Botanical Society of America

Plant Science Bulletin

Summer 2012 Volume 58 Number 2

BSA's Highest Honor Goes to...




2012 Merit Award Winners.....page 38

In This Issue.....

BSA Board Student Representatives visit Capitol Hill...pp. 44

It's the season for awards....pp. 38

BSA election results...pp. 51

From the Editor

The day after the last issue of *PSB* arrived in hard copy, I had a telephone call from an old friend, Hugh Iltis. Hugh has been weakened by strokes and his voice lacks the volume he used to project, but his passion is undiminished. He wanted to inform me of the typo in Peter Raven's printed address (see Erratum, p. 38) but also to take issue with what he felt was a major omission related to human population growth—its underlying cause. Hugh's issue was that Peter did not mention the need for any kind of birth control, which is a main factor responsible for population growth. Of course, population growth was not the focus of Peter's article so it is not surprising that he did not elaborate on it. On the other hand, Hugh had a point that we frequently overlook. We, as botanists, tend to focus on the immediate problem of feeding people while protecting the environment, but this is a Band-aid solution to the underlying problem of human population growth itself. The discussion with Hugh reminded me that we have an educational opportunity, and with our science majors I feel we have an educational obligation, to emphasize the limits as well as the power of science in solving the problems we face as a society. Peter focused on what we can do as botanists to alleviate the ever-increasing need for feeding more people, but in a sustainable way. Hugh would argue that by limiting ourselves to these solutions we are only making the problem worse. Together they illustrate that science, by itself, will not be able to solve the problem. There are ethical, religious, political, and economic factors that provide a context for science; it is our role as science educators to teach both the power and limits of science and to be open to dialogue with professionals trained in other ways of knowing. We should be teaching this to our students and demonstrating it by example.

This is a perfect segue to the report in this issue by our student members on their recent trip to Capitol Hill. One purpose was to inform legislators of the importance of maintaining support for plant science and young scientists may be our best advocates. But, it is also important for our student advocates to be aware of alternative viewpoints and to report back innovative ways of supporting botany in a larger perspective. It is our job as faculty to cultivate this awareness.

-Marsh

Table of Contents

Erratum

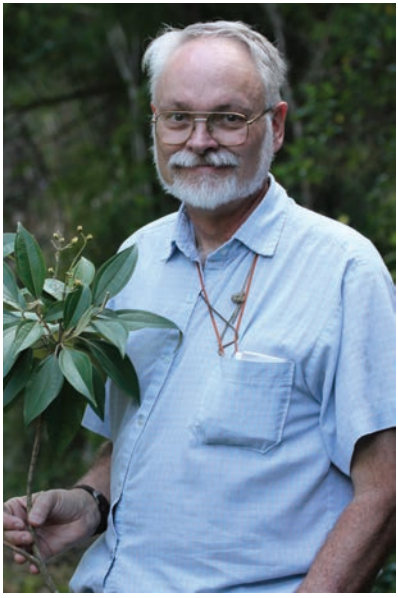
From "Saving Plants, Saving Ourselves": p. 3, column 2, line 5. " …reach 7 million by next spring (April, 2012)…" should read "…reach 7 billion by next spring (April, 2012)…."

The Botanical Society of America's Merit Award

The Botanical Society of America Merit Award is the highest honor our Society bestows. Each year, the Merit Award Committee solicits nominations, evaluates candidates, and selects those to receive an award. Awardees are chosen based on their outstanding contributions to the mission of our scientific society. The committee identifies recipients who have demonstrated excellence in basic research, education, public policy, or who have provided exceptional service to the professional botanical community, or who may have made contributions to a combination of these categories. Based on these stringent criteria, the 2012 BSA Merit Award recipients are:

Dr. Patricia Gensel
University of North Carolina

Dr. Gensel is an international leader in the investigation of early land plant evolution. Her research, including rigorous field and laboratory work, has contributed significantly to our understanding of plant diversity at the time when major lineages of land plants were emerging. Through careful morphological and anatomical investigations she has brought "to life" extinct genera of early land plants and improved our understanding of the ecosystems in which these plants participated. She is active as Professor of Botany at the University of North Carolina, where she has taught since 1975 and has encouraged and collaborated with many students and colleagues internationally. Pat served as president of the Botanical Society of America in 2000–2001, during a time of great transition as the Society began managing its annual Botany conferences independently of AIBS.



Dr. Walter Judd
University of Florida, Gainesville

Dr. Judd is recognized worldwide for his contributions to plant systematics, taxonomy, and phylogenetics. Although he is very well known for his academic achievements, where he has focused on the systematics of the Ericaceae and Melastomataceae, as well as floristics in the southeastern United States and the West Indies, Dr. Judd is also an accomplished teacher, where

at the University of Florida, he has been awarded numerous times for his excellence in pedagogy. He also has taught an internationally renowned class in tropical botany for the past 30 years at Fairchild Tropical Botanical Gardens and The Kampong in Miami. Dr. Judd is the lead author of the influential textbook, *Plant Systematics: A Phylogenetic Approach*, which has been adopted throughout the world as a model for teaching plant systematics and taxonomy. Dr. Judd's passion for teaching, research, as well as learning, is ever influential to the graduate and undergraduate students he mentors. The 2012 BSA Merit Award is a much-deserved honor for Dr. Judd.

Dr. Richard Olmstead
University of Washington

Dr. Olmstead is recognized for his outstanding contributions to reshaping the field of plant systematics, including his leadership on the use of chloroplast data in phylogenetic inference and angiosperm classification. His doctoral research with Melinda Denton resulted in a monograph of the *Scutellaria angustifolia* complex (Lamiaceae). His subsequent research on Asteridae has resulted in major realignments in our understanding of family boundaries in Lamiales (especially Lamiaceae and Scrophulariaceae). He has published influential papers on a broad range of issues in systematics. Dick has guided the careers of numerous undergraduates, graduates, and postdoctoral fellows, fostered extensive collaborative research activities, and made significant service contributions to botanical and systematic societies. The integration of his excellent research program with public outreach activities through the Burke Museum of Natural History and Culture and the University of Washington herbarium serve as a model for how we should be sharing our botanical knowledge to improve the world.

Dr. Allison Snow
Ohio State University

Dr. Allison Snow is recognized for her outstanding contributions to botanical science in the areas of basic research, education, and professional service. Allison's research on pollination biology, gene flow, and risk assessment of transgenic crops represent significant contributions to the field. She has mentored a number of students and researchers, and has been a strong advocate for communicating the importance of botany to the general public via the media. Finally, Allison has been deeply involved both nationally and internationally in service to a variety of organizations, including the National Academy of Sciences, the World Trade Organization, and as president for the Botanical Society of America.

Darbaker Prize

The Darbaker Prize in Phycology is given each year in memory of Dr. Leasure K. Darbaker. It is presented to a resident of North America for meritorious work in the study of microscopic algae based on papers published in English by the nominee during the last two full calendar years. This year The Darbaker Award for meritorious work on microscopic algae is presented to:

Dr. Walter Adey, National Museum of Natural History, Smithsonian Institution. Dr. Adey has been a pioneer of modern phycology. His development of modern coralline taxonomy and the structural analysis have provided the underpinnings for our present understanding of this group that is now being enhanced by molecular methods. He has further pioneered the system of using filamentous algae as scrubbers toward clean water production and biofuels generation.

Dr. Sabeeha Merchant, University of California at Los Angeles. Dr. Merchant has been instrumental in developing the genetics and genomics of *Chlamydomonas* as a model organism. Her work has elucidated the role of metabolic cofactors and iron and copper utilization in the biogenesis of the photosynthetic apparatus, thus providing the basic understanding of chloroplast development for green algae and plants.

Vernon I. Cheadle Student Travel Awards

(BSA in association with the Developmental and Structural Section)

This award was named in honor of the memory and work of **Dr. Vernon I. Cheadle**.

Allison Bronson, Humboldt State University. Advisor: Dr. Mihai Tomescu. Botany 2012 presentation: "A perithecial sordariomycete (Ascomycota) of diaporthalean affinity from the Early Cretaceous of Vancouver Island, British Columbia (Canada)." Co-authors: Ashley Klymiuk, Ruth Stockey, and Alexandru Tomescu.

David Duarte, California State Polytechnic University, Pomona. Advisor: Frank Ewers. Botany 2012 presentation: "Plastic responses of wood development in California black walnut (*Juglans californica*): Effects of irrigation and post-firegrowth." Co-authors: Frank Ewers, Edward Bobich, Shawn Pham, and Kristin Bozak.

Rachel Hackett, Central Michigan University. Advisor: Dr. Anna Monfils. Botany 2012 presentation: "Prairie fen plant biodiversity: The influence of landscape factors on plant community assemblages." Co-authors: Hillary Karbowski and Anna Monfils.

Matthew Ogburn, Brown University. Advisor: Dr. Erika Edwards. Botany 2012 presentation: "Anatomy of leaf succulence in the clade Portulacineae + Molluginaceae: Evolutionary jumps into novel phenotypic space." Co-author: Erika Edwards.

Triarch "Botanical Images" Student Travel Awards

This award provides acknowledgment and travel support to BSA meetings for outstanding student work coupling digital botanical images with scientific explanations/descriptions designed for the general public (see p. 47).

Glenn Shelton, Humboldt State University. 1st place, A charismatic salt rush inflorescence, $500 Botany 2012 Student Travel Award.

Sean Gershaneck, University of Hawai'i at Manoa. 2nd place, 'Ōhi'a Lehua at Akanikōlea, $250 Botany 2012 Student Travel Award.

Andrew Crowl, University of Florida. 3rd place, *Cocos nucifer*a (coconut) dispersal in action, $150 Botany 2012 Student Travel Award.

The BSA Graduate Student Research Award including the J. S. Karling Award

The BSA Graduate Student Research Awards support graduate student research and are made on the basis of research proposals and letters of recommendation. Within the award group is the J. S. Karling Graduate Student Research Award. This award was instituted by the Society in 1997 with funds derived through a generous gift from the estate of the eminent mycologist, John Sidney Karling (1897–1994), and supports and promotes graduate student research in the botanical sciences. The 2012 award recipients are:

J. S. Karling Graduate Student Research Award

Matthew P. Nelsen, University of Chicago. Advisor: Dr. Richard Ree. "Early, on time or 'fashionably' late? The comparative dating of lichen symbionts."

BSA Graduate Student Research Awards

Guadalupe Borja, Oklahoma State University. Advisor: Dr. Andrew Doust. "Integrating phylogeny, morphology, and population genetics: Investigating species relationships in *Paysonia* (Brassicaceae)."

Louisa G. Carter, University of Georgia. Advisor: Dr. Shu-Mei Chang. "Range limits and conservation in species of a Florida endemic plant genus, *Polygonella*."

Gretel Clarke, University of Vermont. Advisor: Dr. Alison K. Brody. "Assessing the effects of pollinators, seed predators, and vertebrate herbivores on the demography of females and hermaphrodites in the gynodioecious plant, *Polemonium foliosissimum*."

Julieta Gallego, Museo Paleontológico Egidio Feruglio. Advisor: Dr. N. R. Cúneo. "Analyses of diversification rates of Patagonian Paleozoic and Mesozoic lineages of gymnosperms through calibration of molecular and morphological phylogenies."

Rachel M. Germain, University of Toronto. Advisor: Dr. Benjamin Gilbert. "Evolution of coexistence mechanisms in Mediterranean annual plant communities."

Rachel A. Hackett, Central Michigan University. Advisor: Dr. Anna K. Monfils. "Influence of landscape and local factors on plant communities."

Kristen Hasenstab-Lehman, Rancho Santa Ana Botanic Garden and Claremont Graduate University. Advisor: Dr. Lucinda A. McDade. "Testing adaptive radiation in the dry tropics: A phylogenetic approach to biogeography, inflorescence evolution, and hydraulic traits in the genus *Varronia* (Cordiaceae, Boraginales)."

Laura Lagomarsino, Harvard University. Advisor: Dr. Charles C. Davis. "Phylogeny and the eolution of vertebrate pollination syndromes in the Neotropical Lobelioideae, a rapid, recent radiation in the Tropical Andes."

Jacob B. Landis, University of Florida. Advisor: Dr. Pamela S. Soltis. "Corolla length does matter: Investigating genetic underpinnings of size."

Vanessa Lopes Rivera, University of Texas at Austin. Advisor: Dr. Jose L. Panero. "Reconstructing the spatiotemporal evolutionary patterns of the Brazilian Cerrado Eupatorieae and Lychnophorinae (Asteraceae)."

Kristen Sauby, University of Florida. Advisor: Dr. Robert D. Holt. "Determining the consequences of herbivory by the invasive South American cactus moth, *Cactoblastis cactorum* (Lepidoptera: Pyralidae), to native *Opuntia* populations in Florida."

Brian J. Sidoti, University of Wisconsin-Madison. Advisor: Dr. Kenneth M. Cameron. "Molecular phylogenetics and population genetics of the *Tillandsia fasciculata* complex (Bromeliaceae): Biogeographical and evolutionary implications."

Sarah Tepler, University of California, Santa Cruz. Advisor: Dr. Jarmila Pittermann. "Understanding drivers of variability in the carbon physiology of the giant kelp, *Macrocystis pyrifera*."

Jinshun Zhong, University of Missouri-St. Louis. Advisor: Dr. Elizabeth A. Kellogg. "The evolution of floral symmetry across the order Lamiales."

The BSA Undergraduate Student Research Awards

The BSA Undergraduate Student Research Awards support undergraduate student research and are made on the basis of research proposals and letters of recommendation. The 2012 award recipients are:

Jenna Annis, Eastern Illinois University. Advisor: Dr. Janice M. Coons. "Evaluating seed ecology of federally threatened *Pinguicula ionantha* (Godfrey's butterwort)."

Ian A. Harkreader, Drake University. Advisor: Dr. Nanci Ross. "Pollination biology and habitat preference of a rare native lily, *Lilium michiganense*."

Hillary Karbowski, Central Michigan University. Advisor: Dr. Anna K. Monfils. "Local abiotic factors and plant assemblages: An investigation into prairie fen biodiversity."

Caprice Lee, University of California, Davis. Advisor: Dr. Sharman Diane O'Neill. "Novel embryological study of *Vanilla planifolia* using confocal scanning laser microscopy."

Tess Nugent, University of Michigan. Advisor: Dr. Selena Y. Smith. "Investigating potential causes for variation in $\delta^{13}C$ discrimination in *Ginkgo biloba*."

Jennifer O'Brien, Eastern Illinois University. Advisor: Dr. Janice M. Coons. "Enhancing seed germination and determining the seed bank of the federally threatened *Scutellaria floridana*."

Bryan Thompson, State University of New York at Plattsburgh. Advisor: Dr. Chris Martine. "Hydroponic technology: The future of farming and its ecological benefits: Growth rate response and productivity of *Ocimum basilicum* and super beefsteak tomato within a soilless environment compared to a soil environment."

