



# PLANT SCIENCE BULLETIN

SUMMER 2014 VOLUME 60 NUMBER 2

## Meet the newest members of the Botanical Society of America's Executive Board



Richard  
Olmstead



Amy Litt



Angela  
McDonnell



Joe Armstrong

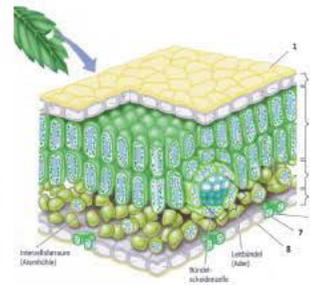
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*BSA attends the USA Science and Engineering Festival....P. 88*



*Geocaching as a way to teach botany.....p. 100*

## FROM THE EDITOR

For the last couple of years the summer issue of *Plant Science Bulletin* has been my favorite one to assemble. It's not just because the spring semester is over and I can begin to look forward to the annual BSA meeting (it's in Boise this year---have you registered yet?). Both of these are true, but the best part is being able to recognize the new BSA leaders and announce the major award winners. At the top of the list are the 2014 BSA Merit Awardees: Drs. Jim Doyle, Jeff Doyle and Michael Donoghue. Each of these scientists has made outstanding contributions to plant science and to the Society. I am also pleased that the Charles E. Bessey Award for botanical education is now a major Society-wide award and this year's awardee, Dr. Bruce Kirchoff, has distinguished himself in his botanical research as well as research in botanical education. Finally, we have a new major Society-wide award, the Emerging Leader Award, and Dr. Stacey Smith is our inaugural recipient. You can read about these and other award winners in the Society News section.

A special note in this summer issue is that Dr. Mackenzie Taylor has agreed to assume the editorship of *PSB* beginning with the spring issue of Volume 61. Mackenzie is eager to build on the tradition and history of *PSB* and make it even more engaging and useful. We're looking forward to a very smooth transition come the first of the year. After all, in the winter water is low and the current is slow in the Missouri River and it will be only a short journey to move the editorial office of *PSB* upstream from Kansas to Omaha, Nebraska!

Finally, there's a special treat in this issue for those who like outdoor games. A few of you know that one of my other hats is a Baden Powell-style Boy Scout campaign hat and I'm keen for pioneering and orienteering. Geocaching is the new, GPS-based, form of orienteering and it is all the rage with young scouts. In our feature article one of our international members, Professor Dirk Albach, describes how he uses geocaching as a way to promote botany to students and the public. Maybe we can set up a small course in Boise (maybe special botanical caches at the mixer?). I'll be heading up the Oregon Trail to Boise in July---hope to see y'all there.

*-Marsh*



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July 26 - 30 2014 - The Boise Centre - Boise, Idaho

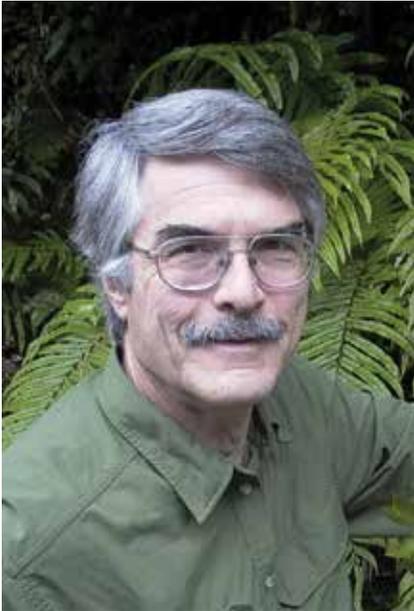
[www.botanyconference.org](http://www.botanyconference.org)



## THE BOTANICAL SOCIETY OF AMERICA'S 2014 MERIT AWARD WINNERS

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, and 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 2014 BSA Merit Award recipients are listed in the following pages.

### CONGRATULATIONS!



DR. JAMES DOYLE  
UNIVERSITY OF  
CALIFORNIA - DAVIS

Professor James A. (Jim) Doyle is recognized for his many distinguished contributions to paleobotany, particularly palynology, and to the understanding of angiosperm phylogeny. Doyle and his associates demonstrated that, worldwide, the Cretaceous fossil record shows the primary adaptive radiation events of early angiosperm evolution. One of his most valuable insights, derived from both cladistic analysis and stratigraphy, was the observation that angiosperms with tricolpate and tricolpate-derived pollen corresponded to a clade of angiosperms that included the vast majority of living flowering plants. The existence of such a clade, the eudicots, has subsequently been strongly supported by molecular analyses, and the concept has made its way into modern botany and biology textbooks. Throughout his

career and continuing into retirement, Prof. Doyle has shown himself to be an outstanding and inspiring teacher, at both the undergraduate and graduate level. His lectures are meticulously organized, expertly delivered, and focused on principles yet packed with details. His quirky sense of humor emerges and students are left amazed by how much they learned. Prof. Doyle trained nine graduate students over his career and mentored innumerable other graduate students, postdocs, and faculty colleagues.

## DR. MICHAEL DONOGHUE YALE UNIVERSITY

Dr. Michael Donoghue is a world-renowned botanist and a tireless champion of phylogenetics, evolution, and biodiversity research. He is an elected Fellow of the National Academy of Sciences (2005) and the American Academy of Arts and Sciences (2008), and most recently was awarded the prestigious Dahlgren Prize in Botany from the Royal Physiographic Society of Sweden (2011). Donoghue has consistently been ahead of his time—an intellectual leader in the development of new theory and approaches in systematics, species concepts, character evolution, historical biogeography, lineage diversification, and phylogenetic nomenclature. His ideas are always provocative; he has consistently rocked the boat, inspired debate, and moved all of us toward more rigorous thought.

His prodigious research career (he has published hundreds of papers) is matched by his inspired, continual service to our community, including many years in the Directorships of the Harvard University Herbaria and the Yale Peabody Museum. He has also trained and mentored dozens of students and post-doctoral associates, many of whom are now leaders themselves. All of his nomination letters make special note of how naturally Michael inspires his colleagues—and the botanical community at large—with his ideas and creativity, his enthusiasm, and his enormous generosity.



## DR. JEFFREY DOYLE CORNELL UNIVERSITY

Dr. Jeffrey Doyle is an internationally recognized leader in the fields of theoretical and phylogenetic plant molecular systematics and molecular evolution. Over the past several decades he has consistently been at the forefront of the field of molecular plant systematics, contributing not only innovative methods, but also conceptual advances, as well as new empirical findings that have led to an improved understanding of plant diversity. One letter-writer notes that Dr. Doyle has “an astonishing...record of insightful and sustained scientific achievement and has an immense impact on the direction of our field.” Dr. Doyle has made major contributions to clarifying evolutionary relationships among

the legumes, the evolution of nodulation and also on the significance of polyploidy. Importantly, one letter-writer notes that Dr. Doyle’s “commitment to undergraduate education is every bit as impressive as his research and scholarship.” Dr. Doyle was not only an effective undergraduate teacher but also held a major administrative position at Cornell, Director of the Office of Undergraduate Biology,

BRUCE K. KIRCHOFF RECEIVES THE 2014  
CHARLES E. BESSEY AWARD

The 2014 recipient of the Bessey Award is Professor Bruce K. Kirchoff (University of North Carolina, Greensboro). Dr. Kirchoff has been on the faculty at Greensboro since 1986 where he has distinguished himself as a plant morphologist and botanical educator. He is a former member of the BSA Education Committee and served as chair in 1993-94. His botanical education research on image recognition is a direct outgrowth of his morphological studies.



Dr. Kirchoff is transforming the way that students learn through the creation of active, visual learning programs and mobile applications. He has created, validated, and is in the process of distributing groundbreaking software that helps students more easily master complex subjects. Furthermore, he has collaborated not only with scientists in the U.S., but also Europe and Australia, to adapt his visual learning software to local problems such as helping Australian veterinary students recognize poisonous plants and providing visual identification keys for tropical African woods.

