chmp1ab* mutant developing embryos. The mutant embryos lack an important endosomal protein and are not able to complete embryogenesis (from Christoph Spitzer).

(B)–(E) Tomographic slices and 3D reconstruction of autophagic structures likely involved in the trafficking of storage proteins in the maize endosperm.

The second project was recently funded by the US Department of Agriculture and deals with the transport of storage proteins in the maize endosperm (see graphic, above). **Francisca Reyes**, a postdoctoral researcher who received her PhD from the University of Chile, joined the lab last March to work on autophagic events in the maize endosperm. Also, a new graduate student, **Najia Zaman**, joined the lab recently to work on this project (graphic, above).

The third research line is a collaborative project supported by the Great Lakes Bioenergy Research Center to understand cellular mechanisms regulating secondary cell wall formation. We are hiring two talented postdoctoral fellows to work on this topic. □

Sytsma Lab

The systematic laboratory continues its multi-disciplinary approach to understanding phylogenetic relationships, character evolution, and biogeographical patterns within angiosperms. **Ken Sytsma** is nearing completion of a collaborative, five-year, NSF sponsored Angiosperm Tree of Life project that examines relationships among all major groups of angiosperms with the most extensive sampling of genera and genes ever conducted in a phylogenetic analysis. Twelve problematic nodes within the angiosperm tree of life—the “dirty dozen”—were examined in greatest detail. Sytsma examined one of these, the order Ericales, from molecular, morphological, and fossil perspectives. The order now contains unusual carnivores, parasites, and mycotrophs. Some of their placements within angiosperms have been unknown until

DNA sequence information was obtained. Ken is also involved with phylogenetic studies of *Clarkia* (Onagraceae), Hawaiian Lobeliaceae, and South American Asteraceae and Bromeliaceae. **Tom Kleist** is studying a problematic family, the holoparasite Mitrostemonaceae, with an undergraduate Herfurth Fellowship.

Ken recently completed several years as Interim Director of the Wisconsin Herbarium and the L&S Chair of the Biology Major. Ken supervises four PhD students (**Rachel Schmidt Jabaily**, **Bryan Drew**, **Brent Berger**, **Ben Grady**) and one MS student (**Josh Sulman**).

Rachel Schmidt Jabaily is working on systematics of the genus *Puya* (Bromeliaceae) and aims to finish her thesis in the next year. She finished her Andean fieldwork with a trip to Colombia in December and



Rachel and Bryan in Peru

a trip to Peru in March, which she got to share with labmate Bryan Drew. She studied variations in life history between *Puya* species and found several new species to describe. She resolved *Puya* phylogeny using AFLPs and presented her findings at the BSA meeting this summer in Vancouver. Additional work concerns systematics of an important Chilean group of species using nuclear and chloroplast DNA.

Bryan Drew continued his study of the *Lepechinia*, a genus of aromatic plants in the mint family. During the past year Bryan collected plants in Peru, Mexico, California, and the Dominican Republic. Research topics include the taxonomic placement of *Lepechinia* within the mint family, the temporal origin of the Madrean floristic invasion into the California Floristic Province, and phylogenetic relationships within *Lepechinia*.

Brent Berger is studying the molecular systematics of the Combretaceae, a pantropical group of lianas, mangroves and trees. This past year, Brent traveled to Costa Rica twice, first to get to know his plants on their own turf and second to participate in the Organization for Tropical Studies ecology course.

While taking the course, Brent got to know some very well-known tropical biologists, trounce around six amazing ecosystems in Costa Rica, and become friends with some of the finest up-and-coming tropical biologists. This coming winter, Brent will return to Costa Rica to study the pollination ecology of the genus *Combretum* and explore more closely the role that color change plays in pollination.

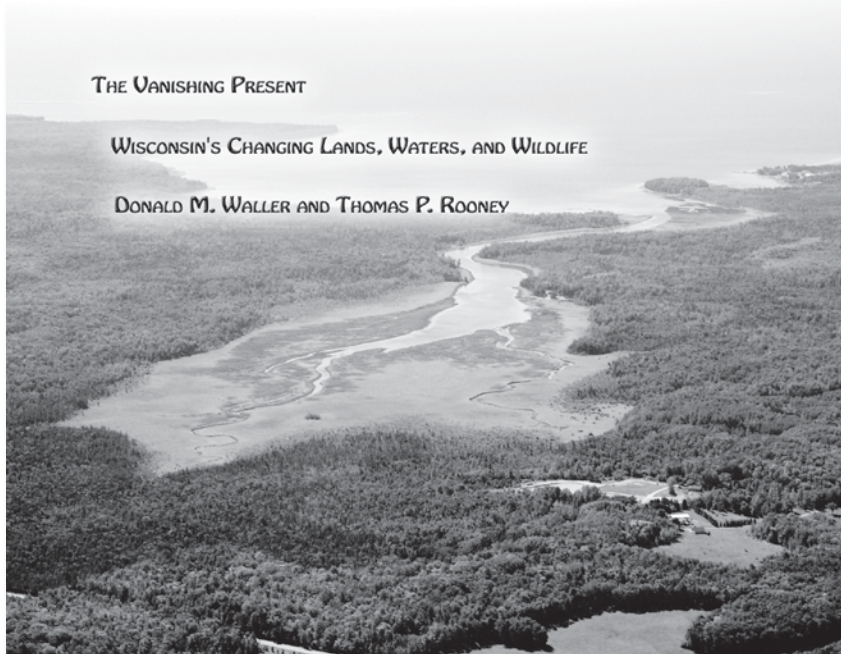
Ben Grady is examining the role different soils play in the speciation of *Eriogonum* (Polygonaceae) in western North America. Field work over the past two summers to areas of unusual soil type in western North America has yielded valuable observations of many rare species, many of which are limited to a particular soil type. Phylogenetic comparisons will determine evolutionary patterns of edaphic speciation among the wild buckwheats.

Josh Sulman is studying the genus *Sparganium*, the bur-reeds. He spent the summer in northern Wisconsin, seeking out the state's 8 species and collecting of tissue samples for DNA extraction needed to develop a phylogeny of the genus. Josh also helped the Northern Highland American Legion State Forest sample forest vegetation, and he contributed a chapter on the wetland vegetation of the Allen Creek Watershed (Jefferson County, WI), for a DNR River Planning Grant aimed at planning conservation efforts. □

Waller Lab

Ecological changes go on all the time around us but are difficult to track and go unnoticed by most. The Waller Lab is increasing the scientific study of these changes, drawing primarily on the valuable baseline work on plant communities begun by John T. Curtis and continued by his students through the late 1940s and 1950s (see below). To increase public awareness of, and concern for, ecological change, **Don Waller** and **Tom Rooney** edited *The Vanishing Present: Wisconsin's Changing Lands, Waters, and Wildlife* (Univ. Chicago Press 2008). It was published just in time for the Ecological Society of America's annual meeting in Milwaukee. The title was inspired by John Magnuson's notion of the 'invisible present' and he was one of the contributors. The book's many other chapters include accounts of ecological change in other taxonomic groups and habitats, including fishes, birds, lichens, amphibians, wetlands, rivers, lakes, prairies, and cities. Pick up a copy and consider giving it to a friend, relative, or policy maker.

The lab received NSF and USDA grants to continue research on long-term changes in Wisconsin plant communities at the Curtis et al. sites. In April, the lab welcomed **Kathryn Amatangelo** (PhD Stanford University 2008) as a post-doctoral research associate.



Katie is using then-vs.-now re-sample data to compare changes in understory community composition between mesic and dry northern forest stands as well as investigating how population changes in species (including weedy invaders) are affected by particular local site and surrounding landscape factors. Data are analyzed not only on plant species abundance and distributions, but also on their functional traits. An impressive field team (one graduate, five undergraduates, and one high school student) helped invent new apparatus to measure the force needed to punch through leaves, tear them in two, etc. As Tim Kratz, Director of the Trout Lake Station, reminded us, we are lucky the university has not yet erected a Plant Subjects Review Committee.

Intrepid PhD candidate **Sarah Johnson** who worked previously in the Apostle Islands and Pictured Rocks National Lakeshores is now leading her field team into the flooded (especially this year) and buggy lowland forests of southern Wisconsin to re-sample the sites studied in the early 1950s by our alumnus **George H. Ware** (1955). **Kelly Wagner**, a former Waller lab member, is leading the southern upland forest field team this summer.

Erika Mudrak (PhD candidate) is finishing her dissertation fieldwork investigating how particular plant species are distributed across small to large spatial and temporal scales. This work draws strongly on the early research done by **Gwen Struik Bray** (MS 1957, PhD 1960) and **Robert Burgess** (MS 1959, PhD 1961).

The Waller lab was fortunate this year to add a GIS specialist, **Steve Horn**, to the team. Steve is leading our efforts to infer landscape variables for analyses of long-term changes in Wisconsin forests. □

Zedler Lab

During the past 10 years, Joy Zedler's students first showed how invasive species have come to dominate wetlands, then tested various ways to control these invaders, and are now finding ways to restore wetlands more effectively. In the past year:

Steve Hall completed his MS degree with three related studies about invasive cattails. In Michoacan, Mexico, with **Roberto Lindig-Cisneros** (PhD 2001) he showed that four harvests a year can reduce cattail (*Typha domingensis*) biomass, deplete

starch reserves in the rhizomes, and facilitate diversity of native plants (Hall et al., in press). In this region, artisans harvest up to four times a year and thus promote diversity (Hall 2008). In the Arboretum's Gardner Marsh, Steve showed that continually cutting cattail (*T. x glauca*) stems at their boundary with sedge meadow should allow sedges to expand vegetatively and the wetland to "self restore." The Arboretum needs an army of volunteers to help cut the cattails in the appropriate manner!