The BSA Young Botanist Awards

The purpose of these awards is to offer individual recognition to outstanding graduating seniors in the plant sciences and to encourage their participation in the Botanical Society of America. The 2012 Certificate of Special Achievement award recipients are:

Rebbecca Allington, SUNY Plattsburgh. Advisor: Dr. Christopher T. Martine

Jenna Annis, Eastern Illinois University. Advisor: Janice M. Coons

Maggie Brown, Miami University. Advisor: Dr. John Z. Kiss

April Diebold, University of Missouri. Advisor: Dr. J. Chris Pires

Garrett Dienno, Miami University. Advisor: Dr. John Z. Kiss

Chloe Drummond, Oberlin College. Advisor: Dr. Michael J. Moore

Patrick Ellis, Vassar College. Advisor: Dr. Mark A. Schlessman

Francisco Gomez, Florida Museum of Natural History. Advisor: Dr. Pam Soltis

Monica Hernandez, University of California-Los Angeles. Advisor: Dr. Ann Hirsch

Emilie Jordao, Central Michigan University. Advisor: Dr. Joanne Dannenhoffer

Kelly Matsunaga, Humboldt State University. Advisor: Dr. A. Mihail Tomescu

Britany Morgan, Rutgers University. Advisor: Dr. Steven Handel

Jennifer O'Brien, Eastern Illinois University. Advisor: Dr. Janice M. Coons

Gina Pahlke, Willamette University. Advisor: Dr. Susan Kephart

Rachel Plumb, Oberlin College. Advisor: Dr. Michael J. Moore

Audrey Ragsac, University of California. Advisor: Dr. Paul Fine

Kendalee Richardson, Weber State University. Advisor: Dr. Barbara Wachocki

Selina Ruzi, Rutgers University. Advisor: Dr. Steven Handel

Megan Saunders, Hillsdale College. Advisor: Dr. Ranessa L. Cooper

Jennifer Schmalz, Weber State University. Advisor: Dr. Barbara Wachocki

Glenn Shelton, Humboldt State University. Advisor: Dr. A. Mihail Tomescu

Christopher Steenbock, Humboldt State University. Advisor: Dr. A. Mihail Tomescu

Lauren Stutts, Campbell University. Advisor: Dr. J. Christopher Havran

Michael Terbush, Ohio University. Advisor: Dr. Harvey E. Ballard Jr.

Weston Testo, Colgate University. Advisor: Dr. James E. Watkins Jr.

Betty Unthank, Miami University. Advisor: Dr. John Z. Kiss

Megan Ward, SUNY Plattsburgh. Advisor: Dr. Christopher T. Martine

Tim Williams, Ohio University. Advisor: Dr. Sarah E. Wyatt

Codi Q. Yeager, Cornell University. Advisor: Dr. Lee B. Kass

Developmental & Structural Section Student Travel Awards

Xiaofeng Yin, Miami University. Advisor: Dr. Roger Meicenheimer. Botany 2012 presentation: "A quantitative analysis of discontinuous phyllotactic transition in *Diphasiastrum digitatum*." Co-author: Roger Meicenheimer.

Christina Lord, Dalhousie University. Advisor: Dr. Arunika Gunawardena. Botany 2012 presentation: "Actin microfilaments: Key regulators of programmed cell death (PCD) in the lace plant." Co-authors: Adrian Dauphinee and Arunika Gunawardena.

Nelson Salinas, New York Botanical Garden. Botany 2012 presentation: "Uncovering venation patterns in neotropical blueberries (Vaccinieae: Ericaceae) and their value for systematics." Co-author: Paola Pedraza-Peñalosa.

Nicholas Miles, University of Florida. Advisor: Dr. Pamela Soltis. Botany 2012 presentation: "Virus-induced gene silencing in carnivorous pitcher plants." Co-authors: Douglas Soltis and Pamela Soltis.

Jacob Landis, University of Florida. Advisor: Dr. Pamela Soltis. Botany 2012 presentation: "All in the family: Pollination syndromes and floral traits in the flowering plant family Polemoniaceae." Co-authors: Douglas Soltis and Pamela Soltis.

Genetics Section Student Travel Awards

Michael McKain, University of Georgia. Advisor: Dr. Jim Leebens-Mack, for the paper "The effect of paleopolyploidy on genome evolution in Agavoideae." Co-authors: Norman Wickett, Yeting Zhang, Saravanaraj Ayyampalayam, Richard McCombie, Mark Chase, Joseph Pires, Claude dePamphilis, and Jim Leebens-Mack.

Travis Lawrence, CSU Sacramento. Advisor: Dr. Shannon Datwyler, for the paper "Testing the hypothesis of allopolyploidy in the origin of *Penstemon azureus* (Plantaginaceae)." Co-author: Shannon Datwyler.

Mycological Section Student Travel Awards

Wesley Beaulieu, Indiana University. Advisor: Dr. Keith Clay, for the paper "Cosmopolitan distribution of ergot alkaloids produced by *Periglandula*, clavicipitaceous symbionts of the Convolvulaceae." Co-authors: Katy L. Ryan, Daniel G. Panaccione, Richard E. Miller, and Keith Clay.

Eduardo Campana, Kent State University. Advisor: Dr. Christopher Blackwood, for the paper "Fungal communities of northeastern Ohio."

Carla Harper, University of Kansas. Advisor: Dr. Thomas N. Taylor, for the paper "Antarctic wood-decay fungi in glossopteridalean roots and stems." Co-authors: Thomas Taylor and Michael Krings.

Phytochemical Section Student Travel Award

Rachel Meyer, City University of New York. Advisor: Dr. Amy Litt. Botany 2012 presentation: "Molecular and chemical differences among Asian eggplants analyzed in a framework of their history of utilization." Co-authors: Bruce Whitaker and Amy Litt.

Pteridological Section & American Fern Society Student Travel Awards

Amanda Grusz, Duke University. Advisor: Dr. Kathleen Pryer. Botany 2012 presentation: "Using next generation sequencing to develop microsatellite markers in ferns." Co-authors: Michael Windham and Kathleen Pryer.

Stacy Jorgensen, University of Vermont. Advisor: Dr. David Barrington. Botany 2012 presentation: "New insights into the heritage of Pacific Northwestern polyploids in the genus *Polystichum* (Dryopteridaceae)." Co-author: David Barrington.

Meghan McKeown, University of Vermont. Advisor: Dr. David Barrington. Botany 2012 presentation: "A molecular phylogeny based on seven markers supports the inclusion of the Australian monotypic genus *Revwattsia* (Dryopteridaceae) in *Dryopteris*." Co-authors: Michael Sundue and David Barrington.

Weston Testo, Colgate University. Advisor: Dr. James E. Watkins. Botany 2012 presentation: "Comparative gametophyte ecology of the American hart's-tongue fern and associated fern taxa: Evidence for recent population declines in New York State." Co-author: James E. Watkins.

The BSA PLANTs Grant Recipients

The purpose of these awards is to offer individual recognition to outstanding graduating seniors in the plant sciences and to encourage their participation in the Botanical Society of America.

Dominique Alvis, University of Maryland-Baltimore. Dr. Mauricio Bustos

Haydee Borrero, Florida International University. Dr. Suzanne Koptur

Maria Friedman, Humboldt State University. Dr. Erik Jules

Erin Fujimoto, University of Hawaii at Manoa. Dr. Tom Ranker

Victoria Hanna, University of California-Irvine. Dr. Kailen Mooney

Sean Gershaneck, University of Hawaii at Manoa. Dr. Pattie Dunn

Lauren Gonzalez, University of New Orleans. Dr. Charles Bell

Alexandria Igwe, Howard University. Dr. Mary McKenna

Jamie Minnaert-Grote, George Mason University. Dr. Andrea Weeks

Rylan Sprague, Black Hills State University. Dr. Benjamin van Ee

Brittany Stallworth, Howard University. Dr. Mary McKenna

Dori Thompson, Texas State University-San Marcos. Dr. Garland Upchurch

Val Yerby, Texas State University-San Marcos. Dr. Nihal Dharmasiri

BSA Student Activists Visit Capitol Hill

Marian Chau (PhD candidate, University of Hawaii at Manoa) is one of the current Student Representatives on the BSA Board of Directors, and Morgan Gostel (PhD student, George Mason University) is a BSA student activist representing the DC area, and recently elected as the next incoming Student Representative.

We recently attended Congressional Visits Day, sponsored by the Biological and Ecological Sciences Coalition (BESC), American Institute of Biological Sciences (AIBS), and the Ecological Society of America (ESA). On the first day, we took part in a public policy training session, and we visited Congress the next day. The training session was great, with short informative talks from Kei Koizumi (White House Office of Science and Technology Policy), Jane Silverthorne (NSF), and Julie Palakovich Carr (AIBS) that gave information on the national budget from different perspectives. Nadine Lymn and other folks from ESA oriented us for the Congressional meeting experience, and then we met with our smaller groups to plan the next day. Morgan was with other folks from mid-Atlantic states, and Marian was placed with Florida (I suppose we were the tropical contingent!).

Marian's Experience

Our Hawaii/Florida team was led by Liza Lester, ESA Communications Officer, who facilitated our day of meetings. One of our Florida constituents actually didn't show up, so it was just Liza, Adam Rosenblatt—a grad student from Florida International University who does ecology in the Everglades—and myself. I actually really enjoyed being in the small group, and the three of us became friends who will definitely stay in touch.

Marian Chau sitting at the desk of Senator Akaka, one of her Hawaii Congressmen, after meeting with a staffer

We visited all of the Hawaii and Florida senators' offices, and a few representatives' offices. I led meetings with Hawaii's congressional staff, and Adam led meetings with Florida's. As you can imagine, that made for a full and hectic day of meetings—we walked back and forth between the Senate and the House office buildings a lot, walking past the Capitol at least four times!—but it was really fun, too. Hawaii's Congressional members are all Democrats, so not too surprisingly they were quite supportive of science, research, and the President's proposed budget that would increase funding for NSF to $7.3 billion (4.8%) in FY 2013. Beyond that, what was interesting and encouraging to me was that the legislative assistants I spoke with were generous with their time and were happy to talk to me, and to learn about things such as research at UH Botany, our recently NSF-funded Consortium of Pacific Herbaria, and rare plant seed storage at Lyon Arboretum in Hawaii. They seemed eager to learn more about how NSF directly benefits our state. I also talked to a couple of them about PlantingScience, and what an excellent investment of NSF funding that has been for making strides in STEM education, along with how NSF funding has benefited other BSA students. Because Hawaii Sen. Daniel Inouye is now the Chairman of the Appropriations Committee, it is great to know that he is a strong proponent of funding for scientific research.

Being present for the meetings with Florida congressional staff was very interesting too. The Democrats were again supportive of increasing funds to NSF, but even the Republicans were at least generally supportive of scientific research and open to talking to us. Only one was not supportive of increases (Rep. Cliff Stearns, R-FL), but at least

understood the importance of scientific research and did not want to decrease funds to NSF. He was honest about his doubts that Congress would even manage to pass a budget before the new fiscal year, and thought that we'd be pretty lucky to get one that keeps funding level, but hey, he's just being a realist. The legislative director for Sen. Marco Rubio (R-FL) was a happy surprise, as we had a very friendly, entertaining, and productive meeting with her. Not only was she strongly in support of NSF funding, she was also generous with her time and even traded personal stories with us.

The variety of congressional staff we spoke with was interesting. One was an AAAS Congressional Fellow and an oceanographer, and it was great talking to another scientist. Other legislative assistants specialized in areas such as education, energy, and financial services, and the legislative director I mentioned before (for Rubio) was actually pretty high up in the chain of command—and you could tell she had a lot more experience. Also interesting were the differences between the House and Senate. House offices were smaller and seemed to be rather hectic and less organized. At all of these meetings, we were sitting with the staffer in the office lobby, sometimes with several other things going on around us. Senate offices tended to be much larger, labyrinthine even, with a lot more staff, and we always met in conference rooms or offices. Although I was disappointed that my planned meetings with my actual senators didn't pan out, we did get to meet with Sen. Daniel Akaka's (D-HI) staffer in the senator's office—and we got a fun photo op of me sitting at his desk. After our meetings were done, Liza, Adam, and I went back to the Capitol to visit the House gallery. By this time it was after 5 pm, and amusingly we got to watch a congressman give a passionate speech to an almost entirely empty House floor—if that's not a metaphor for something, I don't know what is! After that, Liza and I met up with Morgan over happy hour to decompress and trade some stories. An exhausting but productive, educational, entertaining, and great day.

I would like to thank BSA for sponsoring me to attend this event! It was just a great experience overall. Not only did I learn a lot about how Congress works (and doesn't!), I also got some great practice at being a "people person" and interacting with folks who have some influence on the country's purse strings—as well as other science activists. I will definitely stay involved in public policy (I'm already planning to visit directly with my congress-people when they are home for August recess) and will encourage other BSA students to get involved, starting with our workshop at Botany 2012.

Morgan Gostel (far right) with other members of the Mid-Atlantic team visiting Capitol Hill.

Morgan's Experience

Overall, I had the same sentiments as Marian and was also quite impressed with how welcoming and generous congressional staff were with their time. My group included constituents from Maryland, Pennsylvania, and Virginia and was led by the ESA Director of Public Affairs, Nadine Lymn. Our Mid-Atlantic delegation included graduate students, a postdoc, and the current president of the ESA, Steward Pickett. We met with congressional staffers for both of the state senators from Pennsylvania and Maryland and one from my home state (Mark Warner, D-VA). Each of us also had meetings with our local state representatives, with whom we are constituents; a couple of folks in my regional group actually had a chance to speak directly with their representative! In all cases, the meetings were well received and there were opportunities to exchange research anecdotes that related directly to the central issue: funding science is important!

Some offices were, of course, more receptive than others, and there seemed to be a universal concern with uncertainty over budget priorities. Being an election year, it was suggested that budget

issues probably would not be confronted in earnest until later in the year, closer to November and December. In most cases we were encouraged not to let this event be a one-off and to remain involved in scientific policy issues as they arise, even if it just means calling in to clarify a point or error made on a radio show or writing to encourage support of relevant legislative issues when they are coming up for a vote. Of course, the simplest way to have your voice heard is just to vote each November. As a student myself, I frequently hear fellow students mention that they either have not updated their voter registration or in many cases do not vote as an absentee (yes, we're usually far from home). We've recently seen how much of an impact young voters can have and it's important to stress the value of your vote and encourage your fellow students to vote as well!

Overall, the Congressional Visits Day was a great experience and I was glad to have the opportunity to represent the BSA! I owe a huge thanks to Marian for asking me if I'd like to participate and also to the ESA, BESC, and AIBS for organizing such an important event. I look forward to staying involved with AIBS and BSA, and science policy issues.

To conclude, we both strongly encourage students/postdocs to get more involved in public policy issues that concern botany and other biological sciences. A very easy way to start is to join AIBS's Action Center online: http://capwiz.com/aibs/home/. You'll receive action alerts when important issues come up, and you can make a difference simply by writing your congresspeople through AIBS's easy interface. If you want to make a bigger impact, please register for our Botany 2012 Workshop: "Influencing Science Policymakers: A Workshop for Students and Early Career Scientists" (WS12, Sunday, July 8, 3:15–5:15 pm). Registration is free for students and early career scientists, courtesy of BSA.

Your current BSA Student Reps (Marian and Megan) also have great news. At the BSA board meeting in April, we proposed a new BSA Public Policy Award that will support two students to attend Congressional Visits Day each year (including travel and accommodation expenses; the training/meeting support are provided free of charge by AIBS). The BSA Board voted unanimously to establish this new student award beginning in 2013!

-Marian Chau and Morgan Gostel

Marian Chau with a fellow grad student activist (the Hawaii-Florida team) visiting Capitol Hill.