In 2007 he was the BSA Education Booth Competition winner for *Image Quiz: A new approach to teaching plant identification through visual learning* and his work was showcased in the Education Booth at the Botany & Plant Biology 2007 Joint Congress in Chicago. In 2013 he was the inaugural recipient of the American Society of Plant Taxonomists (ASPT) Innovations in Plant Systematics Education Prize and this year he was recognized with the University of North Carolina System Board of Governors award for Excellence in Teaching.

STACEY SMITH RECEIVES INAUGURAL BSA  
EMERGING LEADER AWARD



Dr. Stacey Smith is an accomplished researcher with a true commitment to education and outreach and a willingness to step into leadership roles. She is currently an assistant professor at the University of Colorado, Boulder. Smith did her undergraduate work at Virginia Tech, earned a Master's on a Marshall Fellowship at the Universities of Reading and Birmingham, and then obtained a PhD in Botany from the University of Wisconsin in 2008. After doing a post-doc at Duke University, and spending 3 years on the faculty at the University of Nebraska, she took her current position in 2013. Over that time Dr. Smith has proven herself to be a prolific researcher, with more than 25 publications, including co-authorship of the book, *Tree Thinking: An Introduction to Phylogenetic Biology*.

Dr. Smith is best known for her work on Iochrominae (Solanaceae), a clade that she has turned into a spectacular model system for bridging ecological studies of pollination biology with genetic studies of the biochemical and genetic basis of floral diversity. In addition, she has collaborated on diverse evolutionary studies and has made important contributions in phylogenetic theory. However, as noted by her nominator, "Stacey is not just a great researcher, but also a committed educator." She has been active in traditional university courses, diverse outreach activities especially in a K-12 setting, and as a resource instructor for the OTS Tropical Plant Systematics course. She has also played an important role in identifying the challenge of teaching tree thinking and in providing resources to help teachers overcome those challenges. Finally, it has been noted that Dr. Smith is "a generous and supportive person who leads by example and draws along many other junior (and senior) colleagues in her wake." Given all these contributions to botany, Dr. Smith is a very fitting recipient of the inaugural BSA Emerging Leader Award.

## BSA PUBLIC POLICY AWARD

The Public Policy Award was established in 2012 to support the development of tomorrow's leaders and a better understanding of this critical area. The 2014 recipients are: **Megan Philpott**, University of Cincinnati and the Cincinnati Zoo & Botanical Garden, and **Steven Callen**, Saint Louis University.

## 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 recommendations. 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.

## J. S. KARLING GRADUATE STUDENT RESEARCH AWARD

**Catherine Rushworth**, Duke University - Advisor, Dr. Thomas Mitchell-Olds, *Insights into the origin and persistence of apomixis in the Boechera holboellii species complex*

## BSA GRADUATE STUDENT RESEARCH AWARDS

**Jason Berg**, University of Maryland - Advisor, Dr. Elizabeth Zimmer, *A molecular assessment of the potentially invasive plant species, Mimulus guttatus DC: Estimating genetic divergence, migration rates, and selfing rates for naturalized and invasive populations in North America and Europe*

**Andrew A. Crowl**, University of Florida and the Florida Museum of Natural History - Advisor, Dr. Nico Cellinese, *Integrating morphology, cytology, niche modeling, and phylogenetics to understand the evolutionary history of endemic Campanula Species in the Mediterranean*

**Jessamine Finch**, Northwestern University and Chicago Botanic Garden - Advisor, Dr. Kayri Havens-Young, *The effects of climate change on plant regeneration: linking neighborhood size, tolerance range, and species responses*

**Elliot Gardner**, Northwestern University and Chicago Botanic Garden - Advisor, Dr. Nyree Zerega, *Pollination biology of domesticated artocarpus J.R. Forst. & G. Forst. (Moraceae)*

**Alannie-Grace Grant**, University of Pittsburgh - Advisor, Dr. Susan Kalisz, *Testing the preemptive selfing hypothesis—Does self-pollination limit hybridization in co-flowering related species?*

**Kimberly Hansen**, Northern Arizona University - Advisor, Dr. Tina J Ayers, *Reconstructing the evolutionary history of Campanulaceae with NextGen sequencing*

**Carla J. Harper**, University of Kansas - Advisor, Dr. Thomas N. Taylor, *Fungal diversity during the Permian and Triassic of Antarctica*

**Karolina Heyduk**, University of Georgia - Advisor, Dr. Jim Leebens-Mack, *Physiology and evolutionary genomics of CAM photosynthesis in Yucca (Asparagaceae)*

**Brian Hoven**, Miami University - Advisor, Dr. David L. Gorchoff, *The effect of emerald ash borer-caused canopy gaps on understory invasive shrubs and forest regeneration*

**Kelly Ksiazek**, Northwestern University and Chicago Botanic Garden - Advisor, Dr. Krissa Skogen, *Pollen movement on urban green roofs*

**Emily Lewis**, Northwestern University and Chicago Botanic Garden - Advisor, Dr. Krissa Skogen, *Using pollinator foraging distance to predict genetic differentiation in hawkmoth and bee-pollinated Oenothera species*

**Shih-Hui Liu**, Saint Louis University and the Missouri Botanical Garden - Advisor, Dr. Jan Barber, *Phylogeny of Ludwigia and polyploid evolution in section Macrocarpon (Onagraceae)*

**Blaine Marchant**, University of Florida and the Florida Museum of Natural History - Advisors, Drs. Douglas and Pamela Soltis, *Investigations into the fern genome: filling the missing link in land plant genome evolution*

**Renee Petipas**, Cornell University - Advisor, Dr. Monica Geber, *The contribution of root-associated microbes to plant local adaptation*

**Clayton Visger**, University of Florida and the Florida Museum of Natural History - Advisors, Drs. Douglas and Pamela Soltis, *Genomic consequences of autopolyploidy: Gene expression in diploid and autopolyploid Tolmiea (Saxifragaceae)*

**Emily Warschefskey**, Florida International University and the Fairchild Tropical Botanic Garden - Advisor, Dr. Eric J. B. von Wettberg, *Next-generation domestication genetics of the mango* (*M. indica* L.)

**Keir Wefferling**, University of Wisconsin - Milwaukee - Advisor, Dr. Sara Hoot, *Speciation and hybridization in *Caltha leptosepala* s.l. (Ranunculaceae): Disentangling the subalpine marsh-marigold species complex*

**Kevin Weitemier**, Oregon State University - Advisor, Dr. Aaron Liston, *Genome-enabled phylogeography of a Great Basin milkweed, *Asclepias cryptoceras**

**Brett Younginger**, Portland State University - Advisor, Dr. Daniel Ballhorn, *The diversity and functional role of foliar endophytes in stress-tolerant 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**.

**Carla Harper**, University of Kansas - Advisor, Dr. Thomas N. Taylor - for the Botany 2014 presentation: "*Foliar fossil fungi: Leaf-fungal interactions from the Permian and Triassic of Antarctica*" Co-authors: Thomas N. Taylor, Michael Krings and Edith L. Taylor

**Rebecca Koll**, University of Florida, Florida Museum of Natural History - Advisor, Dr. Steven Manchester - for the Botany 2014 presentation: "*Taxonomic relationships of early and middle Permian gigantopterid seed plants in western Pangea*" Co-author: Steven Manchester

**Meghan McKeown**, University of Vermont - Advisor, Dr. Jill Preston - for the Botany 2014 presentation: "*The Evolution of vernalization responsiveness in temperate Poideae*" Co-author: Jill Preston

## TRIARCH "BOTANICAL IMAGES" STUDENT TRAVEL AWARDS

This award provides acknowledgement and travel support to BSA meetings for outstanding student work coupling digital images (botanical) with scientific explanations/descriptions designed for the general public. See the July *American Journal of Botany* for all submissions.

