

2012 Botany alumni newsletter

THE BOTANY TREE - LETTER FROM THE CHAIR



Trees grow by accretion, accumulating resources while shedding, or absorbing, old parts. Trees gain strength as they age, in part by converting sap- to heartwood. The Botany Tree grew similarly in 2012. New students and staff renewed our canopy, drawing on the sun, rain, and nutrients from our base funding, grants, and a few key gifts. Others departed, and some retain a strengthening role even while shedding job responsibilities.

A point of vigorous growth was **Marisa Otegui's** leadership in obtaining a 3-D tomographic electron microscope, flushing out new opportunities for researchers across campus and complementing our Plant Imaging Center. **Edgar Spalding's** lab also branched out to build new robotic hardware to automate imaging for efficiently analyzing growth in large numbers of plant seedlings. Somehow, they maintained these efforts working out of the former Biology Library refugium while their old lab space became a war zone of construction. They were happy to recolonize beautifully renovated lab space demonstrating that we are getting a new building after all - one lab at a time.

The **WIS Herbarium** is now extending its roots downward into the former library, a space well-suited for those specimen-filled cabinets that have extended like grey tendrils along the halls of Birge. In exchange, rooms vacated in the east end of old Birge are now poised to morph into an advising office and a seminar / reading room. We also plan to replace our aging growth chambers, reducing the incidence of baked plants and hope to keep our -80° freezers cool and secure in a dedicated basement room. Like branches sharing a trunk, we now share many facilities.

Anastomoses are also evident between systematists and ecologists in our collaborative "Dimensions of Biodiversity" project. That maps data on plant functional traits onto phylogenies constructed from new sequence data to explore how traits and patterns of population genetic variation affect plant responses to habitat fragmentation, climate change, and other forces. This work capitalizes on resurveys of vegetation originally surveyed by **J.T. Curtis** and colleagues in the 50s.

Speaking of trees, even while serving as Chair of Botany, **David Baum** (is there a German pun here?) managed to complete his book with Botany Ph.D. **Stacey Smith** on *Tree Thinking: An introduction to phylogenetic biology* (Roberts & Co. Publishers, 2012). Our strength in phylogenetic methods is exemplified by this book and the work of **Cecile Ané** on reconstructing trees in the presence of complex genetic transmission and that of **Bret Larget** on quicker methods to analyze large trees. Without pausing for breath, Baum continues as Chair of the **James Crow** Evolution Institute (honoring a friend we lost this year) and became

Assistant Director for Students for the Wisconsin Institute for Discovery.

An unexpected gust over the summer carried away a key branch when **David Bogen**, our skilled IT specialist, accepted an outside offer. We wish him the best and hope to graft a new twig soon. Our longest-serving branch - **Ted Cochran** - retired in December. We welcome his shift to heartwood status. And a rumor holds that **Susan Will-Wolf** may soon shed the Ecology 460 lab half of her job to focus fully on lichen research.

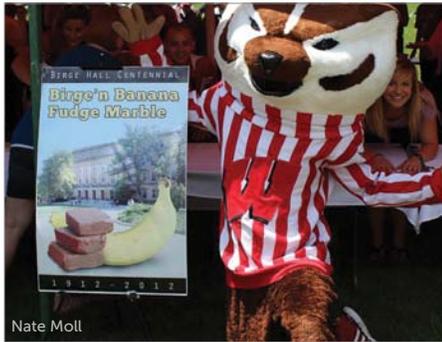
I am out of space and PhD theses await my attention. But I would be remiss if I did not remind you that growth requires resources. If you are able and willing to help us grow the Botany Tree, please consider making a year-end gift towards our departmental needs. **Hugh Iltis** and his wife Sharyn have led by example, establishing the Hugh H. Iltis Biodiversity Fund to support collections for the Herbarium and graduate work in plant taxonomy (see article). And we are eager to supplement other programs (like the O.N. Allen Graduate Fellowship, the J.T. Curtis Award, the Judy Croxdale award, and the Folke Skoog Memorial Scholarship), all of which depend on your contributions. For further descriptions of these and other opportunities for giving, please visit: <http://www.botany.wisc.edu/giftgiving/>

Warm greetings to all and best wishes for 2013.