2012 Triarch "Botanical Images" Student Travel Award Winners

A charismatic salt rush inflorescence

Glenn Shelton, Humboldt State Univeristy

Rushes and other grass-like plants are frequently overlooked amidst a landscape of showy entomophilous (insect-pollinated) flowers. However, up close their inflorescences can be far from drab. The flowers of this coastal *Juncus* species, *J. breweri* (salt-rush), possess elaborate stigmas bearing vivid pink lobes, looking very much like ornamented pink corkscrews. Like many other flowering plants, rushes are anemophilous (wind pollinated). Anemophilous flowers tend to lack showy sepals and petals like those of their insect-pollinated relatives and instead opt for large exserted anthers and stigmas, and small pollen grains that are easily carried by the wind. The helical stigma lobes of these salt-rush flowers likely provide optimal surface area for pollen receipt.

Ōhi'a Lehua at Akanikōlea

Sean Gershaneck,
University of Hawai'i at Manoa

Ōhi'a Lehua (*Metrosideros polymorpha*) is Hawai'i's most common native tree with a distribution ranging from coastal forests to the treeline on some of the world's tallest mountains as well as bogs, swamps, and deserts.

Cocos nucifera (coconut) dispersal in action

Andrew Crowl
University of Florida

Cocos nucifera is the only species in the *Cocos* genus (Arecaceae: palm family). It is a primarily coastal species found throughout the tropics and subtropics.

BSA Science Education News and Notes

BSA Science Education News and Notes is a quarterly update about the BSA's education efforts and the broader education scene. We invite you to submit news items or ideas for future features. Contact: Claire Hemingway, BSA Education Director, at chemingway@botany.org or Marshall Sundberg, PSB Editor, at psb@botany.org.

PlantingScience

As the spring PlantingScience session ends, almost 12,000 middle and high school science students and their teachers have collaborated on plant investigations. Thanks to the Master Plant Science Team, sponsored by the Botanical Society of America and American Society of Plant Biologists, and the >560 scientists who have volunteered as online mentors since 2005. Students value the chance to work hands-on with plants and connect with scientists online. Here are some of the benefits in the words of a few participants.

Student feedback:

"What I liked most about this experience is learning about the different traits in a plant and watching the plant grow."

"It was fun to be able to interact with an actual scientist about the experiment and learn new things. He helped us to point our many things that we would have never noticed on our own and it was very helpful."

"I liked having to figure things out on my own or with my group and figuring out why things happened and finding out what would happen if we did this or that."

"The thing I liked most was being able to talk to a scientist about what we were doing, and he gave us helpful suggestions on how to do things. Our scientist also asked us questions on what we were doing that helped us keep our minds working."

Teacher feedback:

"PlantingScience has given me a framework for open inquiry. Students enjoy working with their mentors and it gives each group a chance to have some one-on-one feedback that I don't always have time to give them. Students embrace their projects more than anything else I do in the class and when they give their final presentations, important topics such as finding that similar results are often found between different groups who did similar experiments to show students how bodies of evidence are built up by multiple people studying similar topics."

"The mentors posed great questions and were very approachable. It seemed like the students were able to relate to them."

"Despite being a long time period to commit to one inquiry, I felt it benefited the students in a number of ways. First, their ownership and responsibility was heightened and very evident. Second, they were thinking and discussing at a level much deeper than any activity prior to this experience. As a teacher, it allows me to do true open-ended student-generated inquiry which is nice."

Mentor feedback:

"*It has provided a benefit in that it counts as service for me in my job, but more importantly I can directly help students become better thinkers, which benefits everyone."*

"I think that learning how to talk to different levels to students (I am a college professor) helps my teaching at many levels."

"It is a lot of fun interacting with students from an age group I don't have the chance to spend a lot of time with. It is a good reminder of where public knowledge of plant science stands, and a great opportunity for me to practice explaining key concepts in a simple and straightforward way."

As these quotes suggest, there is a special magic at work when students, teachers, and scientist mentors engage in collaborations. We are currently working on major improvements to the website that will enhance the user experiences. And we are excited to be working more closely with the 14 partner societies and organizations as the program plans for the future.

Education Bits and Bobs

Scores up, inclusion down, and gender preferences in AP courses

Females take the AP Biology test in higher numbers than males. This is one of the noteworthy statistics included in the College Board's 8th annual report on the Advanced Placement program. The finding may have implications down the pipeline. Research shows that students who take AP science exams are more likely to earn science degrees. The decade-long trend for increasing numbers of students taking and succeeding on the AP exams is also promising. However, of the STEM exams, scores are lowest for Biology and Environmental Science. Across all subject areas, underserved minority and low-income students are significantly underrepresented in AP classrooms. Access the report online:

http://apreport.collegeboard.org/report-downloads

Read a related story: http://blogs.edweek.org/edweek/curriculum/2012/02/girls_like_biology_boys_like_p.html

Can Reimagining Community Colleges Reclaim the American Dream?

Educating an additional five million students by 2020 is an overall goal of a report released by the American Association of Community Colleges. The report is a roadmap for dramatic changes to community colleges to ensure their role in preparing students for education and workforce pathways. Currently, many students arrive at community colleges unprepared and take at lease one remedial course. Recommendations in the report suggest reforms to redesign students' experiences, reinvent institutional roles, and reset the system to promote rigor, transparency, and success.

Access the online report:

http://www.aacc.nche.edu/AboutCC/21stcenturyreport/index.html

Read a related story: http://blogs.edweek.org/edweek/college_bound/2012/04/to_move_community_colleges_ahead.html?cmp=ENL-EU-NEWS2

International Graduate School Applications Static in the Life Sciences

Foreign student applications for fall 2012 admissions to U.S. graduate schools saw no growth in the life sciences. In contrast, applications increased over last year for all other fields. For example, education rose by 17%, engineering increased by 12%, and the arts and humanities rose by 4%. The top five countries of origin for international graduate students are China, India, South Korea, Taiwan, and Canada. The full report of the 242 institutions by the Council of Graduate Schools is available online at:

http://www.cgsnet.org/international-graduate-applications-rise-seventh-consecutive-year-china-mexico-and-brazil-show-large.

Faculty Leakage by Gender and the 11-Year Itch

Although male and female faculty are retained and promoted at similar rates, the good news from a recent *Science* article ends there. Less than 50% of science and engineering faculty hired are retained over the long term. These departing tenure-track faculty exit at a median of 10.9 years. The low retention rates pose significant direct impact costs and can led to disruption at universities. Expanding current trends of women hires and retention to a long-term view, the authors note that gender equality in science, technology, engineering, and math (STEM) departments could still be 100 years away.

Read an article from the *Chronicle of Higher Education* on the *Science* article and a related article in *American Scientist*:

http://chronicle.com/article/Gender-Equity-on-Science/130839/

See a video of Prof. Deborah Kaminski, one of the study coauthors, talking about the study at: http://www.youtube.com/watch?v=vIJOvIqHymA

Exploring Undergraduates' Understanding of Photosynthesis Using Diagnostic Question Clusters

Parker, J.M., Anderson, C.W., Heidemann, M., Merrill, J., Merritt, B., Richmond, G., and M. Urban-Lurain. 2012. *CBE Life Sciences Education* 11(1): 47-57.

The authors present an assessment tool that focuses on common, well-documented misconceptions about photosynthesis and energy relationships in plants from the sub-cellular through ecosystem levels. They demonstrate that properly constructed groups of multiple choice/true-false questions can be as effective at identifying student misconceptions as the more rigorous qualitative techniques of interviews and open-ended essays. Questions, and student responses, are summarized in the appendices.

Backyard Botany: Using GPS Technology in the Science Classroom

March, K.A. 2012. *American Biology Teacher* 74(3): 172-177.

I work with Boy Scouts a lot and geocaching has become the latest thing in teaching orienteering. The kids love it. The author takes the idea of geocaching and adapts it to field use for finding and identifying trees. Adding the GPS makes keying out the trees much more palatable than the old walk-around. Why not make it a game? Sometimes we need all the help we can get to make learning fun!

An Antique Microscope Slide Brings the Thrill of Discovery into a Contemporary Biology Classroom

Riser, Frank. 2012. *American Biology Teacher* 74(5): 311-317.

The author purchased a "folk art" handmade microscope slide from around 1890 from an online antique dealer. The slide contained 90 different angiosperm seeds, and other propagules, in an artistic arrangement. Of course there was no key to the species represented—thus the challenges to students. How many of these seeds can we identify? In addition to a beautiful color close-up photo of the slide, there are 10 more sharply detailed images of seeds and seed characters. If you don't subscribe, it is worth a trip to the library just to see the images!

BSA Election Results

Congratulations to the newly elected officers of the Botanical Society of America

Pam Diggle
President-Elect

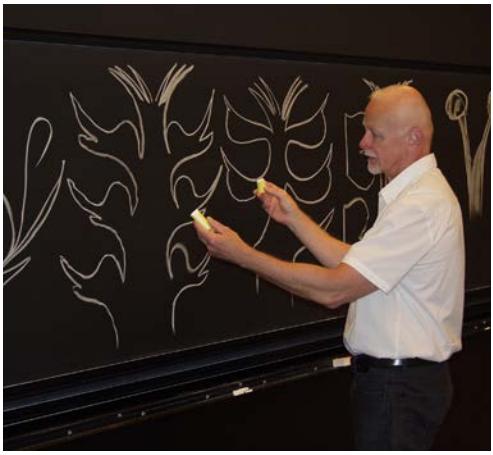
Andrea Wolfe
Secretary

Susan Singer
Director
at Large -
Education

Morgan Gostel
Student
Representative

Past-President Karl Niklas Named One of "Best 300 Professors"

Random House/Princeton Review Books included BSA Past-President Karl Niklas as one of the 17 biologists recognized in their recently published book, *The Best 300 Professors*. The Princeton Review teamed with the online site RateMyProfessors to identify popular professors and combined this with information from its own surveys and information from individual colleges to narrow the list to 300. For some inspiring comments, check out Karl at http://www.ratemyprofessors.com. He doesn't rate very high on "easiness," but he certainly inspires his students (and even gets a "hot" rating!).



The Legacy Society Celebrates

A night that recognized, honored, and applauded individual service to the Botanical Society of America

The Legacy Society of the Botanical Society of America hosted its first regional event in April in Saint Louis. Hosted by two of the Legacy Society's founders, Drs. Peter and Pat Raven, this very special evening took place at the historic Chase Park Plaza Hotel for a night of dinner, drinks, and unique presentations to honor and recognize the vital contributions and service of individual BSA members.

Dr. Peter Raven addresses the BSA Legacy Society.

For those of you who may not be familiar with the BSA's Legacy Society, the concept for the group came together during centennial celebrations at the Botany 2006 Conference in Chico, California. Senior members of the Society, together with the Development Committee, determined it was time to build upon the legacy of giving initiated by our predecessors. This handful of Legacy Society founders truly understood the importance of building and growing an active group to create a sustainable financial future for the BSA. They demonstrated their appreciation for the over 100 years of the Society's history, and all that the Society has done for its members and the botanical sciences through planned legacy gifts.

In just over six years, the Legacy Society has quietly nurtured the vision and has grown its membership to more than 70 individuals. The generous, individual commitments made by members of the group will secure the future for the BSA in its mission to provide members with research opportunities, conferences, publications, and awards that help build the careers of young scientists.

Last year, the Legacy Society felt it was long overdue that we regularly celebrate the important individual contributions made by some of our members and began plans to sponsor Legacy Society Celebrates events in regions throughout the country. At this first event in the Central States region, historian Dr. Vassiliki Betty Smocovitis and current *American Journal of Botany* editor Dr. Judy Jernstedt provided enlightening presentations about the rich history of the *AJB* and the BSA. Saint Louis member and Assistant Professor of Biology at Saint Louis University Dr. Allison Miller

Dr. Judy Jernstedt receives a plaque for her service as Editor of the American Journal of Botany.

Dr. Allison Miller shares her presentation, "Botany in the Next Generation: Advancing Plant Science on the Shoulders of Giants."

demonstrated in her presentation, "Botany in the Next Generation: Advancing Plant Science on the Shoulders of Giants," that the botanical sciences continue to progress, and that our legacy is based on a foundation of scientific discovery passed on from generation to generation. She also shared how society in general is benefiting from the dynamic impact and breadth of new genomic research on the future of our field.

And, since we are approaching the cusp of the centennial for the *American Journal of Botany*, the event was also an opportunity to individually recognize the service and dedication of our former and current *AJB* editors, Drs. Judy Jernstedt, Karl J. Niklas, Nels R. Lersten, and Theodore Delevoryas. We thanked them for all that they have contributed to our Society, and to the development of botanical sciences.

Finally, the Legacy Society honored its own. Attending Legacy Society members from the Central States region were recognized and applauded for their long-standing commitment, vision, and financial generosity toward the future of the BSA. It was truly heartwarming to be a part of this first Legacy Society Celebrates event.

The BSA has a long tradition of member commitment and support for everything we do—from our annual conferences, publications, education, and outreach programs, to student awards, lecture funds, and so much more. We look forward to our next Legacy Society Celebrates event scheduled to take place on the East Coast, where additional members will be recognized for their unique contributions to our Society.

The important foundation of support our Legacy Society members have provided for the future of the BSA is truly a testament to their life-long commitment to our mission, and they carry forth the tradition of giving that our predecessors envisioned.

Dr. Vassiliki Betty Smocovitis recounts a brief history of the Botanical Society of America.

To learn more about becoming a BSA Legacy Society member, please go to http://www.botany.org/legacy/. We'd be honored to have you participate in our future!

Dr. Linda Graham
Board Member & Chair, BSA Development Committee

Celebrating 30 Years of the Flora of the Bahamas: Conservation and Science Challenges

An International Symposium (October 30-31, 2012) at the Bahamas National Trust and The College of the Bahamas

The Bahamas National Trust, the College of the Bahamas, Fairchild Tropical Botanic Garden, and Florida International University are putting together a symposium titled "Celebrating 30 Years of the Flora of the Bahamas: Conservation and Science Challenges," which will take place between October 30 and 31, 2012. This announcement is to invite those interested in Bahamian biodiversity to attend the symposium. We will have a section for posters and we would like to encourage researchers and graduate students to present their results using this avenue. We also have plans to publish the symposium proceedings in the *Caribbean Journal of Science* and, in coordination with the Editor-in-Chief of this journal (Dr. David L. Ballantine), the scientific committee will be processing the submissions (see following submission deadline details). This announcement and new developments about the symposium will be posted regularly at http://www.fairchildgarden/bahamas.

1. Scientific Committee:

Dr. Javier Francisco-Ortega (Associate Professor, Florida International University and Fairchild Tropical Botanic Garden)

Dr. Ethan Freid (Botanist, Bahamas National Trust)

Dr. Brett Jestrow (Herbarium Curator, Fairchild Tropical Botanic Garden)

Dr. Dion Hepburn (Chair, School of Chemistry, Environmental & Life Sciences, College of the Bahamas)

2. Organizing Committee:

Tamica Rahming (Director of Science and Policy, Bahamas National Trust)

Eric Carey (Executive Director, Bahamas National Trust)

Dr. Dion Hepburn (Chair, School of Chemistry, Environmental & Life Sciences, College of the Bahamas)

Dr. Javier Francisco-Ortega (Associate Professor, Florida International University and Fairchild Tropical Botanic Garden)

3. Symposium Background:

Sponsored by Fairchild Tropical Botanic Garden and the U.S. National Science Foundation, the latest comprehensive flora of the Bahama Archipelago was published in 1982. This project was initiated by William T. Gillis, but the final work was authored by Donovan Correll and Helen Correll (illustrated by Priscilla Fawcett). Since its publication, 30 years ago, this flora has played a major role in Bahamian education, research, and conservation because it is still the best available catalogue for plant biodiversity of this archipelago. The Bahamas National Trust has a mandate for plant conservation management in the Commonwealth of the Bahamas, and in the last 30 years it has been using this flora as the "manual" for its floristic activities. However, after recent discussions between conservation biologists involved in the symposium, we believe the time has arrived to evaluate what we know about plant biodiversity in the Bahamas and what conservation and research challenges lie ahead. After these discussions we feel that the 30th anniversary of the publication of the *Flora of the Bahama Archipelago* will be a good moment to organize a symposium to discuss these issues in an open arena. In the last 30 years many new research tools have been developed, but we also have many new environmental challenges. This is particularly relevant in the Bahamas, where in the last 30 years: (1) a network of national parks has been established, and (2) new botanical gardens with a strong conservation mission have been recently created or are about to be established.