**Daniel McNair**, University of Southern Mississippi - 1st Place, *Graceful aging*, \$500 Botany 2014 Student Travel Award

**Daniel McNair**, University of Southern Mississippi - 2nd Place, *Last of the longleaf*

**Abby Glauser**, University of Kansas - 3rd Place, *Resilience*, \$250 Botany 2014 Student Travel Award

**Carla Harper**, University of Kansas - 3rd Place, *260 million year old (Permian) mycorrhizal fungi from Antarctica*, \$250 Botany 2014 Student Travel Award

## 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 2014 award recipients are:

**Meredith R. Breeden**, Fort Lewis College - Advisor, Dr. Ross A. McCauley, *Pollination biology of the narrow endemic *Ipomopsis ramosa*, in Roaring Fork Canyon, CO*

**Alice Butler**, Bucknell University - Advisor, Dr. Chris Martine, *Floral development in *solanum sejunctum* and *solanum asymmetriphyllum**

**Matthew Galliard**, Kansas State University - Advisor, Dr. Loretta Johnson, *Long-term field selection of big bluestem ecotypes in reciprocal gardens planted across the Great Plains precipitation gradient*

**Ian Gilman**, Bucknell University - Advisor, Dr. Chris Martine, *Field botany and population genetics of *Draba* L. (Brassicaceae) in the Rocky Mountains*

**Morgan Roche**, Bucknell University - Advisor, Dr. Chris Martine, *Genetic diversity within and among species of dioecious Australian *solanum**

**Dylan D. Sedmak**, Ohio State University - Advisor, Dr. John Freudenstein, *Fungal variability and habitat correspondence in the North American orchid *Cypripedium acaule* ait.*

**Kayla Ventura**, University of Florida - Advisor, Dr. Pamela Soltis, *Identifying the cellular component of flower size differences in *Gilia* (Polemoniaceae) associated with changes in pollinators*

## DEVELOPMENTAL & STRUCTURAL SECTION STUDENT TRAVEL AWARDS

**Italo Antonio Cotta Coutinho**, Universidade Federal de Vicosa - Advisor, Renata Maria Strozi Alves Meira - for the Botany 2014 presentation: *"Diversity of secretory structures in *Urena lobata* L.: ontogenesis, anatomy and biology of the secretion"* Co-authors: Sara Akemi Ponce Otuki, Valéria Ferreira Fernandes, Renata Maria Strozi Alves Meira

**Roux Florian**, INRA - Advisor, Jana Dlouhá - for the Botany 2014 presentation: *"Flexible juveniles or why trees produce 'low quality' wood?"* Co-authors: Jana Dlouhá, Tancrede Almeras, Meriem Fournier

**Rebecca Povilus**, Harvard University - Advisor, William Friedman - for the Botany 2014 presentation: *"Pre-fertilization reproductive development and floral biology in the remarkable water lily, *Nymphaea thermarum*"* Co-authors: Juan M. Losada, William E. Friedman

**Beck Powers**, University of Vermont - Advisor, Jill Preston - for the Botany 2014 presentation: *"Evolution of asterid HANABA TARANU-like genes and their role in petal fusion"* Co-author: Jill Preston

## ECOLOGY SECTION STUDENT TRAVEL AWARDS

**Rachel Germain**, University Of Toronto - Advisor, Dr. Benjamin Gilbert - for the Botany 2014 presentation: *"Hidden responses to environmental variation: maternal effects reveal species niche dimensions"* Co-author: Benjamin Gilbert

**Jessica Peebles Spencer**, Miami University - Advisor, Dr. David L. Gorchov - for the Botany 2014 presentation: *"Effects of the Invasive Shrub, *Lonicera maackii*, and a Generalist Herbivore, White-tailed Deer, on Forest Floor Plant Community Composition"* Co-author: David L. Gorchov

## GENETICS SECTION STUDENT RESEARCH AWARDS

Genetics Section Student Research Awards provide \$500 for research funding and an additional \$500 for attendance at a future BSA meeting.

**Kevin Weitemier**, Oregon State University-Graduate Student Award - Advisors: Dr. Aaron Liston, for the proposal titled *"Genome-enabled phylogeography of a Great Basin milkweed, *Asclepias cryptoceras*"*

**Kimberly Hansen**, Northern Arizona University- Masters Student Award - Advisor: Dr. Tina Ayers, for the proposal titled *"Reconstructing the evolutionary history of *Campanulaceae* with NextGen sequencing"*

## PTERIDOLOGICAL SECTION & AMERICAN FERN SOCIETY STUDENT TRAVEL AWARDS

**Alyssa Cochran**, University of North Carolina, Wilmington - Advisor, Dr. Eric Schuettpelz - for the Botany 2014 presentation: *"*Tryonia*, a new taenitidoid fern genus segregated from *Jamesonia* and *Eriosorus* (Pteridaceae)"* Co-authors: Jefferson Prado and Eric Schuettpelz

**Jordan Metzgar**, University of Alaska, Fairbanks - Advisor, Dr. Stefanie Ickert-Bond - for the Botany 2014 presentation: *"From eastern Asia to North America: historical biogeography of the parsley ferns (*Cryptogramma*)"* Co-author: Stefanie Ickert-Bond

**Jerald Pinson**, University of North Carolina, Wilmington - Advisor, Dr. Eric Schuettpelz - for the Botany 2014 presentation: *"Origin of *Vittaria appalachiana*, the 'Appalachian gametophyte'"* Co-author: Eric Schuettpelz

**Sally Stevens**, Purdue University - Advisor, Dr. Nancy C. Emery - for the Botany 2014 presentation: *"Home is Where the Heat Is? Temperature and Humidity Responses in a Fern Gametophyte"* Co-author: Nancy C. Emery

## 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 2014 “Certificate of Special Achievement” award recipients are:

**Theresa Barosh**, Willamette University, Advisor: Dr. Susan Kephart

**Allison Bronson**, Humboldt State University, Advisor: Dr. Alexandru M. Tomescu

**Jamie Burnett**, Humboldt State University, Advisor: Dr. Alexandru M. Tomescu

**Katherine Chapel**, Miami University, Advisor: Dr. Michael A. Vincent

**Nels Christensen**, Connecticut College, Advisor: Dr. T. Page Owen, Jr.

**Gemma Dugan**, Bucknell University, Advisor: Dr. Chris Martine

**Vince Fasanello**, Bucknell University, Advisor: Dr. Chris Martine

**Leila Fletcher**, Barnard College, Columbia University, Advisor: Dr. Hilary Callahan

**Anna Freundlich**, Bucknell University, Advisor: Dr. Chris Martine

**Maria Friedman**, Humboldt State University, Advisor: Dr. Alexandru M. Tomescu

**Blake Geraci**, University of Florida, Advisor: Dr. Pamela S. Soltis

**Grace Glynn**, Connecticut College, Advisor: Dr. T. Page Owen, Jr.

**Cody Groen**, College of St. Benedict/St. John's University, Advisor: Dr. Stephen G. Saupe, Ph.D.

**Anna Herzberger**, Eastern Illinois University, Advisor: Dr. Scott J. Meiners, Ph.D

**Julia Hull**, Weber State University, Advisor: Dr. Ron Deckert, Ph.D.

**Emily Keil**, Ohio University, Advisor: Dr. Sarah E. Wyatt

**Michael LeDuc**, Connecticut College, Advisor: Dr. T. Page Owen, Jr.

**Jessica Mikenas**, Oberlin College, Advisor: Dr. Michael J. Moore

**Luis Mourino**, University of Florida, Advisor: Dr. Pamela S. Soltis

**Taylor J. Nelson**, Weber State University, Advisor: Dr. Sue Harley

**Chelsea Obrebski**, Miami University, Advisor: Dr. Michael A. Vincent

**Rhys Ormond**, Willamette University, Advisor: Dr. Susan Kephart

**Kelsey Phipps**, Eastern Illinois University, Advisor: Dr. Scott J. Meiners, Ph.D.

**Molly Sutton**, Weber State University, Advisor: Dr. Barb Wachocki

**Amanda Thornton**, Campbell University, Advisor: Dr. Chris Havran

**Drew Walters**, Fort Lewis College, Advisor: Dr. Ross A. McCauley, Ph.D.

## THE BSA PLANTS GRANT RECIPIENTS

The PLANTS (Preparing Leaders and Nurturing Tomorrow's Scientists) program recognizes outstanding undergraduates from diverse backgrounds and provides travel grants and mentoring for these students.