Don Waller, Chair



Birge Hall turns 100!



Nate Moll



The Birge Hall centennial year was celebrated with a bespoke Babcock Hall ice cream flavor, "Birge'n Banana Fudge Marble" (above), and with commemorative banners in the lobby.



Honorary Fellow Jim Bennet received the 2012 Outstanding Member Award from the Natural Resources Foundation.

This newsletter is published by the Department of Botany at the University of Wisconsin-Madison for alumni, colleagues and friends. Editorial team: David Baum, Andrea Herr-Turoff, Neil McLaughlin, Joy Zedler, Sarah Friedrich.

Submissions are welcome. Please send comments, ideas and photos to:

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Herbarium Curator Ted Cochrane Retires after 42 Years of Service

December 3, 2012 marked a milestone in the history of the Wisconsin State Herbarium as Mr. **Theodore S. Cochrane**, Senior Academic Curator, retired after more than 42 years of service. Ted was raised in Beloit, WI and attended the University of Wisconsin, Madison where he earned his B.S. and M.S. degree in Botany. In 1970 he was hired as a Curator and would eventually become recognized as one of the state's leading authorities on the flora of Wisconsin. His dedication to plant collecting, identification, and conservation were recognized by the department at a luncheon and reception, which was attended by current and former students, faculty, and colleagues, including a large number of biologists from the Wisconsin Department of Natural Resources.

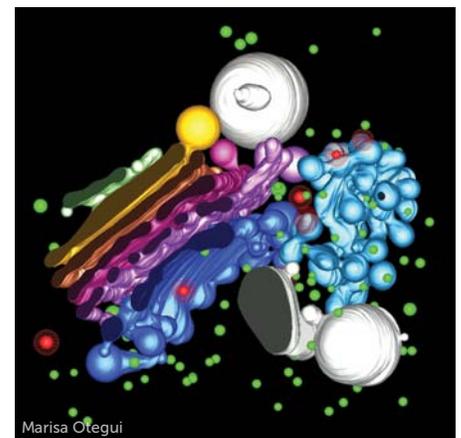


Mark Wetter, Ted Cochrane and Ken Cameron at Ted's retirement reception.

Everyone in attendance commented on the unparalleled knowledge, dedication, and work ethic exhibited year after year by Ted for more than four decades. He and his wife, Barbara, intend to travel more than they have in the past now that he is retired, but Ted expects to continue working as a volunteer in the herbarium on a regular basis for the foreseeable future. Congratulations!

Otegui Brings 3D Electron Microscope to Campus

A team of UW scientists, led by **Marisa Otegui**, succeeded in bringing to campus a powerful new electron microscope equipped to produce high-resolution, three-dimensional images of a wide range of biological samples. This machine allows Otegui and other biologists to study the location of individual proteins within complex three-dimensional cellular structures. Common electron microscopes produce two-dimensional images in shades of grey from thinly sliced samples. By using a very high voltage, this new machine allows for thick samples to be prepared and visualized from multiple angles. A three-dimensional image can then be built-up using computational tomography, as used in medical CT-scans. This new microscope, funded by a National Science Foundation grant to Otegui and contributions from the UW Graduate School, Morgridge Institute for Research, and the College of Letters and Science for a total of \$1.6 million dollars, will allow biologists to obtain detailed three dimensional information of subcellular structures from flash frozen materials. The new instrument is housed in the College of Engineering's Materials Science Center, and will be used by researchers from all major research units on campus.