Mike Healy analyzed his 3-year field experiments on reed canary grass (*Phalaris arundinacea*) control, which tested a comprehensive method of controlling "Wisconsin's worst wetland weed." In nine sites, reed canary grass prevailed despite numerous treatments employing herbicides, seeding of natives, and burning. There is no magic bullet, but strong intervention and annual treatment can slow the growth of this plant, which dominates nearly 500,000 acres of Wisconsin wetlands (T. Bernthal, DNR, pers. com.).

In summer 2008, emphasis shifted toward the restoration of tussock sedge (*Carex stricta*), which previous students (**Katy Werner**, MS 2001; **Michelle Peach**, MS 2005) had shown to facilitate diversity (the bigger the tussock, the more native species it can support). Further testing involves this sedge's ability to store carbon (**Beth Lawrence's** PhD research) and take up nitrogen (**Alex Bilgri's** Senior Thesis research). Meanwhile, **Sally Gallagher** is exploring its plasticity in allocating biomass to roots vs. shoots when grown with varied nutrient levels and varied hydroperiods.

A senior from Drake University, **Miranda DuPont**, followed up work done by **Dr. Suzanne Kercher** (PhD 2004) on air tissue in plant roots. With help from Sally Gallagher and funding from NSF's Summer Undergraduate Research Program, compared "height growth efficiency" of tussock sedge with Canada bluejoint grass and two invaders. The invasive cattails grew tall using the least biomass (leaves are mostly air spaces).

MS student **Jim Doherty** spent his summer sampling Curtis Prairie (the "world's oldest restored prairie") and continuing long-term monitoring at the Arboretum with help from **Mark Wegener** and **Brad Herrick** (Arboretum Database Administrator and Ecologist, resp.). The resampling effort is a strategic test of current theory that plant productivity increases with richness. Jim is also testing diversity and productivity relationships in salt marshes at Tijuana Estuary, California.

MS student **Erik Olson** began grad school with extensive data on submersed aquatic vegetation, which he collected in Lac Court Oreilles, Wisconsin's

third largest lake. Erik is co-advised by Steve Ventura (Soils Dept.) and his Environment-and-Resources thesis will report his study of the invasive Eurasian milfoil in relation to physico-chemical variables, other species, and human use. His work has already helped the Arboretum develop planting plans for stormwater basins designed to reduce flood impacts while supporting native plant diversity.

Students of the spring 2008 Plant Ecology Seminar saw their review of literature on large restoration experiments published by the journal *Restoration Ecology* (Wagner et al. 2008). This opinion piece calls for more large experiments in restoration sites, like examples underway at Tijuana Estuary and the Arboretum. Papers from previous students also made their way into print this year: **Christin Frieswyk** (PhD 2005), **Aaron Boers** (PhD 2006), **Alison Varty** (MS 2007), and **Cathi Bonin** (MS 2007). □

Alumni News

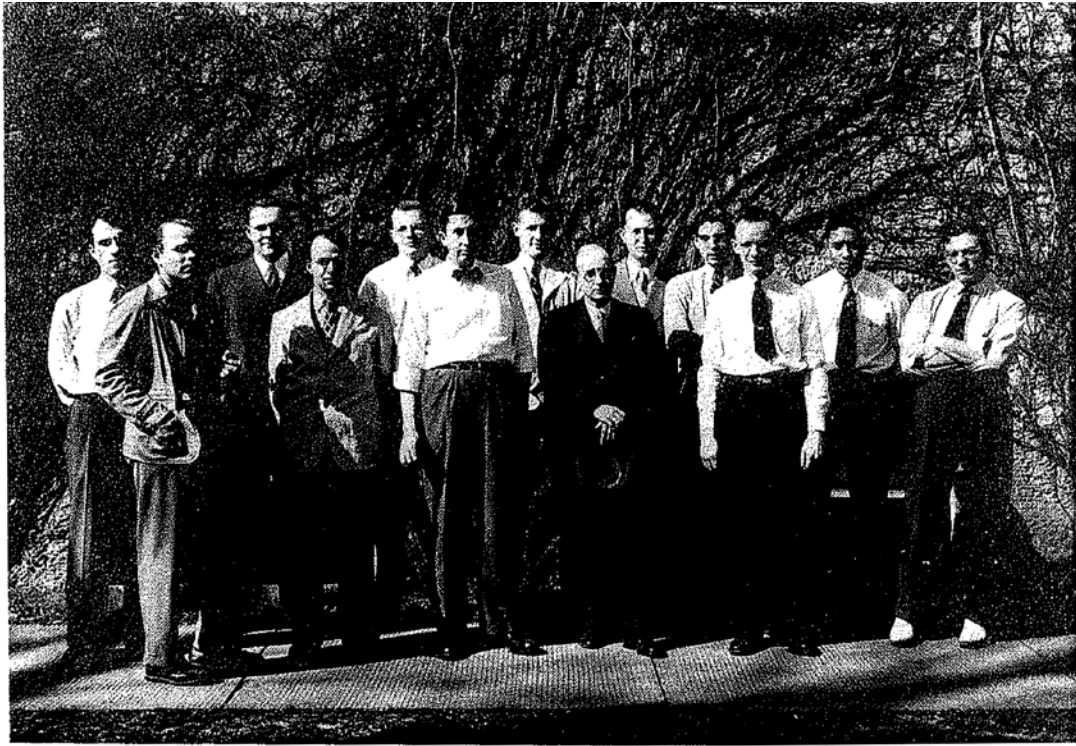
Susan Foster (BS 1975–Botany & Zoology) is a Professor of Biology and Chair of the Biology Department at Clark University. She is also president elect for the Animal Behavior Society and will take office in 2009–2010. □

David Hanson (PhD 1999) • David was recently promoted to Associate Professor at the University of New Mexico in Albuquerque. His research interests include the evolution of photosynthetic CO₂ concentrating mechanisms and the role of pyrenoids; the evolution of the photosynthetic enzyme Rubisco and of isoprene synthase; the physiological ecology of Sphagnum moss and general bryophyte biology; the molecular and whole plant physiology. David has 10 invited presentations and 8 publications to date. David teaches in a range of courses, including Molecular Techniques (the goal of this course is introduce protein expression, purification, and analysis to the standard genetic methods); Plant Stress Physiology (the goal of this course is to give students practical experience in developing a research project); Environmental Biophysics (the goal of this course is to familiarize students with important

concepts involving how organisms physically interact with their environment); Life After Grad School (the goal of this course is to provide personal experiences of Faculty, Academic Staff, Government & Industry positions, and PostDoc opportunities). David's dissertation title was "Ecological and Evolutionary Aspects of the Emission of Isoprene from Land Plants" under the guidance of **Tom Sharkey** and **Linda Graham**. □

James Henderson (MPH 1940; PhD 1943) • James is 91 and has many fond memories of his graduate study years at UW–Madison in Birge Hall. He was kind enough to send along a photo of the Wisconsin Gang in 1942 (opposite page, top) and a copy of his publication "Fifty Years as a Plant Physiologist." Dr Henderson's abstract follows verbatim:

"This chapter is a chronological and biographical sketch of the professional life of a botanist-plant physiologist. He just happens to be of African-American descent. He cites his early education and through college and graduate school, as well as his war years at the University of Chicago. His postdoc appointment at Caltech with James Bonner



THE WISCONSIN GANG OF 1942

FRONT ROW: 1 JOE WEYBREW, 2 ED BALL, 3 FRITZ STAUFFER, 4 B.M. DUGGAR, 5 GENE ELLIOTT, 6 ED SPOERL
 BACK ROW: 7 RENE BLONDEAU, 8 JOHN CURTIS, 9 MACK DUGGER, 10 GEORGE GRIES, 11 JOE KLOTZ, 12 JIM KUNTZ, 13 JIM HENDERSON

was really his professional beginning and highlight. Most of his teaching and research years were spent at Tuskegee University and the George Washington Carver Research Foundation. He spent several tours of research activity, in both the United States and foreign countries. His contact with plant physiologists was quite broad, both in the United States and overseas. Finally, in his senior years, he has turned to mentoring young students into careers in the biological and allied sciences."

This activity, he states, has "kept me young beyond my chronological age." One of the research tours occurred in the summer of 1950 when he accompanied **Emma Fiske** to Briancon, France, just after the 8th International Botanical Congress in Paris, to a mountain just into the border of Italy.