**Marilyn Creer**, Alabama A&M University, Advisor: Dr. Tatiana Kukhtareva

**Gemma Dugan**, Bucknell University, Advisor: Dr. Chris Martine

**Shawna Faulkner**, Humboldt University, Advisor: Dr. Alexandru Tomescu

**Michelle Garcia**, University of Texas-El Paso, Advisor: Dr. Michael Moody

**Aidee Guzman**, University of Wisconsin-Madison, Advisor: Dr. Eve Emshwiller

**Timothy Hieger**, University of Kansas, Advisor: Dr. Thomas N. Taylor

**Shayla Hobbs**, University of Illinois, Advisor: Dr. Tina M. Knox

**Michelle Jackson**, Smith College, Advisor: Dr. Jesse Bellemare

**Claudia Christine Marin**, University of California Riverside, Advisor: Dr. Milton McGiffen

**Sean Pena**, Florida International University, Advisor: Dr. Suzanne Koptur

**David Pozo Garces**, Central Michigan State University, Advisor: Dr. Anna Monfils

**Yisu Santamarina**, Florida International University, Advisor: Dr. Bradley Bennett

**Samuel Torpey**, University of Idaho, Advisor: Dr. David Tank

## BSA STUDENTS PARTICIPATE IN CONGRESSIONAL VISITS DAY 2014

### BSA PUBLIC POLICY AWARD OFFERS UNIQUE AND PERSONAL EXPERIENCE IN WASHINGTON, DC

On April 9-10, BSA graduate student members Megan Philpott (University of Cincinnati), Steven Callen (Saint Louis University), and Morgan Gostel (George Mason University) met with members of Congress to discuss the importance of funding for basic scientific research through the National Science Foundation (NSF). This was the third year that BSA student members have participated in this annual event, organized by the American Institute of Biological Sciences (AIBS) and the Biological and Ecological Science Coalition (BESC) for biologists to meet with members of congress.

As a bit of background, this year President Obama's budget proposal requested \$7.255 billion in appropriations for the National Science Foundation. This is 1.2% more than last year's request. Recently, appropriations request letters were submitted to House (Representative Butterfield, D-MA) and Senate (Senator Markey, D-NC) appropriations committees, requesting this amount be increased to \$7.5 billion for FY 2015, which helps to mitigate net losses due to inflation and maintains support for important NSF programs.

Megan and Steven are recipients of the second annual BSA Public Policy Award and have described their experience below.

#### MEGAN'S EXPERIENCE

Fellow BSA Public Policy Award winner Steven Callen and I met with BSA student representative, Morgan Gostel, the day before the festivities started to get oriented. April 9 kicked off with a meeting between the first-time Congressional Visits attendees and members of the scientific community with extensive experience in public policy. It was a candid look into the day-to-day world of communicating science to policy-makers. Afterward, we got a run-down of the political climate in Congress right now regarding science policy and research, the proposed budgets for various scientific research agencies for 2015, and how exactly to communicate effectively with policy-makers regarding our requests.

April 10 was the big day to meet with our Congress people. I was in a group with two other graduate students representing Michigan and



*Megan Philpott, University of Cincinnati (right), with two other graduate students during Congressional Visits Day 2014.*

Pennsylvania, led by Brian Wee, Chief of Strategic Alliances for the National Ecological Observatory Network. We each met with the offices of our two state senators and state representative, and I led the meetings with my Ohio congressmen, Sen. Sherrod Brown, Sen. Rob Portman, and Rep. Steve Chabot. Our main request was a modest increase for the NSF budget in FY2015 to \$7.5 billion, up from the proposed budget of \$7.255 billion. **Most of the offices we met with seemed very supportive of funding basic scientific research in their state, but time and time again, legislative staff stressed the difficulty of passing any budget increases given the current political climate.** According to the AIBS, several of the Senator's offices that CVD participants met with signed a "Dear Colleague" letter circulated in support of an increased NSF budget, so hopefully our meetings had a positive impact.

All in all, my involvement with CVD was an eye-opening and educational experience. It's easy to get discouraged as a citizen when it feels like your elected officials don't share your priorities, but actually going to Capitol Hill and meeting



*Steve Callen, Saint Louis University, meets with Senator Claire McCaskill (D-MO) during Congressional Visits Day 2014*

with congressional offices showed that we citizens can have a little more impact than just going to the polls on Election Day. **I feel inspired to stay involved with science advocacy and public policy at the federal level, and I'm currently trying to get involved at the state level as well.** In all, I'm incredibly grateful to the BSA for allowing me to have such a great experience.

### STEVEN'S EXPERIENCE

Until my visit to the U.S. Embassy in Beijing last summer during my 2013 NSF East Asian and Pacific Summer Institute Fellowship, I had never considered, or even thought about, how important science policy and policymakers are in directing the landscape of scientific research and development in the United States and in supporting my own research. Inspired by that embassy visit, I subsequently began to increase my awareness and understanding of issues in science policy and actively started to find avenues for student participation in policy that would consequently give me the chance to have an impact on the current state and future direction of science R&D. Thanks to the Botanical Society of America, I was able to take a significant step in that direction by immersing myself in part of the science policy process by attending CVD this year.

Our group was lead by Richelle Weihe, Governmental Grants and Contracts Coordinator at the Missouri Botanical Garden, and also

included Chris Lorentz (from Thomas More College in Kentucky) and Don Natvig (from the University of New Mexico). Since there were four of us representing three states, we were tasked with having conversations with Senate and House members (or their staff) from Missouri (Sen. McCaskill, Sen. Blunt, and Rep. Clay), Kentucky (Sen. Paul, Sen. McConnell, and Rep. Massie), and New Mexico (Sen. Udall, Sen. Heinrich, and Rep. Lujan Grishman).

What was particularly unique about this group of Senators and Representatives was the diversity of their backgrounds: five are Democrats and four are Republicans; two are women; one is African-American; collectively they come from six different religious backgrounds; and, while most are in their first term, they have different levels of experience in Congress (up to seven terms)! As a result, it was interesting seeing first-hand the different ways that each of their offices operated, their levels of understanding how science works, and their individual perspectives on federal funding for science R&D.

For instance, while the office of Sen. McCaskill (D-MO) expressed support for federally supported science research, though her policy is to generally not sign letters of support for any issue, Sen. Rand Paul's (R-KY) office bluntly suggested that the best we could hope for, since this is an election year, is to maintain status quo until some time in the following year, but that his office is generally in favor of across-the-board budget cuts (not just to the sciences). Alternatively, the office of Sen. Wm. Lacy Clay (D-MO) was uniquely transparent in their complete support of increased federal funding to science research, which actually was evident before our meeting, as he had, just days before, signed the Butterfield-McKinley Dear Colleague Letter in support of a \$7.5 million budget for NSF for fiscal year 2015 (\$245 million more than currently proposed by Pres. Obama).

While the entire day was full of excitement and "teachable moments" for me, my experience at CVD both began and ended with my two biggest highlights. As residents of Missouri, Richelle and I were both able to attend Sen. McCaskill's constituent coffee hour (along with vacationers and groups advocating for different issues). It was a little intimidating meeting with a member of Congress for the first time, but I was quickly put at ease by Sen. McCaskill's sense of humor and straightforward demeanor. After listening to her

tell us about the current state of things in the Senate and then having our photo taken with her, we met with one of her policy analysts in the hallway and were able to get into more detail about the need for federal funding for science, how it has been used to support our own work, and other ways in which federal funding has benefitted science R&D and STEM training in Missouri. Our message was well-received, and, just before we left, I offered myself as an eager source of advice on future science policy issues.