4. Symposium Agenda:

October 30 (Tuesday):

Morning and afternoon at the College of the Bahamas (New Library of Oakes Field Campus, Thompson Boulevard). Oral and poster presentations (see following list of speakers and agenda).

October 31 (Wednesday):

A. Morning: Field-trip (tentative depending on number of interested participants and available funding) to visit at least one of the New Providence national parks (Primeval Forest National Park and/or Harold and Wilson Ponds National Park); led by Ethan Freid. We are not certain about the number of slots that we will have available in the

buses; therefore, please indicate in your registration e-mail if you are interested in joining this field trip. Participants will be registered for this field trip on a first-come, first-served basis.

B. Afternoon (starts at 5:00 PM). Reception at the Retreat Gardens, Headquarters of the Bahamas National Trust.

B.1. Tour to the garden living collections; led by Ethan Freid.

B.2. Welcome words by Neil McKinney, President of Bahamas National Trust.

B.3. Lecture: "Bahamas National Trust Program to Advance Botanical Education, Research, and Conservation" by Eric Carey (Executive Director of the Bahamas National Trust)

5. Oral/Poster Presentations and Speakers (Symposium, October 30):

1. Dion Hepburn: Welcome words

2. Javier Francisco-Ortega: Introduction to the symposium

3. Keynote speaker: W. Hardy Eshbaugh, Miami University (Peter Raven Award recipient, 2008): "The Flora of the Bahamas, Donovan Correll, and the Miami University Connection"

4. Ethan Freid: "Plant Endemicity on the Bahama Archipelago"

5. Lee B. Kass, Cornell University: "Historical Aspects of Correll & Correll's flora of the Bahama Archipelago"

6. Michael Vincent, Miami University: "Systematics, Taxonomy, and the new Flora of the Bahamian Archipelago"

7. Brett Jestrow: "From Plant Exploration to Phylogenetic and Biogeograpical Studies in the Bahamas"

8. Eric Carey, Director of the Bahamas National Trust: "Plant Conservation Challenges in the Bahamas"

9. Carl Lewis, Director of Fairchild Tropical Botanic Garden: "Establishing Bridges Between Science, Education, Community Involvement, and Conservation"

10. Poster Presentations

6. Symposium Fees/Registration, Accommodation, Abstract, Poster, Proceeding Guidelines:

6.1. There are no symposium attendance fees. We are aiming for school teachers to also attend the symposium; therefore, the event aims to have a strong community and outreach component. To register for the symposium, send an e-mail to Javier Francisco-Ortega at ortegaj@fiu.edu. We would also appreciate receiving details of: (1) the hotel where you will stay, (2) if you plan to join the field trip to the National Park (October 31), (3) if you plan to attend only the symposium talks at the College of the Bahamas (October 30), (4) if you plan to attend only the reception at the Retreat (October 31), and (4) if you plan to attend the activities offered both at the College of the Bahamas and at the Bahamas National Trust (October 30 and 31).

6.2. There are no hotels near the College of the Bahamas or the Retreat Gardens. However, there are several hotels along W Bay Street and Bay Street where you should be able to find accommodation. We are planning to provide transportation from a designated point near the hotel area to the College of the Bahamas and to the Retreat. A passport is required to travel to the Bahamas, but visa is not needed for U.S. citizens and legal residents.

Potential hotels are:

British Colonial Hilton - Nassau (Number One Bay St., Nassau N 7148, Bahamas, Phone: (242) 322-3301)

Towne Hotel (40 George Street, Nassau PO BOX N-4, Bahamas, Phone: (242) 322-8451)

Nassau Palm Hotel (West Bay Street, Nassau 19055, Bahamas, Phone: (242) 356-0000)

El Greco Hotel (West Bay Street, Nassau, Bahamas, Phone: (242) 325-1121)

Nassau Junkanoo Resort (West Bay & Nassau Street, Nassau, 8191, Phone: (242) 322-1515)

There are also several hotels near the airport, but transportation from this area to Nassau is not inexpensive.

6.3. Abstracts of posters and lectures from speakers should be send by e-mail to Javier Francisco-Ortega at ortegaj@fiu.edu before September 15, 2012. Each abstract should have a maximum of 250 words. Although the talks of the symposium have a focus on the Bahamian flora,

we want the symposium to also be an opportunity for biologists and environmental scientists to show their results. Therefore, we welcome posters in any area of environmental biology pertinent to the Caribbean Islands and South Florida, including both marine and terrestrial systems. Abstracts will be posted in the website of the symposium as we receive them.

6.4. Posters should not be more than 4 feet (121 cm) wide by 4 feet (121 cm) high.

6.5. The deadline to submit manuscripts to the *Caribbean Journal of Science* is December 16; however, we encourage participants to send their submissions to this journal just around the time of the symposium. We will have a limited number of pages for the issue of the *Caribbean Journal of Science* devoted to the symposium proceedings. Manuscripts need to be sent to the Editor-in-Chief of the journal, Dr. David L. Ballantine, at david.ballantine@upr.edu. Please indicate in the cover letter that the manuscript is part of the symposium proceedings.

MISSOURI BOTANICAL GARDEN ETHNOBOTANISTS RECEIVE NATIONAL GEOGRAPHIC SOCIETY GRANT FOR STUDY AT CROW CREEK INDIAN RESERVATION

Project Explores Traditional Ecological Knowledge of the Dakota Sioux People

ST. LOUIS, MO—The National Geographic Society's Committee for Research and Exploration has awarded a one-year, $15,150 grant to Dr. Wendy Applequist, an ethnobotanist at the Missouri Botanical Garden's William L. Brown Center, who will collaborate with fellow ethnobotanist Karen Walker and Peter Lengkeek, tribal member of the Crow Creek Indian Reservation, to collect information about the traditional ecological knowledge of the Dakota Sioux People living on the Crow Creek Indian Reservation in central South Dakota. Native Americans have accumulated knowledge about their environment for centuries, developing skills in using plants that grow around them for food, medicine and shelter. Faced with an overwhelming potential for this knowledge to be lost in our modern society, project organizers, together with tribal members, seek to empower communities within the reservation to promote the preservation and use of traditional ecological knowledge.

Historically, Native Americans have passed their knowledge from one family to the next through oral traditions of storytelling, songs and teaching. Traditional Ecological Knowledge (TEK) is a rich part of the cultural heritage of the Dakota People, who have used the prairie bioregion's flora and fauna for food, medicine, dyes, ceremonies and building materials. In recent times, tribal members have grown concerned that their valuable traditional knowledge is being lost as community elders pass away. Together with former tribal council member Lengkeek, the Missouri Botanical Garden designed a research plan to document the native plant knowledge of their reservation to ensure this knowledge is continuing to be passed on for future generations.

The Crow Creek Indian Reservation was established in 1862, the result of the exile of the Dakota People formerly living along the lakes and rivers of Minnesota in the early 1800s. The 400-square-mile area is located in central South Dakota bordering the Missouri River, and its terrain includes prairie bioregion, woodlands, rivers, Missouri Hills and watershed areas. The reservation is home to over 2,000 people.

Although several ethnobotanical studies have been conducted with the Sioux Nation in the past, no such study has ever been conducted on the Crow Creek Indian Reservation. William L. Brown Center (WLBC) staff member Karen Walker and two students from the local tribal high school are conducting interviews with members of the reservation to ascertain their native plant use, both today and in the past. Project organizers predict that the diversity of species currently used by the tribe will be reduced due to ongoing cultural change, but that some plants native to their vicinity will be newly recorded.

WLBC staff will invite tribal elders who are considered knowledge holders in the community to join them in the field, collecting and vouchering all useful native plants mentioned during interviews and documenting the traditional process of plant collection and harvesting management techniques. Voucher specimens will be housed at the Missouri Botanical Garden, with duplicates remaining on the reservation. Staff will also conduct a floristic survey of the reservation, emphasizing the presence and

distribution of culturally important plants.

The resulting information will be amassed in a database and shared with the tribe at a native plants workshop this fall. All members of the tribe will have access to the voucher specimens and compiled interview data for purposes of learning and education.

"It is a great honor and privilege to work with the Dakota Sioux People," said Walker. "As we visit with the elders and community members, recording TEK, it reinforces the important role plants have played in traditional diet, health and religion. The information that is being shared with us is a valuable resource to the whole community. It is also rewarding to see the excitement and energy from the students involved—there is no better way to preserve traditional ecological knowledge than to have the younger generation learning it directly from their tribal elders."

With the William L. Brown Center, the Missouri Botanical Garden is a global leader in discovering, explaining and disseminating information about the diverse and dynamic relationships between people and plants throughout the world. Today, 153 years after opening, the Missouri Botanical Garden is a National Historic Landmark and a center for science, conservation, education and horticultural display. With scientists working in 35 countries on six continents around the globe, the Missouri Botanical Garden has one of the three largest plant science programs in the world and a mission "to discover and share knowledge about plants and their environment in order to preserve and enrich

Special Lecture at Botany 2012

The inaugural *American Journal of Botany* special lecture at Botany 2012 will feature Gar Rothwell (Ohio University), who will present "Integrating Plant Evolution, Paleontology, and Molecular Genetics: A Developing Paradigm."

Rothwell's talk will focus on how, within the developmental framework, evolution can be interpreted as proceeding by the successive alteration of ontogeny, which is mediated via regulatory genetics. Neither genetic sequences nor experimental manipulations of development are directly available to the paleontologist. Nevertheless, by identifying structural "fingerprints" of developmental regulatory mechanisms, ontogenetic patterns can be inferred from the morphology and anatomy of extinct plant species.

For more information on this talk, go to www.botanyconference.org.

Four Prominent Botanical Institutions Announce Plans to Create First Online World Flora

Missouri Botanical Garden; The New York Botanical Garden; Royal Botanic Gardens, Kew; and Royal Botanic Garden Edinburgh Leading Effort to Develop World Flora by 2020

World Flora meeting (ST. LOUIS): The Royal Botanic Gardens, Kew (RBG Kew), the Royal Botanic Garden Edinburgh (RBGE), The New York Botanical Garden (NYBG) and the Missouri Botanical Garden (MBG), have announced plans to develop the World Flora—the first modern, online catalog of the world's plants—to be made available by the year 2020. This massive undertaking will include the compilation of information on up to 400,000 plant species worldwide. It will also achieve a primary target of the Global Strategy for Plant Conservation, an ambitious effort first adopted by the United Nations' Convention on Biological Diversity in 2002, to halt the continuing loss of plant biodiversity around the globe. Representatives of the four botanical gardens recently met to organize a framework to guide their efforts and respond to this need for a baseline survey on the plants of the world that has been called for by the international community. A Memorandum of Understanding (MOU) detailing plans to create the World Flora was recently signed into effect by the four institutions.

Royal Botanic Gardens, Kew Professor Stephen Hopper, Director, Royal Botanic Gardens, Kew said, "Using the wealth of resources available at our institutions, we will help to provide the baseline data needed to develop plant-based solutions for a rapidly changing world. Botanical institutions worldwide have much expertise to contribute to this effort to capture the information necessary to better conserve and sustainably use the planet's plant diversity."

"Botanic gardens have led the way in spearheading international conservation strategies and programs, and are a natural partnership for mobilizing much needed information on plant biodiversity," said Professor Stephen Blackmore, Regius Keeper of the Royal Botanic Garden Edinburgh. "This is a large task, but with many contributors we can deliver what is needed."

"The world's great botanical gardens are proud to lead this effort," said Gregory Long, Chief Executive Officer and The William C. Steere Sr. President of The New York Botanical Garden. "Thanks to advances in our botanical knowledge and in digital technology, an online World Flora is within our grasp. It is imperative that we create this resource, which will help us assess the value of all plant species to humankind and be effective stewards to ensure their survival."

"There are few institutions in the world that have the capacity to foster this project, and no one of us could do this alone," added Dr. Peter Wyse Jackson, President, Missouri Botanical Garden. "We all want to see this come to fruition, and the entire international community will benefit from it. With the botanical resources and knowledge we each possess, it was implicit that our institutions would step forward to collaborate on this project."

Plants are one of Earth's greatest resources. They are sources of food, medicines and materials with vast economic and cultural importance. They stabilize ecosystems and form the habitats that sustain the planet's animal life. They are also threatened by climate change, environmental factors and human interaction. There are an estimated 400,000 species of vascular plants on Earth, with some 10 percent more yet to be discovered. These plants, both known and unknown may hold answers to some of the world's health, social and economic problems. A full inventory of plant life is vital if their full potential is to be realized before many of these species, and the possibilities they offer, become extinct.

The critical situation for plants, where at least 100,000 plant species are threatened by extinction worldwide, has been recognized by the U.N. Convention on Biological Diversity (CBD). In 2002, a Global Strategy for Plant Conservation (GSPC) was developed and adopted by the Convention.

In 2004, a Global Partnership for Plant Conservation (GPPC) was formed, involving leading environmental, conservation and botanical organizations who came together to support the achievement of the GSPC. The four botanical gardens involved in this new project are all members of the GPPC.

New York Botanical Garden "An online Flora of all known plants" is the first of the GSPC's targets for the period 2011-2020. Earlier work by the Royal Botanic Gardens, Kew and the Missouri Botanical Garden addressed one of the GSPC's earlier targets for 2010 with the launch of The Plant List, an online portal containing the accepted names and synonyms of all known plant species. The forthcoming Flora will use The Plant List as a building block for something much more detailed, containing not just names but also descriptions, images and distribution information about every plant.

The team tackling the World Flora will build a collaborative partnership for this work worldwide and create a structure and program able to incorporate data from institutions and individuals all over the world. In some cases, existing electronic data sets will be combined and augmented with the results of botanical research published over more than a century around the world. Much historic information will require a thorough review and update, along with a conversion to an electronic medium. As new plants are subsequently collected, named and described, they too will be added to the World Flora.

"We look forward to working with institutions worldwide to produce a sustainable resource to aid conservation globally, regionally and nationally," said Hopper.

From L to R: Dr. Bob Magill, Senior Vice President, Science and Conservation, MBG; Melissa Tulig, Associate Director of the William and Lynda Steere Herbarium, NYBG; Professor Stephen Blackmore, Regius Keeper, RBGE; Chuck Miller, Vice President, Information Systems, Missouri Botanical Garden; (front) Dr. James S. Miller, Dean and Vice President for Science, NYBG; (back) Dr. Mark Watson, Co-ordinator of RBGE's Major Floras Programme, RBGE; (front) Dr. David Simpson, Assistant Keeper and Head of Systematics, RBG Kew; Dr. Alan Paton, Assistant Keeper and Head of Biodiversity, Information and Conventions, RBG Kew; Dr. Peter Wyse Jackson, President, MBG; Nicholas Turland, Associate Curator, MBG. Photo taken on site at the Monsanto Center research facility of the Missouri Botanical Garden, January 24, 2012. Photo by Jeff Ricker, courtesy Missouri Botanical Garden.