His PhD committee was composed of his major professor, **John F Stauffer**, Assistant Professor of Botany (plant physiology); **Norman C Fassett**, Associate Professor of Botany & Curator of Herbarium (taxonomy); **W. E. Tottingham**, his minor professor, Associate Professor of Biochemistry (plant biochemistry); **J. W. Williams**, Professor of Chemistry

(physical chemistry); and **B. M. Duggar**, Professor of Physiology and Applied Botany. His dissertation title was "The Growth of Tobacco Plants in Solution Culture Aerated with Air Containing Different Partial Pressures of CO₂." □

Robin Kimmerer (PhD 1983) • Robin is a Professor at SUNY-Syracuse in the Environmental & Forest Biology Department and is also the Director of the Center for Native Peoples. Her research involves the areas of Ecology of mosses; Restoration of culturally significant plants to Native American communities; Environmental partnerships with Native American communities; Traditional Ecological Knowledge; Disturbance ecology; and Recovery of epiphytic communities after commercial moss harvest in Oregon. Her teaching includes the following courses: General Botany (an introduction to plant biology); Disturbance Ecology (focuses on the role of natural and anthropogenic disturbance on the dynamics of Adirondack ecosystems); Ecology of Mosses (a study of taxonomic diversity, ecological adaptations and the roles of bryophytes in ecosystems); Land & Culture: Native American Perspectives on the Environment

(an integrative course which examines the management of natural resources and environmental problem-solving from a Native American perspective); Field Ethnobotany (seminar discussions on subjects of interest and importance in environmental and forest biology); and Traditional Ecological Knowledge. Robin published the book *Gathering Moss: A Natural and Cultural History of Mosses* that won the prestigious 2005 John Burroughs Medal for outstanding natural history writing. She has published more than 10 articles in major journals and the New York Times. Robin is very active professionally as well, as evidenced by these projects and programs: Director of Undergraduate Mentoring in Environmental Biology; Research Assistantships for minority high school students; Curriculum Development: Development of Traditional Ecological Knowledge curriculum for General Ecology classes; Chair, Traditional Ecological Knowledge Section, Ecological Society of America; and she is a member of the Advisory Board, SEEDS program. Robin's major professor at UW–Madison was Tim Allen; her minor was in Forestry. Her MS thesis title was "The Role of Disturbance in a Riparian Bryophyte Community." Her dissertation title was "Vegetation Development & Community Dynamics in a Dated Series of Abandoned Lead-Zinc Mines in SW Wisconsin." □

J. Chris Pires (PhD 2000) • Chris is an Assistant Professor at the University of Missouri-Columbia in the Biological Sciences Division. He was recently awarded the MU Outstanding Undergraduate Research Mentor Award in 2008. Chris completed postdoctoral positions at the Royal Botanic Gardens, Kew, United Kingdom and the Agronomy Department at UW–Madison before joining the University of Missouri–Columbia in 2005. His research experience broadly encompasses plant evolutionary biology—from phylogenetic studies in plant diversity to genomic approaches in gene expression. Current investigations are directed at the evolution and of polyploid plants. Polyploidy, the process of genome doubling that gives rise to organisms with multiple sets of chromosomes, is a major evolutionary force in both plants and animals. His leading conceptual questions pertain to the causes and consequences of genome doubling and the presence of novel features found in polyploids but not in their diploid relatives. Such evolutionary novelty could be a morphological innovation or the ability to adapt to a new ecological niche. Understanding the pattern of how such novelty might arise requires an understanding of the evolutionary history (phylogeny) of polyploidy plants and their diploid relatives. Answering these questions about polyploidy evolution requires not only phylogenetic theory but also genomic tools. □

The speed of science

Lace up your sneakers if you want to keep pace with Chris Pires. This rising star in life sciences research gets down and dirty with broccoli and Brussels sprouts and keeps a schedule that will make your head spin.

Story by Lisa Greshong
Photos by Rob Hill

Question: What is it like to be a junior faculty member, clawing your way up the scientific and academic ladder?

a. Exhilarating
b. Collaborative
c. Busy. Very, very busy.
If you answered "all of the above," you already know a little about Chris Pires, an assistant professor of biological sciences and an investigator in the Bond Life Sciences Center.

With his sneakers, cargo shorts and rumpaid plaid shirt, Pires could easily be mistaken for one of the graduate students huddled around the table of the Wednesday morning Phylogenetic Methods and Applications seminar he teaches with Ben Cosnett, associate professor of biological sciences.

But as Pires scribbles notes while the students debate methods of building evolutionary trees, it becomes obvious that he's a step or three ahead of them. He flips through articles such as "Maximum likelihood as an alternative to parsimony for inferring phylogeny using nucleotide sequence data" and helps them unravel threads of discussion.

Of course, teaching is only part of faculty life. More than half of Pires' time is devoted to his research on *Brassica*, the species that includes cabbage, cauliflower, broccoli, Brussels sprouts, kale and kohlrabi. Although Pires' plants sound like the fixings for a great stir-fry, there's no snacking on the study subjects. His lab's genetic modifica-

tions require that the plants get burnt to a sterile crisp after the research is done.

Pires came to Missouri as a co-investigator on a multimillion-dollar genomics grant. He is also the primary investigator of his own grant—an impressive accomplishment for a new faculty member, and one that speaks to the devotion he shows to grant writing, since only a tiny percentage of proposals get funded.

Add to that the service—committee work and the like—expected of all faculty and slivers of a personal life, and you end up with one busy guy.

Mentors like Karen Cone, professor of biological sciences and Pires' next-door neighbor, help him with the juggling. "What I feel I've done as a mentor to Chris," Cone says, "is help him put all the responsibilities of the job into perspective and try to help him formulate his priorities."

Question: According to the calendar that rules his days from 6 a.m. to 10 p.m., Pires can be found:

a. Cleaning his kitchen from 10 to 11 a.m. on Sunday
b. Balancing lab finances from 1 to 2 p.m. on Monday
c. Conducting lab meetings from 1:30 to 3:30 p.m. Wednesday
d. Preparing for class from 2 to 8 p.m. Monday

Answer: Yep, he's busy and organized. Pires has an elaborate weekly schedule taped to the cabinet above his computer,

along with a list charting the progress of the 40-odd academic papers he's working on. The schedule assigns chunks of every waking hour to anything from teaching classes to composing e-mail to having dinner with his wife, Kate Anderson. (She gets Wednesdays. On other weekdays, he eats on campus.)

Pires gets on the computer the minute Anderson gets in the shower in the morning, so he has regularly fired off his first e-mails before 8 a.m. He likes to catch colleagues in Europe and Korea before they leave work for the day.

Anderson says the scientific networking has a bonus: "You never know where you're going to end up," she says, remembering a night last summer when she found herself in a Korean bar singing karaoke with Pires' colleagues.

According to his schedule, Mondays from 6 to 8 a.m. find Pires in one of several greenhouses where his research plants grow. Lunch is slotted in, but Pires generally makes his food while sprinting down hallways.

Gym visits (Monday–Wednesday, 5 to 6 p.m.; Thursday 2 to 3 p.m.; Saturday 9 a.m. and Sunday at noon) are some of the few times students and colleagues can expect not to receive e-mails from him. (He hopes the Missouri Student Recreation Complex never gets built.)

"My laptop with wireless is the best thing and the worst thing that ever happened to me," he says. That sentiment is echoed by Anderson, a specialized services librarian for

"I like to walk when I want to think," says Chris Pires, assistant professor of biological sciences and an investigator in the Christopher S. Bond Life Sciences Center. With long legs and scholarly ambition, Pires makes it challenging to keep up.

WINTER 2008

Chris Pires seeks an evolutionary force

David Rogers (PhD 2006) • David received his PhD degree in 2006; his dissertation title was “Fifty-five Years of Change in Southern Wisconsin Forests: Patterns of Species Loss and Homogenization”. Since that time David has been a postdoctoral fellow in the Hotchkiss lab, spending several months in Hawaii. David received a Davis Summer Research Fellowship in 2003 and Davis Research Grants in 2002 and 2003. David has published several articles and given many professional talks. He recently accepted a position at UW–Parkside as an Assistant Professor in the Biological Sciences Department. His research interests include: Midwestern Plant Communities, Historical Ecology, Restoration Ecology and Conservation Biology. David joins another alum of the UW–Madison Botany Department; **Bryan Lewis**, (PhD 1997) who serves as the Assistant to the Dean and is the Pre-Health Advisor at UW–Parkside. □

Susan Carpenter (MS 1980; MS in C&I 1999) • Susan is a native plant gardener at the UW Arboretum. As quoted in a March 2007 profile, “one special aspect of working in the Arboretum now is remembering **Grant Cottam** (PhD 1948 in Botany & Zoology) and **Virginia Kline** (BS 1947 in Chemistry; MS 1975, PhD 1976 in Botany). They were grad school mentors who taught me so much about Wisconsin native plants and ecology. In my job now, I draw from and build on this knowledge every day.” □

Roland Dute (PhD 1976) • His major professor was **Ray Evert**. Roland’s thesis title “Sieve-Element Ontogeny in *Equisetum Hyemale*.” Roland has been a faculty member for 25 years at Auburn University in the College of Sciences & Mathematics, Biological Sciences department. He was one of two recipients of the Gerald & Emily Leischuck Endowed Presidential Award for Excellence in Teaching in 2007. Roland teaches freshman biology courses for majors and non-majors as well as advanced undergrad and grad courses. He advises undergrads in zoology and pre-vet medicine, and also mentors grad students. Roland stands apart from many other extremely talented teachers, mostly for his extra efforts to help students master complex subjects in terms that even non-majors can comprehend. A colleague wrote, “Roland’s expository speaking style is punctuated with matter-of-fact presentations of complex concepts and a conversational manner that allows students in large classes to think he is having a one-on-one conversation with each of them.” His current research involves plant anatomy, in particular wood structure. He is particularly interested in the construction and phylogeny of torus-bearing pit membranes. □