Toward the end of the day, our group had a meeting with Rep. Clay. We were not planning on meeting with him, but, to our surprise, he was in his office and quickly stepped out to greet us and say “hello” before he had to run off to vote. A bit mystified by his unexpected appearance, I collected myself and was directed into a room to speak with one of his legislative assistants, Ms. Noelle Lindsay. The two of us bonded immediately as a result of some common ground. After I explained how federal funding is helping to support my dissertation project on an invasive plant species, she told me how her dad struggles to remove the same plant from his backyard year after year! As Richelle and I were leaving the office, Ms. Lindsay, laughing, mentioned she was going to text her dad that she met someone whose research might help to relieve some of his backache.

Overall, I greatly enjoyed CVD, and it has helped to solidify my interests in continuing to have a role in science policy. While we did our best to get our message across during each of our brief 15-minute meetings, this is really just the start. As I was told in a panel discussion the day before at the ESA, **the best way to ensure you have a long-term impact on science policy is to form relationships with the members of Congress and their staff by communicating with them clearly and frequently and by explaining the ways in which science issues are relevant to them and the states they represent.** I plan to cultivate the relationships I started at this 2014 CVD by writing follow-up emails and letters, sending messages to members of Congress on social media such as Facebook and Twitter, and returning to participate in more CVDs. I am most appreciative to the BSA for sponsoring my visit; to the ESA, BESC, and AIBS for organizing it; and to Morgan for coordinating my trip and showing Megan and me around DC.

## MORGAN'S EXPERIENCE

This year I led a team, which was markedly different from my experiences in 2012 and 2013. Because this was my third time at the CVD, I was able to share my experience from previous years with new participants. My team included two other graduate students from Arizona State University and the University of Delaware. Our team met with legislative aides and coordinators from seven congressional offices, including both senators from Arizona and Delaware, as well as Representatives Carney (Delaware) and Sinema (Arizona, 9th). I also met with a legislative correspondent from Senator Mark Warner's office (Virginia). The week following our meetings, I heard back from the legislative correspondent I met with that both Virginia Senators (along with 19 other senators, including both from Delaware as well) had signed the Markey “Dear Colleague” letter requesting increased appropriations for the NSF—it makes me wonder if our meetings helped make this difference!

The most dramatic difference between the BESC this year from my previous two years was the overall nature of the meetings. Last year, the President's budget was released on the same day of the event, so few members of Congress were familiar with the specificity of the appropriations requests. Rhetoric surrounding budget priorities was very heated and the word “funding” had somewhat of a palpable air of intrigue and suspicion surrounding it. This year I detected much more of a need to communicate and cooperate on the budget and a sense of urgency. Among the legislative staffers our team met with, all were specialists on science and technology policy and included a former post-doctoral AAAS Congressional Fellow. We were able to share stories about how our work has touched the lives of not only a local constituency, but also improves our fundamental understanding of biological systems at a global scale.

Despite the challenges and opportunities observed during the CVD, **it is satisfying to realize the underlying support for basic research and level of understanding among many congressional offices that basic research is not a partisan issue.** What is most shocking is the perspective I have gleaned over the past three years as a participant in the CVD and how radically attitudes toward funding for basic research can shift from one year to the next. Despite the shifting policy climate, the salience of our message remains the same: **basic research supports education**

**and innovation priorities that help develop our nation both uni- and multilaterally as a leader in science and technology.** A continued commitment is necessary to maintain a leadership role in basic research and it is our job, as botanists, to communicate the importance of this role, its breadth, and the interconnectedness we share with both the biotic and abiotic features of the planet that botanical research helps us better understand.

Already in the few weeks following the 2014 CVD, we have observed some positive response to our message, including support in the Senate for the Senator Markey “Dear Colleague” appropriations letter and just two weeks ago, the House voted to pass a bill supporting \$7.4 billion for the National Science Foundation—not quite the amount requested by CVD participants (\$7.5 billion), but an increase of \$154 million from President Obama’s request for 2015.

### WHAT CAN YOU DO?

Write to your congressional representatives, sign up for Public Policy Reports from the American Institute of Biological Sciences (AIBS, <http://www.aibs.org/public-policy-reports/>), and become involved! If you can’t make it to Washington, D.C., the AIBS organizes an annual event in August called the Biological Sciences Congressional District Visits, which gives scientists an opportunity to meet locally with their representatives and senators to discuss the importance of the work you do and federal funding that supports it. Registration for the event is free and should be opening soon! If you can’t attend in person, remember that you can always write your representatives and senators to ask for their support and/or thank them if they already have supported policy that is important to you!

Finally, if you are a graduate student or post-doc, be sure to keep an eye out for these important opportunities to engage in public policy, sponsored by the BSA and our Public Policy Committee (become a member!) You can expect a call for proposals for the 2015 BSA Public Policy Award in Fall 2014!

With deep gratitude to the BSA membership for supporting important botanical education and outreach, as well as the Public Policy Committee’s commitment to improving opportunities for public policy action,

—Megan Philpott, Steven Callen, and Morgan Gestel

### Lloyd Library and Museum

Bringing Science, Art,  
and History to Life  
Because the Past is the  
Path to the Future



THE *AMERICAN JOURNAL OF BOTANY* CONTINUES CENTENNIAL  
CELEBRATION THROUGHOUT 2014

The celebration of the first 100 years of the *American Journal of Botany* continues! The last issue of the *PSB* featured interviews with some of the *AJB*'s most prolific authors over the years: Karl Niklas, Pam and Doug Soltis, and Mark Chase. This issue features interviews with more members of this elite group, as the following pages show.

The *AJB*'s unique Centennial Review papers have also been attracting a lot of attention and positive comments. These papers take a look at key research from the *AJB*'s past and re-examines and updates the research to find where the field stands now and into the future. The following *AJB* Centennial Review articles are already available and can be accessed for free:

- “Plant evolution at the interface of paleontology and developmental biology: An organism-centered paradigm” by Gar W. Rothwell, Sarah E. Wyatt, and Alexandru M. F. Tomescu [101(6):899, 2014]
- “Is gene flow the most important evolutionary force in plants?” by Norman C. Ellstrand [101(5):757, 2014]
- “Repeated evolution of tricellular (and bicellular) pollen” by Joseph H. Williams, Mackenzie L. Taylor, and Brian C. O'Meara [101(4):559, 2014]
- “The voice of American botanists: The founding and establishment of the American Journal of Botany, ‘American botany,’ and the Great War (1906-1935)” by Vassiliki Betty Smocovitis [101(3):389, 2014]
- “The nature of serpentine endemism” by Brian L. Anacker [101(2):219, 2014]
- “The evolutionary-developmental origins of multicellularity” by Karl J. Niklas [101(1):6, 2014]
- “The American Journal of Botany: Into the Second Century of Publication” by Judy Jernstedt [101(1):1, 2014]

These articles are also hosted at [www.botany.org/ajb100](http://www.botany.org/ajb100), and the site also hosts other free content---nearly 1000 articles from the history of the *AJB*, as written by the journal's top 25 contributors!

The *AJB* is one of the few surviving plant science publications published by a non-profit scientific society. The journal, and its authors, reviewers, editors, readers, and subscribers, are at the heart of the Botanical Society of America, and the strength of this connection makes the *AJB* stand out from many other journals.

American Journal of  
**Botany**  
Celebrating 100 years  1914–2014

## SHIRLEY TUCKER, UNIVERSITY OF CALIFORNIA–SANTA BARBARA

*Shirley Tucker has not only published 55 articles in the American Journal of Botany over 55 years, but has served as BSA President (1986-1987) and Program Director (1978). She also won the BSA's highest honor, the BSA Merit Award, in 1989. We asked Shirley to look back over her career and some of the key research she published in AJB over the years.*

**The first article you published in AJB was "Ontogeny of the Floral Apex of *Michelia fuscata*" in 1960. Take us back to that period—where were you, what were you doing, and what were you studying/most interested in at the time?**

I was a Research Associate in the Botany Department at the University of Minnesota, supported halftime on my first NSF research grant, which was on floral development in Magnoliaceae. I had completed my PhD at the University of California (Davis) and moved to Minnesota with my husband Ken, where he obtained a position in Entomology. Fortunately I could work in the laboratory of Dr. Ernst Abbe, with whom I had done an MS degree working on *Zea mays* seedling development. Living material of Magnoliaceae was scarce in St. Paul, but a small tree of *Michelia fuscata* in a public greenhouse was sufficient to produce four publications (all in *AJB*) describing its vegetative and floral development as well as its odd phyllotaxy. Meanwhile I was also preparing my PhD work, on floral ontogeny in *Drimys winteri*, for publication.