Marisa Otegui

Tomographic reconstruction of a Golgi stack and associated vesicles. Golgi stacks in plants produce some of the cell wall polysaccharides

Tillandsia Taxonomy Clarified with Help from Flora Aeterna Fellowship

Flora Aeterna Fellow, **Brian Sidoti**, has shed light on the systematics and genetic diversity of endangered taxa in the the epiphytic *Tillandsia fasciculata* Sw. (Bromeliaceae) complex. The *T. fasciculata* complex consists of eight varieties of that species, 25 additional species, and three natural hybrids. All taxa occur in the Caribbean, a recognized biodiversity hot spot. Brian, the first person to use modern molecular methods in this group, set out to resolve taxonomic uncertainties that have persisted since the 18th century. He aims to examine the genetic variation within this group, evaluate the monophyly of the complex, and determine phylogenetic relationships among its taxa.

Flora Aeterna funds supported travel to Florida, New York, the Dominican Republic, Trinidad, St. Lucia, and Guadeloupe. Sidoti collected plants and photographed over 4000 herbarium specimens, which he will examine and geo-reference to construct a database of all bromeliads in the Caribbean, allowing him to evaluate species richness in protected parks. Two undergraduates, Jackson Dargan and Andy Muench,

helped organize these files. Leaf material from approximately 185 plants was collected in the Dominican Republic and the Lesser Antilles, with specimens deposited at WIS and live plants housed in the Botany Greenhouse.

T. fasciculata var. *densispica* is listed as endangered in Florida, which is the northernmost range for the complex. Preliminary results from microsatellite data reveal genetic structure among *T. fasciculata* var. *densispica* (n=170), *T. bartramii* (n=13), and *T. x floridana* (n=33) from Florida and the Bahamas. Brian presented his findings at the conference of the Society for the Advancement of Chicanos/Latinos and Native Americans in Science in Seattle, WA.



Tillandsia fasciculata var. *densispica*.

Update on the Outreach Conservatory

Wondering what's happening with the cloud forest conservatory? We are sorry to report that engineering assessments of the site turned up a number of factors that greatly inflated the cost of the proposed greenhouse addition. While we hope one day to go back to this exciting project, the department voted to redirect the funds that had been raised to other uses, including hiring an outreach specialist. This person will be charged with developing programs for school children and the public and building the strong ties with the local community that would be needed to eventually fundraise for a cloud forest conservatory.

Hugh H. Iltis Biodiversity Fund to Support Graduate Student Fieldwork



A marvelous gift to the department recently came from Professor Emeritus **Hugh H. Iltis** and his wife **Sharyn Wisniewski**. The gift establishes the Hugh H. Iltis Biodiversity Fund to support the collections of the Wisconsin State Herbarium (WIS) and graduate student work in plant taxonomy.

Dr. Iltis served as Professor of Botany and Director of the UW-Madison Herbarium from 1955 to 1993. During this time, the vascular plant collection of the herbarium more than tripled in size, from 196,000 to 670,000 specimens (including ca. 40,000 of Iltis' own collections). As a result, WIS is respected today as one of the premier international research institutions of its kind, and the tenth largest herbarium in the New World.

Dr. Iltis and most of the students he trained devoted their lives to the study of plant diversity, land stewardship, and conservation. The new fund will allow future plant taxonomy students to continue that tradition by providing financial support, especially summer fellowships and field research awards. According to the donors' wishes, preference will be given to students collecting specimens for the Wisconsin State Herbarium, especially those working in Latin America. Anyone who wishes to add donations the Hugh H. Iltis Biodiversity Fund is encouraged to contact the UW Foundation, State Herbarium, or Department of Botany (visit our homepage at your convenience). Thank you Hugh and Sharyn for your generosity!