Blanche and Oakes Ames: A Relationship of Art and Science

Maura C. Flannery
Professor of Biology
St. John's University, Bent 268
Jamaica, NY 11439

Submitted 15 October 2011
Accepted 8 March 2012

Blanche and Oakes Ames are a fascinating couple, as is evident in *Jottings of a Harvard Botanist* (1979), a collection of Oakes Ames's writings, from letters to speeches to diary entries. All these deal with his life as a Harvard botanist and his relationship with his wife, Blanche. Almost 30 years after his death in 1950, his daughter Pauline Plimpton assembled these materials, and her son George Plimpton wrote the Foreword. Particularly interesting from the viewpoint of their relationship are the letters that Ames wrote to Blanche, as well as the stories about their home, Borderland, which she designed to include a two-story library, a laboratory, and a herbarium for Oakes to use for his orchid research. Blanche was an accomplished artist who did hundreds of illustrations for her husband's botanical publications. Several of her drawings are included in *Jottings* as is her portrait of Oakes. There are also the details of her many other endeavors, ranging from politics to invention.

Oakes Ames was born in 1874 in Easton, Massachusetts to a family that had made its money producing shovels—for the Pacific Union Railroad. They had a greenhouse on their property, and Oakes's father, Oliver Ames, who had been Governor of Massachusetts, grew orchids among other plants. It was the orchids that attracted Oakes. From an early age, he grew his own orchids and developed an extensive collection, which he donated to the New York Botanical Garden in 1906, relatively early in his career. Thereafter he relied primarily on herbarium specimens for his research. He attended Harvard University and went on to spend his entire working life there, becoming professor of botany, chair of the botany department, and director of the Botanic Museum and the Arnold Arboretum.

Oakes participated in collecting expeditions to Central and South America, Florida, the Philippines, and the Caribbean, naming over a thousand new species. He amassed a large herbarium focused on orchids with 64,000 specimens (Sax, 1950). He donated this to Harvard, along with his economic botany collection and his botanical library, providing a substantial endowment for its maintenance. Oakes published scores of articles and such books as *Orchidaceae: Illustrations and Studies of the Family Orchidaceae* (1905), *Orchids of Guatemala* (with D.S. Correll, 1952), and *Economic Annuals and Human Cultures* (1939). This last was based on a course he taught in Harvard's general education program and stressed the long and pivotal role of agriculture in human history. The book became a classic and a major contribution to the field that Ames helped to found. He also developed a large economic botany collection that is still housed at Harvard and that was used in his teaching. His approach in the classroom was different from what might be expected in an economic botany course. His former student Edgar Anderson (1952) writes that Ames spent little time on topics like agriculture, but a month on arrow poisons. Yet somehow he got across the message that economic botany was an important part of human history and an intriguing field to explore.

Blanche Ames and Her Many Interests

Blanche Ames was born in 1878 in Lowell, Massachusetts. Her father, Adelbert Ames, was also a Governor, of Mississippi during the Reconstruction Era after the Civil War. Even though Oakes and Blanche shared a surname, they were not related. A graduate of Smith College, she married Oakes in 1900. They had four children, and early in their marriage they lived with Oakes's mother, in an admittedly spacious house, but under less than ideal conditions. While Oakes was on a trip to Europe in 1905 doing research on orchids, Blanche went house hunting, reporting to Oakes by letter on a lovely home she was considering. Oakes wrote back telling her not to be too hasty, but upon his return, he got the message clearly enough that they bought property in North Easton with a farmhouse where they lived for several years until Borderland was built. Oakes's mother wasn't happy about the move and threatened to prevent him from taking his orchids, though she eventually relented after an exchange of tense letters.

Blanche Ames is one example among many of wives who supported their husband's botanical work artistically. Marion Ruff Sheehan documented

the work of his husband Thomas Sheehan, also an orchid expert; Joseph Hooker's wife, Maria, did engravings for his publications; and both the wife and eldest daughter of the agronomist and botanist Lewis Sturtevant created illustrations for his writings. While some women's contributions were hidden by the fact that their works were unsigned, Blanche signed everything she produced. In addition to doing illustrations for Oakes, she also did them for his colleague Donovan Correll's *Orchids of North America North of Mexico* (1950).

It is evident in many ways that Blanche did not sit quietly drawing orchids. She managed a family of four children with several homes and had time to seriously support causes from women's suffrage to birth control, including creating a series of cartoons for the suffragist cause (Clark, 2001). Since both her parents had been inventors, Blanche saw design as a normal response to practical dilemmas. When the architect who was designing their house proved impossible to work with, she undertook the task and worked with contractors. She also devised the drainage system for the property—with dams, and time has proven its practicality. During World War II, she patented an apparatus to trap enemy planes, and when 90 years old, she developed an antipollution device for toilets (Crane & Haff, 1982). Blanche obviously didn't see age as a barrier. When in her eighties, she wrote a biography of her father, Adelbert Ames (Ames, 1964). She undertook this project in response to John F. Kennedy's (1956) *Profiles in Courage* where Adelbert was labeled as a carpetbagger governor of Mississippi.

With another family member, her brother Adelbert (Del) Ames II, Blanche developed a series of color charts, with about 3300 color variations, making it more comprehensive than the Musell Color System. It took them over a year to create the entire scheme, and Blanche employed it in her paintings to illustrate its usefulness. This work led them to an investigation of perception, and in particular of binocular vision (Behrens, 1998). Their collaboration yielded a device to replicate binocular vision, and Blanche painted several still lifes to test it out. Del published three papers on their work, two with co-author Charles Proctor, but Blanche was not included as a co-author on any of these. When he showed her the draft of a fourth paper, she rebelled; they had heated words during which Del claimed that she had contributed nothing to his ideas. This resulted in several letters between the two that eventually calmed the situation. Blanche became co-author on the paper, but the siblings never collaborated again (Ames, Proctor & Ames, 1923).

Throughout their marriage, while serving as Ames's chief illustrator, Blanche also painted portraits and a number of commissioned pieces, including a mural (*Orchids and Artists*, 1991). She worked in several different media from watercolor to oils to etchings to relief sculptures, as well as in pen and ink—the staple of botanical illustrators. There are many examples of two types of her work at the Oakes Ames Herbarium at Harvard. First are her pen and ink drawings that are frequently found on the herbarium sheets, sometimes as copies, documenting the drawings she did for Oakes's publications.

Secondly, there are a number of her watercolors that are also included on herbarium sheets. Some were done while she and Oakes were visiting herbaria including the Botanical Museum Berlin-Dahlem in 1922. One of these is a watercolor of *Stanhopea ruckeri* Lindl. This was based on a flower that the botanist and orchid authority Rudolf Schlecter had been carrying as a means of identification when he met them at the Berlin railroad station on the evening of August 25. Blanche lost no time getting to work. She did a number of watercolors of individual species over the next few days—several a day—including *Stanhopea*. On the herbarium sheets at Harvard, there are not only the watercolors, each dated, but cuttings taken from the Berlin collection that were used as models for Blanche's art and then pressed by Ames. These sheets are now particularly significant because almost all the specimens in Dahlem where destroyed in a bombing raid in 1943 (Angell & Romero, 2011).

Oakes Ames was obviously not a purist who thought that only specimens should be put on herbarium sheets. He included photographs of live plants and of herbarium specimens from collections he'd visited, as well as Blanche's drawings and some of his own, which are simpler and rougher. Frequently a copy of one of Blanche's published drawings with her exquisite lettering is included; sometimes there is a portion of a published article or even on the entire article pasted to a sheet. There are also sketches by others such as Charles Schweinfurth, a botanist who worked with Ames for 35 years. The sheets sometimes look rather cluttered, but they are obviously rich sources of information and are indicative of Oakes's philosophy that an herbarium sheet was a working document.

The Charts

Among the most impressive illustrations that Blanche created are the "Ames Charts" done in 1916 and 1917 for Oakes's economic botany course. They are kept in the archives of the Harvard Botany

Libraries and are very well-preserved. They were hanging in the Nash Lecture Hall, the economic botany classroom, until it was dismantled in the late 1980s. They had been framed under glass, which explains their excellent state of preservation, as does the fact that Blanche obviously used the best paints.

These are amazing works, varying in size but approximately three by four feet. They are India ink with watercolor renderings of phylogenetic trees showing the relationships among species of useful plants. The largest has the title, "Economic Plants of the Archichlamydeae arranged in accordance with the System of Engler & Gilg.," presented in a decorative calligraphed label at the bottom of the chart, reminiscent of labels on old maps (Figure 1). The label includes the title, bordered on either side with a cornucopia and a vase of flowers at the bottom center; there is also a tiny peanut after "Gilg." This small touch suggests that Blanche had fun on this project and that she enjoyed working with Oakes. The base of the tree is marked "Sub-Class 1," with the stump of another trunk, "Dicotyledoneae Class 2," pushing out to the side;

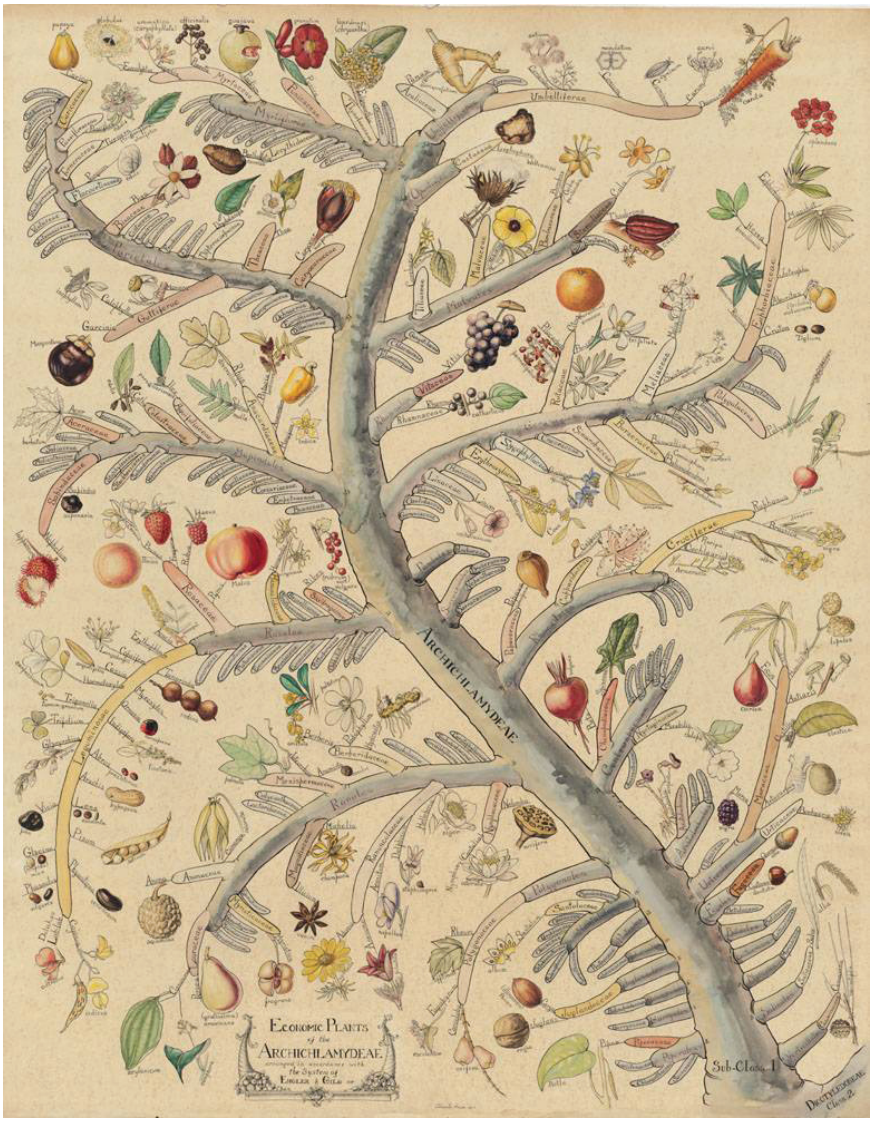


Figure 1. Economic Plants of the Archichlamydeae arranged in accordance with the System of Engler & Gilg.

the latter is presented in a separate chart. The major trunk is labeled Archichlamydeae with several branches and sub-branches also labeled. There are 30 branches, numbered 1 at the bottom to 30 at the top. The branches are of varying thicknesses representing higher taxa; a genus name is noted by an ink line extending to a drawing with the species name alongside the drawing.

On the tree there are dozens of sketches of plants, fruits, nuts, representing species of economic importance. The entire chart is covered with these small watercolor drawings of plants; some of the pencil marks from underlying sketches remain. The arrangement of the drawings on the tree is extraordinary. It must have taken Blanche a long time, and many preliminary sketches, to develop the layout. This is truly a labor of love as well as a masterpiece of scientific illustration. I can imagine Blanche and Oakes putting their heads together over the sketches, she blocking out individual branches, and he making changes, suggesting which plants he would like to use as examples. When it was completed, she signed it "Blanche Ames 1916."

The chart titled "Economic Plants of the Metachlamydeae arranged according to the system of Engler & Prantl" is the companion to the first. This has the best of the labels, rivaling that of a fine Renaissance map. On one side of the label's text there is an ink drawing of a woman representing Ceres, goddess of agriculture, and on the other a Native American surrounded by baskets, smoking pipe, corn, etc. This chart is not as large or elaborate as the other, but it still fills the page. The base of the trunk is labeled "Class 2 Dicotyledoneae." Going up the trunk is the label: "Subclass 2 Metachlamydeae or Sympetalae." There are no numbers on the branches here as there are on the other chart, but branches are labeled "order" at the point where each attaches to the trunk. The chart is again signed "Blanche Ames 1916" and her humor, or his, again shows itself, this time in a drawing of *Ecballium elaterium*, the squirting cucumber, in the process of squirting.

The patience and the detail found in the drawings—all the tiny hairs and the stippling—are exceptional. In addition to ink and watercolor, Blanche used graphite for very subtle shading in places, so she really wanted to get it right. There is still greater detail in the chart labeled "Genera of the Gymnospermae with the more important Economic Species arranged after Engler & Gilg. modified." It is an amazing production; there is much more work here because of the pinecones. There is also more detailing on the branches to highlight all the texture. This sheet is signed "Blanche Ames, 1917," so it must have been completed in the year following the other charts. There was obviously a limit to what even she could accomplish in a year.

Other Work

Blanche did a different type of art for another of her joint enterprises with Oakes, the Christmas cards they sent from 1937 to 1949. Each year's card included an etching by Blanche of an orchid—of course—as well as a poem or other quote from writers such as Wordsworth, Whitman, and Robert Browning, which were chosen by Oakes. The etchings often had imaginative backgrounds, such as the interior of a cathedral. All these cards were reprinted in a small book called *Orchids at Christmas* originally published in 1975 and then reprinted in 2007 with additional commentaries. It is a lovely little book and indicates that even though more than a generation had passed since his death, Oakes was still admired and remembered at Harvard, as was Blanche.