**Your most recent article in the *AJB* was "An open-flower mutant of *Melilotus alba*: Potential for floral-dip transformation of a papilionoid legume with a short life cycle?" in 2010. How has the thread of your research changed over time?**

About 1983, my research interest turned to legume flowers, at first investigating the developmental distinctions among the three subfamilies. Fifty-three publications on leguminous floral ontogeny resulted, 26 of which were in the *AJB*. Subfamily Caesalpinieae proved most diverse in floral ontogeny, and I was fortunate in receiving material for this work from west African tropics from systematists. This paper by Ann Hirsch and her students was among the few papers I published on subfamily Papilionoideae, which had relative

uniform floral development. Ann found mutants of *Melilotus alba* that were non-papilionoid and hence interesting to both of us; I supplied the SEM work on it.

**Why have you chosen *AJB* as one of the journals in which you've published throughout your career?**

*AJB* has always been the premier American journal in botany, in my opinion. I have had good relations and help from all its editors from Norman Boke (1970-1974) onward, mostly fair reviews, and straightforward procedures toward publication. The fact that the journal is so widely distributed worldwide is also very important, since my areas of research are practiced worldwide.

*Shirley's complete list of AJB publications, which are free for viewing throughout 2014, can be found at <http://botany.org/ajb100/stucker.php>.*



*Shirley Tucker, accepting the BSA's Centennial Award in 2006 from Dr. Peter Raven. The award acknowledged and honored outstanding service to the plant sciences and the Society.*

GAR ROTHWELL  
OHIO STATE UNIVERSITY AND  
OREGON STATE UNIVERSITY

*Gar Rothwell has been a prominent member of the BSA for more than 45 years, and over that time, he has published nearly 50 articles in the American Journal of Botany---including his just-released AJB Centennial Review article in the June 2014 issue. He shared his thoughts about his research.*

**The first article you published in AJB was “Ontogeny of the Paleozoic Ovule, *Callospermation pusillum*” in 1971. Take us back to that period; where were you, what were you doing, and what were you studying/most interested in at the time?**

I did that paper in the summer between my MS and PhD studies at the University of Illinois at Chicago when I had a short window of time to do a study that others thought unlikely, but that I was convinced could succeed.

**Your most recent research article in the AJB was “Seed cone anatomy of Cheirolepidiaceae (Coniferales): Reinterpreting *Pararaucaria patagonica* Wieland” in 2012. How has the thread of your research changed over time?**

The scope of my studies has broadened from Pennsylvanian age, anatomically preserved fossil plant structure, development, and evolution, to fossil and living plants of all ages and modes of preservation from around the world—but otherwise it maintains the same basic emphasis.

**In looking back over the course of your research, what areas have you consistently explored? What areas did you not expect to explore?**

I have consistently explored plant evolution



*Gar Rothwell and his spouse, Ruth Stockey, following Gar's American Journal of Botany Special Lecture at BOTANY 2012.*

and phylogeny from an organismal perspective, and have employed development as a major focus throughout. However, I did not ever expect to be able to include information from molecular biology and developmental genetics (no such thing for the first 20-25 years) in my studies.

**In looking back at all of the articles you've published in AJB, which stand out and why?**

This forces me to look back and remember what I was thinking when each of the papers was accepted for publication. I'll choose my first paper, “Ontogeny of the Paleozoic Ovule *Callospermation pusillum*,” because it allowed me to develop a new approach for integrating developmental studies of extinct plants with similar studies of living plants. It also was the first project I conceived and implemented entirely on my own (only one edit by Tom Taylor), and it gave me confidence in my ability to do what I loved doing for the rest of my life.

For the same reasons (and to emphasize that it wasn't all downhill from the first), I also really like the 2005 article “Evidence of polar auxin flow in 375 million-year-old fossil wood” with Simcha Lev-Yadun, which allowed us to begin inferring the role of regulatory genetics in the growth and evolution of extinct plants.

**Why have you chosen the AJB as one of the journals in which you've published throughout your career?**

The Botanical Society of America is my organizational scholastic “home,” and the widely read “house journal” is a natural for the audience I wish to reach.

*To delve deeper into Gar's extensive research in the AJB, please see his full list of articles at [www.botany.org/ajb100/growthwell.php](http://www.botany.org/ajb100/growthwell.php)*



*Gar Rothwell at the 1975 Botany meeting.*

DANIEL CRAWFORD  
UNIVERSITY OF KANSAS

*Dr. Daniel Crawford, who has served as BSA President in 1996 and received the prestigious BSA Merit Award, has been publishing in the American Journal of Botany for nearly 45 years. He shared his thoughts about publishing his systematics work most prominently in the AJB over the years.*

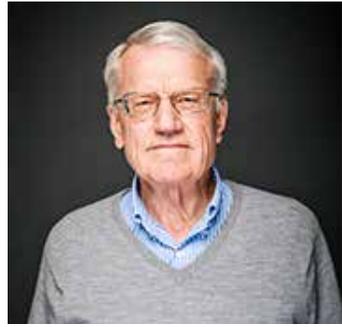
**Your most recent article in the AJB was “Invasive congeners are unlikely to hybridize with native Hawaiian *Bidens* (Asteraceae)” in 2013. Tell us a little about how systematics research has changed since your first AJB article in 1971 (“Systematics of the *Coreopsis petrophiloides*-*Lucida-Teotepecensis* Complex”).**

One driver of change has been the availability of new methods for generating data. In initial studies in the '60s and '70s, the “new” data were comparative secondary chemistry, with enzyme electrophoresis and DNA not in the “tool kit” of the plant systematist. New methods drove the direction of research and the kinds of questions that could be addressed. Of course, explicit methods of phylogenetic analysis changed the thread of research.

**How has the thread of your own research changed over this time?**



*Daniel Crawford in the late 1980s from Juan Fernandez (Robinson Crusoe) Islands, placing plant material into liquid nitrogen for use in allozyme and DNA studies.*



*Daniel Crawford, 2014, at the University of Kansas.*

Two constant themes have been studies of a particular group of Asteraceae, tribe Coreopsidae, and especially the genus *Coreopsis*, and the origin and evolution of island plants. During my first eight years on the faculty at the University of Wyoming, I did not even contemplate studying plants of oceanic islands, but interactions with Tod Stuessy following the move to Ohio State initiated and nurtured a long-standing interest in island plants.

**In looking back at all of the articles you’ve published in AJB, which stand out and why?**

While it is difficult to select among articles published in *AJB*, the two papers summarizing allozyme diversity in native and endemic plants of the Canary and Juan Fernández Islands published in 2000 and 2001 are especially rewarding (Francisco-Ortega et al. “Plant genetic diversity in the Canary Islands: a conservation perspective” and Crawford et al. “Allozyme diversity in the endemic flowering plant species of the Juan Fernández Archipelago, Chile: ecological and historical factors with implications for conservation”). Both articles are the products of collaborative efforts with long-time colleagues and friends in the U.S., Chile, and the Canaries. Also, both papers have discussions of the conservation of the floras of the two archipelagos.

**Why have you chosen *AJB* as one of the journals in which you’ve published throughout your career?**

Since 1971, a substantial number of new journals have been established, thus providing more places to submit papers. Yet, *AJB* and *Systematic Botany* have always been my two “home” journals, as I am basically a botanist and a systematist. Also, *AJB* has stayed with the trends in making the journal visibly more attractive and in incorporating features such as special issues centered on topics of current and general interest.