Kenneth Karsten (PhD/Minor in Chemistry 1939) • His major professor was **Benjamin M. Duggar**. Ken’s thesis title “Root Activity and The Oxygen Requirement in Relation to Soil Fertility” recently appeared on the internet. Ken met Dr. Duggar at the agricultural experiment station field trials. Ken then had a summer fellowship with Dr. Blakeslee on chemical stimulation of the ovary of *Datura* to stimulate embryo formation with fertilization. Next, he taught General Biology & Physiology at Brooklyn College. From there he moved on to do organic chemical work at Niagara Sprayer & Chemical Company; then transferred to Rohm & Haas to do applications, formulation and development of company products plus field and greenhouse screening of new chemical compounds for activity as plant disease fungicides. From there he moved to the RT Vanderbilt Company where he served in various capacities—organic chemical synthesis, development of plant application products for banana culture in greenhouse & Central America with cooperation from United Fruit Company, and to a lesser extent Standard Fruit Company. During this time Ken searched for chemical products for use in soaps and detergents. Ken is a Senior inventor (patents, foreign and USA)—Head & Shoulders Shampoo and ZNP Soap. Ken worked as Sales Manager at RTV for a number of years, was promoted to Vice President and Director of Research until his retirement, then part time in the Ad Department. Ken brought computer work to the department for use in their literature, price and product lists, etc. Now Ken grows bamboo in his Florida Bamboo Republic. □

Helen G. Koritz (MA 1948, PhD 1951) • “Thanks to **Dr. Skoog**, I spent a year as a post-doc at Cal Tech with **Frits Went**, a world known botanist. I worked in Belgium for a year (thanks to Dr. Went), then raised four children and returned to the Biology Department at a small Catholic college in the Bronx (College of Mount St. Vincent) until my retirement in 1993. Regards to anyone who remembers me.” □

Robert P. McIntosh (MS 1948, PhD 1950) • McIntosh is noted for his classic ecological research with **John Curtis**. Bob retired after teaching Ecology for 44 years at Notre Dame (and previously at Middlebury College and Vassar). His book *Background of Ecology* came out in 1985. For the past 32 years, Bob was also the editor of the journal *The American Midland Naturalist*. □

Joan W. McIntosh (MS 1947) • taught science in elementary schools and then switched to poetry. She has published 5 books to date. □

Eric Menges (PhD 1983) • Eric is now the Senior Research Biologist at the Archbold Biological Station located in Lake Placid, Florida. The Station is devoted to long-term ecological research and conservation and is funded principally by proceeds from an endowment founded by Richard Archbold. In addition to the 5,193-acre globally significant natural preserve, the Station also manages the MacArthur Agro-ecology Research Center (MAERC) (10,500 acres) at Buck Island Ranch and an adjacent reserve (3,648 acres). Eric's research focuses on the demography and life history of plant populations, effects of habitat fragmentation on genetic structure and ecological traits, modeling extinction probability and population viability, life history adaptations of scrub plants to fire, fire effects on plant population dynamics, restoration ecology, plant conservation, and the ecology of introductions. His study species include scrub balm (*Dicerandra frutescens*), wedge-leaved Eryngium (*Eryngium cuneifolium*), Highlands scrub hypericum (*Hypericum cumulicola*), Carter's mustard (*Warea carteri*), and several other rare plant species. Some of Eric's research projects also involve community dynamics in Florida sand pine scrub, and other upland plant communities, including the role of fire. □

Jeffery Morawetz (BS 2000) • Jeff received his PhD in 2007 from Ohio State University and is currently a postdoctoral fellow at the University of Michigan, working with **Paul Berry** (formerly from UW-Madison/Botany Dept) on a new NSF Planetary Biodiversity Inventories grant, along with **Riki Riina** (PhD 2006). Professor Berry is the Principal Investigator on the project ("EuphORBia: a global inventory of the spurge"), which aims to produce a worldwide virtual monograph of the genus by 2012, using modern bioinformatic tools, traditional field work and taxonomy, molecular phylogenetics, and floral developmental studies. *Euphorbia* contains over 2000 species and is distributed worldwide, but is most prominent in Africa, where many cactus-like succulents have evolved. □

Eric Singsaas (PhD 1997/Minor in Biochem) • After graduation Eric held a 4-month postdoctoral appointment with **Professor Thomas Sharkey** at UW-Madison/Botany Dept. From there he obtained a 2-year postdoctoral appointment at the University of Illinois-Urbana/Champaign in the Plant Biology Department. Next, he was an Assistant Research Scientist at the University of Michigan Biological Station. In September 2001 he became Assistant Professor at UW-Stevens Point Biology Department. Eric is a broadly trained plant

biologist interested in the function of plants across cell, organism, and ecosystem levels. His research focuses on the interchange of materials between plant and atmosphere, the mechanisms of plant functional acclimation to changing environments, and applications of plant physiological techniques and models for phytoremediation. Eric develops conceptual and mathematical foundations that allow him to ask relevant questions about plant function, test questions using elegant applications of modern techniques, and share enthusiasm for science with students of all levels. Eric was featured in an article in Wisconsin Technology in September 2007. □

Richard T. Ward (PhD 1954) • Ward's major professor was **John Curtis** and his dissertation focused on the Beech forests of Eastern Wisconsin. After graduation, his first appointment was in the Biology Department of Beloit College, 1954-57. Richard then moved to the Botany & Plant Pathology Department at Colorado State University, where he resurrected Plant Ecology course offerings for forestry students and advised graduate students who worked in alpine tundra and on ecotypic variation in native grasses of the western plains and mountain region. During his sabbatical in 1963-64, Richard conducted research in the southern Andes on above-timber plant life on Cerro Catedral (Bariloche) and a stand of *Nothofagus-Libocedrus*. Upon his return, Richard was appointed Acting Chair after clearly stating he was not interested in being a candidate for the regular position. It took a year and a half to persuade him to assume the regular Chair position, which he held until summer 1975.

Richard and Barbara have been married for over 50 years and have two children. Justin works with Conservation International and Patricia has a book in progress, *Living with a Legend*.

Among Ward's graduates are scientists who became faculty at Rutgers, the University of California-Davis, Oregon State University, and other prestigious schools. Richard wrote that, without question the experience at UW-Madison was challenging and very rewarding. □

Michelle L. Zjhra (PhD 1998) • Michelle's major professor was **Ken Sytsma** and her dissertation title was "Phylogenetics, Biogeography, and Pollination Ecology of Endemic Malagasy Coleeae (Bignoniaceae)." After graduation Michelle took a position in the Biology Department of Keene State College. In 2003 she moved to the Biology Department at Georgia Southern University, where she is now an Associate Professor. Researchers in her lab investigate ecological, evolutionary and developmental aspects of plant diversity,

with an emphasis on the role of pollination and dispersal. Her interests focus on three areas: first, phylogenetics (evolution, ecology, and taxonomy) of plants, especially Georgia natives, Madagascar endemics, and Old World Bignoniaceae; second, ecological, evolutionary and developmental aspects of floral traits involved in interactions with animals, specifically the evolution of floral syndromes and the evolution of cauliflory; and third, the origins and mechanisms of plant diversity. She uses a phylogenetic framework to address these questions at the interplay between development, evolution and ecology. Current projects include systematic and taxonomic treatments, the evolution of pollination and dispersal systems and their potential impact on patterns of forest diversity, the role of floral scent in the evolution of floral syndromes, and grafting and gene expression experiments to evaluate the genetic and developmental control of cauliflory. □

...IN MEMORIUM

Diana McQuarrie Cottam • Mrs. Grant Cottam passed away on August 1, 2007, at age 86 at Sebring Assisted Care Residence in Madison. Diana was born on May 29, 1921 in Salt Lake City Utah to Margaret Irving and Daniel McQuarrie. She married **Grant Cottam** on Easter Sunday in 1942. Diana and Grant were married for 65 years. She was active in many social justice and environmental causes over the years; she was a pacifist, a supporter of the Civil Rights movement, a lover of libraries, and was generous to many charitable and political organizations. She was active in the Democratic Party, a pioneer in the feminist movement, and a supporter of the arts, most notably the Unitarian Dance Fellowship. Diana is survived by her husband and 5 children. *Memorial gifts may be sent to the Friends of the Arboretum.* □

Timothy Dickson • Mr. Dickson died on May 1, 2008 at age 47. Timothy received a BS degree from UW–Madison in Botany in 1983 and a MS degree in Bacteriology in 1993. At the time of his death, Timothy was a research associate with Techne Corporation in Minneapolis. □

George Setterfield • Dr. Setterfield died on March 15, 2008, at age 79. George received his PhD degree from UW–Madison in Botany in 1954 under the guidance of **Professor Duncan**; his dissertation was titled “Quantitative cytological studies on the antimetabolic action of 2,6-diaminopurine in *Vicia faba* roots.” George was a professor of Biology at Carleton College until retiring in 1985 to Victoria, BC. □

Charles Allen (1872–1954) • National Academy Member Charles Elmer Allen was born on October 4, 1872, in Horicon, Wisconsin, to Attorney Charles and Eliza Allen. He married Genevieve Sylvester in 1902; they had three children. Charles joined UW–Madison in 1902 as an instructor; later became an assistant professor in 1904; advanced to associate professor in 1907 and then achieved full professor status in 1909. Charles retired in 1943 and had Emeritus status until his death in 1954. He received a BS degree in 1899; the thesis title was “The Origin & Nature of the So-Called Middle Lamella in Thickened Plant Cell Walls” under the guidance of **Charles R Barnes**. His PhD degree was completed in 1904; the dissertation title was “Nuclear & Cell Division in the Pollen-Mother-Cells of *Lilium canadense*” under the guidance of **Robert A Harper**. Charles received an honorary Doctor of Science degree from the University of Chicago in 1941. Among his many honors was a Carnegie Grant in 1904–05 at the University of Bonn, Germany; in March of 1905 he was at the Naples Marine Biological Lab; and in 1924 he was a visiting professor at Columbia University.