In 1947, Blanche and Oakes jointly published *Drawings of Florida Orchids*, with Blanche as first author. As usual, she supplied the illustrations and Oakes the text of short descriptions of the orchids pictured. Whereas in his scientific works the illustrations complement the text, here the illustrations take center stage as they were intended. The two came up with the idea for this publication in late 1946, in preparation for a talk that Blanche was planning to present to the Garden Club of the Halifax Country in Ormond Beach, Florida where they spent winters after Oakes retired from Harvard in 1941. In a matter of months, they had completed the manuscript, and it was published by the press at the Botanical Museum of Harvard University, which Oakes had founded. The illustrations include some that Blanche did specifically for this book, but also a selection of works from their lifetime together studying orchids. It is a lovely monument to their accomplishments.

Blanche also did an number of sculptural reliefs of botanical interest. One was the official seal of the American Orchid Society, which she and Oakes helped to found in 1921 (Crane & Haff, 1982). The seal depicts an American Indian kneeling down to look at an orchid plant. She also created a seal that Oakes Ames used in publications of Botanical Museum of Harvard Press. Perhaps her most

ambitious sculptural work was the monument she designed as a gravestone in the months after Oakes died of heart failure in 1950. She sculpted it in clay, then had it cast in plaster and finally in bronze. It is set above her grave and that of Oakes in the Unity Cemetery in North Easton, Massachusetts. Of course, it is decorated with orchids, including tropical species as well as lady's slipper orchids native to the Northeast. It's easy to imagine that creating this masterpiece was a way for Blanche to continue her 50-year relationship with her husband and his work.

Finally, an oil still life that Blanche painted deserves mention. It relates to the other types of art she produced. It includes—along with the requisite orchids—a microscope, a magnifying glass, and a flask that appears to contain an orchid specimen preserved in alcohol. Many of the drawings Blanche did of the reproductive parts of orchids were based on such specimens; Oakes had thousands of them. I like to think that this painting is an idealized view of the materials Blanche used in creating her artwork for Oakes. The book in the painting might be a reference on orchids, perhaps written by Oakes himself. The entire orchid as well as its dissected parts are at hand; the microscope and hand lens are there for getting the details right. When they were courting, Oakes presented Blanche with the gift of a microscope—what a romantic devil. Perhaps it is this very microscope that's pictured in the painting.

Note: I would like to thank Lisa DeCesare, Irina Ferraras, Gustavo Romero, and Judith Warnement for their gracious assistance at the Harvard University Herbaria and Botany Libraries, as well as the reviewers for their useful comments. This article was written with the support of the St. John's University Faculty Writing Initiative.

References

Ames, A., Proctor, C. A., & Ames, B. 1923. Vision and the technique of art. *Daedalus 58*: 3-47.

Ames, B. 1947. Drawings of Florida orchids. Botanical Museum of Harvard University, Cambridge, Massachusetts, USA.

Ames, B. 1964. Adelbert Ames, 1835-1933: General, Senator, Governor. Argosy-Antiquarian, New York, New York, USA.

Ames, O. 1905. Orchidaceae: Illustrations and studies of the family Orchidaceae. Houghton, Mifflin, Boston, Massachusetts, USA.

Ames, O. 1939. Economic annuals and human cultures. Botanical Museum of Harvard University, Cambridge, Massachusetts, USA.

Ames, O. 1979. Jottings of a Harvard botanist. Botanical Museum of Harvard University, Cambridge, Massachusetts, USA.

Ames, O., & Ames, B. 2007. Orchids at Christmas (Reprint edition). Botanical Museum of Harvard University, Cambridge, Massachusetts, USA.

Ames, O., & Correll, D. S. 1952. Orchids of Guatemala. Chicago Natural History Museum, Chicago, Illinois, USA.

Anderson, E. 1952. Plants, man and life. University of California Press, Berkeley, California, USA.

Angell, B., & Romero, G. A. 2011. Orchid illustrations at Harvard. *The Botanical Illustrator 17*: 20-21.

Behrens, R. 1998. The artistic and scientific collaboration of Blanche Ames Ames and Adelbert Ames II. *Leonardo*, *31*: 47-54.

Clark, A. B. 2001. My Dear Mrs. Ames: A study of suffragist cartoonist Blanche Ames Ames. P. Lang, New York, New York, USA.

Correll, D. S. 1950. Native orchids of North America north of Mexico. Chronica Botanica, Waltham, Massachusetts, USA.

Crane, B. L., & Haff, E. C. 1982. Blanche Ames: Artist and activist (1878-1969). Brockton Art Museum/Fuller Memorial, Brockton, Massachusetts, USA.

Kennedy, J. F. 1956. Profiles in courage. Harper, New York, New York, USA.

Orchids and Artists: Five centuries of botanical illustrations from Peter Schoeffer to Blanche Ames '99. 1991. Smith College Museum of Art, Northampton, Massachusetts, USA.

Sax, K. 1950. Oakes Ames, 1874-1950. *Journal of the Arnold Arboretum 31*: 335-349.

Book Reviews

Books Reviewed

Developmental and Structural

The Shaping of Life: The Generation of Biological Pattern

Lionel G. Harrison
2011. ISBN-13: 978-0-521-55350-6
Cloth, US$99.00. 247 pp.
Cambridge University Press, New York, New York, USA

When it comes to life on our planet, humans have made significant progress in exploring *what* and *where*, more or less distilling *when*, ever busying ourselves with *whom* and *why*. In *The Shaping of Life*: *The Generation of Biological Pattern*, Lionel G. Harrison delivers a compelling look at *how*. Growth is a tremendous and complex realm of study, and here Harrison reaches beneath the more common analysis of structures and their functions to uncover the processes responsible for the living forms that exist. In a rich combination of theory, experimentation, mathematics, and metaphor, Harrison expands his first book, *Kinetic Theory of Living Pattern* (1993) with his own work and further research, compiling into one volume the questions, philosophy, and methodology of physical chemistry in the quest for understanding *how* chemistry and physics on the microscopic level develop into the biological life we recognize.

Harrison is methodical and thorough in his approach. In each of the three parts, a brief and primary exposition addresses the fundamental theories of the subject, the conflicts therein, and the possible paths of study. The explication that follows each includes his own experiments and the models, images, and differential equations derived thereof. Throughout his work there is frequent reference to a number of scientists, from Aristotle in his *Generation of Animals* to Harrison's own student M. J. Lyons and his work with stripe selection in pattern-forming models with linear systems and electron microscope imaging (1992). Harrison's background in physical chemistry is pronounced, but in his integration of metaphors from the operatic works of Offenbach to the elementary truths of Isaac Newton, he demonstrates a broad appreciation for creative inquiry. The organization is clear, from the concise table of contents to the expansive library of resources in which he consistently draws specific and pertinent references.

The heart of Harrison's investigations is the movement within and between that which *creates* organization and that which *is* organized. In his first pages he asserts, "I am concerned mainly with how the tiny, partly fragmentary and partly one-dimensionally ordered genetic beginnings are transformed into the three-dimensional organism by the processes of development." From there, he delves into the dynamics of the chemical and

physical reactions in a number of growths in minute detail. Plants are his first subjects, in which he dissects the nature of cell division and anisotropic changes of shape. Much of his research focused on *Acetabularia acetabulum*, a lengthy aquatic plant (at 4 cm) with a single nucleus, whose propensity for developing vegetative whorls elucidated the possibility for reaction–diffusion mechanisms as a source of such development, rather than the "mechanical buckling" that is favored by some scientists. The more complex nature of higher order plants was studied in the same vein with somatic embryos of conifers, whose generation *in vitro* allowed visibility in another level of vegetal complexity. Within this venture, Harrison sought a "natural continuity" between unicellular and multicellular plants. His studies complemented the work of P.B. Green et al. (1996) and their work in phyllotactic patterns to develop the proportions and interactions between the aforementioned reaction–diffusion process and mechanical buckling. Studies of the latter involved the genus *Microasteras*, another aquatic marvel in the desmid family of algae that is renowned for its repeated dichotomous branching.

In its second part, the text explores the likenesses in development mechanisms in plants and animals, once again questing for interdisciplinary compatibility. There is a powerful merger here of two of the other pioneers in the field, V. B. Wigglesworth (1940) and A. M. Turing (1952), where Harrison synthesizes their theories of activation–inhibition dynamics with extensive detail into diffusion-driven stability and how patterns of chemical concentration yield harmonic waveforms.

There is much attention throughout the book to the classification of processes and then their integration. His three largest considerations from an aspect of physical chemistry are structure, equilibrium, and kinetics. Within this framework, he develops his own "pseudo phyla" of reaction–diffusion, mechochemical, self-electrophoretic, and complex intercellular systems. As he moves into the animal kingdom, he continues with these features on the microscopic level, first with the attractive forces that distribute cells into layered spheres and later to the expression of stripes and spots, onward until the paraxial mesoderm of the axolotl (amphibian) during somite formation. He makes clear the two singularly animal behaviors of having precise placement of specific cell types that produce a function and the movement of cells during development. The final chapter on gastrulation is not of his research, but an assembly of information about the body plans of most metazoa that cumulates the similarities in the kingdoms Plant and Animal, almost apologizing for the fact that he was unable to understand or explore all of each territory.

This book is by no means intended for the faint of heart. While its title might provoke thoughts of the wholesome passage of pupae to butterfly, its pages reveal the seemingly infinite complexity of physical chemistry and formation biology. While he does present a thorough introduction to each investigative tool in his arsenal, the differential equations and intricacy of mathematical models can be a steep climb. Broad theory of scientific disciplines intermingles with uncommonly exact investigation, and it is really the responsibility of the reader to ponder that middle ground in his or her own applications. To those specifically seeking evidence and methods of inquiry into cell sorting and pattern forming of "simple" plants, hyphae, embryonic development, and the dynamic theories therein, *The Shaping of Life* is an excellent resource. To those with interest in the evolution and theory at the interface of physical chemistry and the biological sphere, this book offers a pithy and well-informed perspective. For those who hope for beautiful pictures, it would be best to put down the book and go outside.

Harrison does not give answers or paint pictures, but his clarity of thought and his holistic approach to education are intended to inspire others in the pursuit of understanding. Indeed it has, for when Lionel Harrison passed in 2008 his book was unfinished; it was his team of colleagues and students who shaped and delivered his work to the world. Harrison's distinctive writing style is evident in his sharp wit and fervent love of physical chemistry, but it is Harrison's desire for collaboration and integration that really makes his final work appropriately the work of many.

LITERATURE CITED

GREEN, P. B., C. R. STEELE, and S. C. RENNICH. 1996. Phyllotactic patterns: A biophysical mechanism for their origin. *Annals of Botany* 77: 515–527.

HARRISON, L. G. 1993. *Kinetic Theory of Living Pattern*. Cambridge University Press, Cambridge, United Kingdom.

LYONS, M. J., and L. C. HARRISON. 1992. Stripe selection: An intrinsic property of some pattern-forming models with nonlinear dynamics. *Developmental Dynamics* 195: 201–215.

TURING, A. M. 1952. The chemical basis of morphogenesis. *Philosophical Transactions of the Royal Society of London, Series B, Biological Sciences* 237: 37–72.

WIGGLESWORTH, V. B. 1940. Local and general factors in the development of "pattern" in *Rhodnius prolixus* (Hemiptera). *Journal of Experimental Biology* 17: 180–200.

–Rebecca Bender, Department of Civil Engineering, Michigan Technological University, Houghton, Michigan, USA

Ecological

Fire in the Forest

Peter Thomas and Robert McAlpine
2010. ISBN-13: 978-0-521-82229-9
Hardcover, US$49.00. 225 pp.
Cambridge University Press, New York, New York, USA

Fire in the Forest is an interesting international introduction to the intriguing and sometimes enigmatic role that fire plays in natural and increasingly human-inhabited ecosystems. It is presented from a nontechnical, but well-referenced, point of view by the two primary authors, who are well positioned to provide such insights on this topic.

The text is divided into a logical progression of subjects beginning with an examination of the occurrence of fire in both geologic and historical landscapes throughout the world. Next, the physics of fire is examined in general terms, and these factors are placed within the context of various forests within American, Eurasian, and Australian landscapes. Impacts on abiotic and biotic components of ecosystems subject to periodic fire are then explored. A guest chapter by Peter Hobson examines the benefits and challenges of using fire as a landscape management tool within our contemporary society, in which the wild land–urban interface continues to expand. An informative look at current methods of monitoring and making decisions to let burn or suppress wildfires is provided, and the different methods and approaches that are utilized on various continents are compared. The book concludes with a guest chapter by Kelvin Hirsch, director of the Climate Change and Forests Research Program of the Canadian Forest Service, who examines via three case studies, and some hypothetical scenarios, the potential ways that we may learn to live with and eventually utilize fire within our increasingly human-dominated natural forested environments.

For those readers who are inspired to pursue this subject from a more intense research-oriented perspective, the book provides a list of more in-depth treatises on the role of fire in various ecosystems throughout the world. Each chapter includes judiciously placed references, so that readers seeking a more in-depth account of various subjects can pursue these at will. The frequency of these citations is appropriately spaced so that the text reads more like an informative nonfictional account than a research-oriented textbook. The color illustrations serve to clarify or illustrate the main points being made by the authors in an effective manner. The boxed tables and highlighted detailed studies blend well with the themes of each chapter. The text is well indexed, although why most scientific binomials reference a common name, rather than a page number, escapes this reviewer. In short, it is a well-constructed book that will engage the reader at multiple levels.

In summary, this book does an excellent job of attaining its stated objective of providing the reader with a nontechnical introduction to the mechanics of fire and the role that fire has played and will continue to play in various forest ecosystems throughout the world. This reviewer found the international perspective especially informative, and the authors do an excellent job of making the reader aware that management of fires throughout the world's forests is and will remain an important management challenge for the foreseeable future. The text provides sufficient references so that readers who are stimulated to pursue this topic on a more detailed research level are provided with handy entry-level citations. It is highly recommended for the shelves of every well-stocked educational library, especially those facilities that are frequented by high school and undergraduate students interested in entering environmental and ecosystem management–related professions.

–Roger D. Meicenheimer, Department of Botany, Miami University, Oxford, Ohio, USA

The Last Great Plant Hunt: The Story of Kew's Millennium Seed Bank

Carolyn Fry, Sue Seddon, and Gail Vines
2011 ISBN-13: 978-1-84246-432-8
Cloth, US$45.00. 192 pp.
Kew Publishing, Royal Botanic Gardens,
Kew, Richmond, Surrey, United Kingdom

The Millennium Seed Bank at the Royal Botanic Gardens, Kew, is the world's largest plant conservation program. This book, published by the Royal Botanic Gardens, commemorates the Millennium Seed Bank Project (MSBP), a 10-year effort completed in 2010, and the Millennium Seed Bank Partnership (confusingly, also referred to as MSBP), an ongoing global project to catalogue seeds from plants threatened by extinction (the official goal is to gather seeds from 25% of global plant species by 2020). The book is written well, but organized clumsily, and the bureaucratic spirit that seems to accompany the altruistic efforts of nongovernmental organizations—such as the Royal Botanic Gardens—permeates this book. It is an unusual work, at times seeming like a government report, replete with statistics indicating past courses of action, at other times sounding like a school textbook or museum display, explaining a particular "plant hunt" through maps, panoramic photographs, and interviews with affected locals. The book doesn't rely on a straightforward, A-to-Z description of what the Millennium Seed Bank Project and/or Partnership are; instead, it is a loose collection of related short essays connected by the common theme of the MSBP. Interspersed throughout these essays are accompanying photographs, some of which are incredibly beautiful. The reader has to do quite a bit of work assembling the diverse tidbits of information describing the MSBP and integrating them into a unified account of what exactly the program is about. On the other hand, the diversity of subprojects involved is staggering, and perhaps a single account would have related this fact less effectively.