*Dr. Crawford’s complete list of AJB publications, which are free for viewing throughout 2014, can be found at <http://botany.org/ajb100/dcrawford.php>*

## PAUL MAHLBERG

*Paul Mahlberg has been a member of the BSA since 1951—an incredible 63 years! In that time, he has published 37 articles between 1961 and 2004. He recently expressed his thoughts about his work over his career.*

**The first article you published in AJB was “Embryogeny and Histogenesis in Nerium oleander. II. Origin and Development of the Non-articulated Laticifer” in 1961. Please take us back to that period: what were you studying/ most interested in at the time?**

I chose for my doctoral study the non-articulated laticifer, a most unusual cell type present in a small number of angiospermous families. I became intrigued by this cell from previous knowledge of it during my earlier graduate studies (Master’s degree in Botany, University of Wisconsin) and readings of the classical literature on this cell type. When I entered the Botany Department, University of California, Berkeley (1954), and discussed a thesis topic with Professor Adriance Foster, I selected this cell type for my dissertation. Because the Oleander (*Nerium oleander* L.) and *Euphorbia marginata* Pursh. were generally available in the area, I selected them as models for my study.

Perhaps I was intrigued most by the broad questions of how a body cell could evolve into such an unusual form, and what physiological and/or genetic phenomena gave rise to its intrusive growth capability. These broad questions remain unresolved, in part perhaps because the techniques were not yet available to provide full answers to them. We learned many details about its features but, as we know, answerable questions only lead to new questions. I certainly would like to continue this quest especially with the new techniques only recently available that could probe deeply into the laticifer proteins and genes associated with it growth and differentiation.

**Your most recent article in the AJB was “A Chemotaxonomic Analysis of Cannabinoid Variation in Cannabis (Cannabaceae)” in 2004. How did the thread of your research change over time?**

My broadened interests in lipophilic secretory cells and structures placed emphasis upon secretory glands such as those in Cannabis, also a laticifer-bearing plant. Our gland studies would focus on electron microscopic examination of glands during development and chemical analyses of the contents

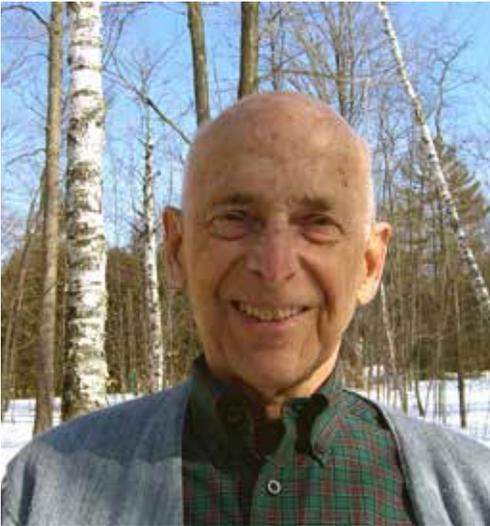


*Paul Mahlberg from the mid-1960s, shortly after completing his PhD, on the campus of University of Pittsburgh.*

within the gland. The distinguishing characteristics for such a study required an extremely abundant number and localized density of glands to facilitate their electron microscopic examination, and glands of large size and great numbers to probe individual glands as well as their concentration so as to aid examination of their structure and contents. I also acquired a large number of accessions, nearly 200, of Cannabis to research as a model for gland character and analyses of their specialized lipophilic chemical contents. Our studies linked cannabinoid synthesis to the gland with its accumulation in the specialized secretory cavity rather than in cells of the gland, and the genetically defined cannabinoid contents, in particular, to strains of distinct geographical origin and distribution.

**In looking back at all of the articles you’ve published in AJB, which ones stand out and why?**

My very first article provided the perspective of the long-term, perhaps elusive, goal to identify those factors that control the differentiation of this unique cell type. It was a consideration of many early biologically oriented scientists as attested in the surprisingly extensive historical literature on this cell type. Those early students of laticifer study were unable to define the nature of this cell type. They were unable to place it into perspective with other cell types as they defined them within the plant body. And I, too, remain unsatisfied in my quest to elucidate those subtle factors that must define the origin and development of this cell among all other cells of the plant body. Detection of



*Paul Mahlberg, 2013, enjoying retirement in Door County, WI.*

the laticifer as fossil laticifer structures, dating back perhaps 50 million years, indicate that it originated early in the evolution of angiospermy, but is limited in its distribution among these plants.

I remain enthused that further studies on laticifers, particularly the non-articulated form, will elucidate its phylogenetic relationship with

other cells of the plant body. Utilization of recently developed cell and tissue probes involving protein and gene techniques, not available during our previous studies, may elucidate the origin and relationship of this laticifer among other cells of the plant body.

But I do wonder at times—how could I still be a part of such studies of this cell type? Perhaps I still haven't left the laboratory. It reminds me of the axiom; there is so much to learn, and so little time.

**Why have you chosen *AJB* as one of the journals in which you've published throughout your career?**

I chose the *American Journal of Botany* for many of our publications because I consider it a leading journal in the field of botanical sciences. It has an international reputation for publishing manuscripts of the highest quality. I consider myself to be a part of the Journal. Our Journal is international in scope and is read by botanists throughout the world. It utilizes the highest quality materials for preparation resulting in excellent reproduction of illustrations provided by authors. These qualities contribute to making our Journal one of the finest of international science journals.

*Dr. Mahlberg's complete list of AJB publications, which are free for viewing throughout 2014, can be found at <http://botany.org/ajb100/pmahlberg.php>*



WHITNEY R. REYES STUDENT  
TRAVEL AWARD PROVIDES FUNDS  
FOR BSA HAWAII STUDENT  
CHAPTER MEMBERS TO ATTEND  
BOTANY 2014 IN BOISE, IDAHO

Whitney Reyes was a bright young scientist whose enthusiasm and passion for botany inspired many. She studied a variety of plants and had field experience in many different ecosystems in Hawai'i, but those who knew her know that her favorites were ferns and fungi. Whitney graduated with a Bachelor's degree in Botany from the University of Hawai'i at Mānoa in 2012, with several years of research experience in the field and laboratory. She is the coauthor of two peer-reviewed publications on the ecology and restoration of the endangered fern 'ihiihi (*Marsilea villosa*), in *American Journal of Botany* and *Restoration Ecology*. Whitney was the recipient of a BSA PLANTS Grant in its inaugural year (Botany 2010 in Providence, RI). She also presented her undergraduate research at Botany 2012 in Columbus, OH. Whitney was the co-founder and president of the BSA Hawai'i Student Chapter, and in its first year (2011) she raised thousands in grant funds to give away native Hawaiian plants at local festivals as public outreach and education events.

Whitney passed away unexpectedly in October 2012 and is dearly missed, but she leaves behind a rich legacy of botanical science, conservation, and outreach. The Botanical Society of America was very much her extended family, so it is fitting to honor her with a travel grant that provides young Hawaiian botanists the opportunity to attend Botany meetings in the future. Officers



*Whitney R. Reyes*



*Whitney R. Reyes Student Travel Award winners: Jason Cantley (PhD Candidate in Botany) and Monica Dittbern (Senior, Botany Major). The plants in the background are native Hawaiian hibiscus, koki'o ke'oke'o, Hibiscus arnottianus. Photo by Marian Chau.*

and members of the BSA Hawai'i Student Chapter worked hard to raise funds for this grant, both locally and at national meetings, beginning with Botany 2013. Many generous donations from BSA national members have helped to fund this grant in Whitney's memory.