Orchid hunting in New Guinea and Pacific biogeographic history

For four years, graduate student **Stephanie Pimm Lyon** stalked *Corybas* orchids throughout the southwest Pacific, from Australia to the cloud forests of montane Borneo, Java, peninsular Malaysia, the Philippines, and Taiwan. *Corybas* – with 140 described species – is composed of elfin plants, each with a single flower of exquisite color and form, held just an inch above a tiny, heart-shaped leaf. The flowers mimic tiny mushrooms and dupe fungus gnats into pollinating them. Stephanie is using DNA sequences to reconstruct the evolution of floral form and geographic spread of *Corybas* across islands of the southwest Pacific. She is also studying relationships among the nutrient-gathering fungi associated with *Corybas* roots, to see whether the orchids and their fungi have evolved in concert.



Stephanie Lyon

Above: Stephanie Lyon pauses with her guides in a cloud forest in montane Java.
Left: A closeup of *Corybas gibbifer*.



Stephanie Lyon

Stephanie spent the winter of 2011 studying *Corybas* in the wilds of New Guinea, including remote parts of the eastern, rugged spine of the island. Her three-month trip was an extraordinary adventure, involving travel via bush planes, buses, and ramshackle cars on some of the worst roads in the world, plus long, steep hikes through misty, mossy, montane forests. To access these areas, Stephanie collaborated with Dr. Ed de Vogel, a long-time orchid hand from the Netherlands who has specialized on New Guinea for the last 30 years, as well as Dr. Shelly James from the Bishop Museum in Honolulu. All were drawn to New Guinea – the world's largest and tallest tropical island – by the enormous diversity of its biota, and the large number of unknown species likely to be hiding in cloud forests of remote, often unexplored, montane valleys.

Indeed, of the 17 species of *Corybas* Stephanie collected, 12 appear to be new to science – truly remarkable! Stephanie

has an uncanny knack for spotting these tiny jewels on the dimly lit forest floor. Based on Stephanie's research, New Guinea appears to be an even greater center of diversity for *Corybas* than previously thought. Through her efforts, scores of new orchid specimens are now in the herbarium at Leiden, and dozens of live *Corybas* plants and their associated fungi are growing in gardens in New Guinea and the Netherlands. Her phylogenetic studies have already shown extensive convergence in form among distantly-related *Corybas* species, as well as remarkable divergence among the New Guinea species, all of which are surprisingly closely-related. Stephanie hopes that her research will provide a model for understanding broader patterns of plant dispersal and evolution from Australia and New Zealand across Wallace's line and throughout the Malay Archipelago.

H IN CLOUD FORESTS

Tropical treelines provide a key insight into global climate change

Haleakalā – the House of the Sun in Hawaiian mythology and the massive shield volcano forming the peak of East Maui – is one of the three tallest mountains in the central Pacific. For several years, **Shelley Crausbay** studied the cloud forests on Haleakalā and the transition from the upper forest to grassland, both of which show strong connections to long-term climatic trends in the Pacific.