He served as Department Chair for the UW Botany Department from 1911–13 and 1914–1919; then was the Chairman of the Biology & Agriculture Division of the National Research Council from 1929–1930; was co-founder and 1st Editor of the Sphinx (first University Humor Magazine); Chairman of the 1899 Badger student year book; Editor-in-Chief 1899 of the student newspaper, The Daily Cardinal; and helped to found the Wisconsin Alumnus, for which he was Editor-in-Chief from 1899–1902. During his tenure at UW–Madison, Charles had 48 publications in 17 periodicals including 2 text books.

In 1915 Charles organized the Biological Division, which consisted of the Botany, Zoology, Plant Pathology, and Experimental Breeding (Genetics) departments. From 1918–1926 he served as the Editor-in-Chief of the American Journal of Botany. In April 1924 Charles was elected to the National Academy of Sciences. Professor Allen died on June 25, 1954, at age 82. Charles helped make the UW–Madison Botany Department one of the great centers of cytology in the United States. □

News from the Wisconsin State Herbarium (WIS)

Staff and collections update

The Herbarium staff continue their commitment to primary forms of botanical work: floristic and monographic research, curation, and education. We are also participating in the further development of the herbarium's databases and Wisconsin Vascular Plants web site (see below). **Ken Cameron** replaced **Paul Berry** as Director of the Herbarium in January 2008. **Ted Cochrane** continues to process specimens and labels, prepare loan returns and exchange shipments, pose and mount specimens, make identifications, and supervise student helpers. He is replacing deteriorated foam and unsatisfactory felt door seals on older cabinets with new felt stripping. **Mark Wetter** is upgrading and enhancing the databases and web sites, accessioning newly mounted specimens, sending and receiving loans, and filing. Most of our recent accessions are from Wisconsin plants, as we have been focused on processing the unmounted backlog of these specimens in connection with our databasing projects. Since 1994, and especially during 1999–2006, nearly 25,000 Wisconsin specimens were mounted. The vascular plant collection now totals more than 774,000 mounted sheets, about one-third of which are from Wisconsin. □

More than a quarter-million WIS specimen records are now online

Herbaria across the world have entered the modern digital age with great enthusiasm by making available over the internet a wealth of information held within their collections. The Wisconsin State Herbarium was among the earliest of academic institutions to begin serving data via the world wide web, and we made tremendous progress in a relatively short time. The Wisconsin Botanical Information System (WBIS) is an online database of information relating to specimens of plants, fungi, algae, and lichens from the entire state, including those that make up the collection of more than 1,065,000 specimens held within the Wisconsin State Herbarium.

Although the long-term goals of WBIS are to gather and enter specimen label information for all Wisconsin taxa, the vascular plants have been the focus of our initial data basing efforts. This project not only includes data from the large number of specimens housed at UW–Madison, but from specimen records at 24 other regional herbaria, agencies, and institutions.

This summer, thanks to the tireless efforts of Senior Curators Mark Wetter and Ted Cochrane,

together with an outstanding team of volunteers, work-study students, and information technology experts, including **Tom Maher** and **Merel Black**, we completed barcoding and label data entry for nearly every Wisconsin vascular plant specimen (>250,000) in the State Herbarium. These records represent about 77 families and over 2,600 native and naturalized taxa of vascular plants, including records from all of the plants listed on the Wisconsin Department of Natural Resources' Bureau of Endangered Resources Wisconsin Natural Heritage Working List as either extirpated, endangered, threatened, or of special concern. In addition to the quarter-million records entered by WIS, our partner herbaria contributed well over 87,000 specimen records, setting the total number of available Wisconsin vascular plant specimen records at more than 337,000.

In addition to our specimen databasing efforts we also developed our WisFlora website to access information on each species of vascular plant in the state. For each taxon we provide its currently accepted scientific name, as well as any synonyms, common names, status (native, non-native, etc.), photographs (when available), distribution maps, and other misc. data. To access these data, search records, view images, or see distribution maps, please visit the Herbarium's (WisFlora) **website at <http://www.botany.wisc.edu/herbarium/>** □

Herbarium begins digitizing its entire 'type' specimen collection

Through a generous grant from the Andrew W. Mellon Foundation, the Wisconsin State Herbarium is set to launch an ambitious two-year campaign to fully barcode, database, and create detailed digital images of its entire collection of 'type' specimens. The grant will provide for the acquisition of a suite of high resolution, state-of-the art scanners, computers, storage devices, training for the use of this equipment, travel expenses for staff to attend annual workshops, and a two-year graduate student assistantship.

As defined by the International Code of Botanical Nomenclature, "a type (typus) is that element to which the name of a taxon is permanently attached". For example, a holotype is usually a single specimen that was clearly designated in the original description of a taxon to represent that taxon. Other types of types (yes, it can be a bit confusing) include syntypes, which are two or more specimens listed in a species description where a holotype was not

designated; lectotypes, which are specimens later selected to serve as the single type specimen for species originally described from a set of syntypes; neotypes, which are specimens later selected to serve as the single type specimen when an original holotype has been lost or destroyed; etc. Although a complete inventory has never been made, we estimate that the Herbarium holds approximately 4,500 types, more than half of which represent Latin American flowering plant species. These will be targeted for Phase I digitization, so that the resulting data and images can be incorporated into the greater Latin American Plants Initiative, an international partnership of herbaria that are creating a standardized library of type information and images for all plants of the Neotropics. <http://aluka.ithaka.org/plants/lapi.html> □

Recent gift of historic specimens

To the average person, a specimen is probably of little value. To the field botanist who covers the gas, food, insect repellent, and time to locate, collect, identify, press, label, mount, and file that specimen, the value is substantial. To a select subset of antique collectors, however, certain herbarium sheets become priceless. Their handwritten labels, which can be quite attractive, are sometimes framed and sold as decorative pieces of art.

Several months ago Dr. Cameron learned that a collection of some 400 herbarium specimens was for sale at an online auction site, eBay. The seller had found the sheets in his attic in Superior, Wisconsin. The labels indicated they were the private collection of A. C. Merryman, mostly collected between 1898–1910 near Milwaukee and across northwestern Wisconsin and others from Freeport, Maine. A preliminary investigation revealed that this private collection is likely that of Mr. Andrew Curtis Merryman (born 1831 in Bowdoin, Maine), who was a giant of the late 19th Century Wisconsin lumber industry.

The Herbarium did everything it could to acquire this unique collection and keep the historical specimens in Wisconsin, but bidding escalated beyond reach. At the last minute, however, a kind-hearted gentleman from Buffalo, New York (retired school teacher and devoted naturalist Mr. James Battaglia), placed the winning bid and donated the entire collection to Madison!

The preservation of most of these specimens is outstanding. Among them are various common wildflowers such as *Viola*, *Aquilegia*, and *Claytonia*, but also rarities like American ginseng (*Panax quinquefolius*). Many of the plants were identified by names that are no longer in use today (e.g.,



Blephariglotis for the orchid genus *Platanthera*), but each provides a glimpse into a world that has changed so since they were pressed 100 years ago. We are truly grateful to Mr. Battaglia for his generosity and support of the Wisconsin State Herbarium.

If you would like to make a contribution to the endowment or collection of the Herbarium, please contact Dr. Cameron (kmcameron@wisc.edu) or anyone in the Department of Botany. □

Herbarium Library gets a makeover

If you have not visited the Herbarium (Birge Hall, Room 160) recently, please stop by to see the significant changes that were made in recent years. All of our vascular plant specimens are now stored in standard metal herbarium cabinets, either on our space-saving compactor systems or within free-standing cabinets along the walls. In addition, the old student office (Room 161) was removed to make space for a new compactor system dedicated

to the Herbarium's Library (formerly in Room 155). The sizeable collection of books, reprints, and journals had reached a point of saturation in the old Herbarium Library. With boxes of material waiting to be filed, the aisles and window wells were blocked. Because the floor could not support a full suite of compactors, a new system was installed in the newer part of the Herbarium.