The Last Great Plant Hunt tells the reader two stories: firstly, it impresses upon the reader the importance of plant biodiversity; and secondly, it explains how seed banking, along with other conservation efforts, can act as a bulwark against extinction. Ostensibly, the book is divided into six sections: what the "last plant hunt" is; the global scale of the MSBP; a series of semi-independent accounts of how seeds are recovered from environments across the world; a primer on how seed banking works; what kinds of applications are possible using banked seeds; and how to begin to restore "degraded ecosystems" using seeds. In actual fact, these sections are broken up with numerous short features and full-page photographs.

One of the interesting parts of this book are the "Job Profile" features describing the role of specific workers at the MSBP. For example, International Coordinator Michael Way is introduced to the reader as a botanist working with scientists in Chile to help bank seeds from endangered local flora; a short background on his work is accompanied by some of the best photographs in the book. Laboratory and Building Manager Keith Manger is introduced as a senior leader at the Seed Bank. Seed Germination Specialist Rosemary Newton is presented as the MSBP's resident germination problem solver, identifying ideal germination conditions for some of the seed bank's tough cases. Some of the one-page descriptions of MSBP employees are interesting and some aren't, but the intention seems to have been to put a human face on the conservation efforts of the seed bank, and with respect to this goal, the profiles are successful.

Perhaps more interesting to the average botanist are the descriptions of the seed banking processes themselves. There is a short description of the seed vault ("The Most Biodiverse Building on Earth"), the storage procedures, the research being performed on seed germination, and many other topics relating to the science of banking seeds. These sections are definitely the high points of the book. Although a good portion of the book is devoted to this topic, the tour seems a little short on detail, and the reader may be left wanting more.

Accompanying nearly every section of this book are photos. Pictures of seeds, of plants, of scientific equipment, of the MSBP personnel, of the Wellcome Trust Millennium Building, of landscapes—all are present in abundance, as *The Last Great Plant Hunt* contains over 150 color photographs. These photos are the other main strength of this book—many of the pictures are eye-catching and beautiful. It isn't just that the photographers only snapped shots of strange and unique plants either, although there are some of these, including a great two-page spread of traveller's palm (*Ravenala madagascariensis*) seeds wrapped in bright blue casings—some of the best shots are of relatively common species.

All in all, this is a strange book. It isn't really a coffee table book, despite its size and being stuffed with gorgeous pictures, since it consists largely of essays. The book has no real introduction, where the authors typically describe the purpose of the book; bizarrely, the closest that any part of the book comes to an overview is the short foreword from HRH Prince Charles, the Prince of Wales, in which he outlines what he thinks the book is about. Furthermore, this book appears to have been ghostwritten by the authors working alongside scientists and bureaucrats at the MSBP, and at times sounds more like an advertisement than an in-depth look at what the Millennium Seed Bank Partnership is all about. That being said, the book is interesting even when the material isn't, and manages to get the reader inspired about seed banking, which may not, even among botanists, be the sexiest topic imaginable. Although unsuitable for a serious, in-depth academic study and at times somewhat confused in terms of its organization, this book is an exciting and visually appealing look at the purpose and practice of seed banking, a vital practice in modern plant conservation biology.

–P. William Hughes, Biology Department, Carleton University, Ottawa, Ontario, Canada

Mycological

21st Century Guidebook to Fungi

David Moore, Geoffrey D. Robson, and Anthony P. J. Trinci
2011. ISBN-13: 978-0-521-18695-7
Paperback, US$65.00. 626 pp.
Cambridge University Press, New York, New York, USA

This book originated from many years of the authors' teaching experience. It is a written in delightful prose, integrating concepts and interdisciplinary knowledge. When a particular topic is not covered extensively, the authors direct the readers to additional literature. This facilitates its use as a textbook in the classroom and as an independent learning tool. The book comes with CD that, when started, opens in Internet Explorer. The CD contains a hyperlinked version of the entire book, the integrated World of Cyberfungi website, and a great growth simulator program called the Neighbour-Sensing program. Tropisms models included are outstanding sources for learning and for understanding growth and development of fungi. The operating manual is very detailed with excellent instructions. The user can install the program or directly start the application and work with it using the IE browser. Everything is designed to be either downloaded or used directly from the browser, and is very user friendly. The Neighbour-Sensing applet is computationally demanding, so it is important to have a reliable computer with good speed. The CD is a great feature of the book, making this an outstanding resource.

The book starts with an overview of fungal communities and microbial diversity, including the importance of fungi in agriculture. A table describing the roles and activities of fungi in biogeochemical processes serves as the appetizer for what is yet to come. The diagrams included are nicely done, and the photomicrographs are of excellent quality. The description of evolutionary origins in Chapter 2 is delightful. The authors manage to put together the "big picture," including a history of the universe from its formation and the developmental changes that resulted in the formation of Earth and the origin of the Earth–binary system, creating the perfect conditions for life. It was a very enjoyable chapter to read, showing fungi in the context of the universe, something that few books are able to address. The authors include tables with additional terminology to allow readers to grasp the material better.

The description of the members of the Kingdom Fungi is nicely done. The authors include information about mechanisms such as sirenin that allow male gametes to find the female gametes. The writing familiarizes the reader with the intricacies of the world of fungi and allows experts to keep this book as a reference. The writing is appropriate for both students and experts; it will be an excellent textbook for teaching because it introduces the concepts with great narration and points of interest about the world of fungi. The life cycles of the fungi are described clearly for the novice and the expert. The photomicrographs are of superb quality and serve as a great source of information for the identification of diagnostic characteristics in fungi. Several of the most important photographs are provided in both black and white and color (after pages 149 and 340); perhaps it would have been better to see those color pictures the first time they were shown, but reduction of costs sometimes requires doing things like this.

The description of the kinetics of colony formation and hyphal branching is clear and concise. If the book is used in the classroom, it will help students understand how these kinetic analyses are done, allowing students to design their own experiments if inquiry-based exercises form part of the coursework. The authors provide resources such as virtual cell animations in shaded boxes that are useful for both teachers and students. One full chapter is dedicated to the fungal cell wall, which is useful given this structure's wide range of functions. In addition, the authors address the "far side" of the cell wall with a discussion of the presence of mating proteins (agglutinins), cell adhesion proteins (adhesins), hydrophobins, and glomalins. Furthermore, the authors discuss the fungal cell wall as a target for chemotherapy, a topic they address in more detail in Chapter 18.

Fungal genetics and diversity are nicely discussed and the concepts are illustrated with clear diagrams that are easily understood by both novices and experts. The sexual reproduction chapter describes mating systems and provides examples in Saccharomyces, Neurospora, Basidiomycota, among others; however, the list of references from this section (8.7) could benefit from more recent publications. The section on biochemistry and developmental biology of fungi includes a discussion of the contribution of fungi to ecosystems leading to the biochemistry, including a discussion of primary and secondary metabolites with clear diagrams illustrating key pathways. The authors give special attention to illustrating concepts that are difficult to understand without such resources.

One of the more delightful sections to read includes Part V (ecosystem mycology, pathogenicity of fungi in plants and animals), which discusses many facets of the uses of fungi and the ecosystem connections and intricate relationships between fungi, plants, and animals. Two additional sections discuss fungal applications in biotechnology and commercial applications at the industrial level; these sections include useful diagrams of the production process of some of the products. The bioinformatics section is clear and succinct, with flow charts of key processes that guide the reader and allow for easy understanding of the material discussed. The book ends with a very nice outline of the classification of fungi (adapted from the *Dictionary of the Fungi* [Kirk et al., 2011], but amended to include emerging phylogeny) and another appendix describing mycelia and hypha differentiation that will serve as an invaluable guide for taxonomists and fungi enthusiasts.

21st Century Guidebook to Fungi combines clear explanation of details with descriptions of big concepts, bringing together interdisciplinary areas. The authors were successful at integrating fungi with other organisms and describing fungi as a part of biological systems. The CD is a great resource, and the overall result is a very useful book for fungi aficionados, experts, students, and classroom teaching. This book could become a classic in the field and will be an enjoyable read for anyone wanting to learn more about fungi.

Literature Cited

KIRK, P. M., P. F. CANNON, D. W. MINTER, and J. A. STALPERS [eds.]. 2011. *Dictionary of the Fungi, 10th ed.* CABI, Wallingford, Oxfordshire, United Kingdom.

–Olga R. Kopp, Department of Biology, Utah Valley University, Orem, Utah, USA

PALEOBOTANICAL

Early Flowers and Angiosperm Evolution

Else Marie Friis, Peter R. Crane, and Kaj Raunsgaard Pedersen
2011. ISBN-13: 978-0-521-59283-3
Cloth, US$160.00. 585 pp.
Cambridge University Press, Cambridge, United Kingdom

Darwin's "abominable mystery" has been used to describe a number of open questions focused on the origin and evolution of the angiosperms. While Darwin was likely referring to the sudden appearance of diverse angiosperm lineages, which was counter to his view of gradualism (Friedman, 2009), questions centered on the nearest living or extinct angiosperm outgroup and homologies with flowers, among other conundrums, have also been assigned to the mystery shelf. This book is to my knowledge the most scholarly treatment of Darwin's "abominable mystery (*sensu* Friedman, 2009)," providing the most complete compilation of fact and interpretation of the angiosperm fossil record. *In toto*, the book demonstrates that during

the early history of the angiosperms, extending 35 million years, there is a "clear and orderly pattern of increasing phylogenetic diversity, increasing structural complexity, and increasing abundance" (p. 498). It also does a fine job of discussing the available evidence of outgroups and what might or might not be homologs to flowers in these outgroups. This book, read along with Soltis et al. (2005) and Stebbins (1974), will both introduce you to outstanding unanswered fundamental questions and provide you with the information to synthesize a more complete understanding of angiosperm floral evolution. They accomplish this by providing an "overview and initial critical analysis of the paleobotanical record" (p. 168) integrated with information from living plants, thus providing a fuller understanding of floral evolution.

The book begins with a description of the phylogenetic position of the angiosperms as well as the characteristic features of the group. The next several chapters introduce the reader to a historical (biological) perspective, discussing the environmental context of early angiosperm evolution as well as the stratigraphic framework and key locales for Cretaceous angiosperms. Next follows the heart of the book, 14 chapters that describe the fossil evidence of seed plants, critically evaluating the evidence for the nearest outgroups to the angiosperms, and continuing the critical evaluation of the fossils defining the stem and crown groups of the angiosperm from the ANITA grade (or ANA grade by some) through the core Eudicots. The last five chapters build upon the foundation chapters by placing the findings in a broader evolutionary context: diversification of the flower in terms of key structural features, the role of pollen and fruit dispersers as mediators of selection, the ecological context of early angiosperm evolution, and a summary of the appearance and frequency of the various angiosperm clades. Each chapter begins with a broad introduction and overview of the topics. Because each chapter is well referenced, the book provides as complete a synthesis of the fossil record of the early angiosperm as I am aware. To reiterate, this book provides not only facts but also many potential questions and thus can serve as both an inspirational textbook (more below) as well as a recipe for future research investigations.

Each reader will take from this tome depending on his or her unique intellectual perspective. My research is split between understanding the forces that determine the type and amount of standing genetic variation and how natural selection shapes genetically based phenotypic variation, using flowers as models for studying the evolution of adaptations. Before reading this book, I could not tell you what the different stages of the Cretaceous are, and I still have to carefully think through the distinction between calyx, sepals, and perianth. Nevertheless, despite my limited formal training (but not limited interest) in paleobotany and plant morphology, my understanding of the adaptive significance of floral features was greatly expanded by taking into consideration the evolutionary history of flowers as reconstructed through the fossil record.

For example, this book demonstrated to me once again the importance of simultaneously considering pollination and mating system evolution (Harder and Barrett, 1996; Holsinger, 1996; Fenster and Marten-Rodriguez, 2007). Bisexual flowers currently predominate in frequency (Barrett, 2010), yet the fossil record reveals that unisexual and bisexual flowers were found in equal proportions until late into the Cretaceous (about 70 mya), when bisexual flowers began to obtain their current frequency (p. 392). This timing also roughly corresponds to the first appearance of flowers with distinct corolla and calyx, threadlike filaments (facilitating herkogamy and protandry; Friis and Endress, 1990; Endress, 2011), nectary disks, sympetally, and zygomorphy, as well as the appearance of pollinators more dependently capable of precise pollination. In the contemporary flora, dioecy is associated with less precise pollination systems, i.e., with smaller flowers that are often radially symmetric with generalized animal or wind pollination systems (Barrett, 2010). Thus, the historical record of sexual systems provides circumstantial evidence that the evolution of separate sexed flowers reflects, in part, selection to avoid inbreeding and inbreeding depression, while the advent of precise pollination and the ability to separate male and female function within the same flower through protandry and herkogamy allows precise (highly directional) placement of pollen on the vector while avoiding self-pollination. Obviously there are also other factors to consider, since half of the early Cretaceous flowers are bisexual, bennettitaleans had bisexual flowers, and evidence suggests that the Gnetales did once upon a time as well. Whether these early bisexual flowers (angiosperms) or bisexual reproductive structures (non-angiosperms) had precise pollination and what their mating systems were are open questions, suggesting that there should be continued efforts to quantify the appearance of floral structures promoting precise pollination as well as continued study of the role of pollination precision in the evolution of inbreeding avoidance.

Another astounding feature of the fossil record is that monocot and eudicot lineages diverge some 120 mya, yet the first appearance of zygomorphy occurs roughly 70 mya, clearly demonstrating the independent evolution of zygomorphy in these two clades (although they may reflect similar gene expression patterns of *CYC/TB1*-like genes; Bartlett and Specht, 2011), which heightens my interest in the outcome of future studies directed at the genetic and developmental basis of zygomorphy in these two groups.

This is not to say that the book is without its faults. The authors are very reserved in their conclusions, concordant with their highly critical (in a positive sense) evaluation of the fossil record. It often seemed to me that they were willing to give you all the information that they know so that you could "take away" what they know. Given the combined intellectual strengths of Friis, Crane, and Pedersen, I would have welcomed more input or guidance from the authors, even if speculative and eventually wrong. Many of the chapters, especially through the descriptions of the fossil record of the major clades (15 of the first 20 chapters), do not end with summary points, so one can be left in some bewilderment as to what one just slogged through. The figures are variable in quality and should uniformly have arrows, etc., pointing to key features of the fossils, but they do not. The ages of the fossils should be referred to in millions of years ago along with the eras, but this is rarely done. The book does assume a paleobotanical and plant morphology background, so jargon abounds for those of us seeking insight into floral evolution through the fossil record, e.g.: "This biphyletic interpretation of seed plant evolution with the recognition of Devonian progymnosperms and the hypothesis that aneurophytalean progymnosperms … while the archaeopteridalean progymonosperms…" (p. 141) and "A key issue with respect to the origin of angiosperms is the evolution of anatropous, bitegmic ovules from the orthotropous, unitegemic ovules of most other extant and fossil seed plants" (p. 152). I would have welcomed boxed text that clarified these statements.