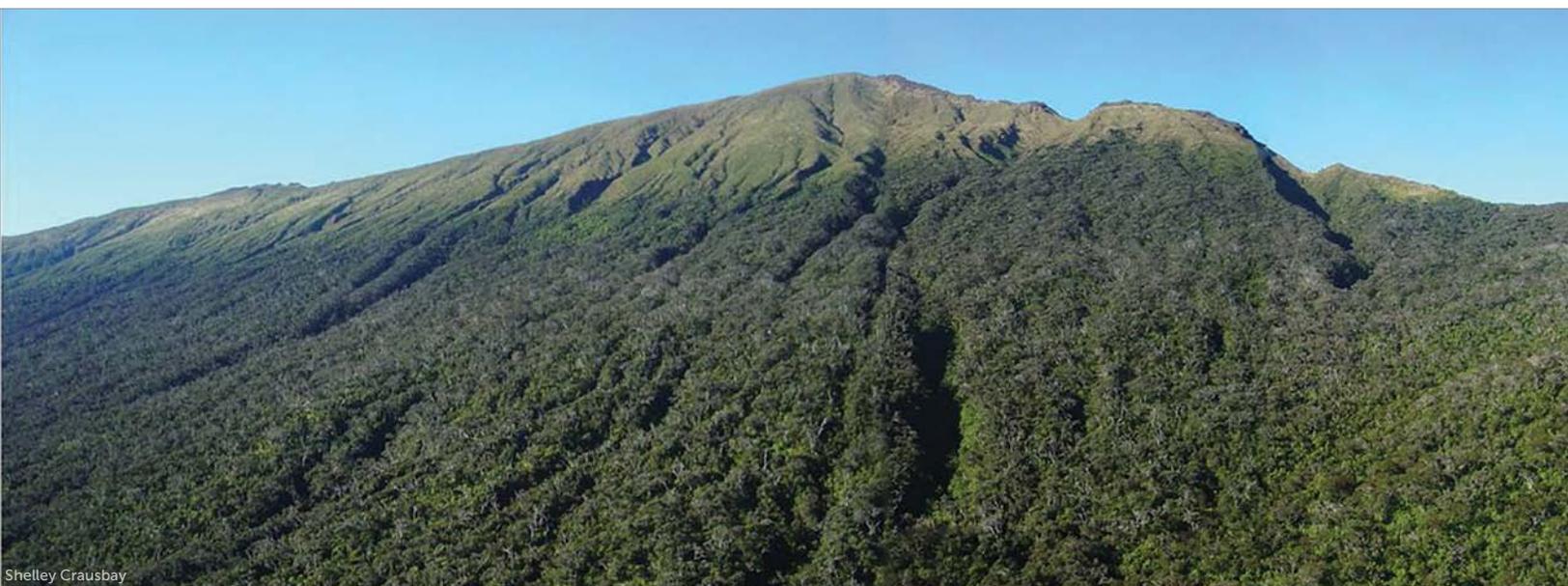
The upper limit of cloud forests drops by over 200 meters from east to west, and it is lower in areas that receive somewhat less precipitation during most years. Shelley's data from twelve weather stations show that the east-west rainfall gradient in most years correlates with cloud-forest composition. However, in El Niño years, the rainfall gradient follows elevation more directly, and overall rainfall declines. As a consequence, the forest-grassland transition is best correlated with climate during El Niño years, while forest composition at its upper limit is best explained by local climate during wetter years. The cloud forests are limited by the trade-wind inversion, above which clouds rarely form.

Shelley extracted sediment cores from three elevations near treeline and assessed their pollen to infer a 3300-year record of vegetation. Variation in the pollen record correlates well with the spatial changes in cloud-forest composition that Shelley documented along the east-west precipitation gradient. More importantly, the timing of shifts in species composition and in the elevation of the forest-grassland transition correlates strongly with the frequency of El Niño events (inferred from lake sediments in the Galápagos). Thus, Shelley's paleoecological research on cloud forests on Maui provides insights into the sensitivity of cloud-forest vegetation to changes in climate, especially the height and strength of the trade-wind inversion throughout the central Pacific. Shelley, advisor, Sara Hotchkiss, and others are now using Shelley's data to predict future changes in cloud forest vegetation under a range of rainfall patterns on Haleakalā and throughout the central Pacific.



Above: Shelley Crausbay and Sara Hotchkiss in the field

Below: Haleakalā, showing a drop in the upper limit of cloud forests on East Maui from east to west. The elevation of the forest-alpine grassland transition is strongly correlated to rainfall and relative humidity during El Niño years, while the composition of forest near that transition is more correlated with climate during average years.



Shelley Crausbay

Thank you to all the alumni who took the time to send us their updates. We had so many people write in that we couldn't print all of them, so half are printed here and the other half will be printed in the spring newsletter. Please keep the news coming!