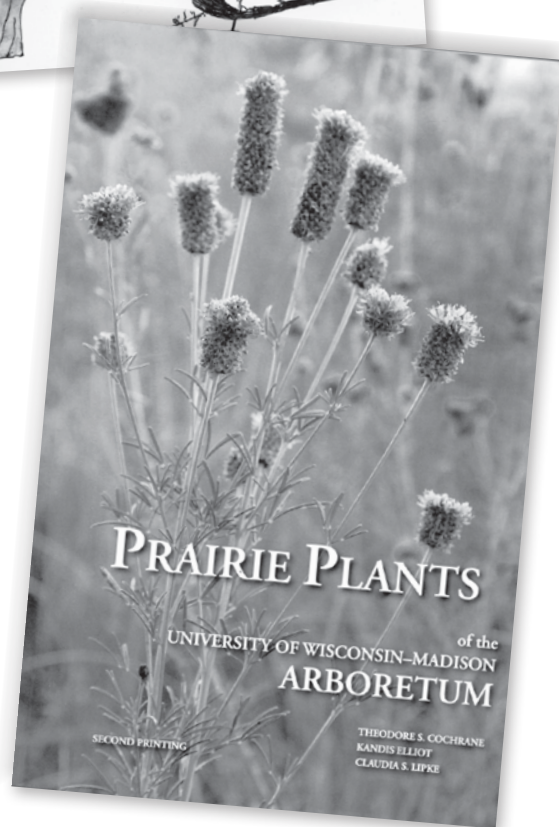
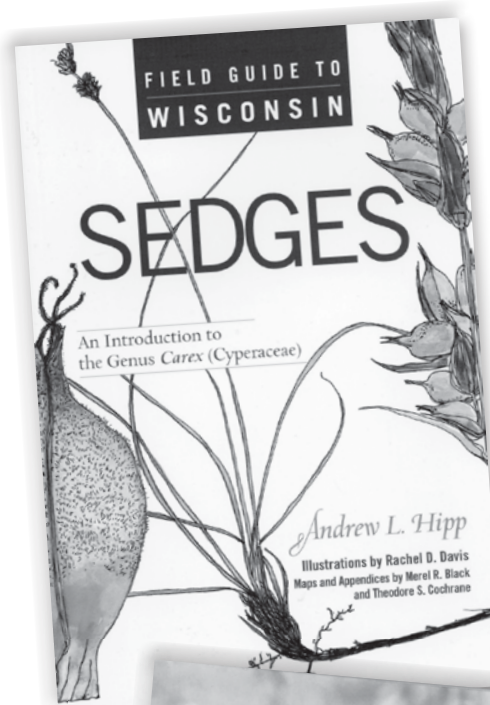
Our modern compactor system not only houses the above library resources, it provides room for future growth. The Herbarium Library is estimated to hold over 7,000 bound volumes (including various floras, monographs, ecological studies, etc.) and over 130,000 reprints. These resources and those of the Biology Library (Birge Hall, Room B164) are well used by staff, students, faculty in Botany, researchers across campus, and visitors. □

Books of Interest

Field Guide to Wisconsin Sedges: An Introduction to the Genus Carex (Cyperaceae) (2008; paperback, cloth), by **Andrew L. Hipp** (author), Rachel D. Davis (illustrator), Theodore S. Cochrane (contributor), and Merel R. Black (contributor), was recently published by the University of Wisconsin Press in collaboration with the University of Wisconsin Arboretum and the University of Wisconsin–Madison Department of Botany. Andrew is now the Herbarium Curator at the Morton Arboretum, Lisle, IL, but he carried out the research for *Field Guide to Wisconsin Sedges* while a doctoral student in Botany. The 6 × 9-inch, 280-page book, is a beautifully illustrated introduction to the largest sedge genus, *Carex*. It is primarily an identification guide for naturalists, wild plant enthusiasts, restorationists, landscapers, and gardeners. Part I provides keys to and brief descriptions of the 157 species inhabiting Wisconsin; Part II presents expanded descriptions, habitat information, and notes on similar species for about 60 of the state's more common species.

Prairie Plants of the University of Wisconsin-Madison Arboretum (2006; paperback), by Theodore S. Cochrane, **Kandis Elliot**, and **Claudia S. Lipke**, was a tremendous success, and our supply was exhausted within a year and a half of publication. This colorful handbook of Midwestern prairie plants describes and illustrates with color photographs more than 360 native and introduced species that grow and bloom on the Arboretum prairies. A second printing featuring a new index separating common names from species names was completed and made available in late summer 2008.

Both books are available at the Arboretum Book Store. <http://uwarboretum.org/bookstore/> □



Research News

MONOCOT EVOLUTION IS FOCUS OF NEW RESEARCH...

Tom Givnish, Henry Allan Gleason Professor of Botany, is the lead investigator on a major new effort to document the evolution of the economically most important group of plants on Earth – the monocots – supported by a grant of nearly \$2.9M by the National Science Foundation under its Assembling the Tree of Life (AToL) Program.

Monocots (including grasses, sedges, palms, ginger, bananas, orchids, onions, yams, pondweeds, and philodendrons) comprise more than 65,000 species of flowering plants, occur in almost all habitats on Earth, and provide the basis for the great majority of the human diet. Monocots also account for much of the commerce in cut flowers and horticultural bulbs, such as crocuses, irises, hyacinths, tulips, and lilies. They dominate grasslands, seagrass beds, bamboo thickets, many wetlands, and are especially common on extremely infertile soils.

A consortium of investigators at seven North American institutions (including Cornell, New York Botanical Garden, Penn State, University of British Columbia, University of Georgia, University of Missouri, and University of Wisconsin–Madison and more than 30 collaborators worldwide) plan to use a revolutionary approach to develop a definitive family tree for the monocots over the next five years and use it to infer relationships among different groups and their evolutionary history across the globe.

For the first time, hundreds of whole chloroplast genomes (the circles of DNA inside the green organelles that conduct photosynthesis) will be sequenced and analyzed. Almost all previous studies using DNA to infer plant relationships have relied on sequences of only one or a few genes or spacers between genes. The new AToL approach will provide sequences for more than 100 chloroplast genes and, in many cases, the spacers between them, providing an avalanche of new data with which to assess evolutionary relationships.

Sequencing the plastomes should also provide (at almost no additional cost) the sequences of all genes in the mitochondria. The AToL team also plans to sequence transcriptomes (i.e., the entire complement of RNA expressed from DNA) from the young leaves of several dozen monocots. For each species, the transcriptome sequences will provide information on thousands of nuclear genes. The unparalleled amount of genetic information from all three plant genomes should provide the most powerful analysis of

relationships among any group of organisms studied to date. The monocot investigation is the first large-scale study to take advantage of the twin revolutions in sequencing technology and computer DNA analysis that have occurred in the last three years, making their phylogenomic approach possible. **Cecile Ané**, a leading expert on computer and statistical analyses of family trees based on complex data sets, is co-principal investigator with Givnish at the University of Wisconsin–Madison. □

ROBOTIC CAMERA TO SPY ON MUTATED PLANTS...

The National Science Foundation awarded \$567,885 to an interdisciplinary team of UW–Madison researchers for plant genome research. The team is led by **Edgar Spalding** of Botany, Amir Assadi of Mathematics, and Nicola Ferrier of Mechanical Engineering. A robotic machine-vision platform will be developed for discovering phenotypes, or different gene expressions, in mutated plants. The team will use hardware, algorithms, and data management to screen root growth and gravitropism in certain mutant and recombinant lines of *Arabidopsis*; a relative of canola. The resulting data will be available to other researchers in biology, computer science, engineering, and mathematics to aid in improving techniques and tools.

The Phytomorph Project will use the camera-controlling robot to analyze root and shoot growth in a variety of conditions. Until now, the lab has relied on about a dozen cameras to image seedlings over several hours as they respond to light and gravity. Using algorithms designed to extract features including growth rate and curvature, they have been able to discern differences in growth between wild type seedlings and seedlings that have a gene “knocked-out,” thus providing evidence for the function of the missing gene as it relates to seedling growth and development. With around 20,000 genes in the model plant *Arabidopsis thaliana* genome, and about 40% of those genes having no known function, there is great potential for discovering more genes involved in early seedling growth.

Imaging a few seedlings at a time per camera results in very slow data acquisition, so the team worked with Ram Subramanian, a graduate student in the Department of Mechanical Engineering, to design a three-axis robot that can move a camera around

a grid of seedling samples, imaging each one in sequence, then repeat the process for additional time points. In this design, 36 different experiments can occur at once using a single camera. In addition to identifying new genes involved in seedling growth, the Spalding lab will share their algorithms with others in

the plant community to help foster rapid discoveries and advance the state of the field.

To learn more about the Phytomorph project, as well as view video footage of the robot being tested, visit <http://phytomorph.wisc.edu/phytomorph.htm> □



The robot “in prep.”

“Titan Two” bloomed for the third time this August. Offspring of our first *Amorphophallus titanum* bloom (“Big Bucky,” 2001) are currently blooming in many areas of the world, realizing our hope of reestablishing populations of this threatened botanical wonder.



Awards

Tim Allen was elected President of the International Society for the Systems Sciences (ISSS) (congratulations, Tim!). There are some big shoes to fill there. Previous Presidents were Margaret Mead, Nobel Laureate Ilya Prigogine, noted for his work on emergent order in chemistry, and the economist Ken Boulding. All Tim's systems heroes have held the ISSS Presidency (Rosen, Pattee, Bateson, Rappoport, Ashby and many others).

The ISSS held its very successful Annual Meeting in Madison where formal sessions were varied, the Memorial Union was a great venue, and the Terrace was wonderful for informal discussions. Because the meeting was in Madison, it showcased talent from across campus. Steve Carpenter from the Lake Lab, and John Foley from SAGE gave great plenary talks, and campus system psychology and neuroscience were represented. Tim Allen's students made presentations on both their work and on how the lab works. **Devon Wixon**, Tim's Botany student, unanimously won the Vickers Award for best student paper. She showed how soft systems approaches are needed to work out a good narrative for what happens to soil microbes under global warming. No one knows whether global warming will increase CO₂ out gassing from soils or the opposite, and a systems approach is crucial to getting everyone on the same page in an area of study that Tim describes as "a mess." The Pig Roast at Tim's house was also a great occasion. In 2009, Tim will preside over the annual meeting on "Making livable sustainable systems unremarkable" to be held in Brisbane, Australia. □

Edgar Spalding was one of ten mid-career L&S faculty members honored with selection to the first cohort of Hamel Faculty Fellows. Each Fellow receives \$10,000 per year for 5 years to support scholarly activities. Edgar used his first award allotment to ensure all members of the Botany Department had no-cost access to the Plant Imaging Center (www.botany.wisc.edu/PIC) that he and the late **Tony Bleecker** established on the B1 level of Birge Hall in 2005 (Thank you, Edgar!). The expensive service contracts for the modern confocal and electron microscopes in the PIC are necessarily paid for by users, but Edgar wanted to make the equipment more easily accessible to all members of the department who wanted to explore without any student or professor worrying about whether the cost could be justified or covered by a grant.