Furthermore, the adaptive, or potentially adaptive, or at least speculatively adaptive basis of many key features of seed plant evolution is not discussed, e.g., the different types of ovules mentioned above or the relevance of tectate-granular pollen, nor is the defining feature of angiosperms—the lack of a distinct laminated endexine in the pollen. All of the above criticisms weigh against using this book as an undergraduate textbook, though it would be wonderfully stimulating at a higher level. From the perspective of using this book as a resource for future research, there are some glaring inconsistencies that potentially lessen its impact. For example, my enthusiastic explanation of the role of pollination precision in the evolution of sexual systems was not based on any presented data, per se, but rather from the statement, "Bisexual flowers, which predominate among extant angiosperms, only become dominant in fossil floras during the Late Cretaceous" (p. 392). The scholarship of the book would have been elevated if the statement was based on trend lines with actual means and ranges from the different extinct communities, as they do for seed and fruit volumes in 25 fossil floras across the Cretaceous through the Neogene (= 135–2.6 mya) (p. 452).

Criticisms notwithstanding, this is an important book for those wishing a fuller understanding of floral evolution. Buy it, read it, discuss it, and you will achieve sexual enlightenment of the floral kind.

Literature Cited

BARTLETT, M. E., and C. D. SPECHT. 2011. Changes in expression patter of the TEOSINTE BRANCHED1-like genes in the Zingerberales provide a mechanism for evolutionary shifts in symmetry across the order. *American Journal of Botany* 98: 227–243.

BARRETT, S. C. H. 2010. Darwin's legacy: The forms, function and sexual diversity of flowers. *Philosophical Transactions of the Royal Society of London, Series B* 365: 351–368.

ENDRESS, P. K. 2011 Evolutionary diversification of the flowers in angiosperms. *American Journal of Botany* 98: 370–396.

FENSTER, C. B., and S. MARTEN-RODRIGUEZ. 2007. Pollination specialization and the evolution of reproductive assurance mechanisms through autonomous selfing. *International Journal of Plant Sciences* 168: 215–228.

FRIEDMAN, W. E. 2009. The meaning of Darwin's "abominable mystery." *American Journal of Botany* 96: 5–21.

FRIIS, E. M., and P. K. ENDRESS. 1990. Origin and evolution of angiosperm flowers. *Advances in Botanical Research* 17: 99–162.

HARDER, L. D., and S. C. H. BARRETT. 1996. Pollen dispersal and mating patterns in animal-pollinated plants. In D. G. Lloyd and S. C. H. Barrett [eds.], *Floral Biology: Studies on Floral Evolution in Animal-Pollinated Plants,* 140–190. Chapman & Hall, New York, New York, USA.

HOLSINGER, K. E. 1996. Pollination biology and the evolution of mating systems in flowering plants. *Evolutionary Biology* 29: 107–149.

SOLTIS, D. E., P. E. SOLTIS, P. K. ENDRESS, and M. W. CHASE. 2005. *Phylogeny and Evolution of Angiosperms.* Sinauer Associates, Sunderland, Massachusetts, USA.

STEBBINS, G. L. 1974. *Flowering Plants: Evolution Above the Species Level.* Belknap Press, Cambridge, Massachusetts, USA.

–Charles B. Fenster, Department of Biology, University of Maryland, College Park, Maryland, USA

Physiological

Light and Photosynthesis in Aquatic Ecosystems

John T. O. Kirk
2011. ISBN-13: 978-0-521-15175-7
Paperback, US$90.00. 649 pp.
Cambridge University Press, New York, New York, USA

Since the first edition in 1983, *Light and Photosynthesis in Aquatic Ecosystems* has provided to all those interested in aquatic sciences a comprehensive synthesis on the physical and biological factors related to photosynthesis in aquatic media. Since its previous edition 18 years ago, the development of new techniques and increasing interest in the effects of global warming on the primary production in the ocean have boosted research in this field, leading to major advances in some of the main areas covered in the book. This considerable amount of new data and the new techniques developed during the past decade have been incorporated in this new edition and can be seen in the updated reference list, which has increased to 1506 references from 1022 in the previous edition.

The new edition has no major structural changes from the previous edition and still presents a total of 12 chapters divided in two sections. The first section focuses on the properties of light and its behavior in the aquatic media, while the second section specifically deals with underwater photosynthesis. In the first seven chapters, the book provides a comprehensive introduction to the physics of light. The author provides a well-structured revision of the topic, starting with the concepts related to the basic properties of light and its behavior at the atmospheric level, and then focusing on the specific interactions of light in the aqueous medium. These chapters are highly recommended to anyone interested in photosynthesis without regard to their specific field of study. The major improvements in this revised edition are found in the final chapter of Part I, "Remote Sensing of the Aquatic Environment," as the drastic development in this area in recent years made an update necessary. The chapter includes a historical perspective, summarizes new information, and provides examples illustrating the development of new methodology and improvement of pre-existing technology. The only four color plates in the book are in this section and the chapter really benefits from their inclusion. It could be argued that the text would benefit from a more detailed (or lively) explanation of the examples selected, but it is clear that the author intends the book to be a scholarly text and assumes a certain level of understanding by the reader. The author presents a solid but brief overview of a variety of essential concepts and refers the reader to a thorough list of relevant literature for further reading.

This trend continues in the five chapters comprising Part II of the book, which focus on the biological concepts of photosynthesis in the aquatic environment. At the beginning of this section, the author gives a brief overview of the essential topics, including all the concepts that would be expected in a textbook on photosynthesis: chloroplast morphology, pigments, reaction centers, and the photosynthetic process itself. The utilization of next-generation sequencing in recent years has increased our knowledge of the chloroplast genome organization in aquatic organisms, providing new insights that in further editions might be an interesting addendum to the morphological and pigment-related information detailed in this chapter. Later on, special emphasis is given to the effect of light on photosynthesis and an ample revision of other limiting factors is also provided. This section, one of the liveliest in the entire book, contains relevant examples of the effects of carbon dioxide, temperature, iron, and anthropogenic eutrophication. In the last chapter, "Ecological Strategies," chromatic adaptation is discussed in detail, both from a phylogenetic and an ontogenetic point of view. This chapter also

presents the only change in the structure of this new edition as it incorporates an independent section on microphytobenthos. As in previous editions, the book does not contain any specific chapters on pollution or anthropogenic action, although information on these topics is scattered throughout the text.

This new edition of *Light and Photosynthesis in Aquatic Ecosystems* is indispensable for any science library and for anyone interested in photosynthesis in aquatic organisms. However, it is not an easy read; this is definitively a textbook for academic use, as is clearly stated in the preface. The book succeeds in every feature essential in a textbook—it is well organized and provides a historical perspective, a high level of complexity, relevant figures, detailed and updated references, and a comprehensive index.

–E. L. Peredo, Department of Ecology and Evolutionary Biology, University of Connecticut, Storrs, Connecticut, USA

Systematics

Hardy Heathers from the Northern Hemisphere: Calluna, Daboecia, Erica

E. Charles Nelson
2011. ISBN-13: 978-1-84246-170-9
Hardcover, US$95.00. x + 442 pp.
Kew Publishing, Royal Botanic Gardens,
Kew, Richmond, Surrey, United Kingdom

The genera *Calluna* (one species) and *Daboecia* (two species) occur natively only north of the Tropic of Cancer; *Erica* has 21 species in the northern hemisphere. Mostly in southern Africa, there are a further 800 or so species of *Erica*, which are not considered here.

The author is an administrator of the Heather Society, in the United Kingdom. If, like me, you hadn't known there was such a group, you will want to visit their website, http://www.heathersociety.org/. There are also heather societies in Germany, Holland, and North America. The author has spent a goodly portion of his adult life chasing after heathers and writing about them: he is author or co-author of about 100 articles on heathers, as cited in this book. It appears that he has personally visited wild populations of every species discussed in this work. One can see this book, adorned with hundreds of color pictures, paintings, and black-and-white line drawings, as a sort of culmination of the author's interest and passion over many a decade. There are also range maps, where appropriate.

I found no keys. The three genera of interest here can easily be distinguished using the key in *Flora Europaea*. The species of the first two genera are easily discernible, but the species of *Erica* are a whole other matter. The author describes each species in admirable detail, with the descriptions accompanied by a highly detailed, elegantly wrought plate of drawings. The etymologies are all explained, the naturally occurring and artificial hybrids are all accounted for, and the nomenclatural histories of every species are properly given. But for identification purposes, one will have to turn to other sources, such as *The European Garden Flora*. The paintings, 23 plates, are beautifully done. There are no nomenclatural innovations, but there are some fascinating discourses on nomenclature, especially concerning *Erica vagans* L., nomen conservandum.

As one would expect, there is an abundant folklore surrounding these plants, and the author clearly delights in searching it out and explaining it. The role of these plants in poetry and fiction is not scanted, either. The briar (or brier) pipe, beloved of historical figures like Albert Einstein, is made from the roots of *Erica arborea*; the word is derived from the French *bruyère* (heather), and has nothing to do with prickly shrubs.

Appendix I (34 pp.) is devoted to recommended and interesting cultivars, all very carefully done. There is no mention of nurseries that offer any of these for sale. The work concludes with two indexes, the first to scientific names, the second to general topics. The book is dedicated to Patrick David Coker, who was the author's undergraduate mentor in a study on *Erica vagans* L. The excellent general index leads one quickly to the story, on page 132. I think Professor Coker would have been gratified.

–Neil A. Harriman, Biology Department, University of Wisconsin-Oshkosh, Oshkosh, Wisconsin, USA. harriman@uwosh.edu

Books Received

The Beauty of Houseplants. Gough, Tom and David Longman. 2011. ISBN 978-1-889878-30-0. (Cloth US$22.95) 118 pp. Botanical Research Institute of Texas, 1700 University Drive, Fort Worth, Texas 76107.

Dates: Production, Processing, Food, and Medicinal Values. Manickavasagan, A., M. Mohamed Essa, and E. Sukumar. 2012. ISBN 978-1-439-84945-3. (Cloth US$149.95) 442 pp. 978-1-439848-37-1. CRC Press, Taylor and Francis Group, 6000 Broken Sound Parkway NW, Suite 300, Boca Raton, FL 33487.

Fungal Cell Wall: Structure, Synthesis, and Assembly, Second Edition. José Ruiz-Herrera. 2012. ISBN 978-1-439-84837-1. (Cloth, US$129.95) 203 pp. 978-1-439848-37-1. CRC Press, Taylor and Francis Group, 6000 Broken Sound Parkway NW, Suite 300, Boca Raton, FL 33487.

Out of Nature: Why Drugs from Plants Matter to the Future of Humanity. Rogers, Kara. 2012. ISBN 978-0-8165-2969-8. (Paper US$19.95) 216 pp. The University of Arizona Press, 1510 E. University Blvd., PO Box 210055, Tucson, AZ 85721-0055.

Plant Fungal Pathogens: Methods and Protocols. Bolton, Melvin D. & Bart P.H.J. Thomma (eds). 2011. ISBN: 978-1-61779-500-8 (Cloth US$159.00) 648 pages, 138 illustrations. Humana Press, 333 Meadowlands Parkway, Secaucus, NJ 07094.

Plant Metabolomics: Methods and Protocols. Hardy, Nigel W. & Robert Hall. 2012. ISBN: 978-1-61779-593-0 (Cloth US$139.00) 340 pp. Humana Press, 333 Meadowlands Parkway, Secaucus, NJ 07094.

Plant Nutrition and Soil Fertility Manual, Second Edition. J. Benton Jones, Jr. 2012. ISBN 978-1-439-81609-7. (Paper US$79.95) 304 pp. CRC Press, Taylor and Francis Group, 6000 Broken Sound Parkway NW, Suite 300, Boca Raton, FL 33487.

Plant Physics. Niklas, Karl J. and Hanns-Christoff Spatz. 2012. ISBN 978-0-226-58632-8 (Cloth US$55.00) 448 pp. University of Chicago Press, 1427 E. 60th Street, Chicago, IL 60637.

Recombinant Gene Expression: Reviews and Protocols, 3rd Ed. Lorence, Argelia. 2011. ISBN: 978-1-617-79432-2 (Cloth US $159.00) 649 pages, 105 illustrations. Humana Press, 333 Meadowlands Parkway, Secaucus, NJ 07094.

Spring Wildflowers of the Northeast: A Natural History. Gracie, Carol. 2012. ISBN 978-0-691-14466-5. (Cloth US$29.95). 290pp. Princeton University Press, 41 William Street, Princeton, New Jersey, 08540-5237.

Botany 2012

the next generation

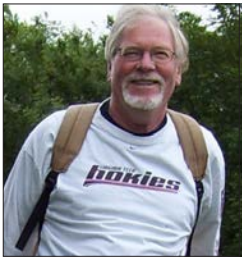
Featured Speakers

For complete information, titles, and abstracts
www.botanyconference.org

Plenary Lecture
Sir Peter Crane

"Respecting the Past and Embracing the Future: Envisioning Botany in the Next Generation"

American Journal of Botany
Special Lecture
Gar W. Rothwell



Weresub Memorial Lecture
Robert Antibus

Regional Botany
Special Lecture
Jim McCormac

Enhancing Diversity in Plant
Biology Luncheon
Maria Elena Zavala

Kaplan Memorial Lecture
R. Larry Peterson

Let's experience COLUMBUS.com ***together!***

Plant Science Bulletin

ISSN 0032-0919
Published quarterly by
Botanical Society of America, Inc.
4475 Castleman Avenue
St. Louis, MO 63166-0299

Periodicals postage is paid at St. Louis, MO & additional mailing offices.
POSTMASTER:
Send address changes to:
Botanical Society of America
Business Office
P.O. Box 299
St. Louis, MO 63166-0299
bsa-manager@botany.org

The yearly subscription rate of $15 is included in the membership

Address Editorial Matters (only) to:
Marshall D. Sundberg
Editor
Department of Biological Sciences
Emporia State University
1200 Commercial St.
Emporia, KS 66801-5057
Phone 620-341-5605
psb@botany.org

The Botanical Society of America is a membership society whose mission is to: promote botany, the field of basic science dealing with the study & inquiry into the form, function, development, diversity, reproduction, evolution, & uses of plants & their interactions within the biosphere.|

The Botanical Society of America Merit Award

The Botanical Society of America Merit Award is the highest honor our Society can bestow. Each year, the Merit Award Committee solicits nominations, evaluates candidates, and selects those to receive an award. Awardees are chosen based on their outstanding contributions to the mission of our scientific society. The committee identifies recipients who have demonstrated excellence in basic research, education, public policy, or who have provided exceptional service to the professional botanical community, or who may have made contributions to a combination of these categories.

For a complete list of Merit Award winners dating back to 1956 see: http://www.botany.org/awards_grants/detail/bsamerit.php

Support Our Botany 2012 Exhibitors & Sponsors

Roche

OXFORD UNIVERSITY PRESS

Silver BIOLOGY

JSTOR

PhytoTechnology Laboratories "Helping to Build a Better Tomorrow Through Plant Science"

Botanical Research Institute of Texas

Yale

WILEY-BLACKWELL

Botany

NYBG PRESS Professional Books & Journals

LI-COR Biosciences

University of Chicago Press

Flora of North America

Metis LLC

CONVIRON Building Partnerships | Creating Solutions

WILEY-BLACKWELL

CORNELL UNIVERSITY PRESS

academia book exhibits

MISSOURI BOTANICAL GARDEN PRESS

W. H. FREEMAN www.whfreeman.com

BioChambers INCORPORATED A Subsidiary of Enconair Technologies Inc.

SOFTGENETICS®