Jim Habeck (BS, 1954, MS 1957, PhD 1959) As a 1959 graduate from the Curtis and Cottam plant ecology program, Jim says, "it shouldn't be any surprise that I turned 80 this year... after a 1960-1992 tour of duty as a professor of ecology at the University of Montana," which he calls the "Last Best Place" for an ecologist. Jim still hikes the local mountains, drives into high country, photographs plants, advises on vegetation management, and attends seminars to keep up on ecological issues, including climate change. He stays in contact with Australian fire ecologists whom he met on sabbaticals and reads about plants discovered in Montana on the 1805-06 Lewis and Clark Expedition. Reflecting on his training at UW, he says, "I couldn't have picked a better major, nor a better place to study botany and ecology."

Edward W. Beals (MS 1958, PhD 1961) After receiving his PhD in 1961, Ed worked in Alaska (Zoology and Anthropology), then spent four years in Lebanon and Ethiopia before returning to Madison. At UW for 28 years, Ed trained as many ecology grad students in his home department (Zoology) as in Botany (his adjunct appt.). His research focused on the Neotropics, with additional contributions to the mathematical analysis of ecological data. After early retirement, Ed taught at Unity College, Maine, for 11 years. His second retirement in 2003 took him to Newberg, OR, where he taught botany and evolution as an adjunct professor at George Fox University. At age 80, Ed no longer teaches, but he still plays the organ at church. His recent publications are musical compositions, which have earned him many honors.

Fred Swan (MS 1961) A trip to Paris in September and their 50th wedding anniversary on Nov. 24, 2012, were highlights this year for Fred and Pat, their two sons and their wives.

Bryce Smith (PhD 1965) Alive!! Traveled to the NW for a family reunion in our small MH in June. Still walking, reading and taking my pills. Best wishes to all.

David H. Lorence (BA 1970) David is director of science at the National Tropical Botanical Garden on Kauai, Hawaii. He and Warren L. Wagner (Smithsonian Institution) are finalizing a Flora of the Marquesas Islands (French Polynesia), currently available as a web version. He also continues work on the Micronesian flora with collaborators at the New York Botanical Garden.

Herman Gilman (BS 1973) Herman retired in 2009 from his career in the public sector, then trained with the Seward Park Audubon Environmental Center in Seattle, where he leads bird walks, offers environmental classes to middle school students, guides toddlers on nature hikes, and teaches about native plants (including 500-yr-old Douglas fir and western red cedar trees). This 300-acre urban park is the last remaining old growth forest in the Seattle Metropolitan area. He also assists "Owl prowls" walks and teaches middle school students about woodland and riparian habitat, aquatic ecology, water chemistry and analysis.

Vicki Watson (MS 1976, PhD 1981) For 30 years, Vicki has been a professor of Environmental Studies at the University of Montana. She was named "Sustainability Advocate of the Year" by the Missoula Sustainable Business Council. And she is enjoying her grandson.

Mary Doohan (PhD 1978) (JD 1989 Texas Tech University) Mary is Vice President, General Counsel & Secretary of Morton Salt, Inc., headquartered in Chicago. Although most of her career (over 20 years) has been in law, her

science education was an immeasurable advantage in the business world. Continuing the UW connection, her son Michael Lehrman graduated from UW Madison in 2006 in Political Science.

Robert Price (MS 1979) For some years, Robert has been a scientific and technical editor, e.g., the scientific editor for *Conifers Around the World* (2011, Dendropress Ltd., Budapest). This lavishly illustrated book on temperate conifers pictures the plants in their native habitats around the world. Robert is based in Sacramento, California, where he works as a botanist in the Seed Science Laboratory and Herbarium of the California Department of Food and Agriculture. In his spare time, he searches the Sierra Nevada for elusive, possibly undescribed species of alpine mustards (*Draba* spp., which he studied for his MS degree) to complement earlier publications in the 1980's.

Emmet Judziewicz (MS 1981, PhD 1987) This fall, Emmet was promoted to Professor of Biology at UW-Stevens Point. In 2011 he collected grasses in the Outback of Australia's Northern Territory with Smithsonian botanists Paul Peterson and Rob Soreng. With Robert Freckmann (UWSP), Lynn Clark (Iowa State University), and Merel Black, he is writing a new "Field Guide to Wisconsin Grasses" to be published next year. He and his students at UWSP have been describing several new species of the Andean bamboo genus *Aulonemia*.