Edgar's extra contribution of \$10,000 went a long way to meeting this year's needs, but at least three times as much had to be raised from additional sources. Edgar hopes to raise additional support for the Plant Imaging Center from alumni and friends of Botany. He is dedicating his 2008–09 Faculty Fellow award of \$10,000 to match new gifts to the **Anthony B. Bleecker Memorial Fund**, which is used by the Botany Department to support the campus Plant Imaging Center. To contribute, please use the form at the back of this newsletter or give online through the UW Foundation's secure server at <http://www.botany.wisc.edu/giftgiving> (designate your gift to the Bleecker Fund, #12164180). Your gift will both honor the work of Tony Bleecker and provide the PIC access that is so important to the work of Botany faculty and students.

Eve Emshwiller is the current President-Elect of the Society for Economic Botany, which is the premier ethnobotanical society in the USA and beyond. She will serve one year as President-Elect, one year as President, and one year as Past-President, each of these having specific roles on the Executive Council of the society. □

Graduate student awards (Congratulations!)

Vilas awards were given to **Shelley Crausbay**, **Rachel Jabaily**, and **Ru Zhang**. **Stephanie Lyon** received a 3-year NSF grant. **Rachel Jabaily** was named a 2008 Graduate Student Mentor award, **Robert Wernerehl** received a Hertel award, **Jane Bradbury** received the Eldon Newcomb TA Award; **Brent Berger** received the UW–Madison Early Excellence in Teaching Award; a John J Davis Summer Research Fellowship was awarded to **Bryan Drew** and **Evelyn Williams**. John J Davis Research Grants were awarded to **Brent Berger**, **Emily Butler**, **Bryan Drew**, **Sarah Gallagher**, **Andrew Gardner**, **Ben Grady**, **Michelle Haynes**, **Katie Konchar**, **Brian Walsh**, and **Evelyn Williams**. The following students received a Kenneth Raper Travel Grant: **Ben Adamczyk**, **Emily Butler**, **Philip Gonsiska**, **Beth Lawrence**. □

Undergraduate student awards (Congratulations!)

Jennifer Jackowski had the Highest GPA in Botany; **John Beirne** was selected for the Folke Skoog Award; **Peter Grande** received a Frits Went Plant Biology Award, and **Thomas Kleist** received the Theodore Herfurth Scholarship. □

Of Interest to All

The Arboretum will soon be 75 years old!

In 2009, the Arboretum will celebrate its 75th anniversary with a variety of special events. In the first of these, **Joy Zedler** will offer the graduate Plant Ecology Seminar (Bot 950, spring 2009) to students interested in looking back over the past 75 years to review how the science of Restoration Ecology developed and forward to the next 75 years to recommend how the field should progress to tackle challenges such as climate change and increased urbanization. A dozen guest speakers will join the seminar in person or as “virtual visitors” using electronic connections.

Watch the Arboretum web site for notices of additional activities for broader audiences during 2009 and 2010: <http://uwarboretum.org>. □

Biking to work is the ultimate green...

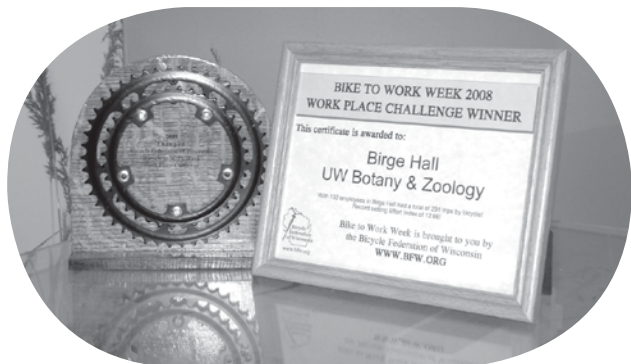
You need to get from point A to point B. What is the cleanest, most efficient way? The “greenest” form of transportation ever invented is the bicycle! The Bicycle Federation of Wisconsin celebrated the annual Bike to Work Week the first week in May. A friendly competition among businesses and organization in the Madison area asks who can get the most employees/members to bicycle commute to work during that week? Scores are “normalized” using a complicated formula (including a square root!) to arrive at an “effort index”. Competition is fierce, because Madison is a BIG bicycling community, with the world head quarters of Schwinn, Mongoos, GT (and Trek nearby in Waterloo). Thus, it was amazing that, for the second year in a row, Birge Hall won the contest! Yup, the Zo and Bot cyclists in Birge Hall take their “green” seriously and are happy to display their trophy in the beautiful Birge Hall lobby. □

Educational Posters for Everyone

Botany Art and Photo staff Kandis Elliot and Claudia Lipke, in collaboration with Greenhouses and Garden Director Dr. Mo Fayyaz, have prepared six educational posters showcasing the beauty of botany. Each poster offers an introduction to a botanical subject, such as flower anatomy, fruit types, pollination and pollinators. Information was checked for accuracy by our faculty. In all, ten posters are planned for this series.

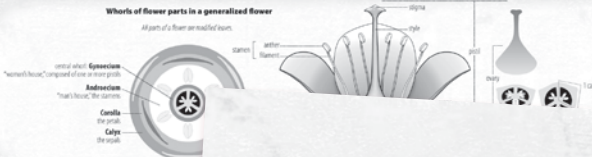
The posters, designed for a wide audience from middle school on up, provide introductory information for college instructors, greenhouse managers, school teachers and anyone involved in plant sciences or just likes “botanizing.” The posters’ striking illustration and photos always catch students’ attention, resulting in “self-training” botany sessions, whether in the classroom or on the kitchen wall!

This project is an outreach effort that combines knowledge and skills uniquely amassed in UW–Botany personnel. Posters are printed one at a time in the Art and Photo lab, using archival inks on 24" × 36" heavy premium luster paper; sale funds go to support the Greenhouses and Garden, and the Art and Photo lab’s outreach projects. To see full-color images of posters offered to date, visit <http://www.botany.wisc.edu/art/pages/posters.html> □

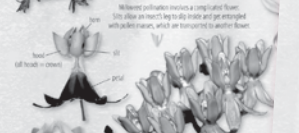
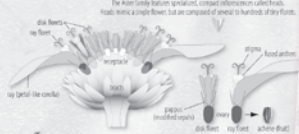


Specializations in Flowers

Flower parts are modified in many ways, from simple variations to highly complex forms in which the various parts may be difficult to identify.



Petalis, sepals, and stamens are given special names and often characters



Educational Posters produced by and in the Botany Department.

Carnivorous Plants

Carnivorous plants are denizens of sunny, warm, locations marked by a short supply of available nutrients. These mostly herbaceous perennials may be bog or rock dwellers, or epiphytes with access to little or no soil.



Classification of Fruits

A fruit derived from **ONE FLOWER** with **ONE OVARY** is called a **SIMPLE FRUIT**. A fruit derived from **ONE INFLORESCENCE** with **MORE THAN ONE OVARY** is called an **AGGREGATE FRUIT**. A fruit derived from **MORE THAN ONE FLOWER** is called a **MULTIPLE FRUIT**.

FLESHY fruits may develop from the ovary walls or other parts of the flower.

- Drupe**: has one seed, enclosed in "stone" (the hardened endosperm, or inner ovary wall); drupelet may be applied to fruit of aggregate or multiple fruits.
- Berry**: has several seeds; berry can be, but is not a "true" berry (i.e., the ovary).
- pepo**: from an inferior ovary, has a fleshy pericarp.
- hesperidium**: has a fleshy rind containing secretory glands; hesperidium seed where the guava "apple" (guava) fruit.
- Aggregate**: develops from one flower and each develops into a fruitlet; accessory fruitlets enclosed in a structure not derived from any ovary.
- Nip**: fruitlets enclosed in a separate or separate structure.
- Multiple**: from an inferior ovary, has a fleshy pericarp; multiple fruitlets enclosed in a structure not derived from any ovary.
- Syconium**: seed enclosed in a fleshy "cup" (pericarp).

DRY AND DEHISCENT fruits open to show seeds.

- Capsule**: pod derived from two or more carpels; type opens in a variety of ways, depending on species.
- Follicle**: fruit (pod) derived from one carpel.
- Legume**: pod derived from one carpel; pod opens along two seams.
- Samaroid**: fruit wing.
- Schizocarp**: divided fruit that may or may not be dehiscent; each fruit part (mericarp) may be dehiscent or indehiscent.
- Silique**: capsule of the mustard family (Brassicaceae); a fruit wall (silicle) that splits away from a stalk (siliqua) covering ovary.
- Silicle**: inner silique.
- Caryopsis and Nut**: one seed, enclosed in a hard fruit wall.
- Achene**: "seed" in a "husk"; one seed, but not truly enclosed in a hard fruit wall.
- Samaroid**: fruit wing.
- Cypselia**: achene of the Aster family (Asteraceae); fruit or other woody, often with a pappus (lightweight "parachute").
- Utricle**: "seed" in a "husk"; the achene wall is inflated.
- Caryopsis or grain**: fruit of a grass.

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Donate to the Department of Botany...

Each year, we face a bigger gap between our needs and the budget provided by the University and, ultimately, by the state government and student tuition. Our existing endowments, provided by the extraordinary generosity of past alumni and alumnae, help greatly, and yet the department lags behind the inexorable increases in costs.