Douglas Fuller (BS 1983) On a Fulbright Scholarship based in Manaus, Brazil, Dr. Fuller has been studying the spatial ecology of malaria vectors and malaria epidemiology in the Amazon. He was recently promoted to Professor at University of Miami, where he chairs the Department of Geography and Regional Studies.

Margaret Kuchenreuther (PhD 1991) An Associate Professor of Biology, Margaret is the first University of Minnesota Morris faculty member and only faculty member throughout the UM in 2011-12 to

receive the UM Outstanding Community Service Award, which recognizes exceptional community service that makes an enduring contribution to the external community and improves public life and the well-being of society.

J. Chris Pires (PhD 2000) Chris studies systematics, phylogenetics, and genome evolution of polyploidy plants as an Associate Professor of Biological Sciences at the University of Missouri.

Cristina Walcher-Chevillet (BS 2001) In 2011, Cristina completed her PhD in Biology at UW-Seattle with Jennifer Nemhauser. Her training and thesis, "Auxin and brassinosteroid signaling pathways converge at multiple levels to mediate seedling development," earned her a Visiting Assistant Professorship in Biology at the University of Puget Sound.

Gregory Bean (MS 2002) For the past 9 months, Gregory has been working in St. Louis, MO as a protein purification research scientist for Monsanto. While the summer was hot, he looks forward to a warmer winter than in Madison.

Maria Spletter (BS 2003) In 2010, Dr. Spletter received her PhD from Stanford University, then became a postdoc at the Max Planck Institute for Biochemistry in Germany. Her work concerns genetic control of muscle development in *Drosophila melanogaster*,

in particular the pathways that control the differentiation of different muscle types. Her work is supported by a Humboldt and EMBO fellowship and NIH-NRSA.

Paul Morehead (BS 2004) For 6.5 years, Paul has enjoyed living in and exploring Taiwan, where he teaches English. As a botanist, he helps his brother's NGO (EarthPassengers.Org) teach Permaculture Design to local residents. The aim is sustainable living and agriculture, involving demonstration of solar cooking, recycling-reuse-and-repurposing of resources, cob ovens, self-sustaining forest gardens, and retaining traditional, low-impact agricultural methods.

Alex Bilgri (BS 2010) Alex returned to UW to work on an MS in Plant Pathology, focusing on *Aphanomyces* and alfalfa.

Deniz Aygoren (MS 2011) Deniz is a PhD student at the University of Reading (UK) working on phylogenetics of Fabales with Dr. Julie Hawkins.

Bryan Drew (PhD 2011) As a Postdoc in the Soltis Lab at the University of Florida, Bryan is working on an "Open Tree of Life" project, with the goal of assembling all existing phylogenies into one publicly accessible and user-friendly tree (opentreeoflife.org/). He is gathering phylogenies of green plants and

determining the phylogenetic placement of *Amborella* (that rascal!) using all three plant genomes.

Charles Tucker (MS 2011) Charlie's nonthesis degree in Botany led him to pursue field research and a second MS at Missouri State U. His research on Ornate Box Turtle thermal ecology and reintroduction takes place in the Upper Mississippi National Wildlife and Fish Refuge. He is learning how temperature dependent sex determination might affect the sex ratios of reintroduced populations. As a Refuge employee, he also manages habitat, controls invasive species, and monitors vegetation, migratory birds, and mussels.

Deidre Conocchioli (BS 2012) Working with the "Seeds of Success" program of the Chicago Botanic Garden and the Bureau of Land Management in New Mexico, Deidre collects native seeds for research and preservation of genetic material. She writes, "I can't believe I am getting paid to be outside learning about plants!!"

Ben Grady (PhD 2012) Ben is an instructor at UW Platteville.