We therefore are announcing a new initiative, coordinated by the Botany Finance Committee, to seek donations to cover some quite pressing ongoing costs and, where possible, to encourage our many friends to consider donations that would add materially to long-term support of the department.

Our current endowments are extremely important in supporting students. For example, each year the **Davis Fund** helps support summer research by roughly eight graduate students in ecology and systematics, including a few stipends that allow students to complete their dissertations when no other funds are available. The **Newcomb Fund**, just initiated, allowed two of our graduate students to conduct PhD research in Australia and Mexico this past summer. The **Allen Fund** provides a year-long fellowship, every other year, to an outstanding senior graduate student in the department. The **Raper Fund** helps about four students per year attend national or international professional meetings. Finally, the Department of Botany **General Fund** provides flexible support to meet unforeseen needs and take advantage of special opportunities. We are extremely grateful for this support and for many, many good results that it underwrites, especially the fine work of our students.

But the sad fact is that there are many pressing needs that neither our existing endowments, nor our UW budget, can cover. For example, it is increasingly difficult to fund our departmental colloquium, our

graduate field trips to the southern Appalachians and our undergraduate field trips to the tropics. Even small donations make a big contribution to covering these and other needs.

To make a donation to the Department of Botany, please peruse the following pages that list various opportunities for gifting. You will also find this information at

<http://www.botany.wisc.edu/giftgiving/>

You may also directly contact our Department Administrator Barbara Erlenborn (bjerlenb@wisc.edu) or Finance Committee chair Tom Givnish (givnish@wisc.edu).

Whether your gift is large or small, your help will make a huge difference and be deeply appreciated by the department and our students. □

MOVING THE *ALUMNI NEWSLETTER* TO THE 21ST CENTURY

Under consideration is the possibility of moving the Alumni Newsletter from a paper output to an electronic version. Doing so would result in ecological and financial savings.

A question to our readers is “What are your thoughts concerning a change to an electronic version of the Department of Botany Alumni Newsletter?”

Please send your response to Sue Bader, via email (smbader@wisc.edu) or via mail (Department of Botany, University of Wisconsin, 430 Lincoln Drive, Madison WI 53706). So that we can be prepared for a shift to email, if the alumni/alumnae approve, we would also greatly appreciate receiving your email at this time. Needless to say, we will not share your email address with any outside individual or group.

University of Wisconsin–Madison

Department of
BOTANY



DEPARTMENT OF BOTANY ANNUAL FUND DRIVE

PLEASE ACCEPT MY CONTRIBUTION IN THE AMOUNT OF \$ _____ (ENCLOSED)
WHICH IS DESIGNATED FOR:

UW Foundation Accounts (Department of Botany)

- DEPARTMENT OF BOTANY GENERAL FUND—serves as the department’s “general” account.
- BOTANY GREENHOUSE/GARDEN EXPANSION FUND
- E. K. AND O. N. ALLEN HERBARIUM FUND—supports varied activities of the UW Herbarium.
- O. N. ALLEN GRADUATE FELLOWSHIP—provides a fellowship for an outstanding graduate student.
- MCCULLOUGH FUND—used at the Chair’s discretion, primarily for faculty and academic staff development.
- CURTIS FUND—provides an award for the best Ecology undergraduate student paper.
- RAPER FUND—provides funds to enable graduate students to travel to meetings.
- JUDITH CROXDALE FUND—memorial fund to support women beginning research careers.
- FOLKE SKOOG FUND—memorial fund to support Dr. Skoog’s research and teaching initiatives.
- BLEECKER FUND—memorial fund for Plant Imaging Facility.

For donations to the above funds, please make checks payable to UW Foundation and send to: US Bank Lockbox, P.O. Box 78807, Milwaukee WI 53278-0807.

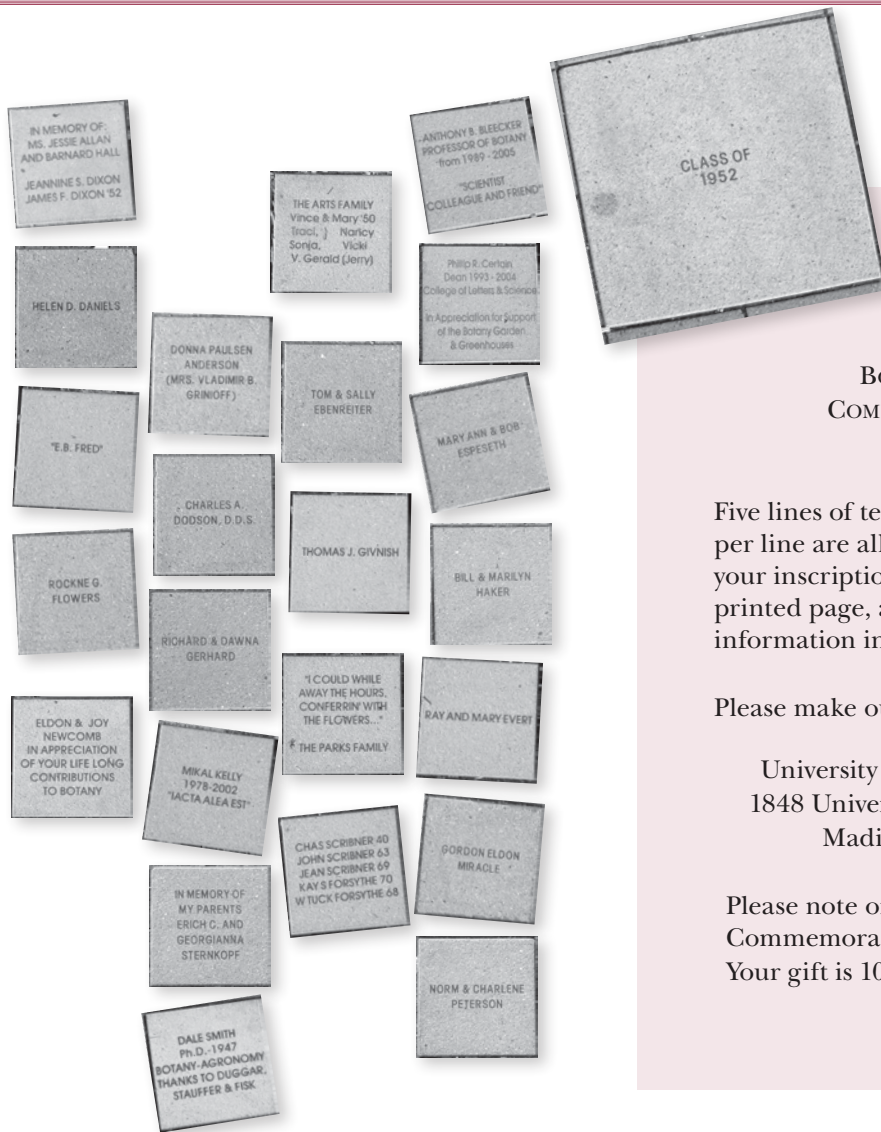
Trust Funds—UW Board of Regents (Department of Botany)

- PAUL J. ALLEN MEMORIAL LECTURE—supports a lecture by an eminent scientist in the Botany Colloquium series.
- JOHN J. DAVIS FUND—supports research activities of the department, including graduate student fellowships, travel support, and funds to provide speakers for the Botany Colloquium series.

For donations to these two funds, please make checks payable to the University of Wisconsin and send to:

Chairman
Department of Botany
University of Wisconsin-Madison
430 Lincoln Drive
Madison WI 53706-1381

All contributions are tax deductible; many corporations have a matching grants program.



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Five lines of text with 16 characters per line are allowed. Please provide your inscription on a typed or neatly printed page, along with your contact information in case we have questions.

Please make out check to:
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Please note on check: "For Botany
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Additional ways to "Gift" UW–Madison, Department of Botany

- a) **Visit the Botany Gift Giving webpage.** www.botany.wisc.edu/giftgiving/
- b) **Credit card gifts by phone.** Please call (608) 263-4545 or (800) 443-6162.
- c) **Payroll deduction for UW–Madison staff.** Please call 608-263-4545 or 800-443-6162. A "Payroll Deduction Form" will be sent to you for completion. Complete the form and return to UW Foundation. The Foundation will forward the form to UW Payroll.
- d) **Pledge.** This can be done over the phone, or (if it's a large sum) UWF will send a personalized pledge document.
- e) **Checks** are always gladly accepted. Checks should be made payable to UW Foundation and sent to US Bank Lockbox, P.O. Box 78807, Milwaukee, WI, 53278-0807. Please write "Department of Botany" in memo area.

ADDRESS CORRECTION AND ALUMNI NEWS

Please use this form to update our information on your activities for use in the next issue of the newsletter. Feel free to send news clippings, articles about yourself, etc. for your permanent file. Be sure to keep us informed of address changes so that we can continue to send you mailings from the department. You can also send us update information via email to: smbader@wisc.edu.

Sue Bader
Department of Botany
University of Wisconsin-Madison
430 Lincoln Drive
Madison, WI 53706-1381

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Please tell us what you've been up to since graduation and any special items you'd like to share in the next newsletter. We'd also be interested in any thoughts you have about your educational experience here. Attach extra pages as necessary. PHOTOS WELCOME!



THE UNIVERSITY
of
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This newsletter is published by the Department of Botany at the University of Wisconsin, Madison, for alumni, colleagues and friends. Dr. Joy Zedler and Suzanne Bader, editors; Kandis Elliot, art and layout; Claudia Lipke, photos. Submissions are welcome. Please send comments, ideas, and photos to:

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