Evelyn Williams (PhD 2012) Evelyn is working at the Chicago Botanic Garden on *Lepidospartum burgessii* (a gypsum salt flat specialist shrub) conservation and *Artocarpus heterophyllus* (jackfruit) systematics.

Make a Gift

For a full listing of giving opportunities and online donations, please see: <http://www.botany.wisc.edu/giftgiving/>

To mail a donation, please make checks out to the University of Wisconsin Foundation and include the fund number on the check. Please send to:

UW Foundation
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Milwaukee, WI 53278-0807

Questions? Contact: Ann Lippincott
ann.lippincott@supportuw.org
608-263-3604



The Botany Department welcomed thirteen new graduate students to the program in Fall 2012.



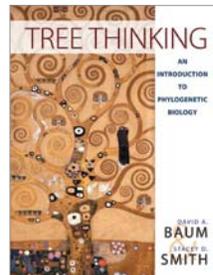
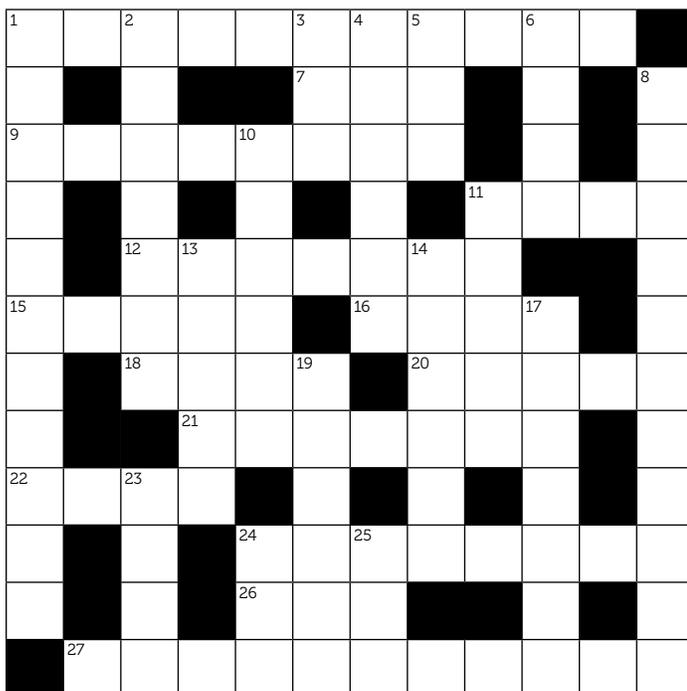
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BOTANY CROSSWORD contributed by David Baum

Submit your answers to Andrea Herr-Turoff at botgrad@ls.wisc.edu by January 31, 2013 to be entered in a drawing for David Baum and Stacey Smith's *Tree Thinking: An introduction to phylogenetic biology*. Solutions will be posted on the "Alumni" page of the Botany website after that date.



Across

1. Retention of structures such as leaves, even after they have senesced.
7. Contrast to dip.
9. Arborescent mallow
11. Spignel
12. Legume that occurs at the scrimmage line?
15. Olives
16. Of alders
18. Piece of lab equipment, informally

20. Some bacteria used for plant transformation, for short

21. Consonant free holly species

22. Gene region retained in mRNA

24. More graminaceous

26. Less common, common name for *Avena*

27. Arecaceous resort

Down

1. Dark-spored alga
2. Updates the taxonomy of a group
3. Subjective pronoun for a megagametophyte?
4. Crabby mahogany taxon?
5. Air and water agcy.

6. Inflorescence type

8. Surfaces along which two carpels are joined

10. Invasive plant that brings together *Camellia sinensis* and French salt?

11. Anacard fruit

13. Storage protein in rapeseed embryos

14. Tropical oil source

17. Greenhouse and garden director, Mo Fayyaz, for one

19. Turkey oak

23. Edible mallow

24. Crypto_____

25. Plants' energy currency