The Hawai'i Chapter is pleased to announce the first winners of the Whitney R. Reyes Student Travel Award: **Monica Dittbern** (Senior, Botany Major) and **Jason Cantley** (PhD Candidate in Botany). They will have domestic airfare and accommodation expenses covered, up to \$1500 total, to attend Botany 2014 in Boise, ID, where they will gain valuable experience, knowledge, and opportunities to network with other BSA members. The awardees will also give a short presentation on their Botany 2014 experience at the first BSA Chapter meeting of fall 2014, sharing their experience with potential future BSA members. The Hawai'i Chapter would like to sincerely thank the BSA membership for their support in the success of the Whitney R. Reyes Student Travel Award.

—Dr. Marian Chau, Chair, Whitney R. Reyes Student Travel Award Committee



# 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: Catrina Adams, Acting Director of Education, at [CAAdams@botany.org](mailto:CAAdams@botany.org) or Marshall Sundberg, PSB Editor, at [psb@botany.org](mailto:psb@botany.org).

## SOCIETY INITIATIVES AND MEMBERS IN ACTION

### USA SCIENCE AND ENGINEERING FESTIVAL

BSA was well represented at the 2014 USA Science and Engineering festival in Washington D.C. in late April. The 3-day festival was enormous and extremely well attended. Several thousand people, including K-12 students and teachers, families, and adults, stopped by our booth to learn about plants, plant science careers, and PlantingScience.

Our volunteers entertained and educated an almost constant stream of visitors, engaging them with a choice of several activities. A "Guess the Plant" scent-identification quiz was very popular. (Cinnamon and coffee were the most recognized plant scents, while rosemary stumped many!) Few visitors were aware of plants' use of chemicals for defense against herbivores, and many were surprised to learn how cinnamon bark is harvested. Plastic fruits and vegetables were sorted hundreds of times by visitors of all ages. Although visitors often categorized tomatoes as fruits, bell peppers and corn were very rarely placed in the same group. Many visitors were shocked to learn how botanists define fruits.

A plant evolution/phylogeny card sorting game developed by Phil Gibson and Josh Cooper was another popular activity used to teach very basic plant evolution concepts. Sorting plant cards by image, by a stylized representation of plants' characteristics, and/or by a stylized molecular code, visitors could experience how scientists organize plants and construct phylogenies. Fairhope Graphics (<http://www.fairhopegraphics.com>), a neighboring booth offering a poster-sized watercolor depiction of the phylogenetic "History of Existing Life," provided a serendipitous visual we referred to often.

Chris Martine's "Plants are Cool, Too" video series was running on a screen for much of the event, as well as a video series of "flashcards" for identification of common plants of Manassas National Battlefield Park courtesy of Greg Perrier.

We also gave some career advice and information to students interested in botany, including a parent of an undergraduate student considering abandoning pre-med for a career in plant biology, several high school students seeking college advice, and a number of elementary-aged students who were extremely enthusiastic about plants. The PlantingScience program intrigued many K-12



*BSA members Phil Gibson, Greg Perrier, Owen Schwartz, and Linda Franklin sharing their love of plants with thousands of visitors at the USA Science and Engineering Festival.*

teachers in attendance, and we hope to recruit some new teachers to the program as a result of the event.

“Wow, thanks! I learned something new today!” was a constant refrain from visitors leaving our booth, adults and children alike.

The booth would not have been possible without the help of volunteers **Josh Cooper, Linda Franklin, Phil Gibson, Morgan Gostel, Kristen Hoefke, Ingrid Jordan-Thaden, Amy Litt, Greg Perrier, and Owen Schwartz**. We'd also like to thank members of the Education Committee who helped with early planning for the event. We learned a lot about logistics that will help us improve our booth and plan engaging activities for the future.

## PLANTINGSCIENCE

The PlantingScience team would like to thank the many scientists who volunteered their time to share their excitement about plant science with the 200+ teams participating in PlantingScience this spring. It makes such a difference for students to have the opportunity to work with and get to know scientists as they design projects. Here are some thanks students and teachers offered to their scientist mentors:

### STUDENT THANKS:

“I would like to thank you for all of your advice to me and my team. You were a great helper to us! I must say, our final conclusion was satisfying in a way that we didn't get what we were expecting and learned something new about the growth of spores. I had a great time working on the lab and your advice was always useful. Thank you VERY much for everything.”-**greenhorse (The Herbivores)**

“To wrap up the project, I would like to say how happy I am to have this experience and participate in such a cool project. I never would have fathomed I would communicate with you and the students in the Netherlands. Thank you for all your help and advice throughout our experiments! The whole project was really fascinating and I would like to do more things like it. Thanks again!”-**Gabby (The Wolf Pack)**

### TEACHER THANKS:

“The kids have really enjoyed working with the scientists this year—some actually checked their page on a daily basis to see if their scientist communicated with them. For several students this experience was a total transformation—one

*of my kids who was reluctant to complete anything has been communicating with his scientist and researching what his scientist works on so he can ask his scientist. He also is a perfect, tuned in, interested student. His grades are up all around and he will be in my AP Environmental next year. I love Planting Science!”* -**Ms. Lauer**

“Hi Mentors! I wanted to thank all of you for working with my kids! I have two very diverse groups, but they've all enjoyed their time working on this project...It has been a great learning experience for the kids and for me, as well! Who knows, perhaps you have inspired some future plant scientists!” -**Mrs. Buzzell**

“Thanks to all the Mentors, Liaisons, and the PS Team for everything you are doing to make science class come to life for my students! My colleagues have told me that they've been hearing students talk enthusiastically about their projects in the halls or in other classes! If they're talking science when they don't even have to be, that must mean the PlantingScience program is making a definite impact! :)”-**Ms. Schraeder**

Student teams developed many excellent and ambitious projects this spring. Many teams have produced videos to present their project results this session. This spring's star project winners are featured on the homepage of [www.plantingscience.org](http://www.plantingscience.org), so please stop by to see what the students have been up to.

Mr. de Graaf has put together a video of highlights from this spring's Netherlands/Florida class videoconference, viewable on YouTube: <http://youtu.be/e-gvWHNj4Es>

## INQUIRING ABOUT PLANTS E-BOOK NOW ON SALE

The e-book *Inquiring About Plants: A Practical Guide to Engaging Science Practices* by Gordon Uno, Marshall Sundberg, and Claire Hemingway is now available. All proceeds from the sale of the \$9.99 e-book will benefit the PlantingScience program. <http://www.amazon.com/Inquiring-About-Plants-Practical-Practices-ebook/dp/B00KI2GVD0/>



*Team H2OMuchForYou from Springfield Central High School, one of 10 Star Project winning teams of the Spring 2014 PlantingScience session.*

## CHARLES E. BESSEY AWARD

Our congratulations to Bruce Kirchoff, University of North Carolina, Greensboro, who is the 2014 recipient of the Charles E. Bessey Award. Please see the separate announcement on page 72.

## UPCOMING OPPORTUNITIES TO ENHANCE TEACHING AND LEARNING

Attend the *Society for the Advancement of Biology Education Research (SABER)2014 National Meeting*, July 17-20 at the University of Minnesota, Twin Cities, MN. Learn more at <http://saber-biologyeducationresearch.wikispaces.com/National+Meeting+2014>.

Make plans to attend the *2nd Life Discovery – Doing Science Education Conference*, October 3-4 at San Jose State University in San Jose, CA. The theme for this year's conference is "Realizing Vision and Change, Preparing for Next Generation Biology." Learn more about this upcoming conference at <http://www.esa.org/ldc/>.

## DON'T MISS BOTANY 2014: NEW FRONTIERS IN BOTANY

An exciting number of education, outreach, and training offerings for you to consider:

### Sunday

- Workshops on genomics, the PlantED digital library, visual learning, developing a hands-on distance education botany lab course, incorporating the plant fossil record into your botany course, software for teaching plant ID, preparing digital images for publication, and more.
- Professional Development workshops for students: Graduate School: how to apply and what to expect; Crafting an effective elevator speech and communicating broader impacts of your work; networking workshop for students and postdocs.
- Firewise! Botany-in-Action Service Project

### Tuesday

- Vision & Change in Undergraduate Botany Education, organized by J. Phil Gibson

Also, don't miss the Teaching Section presentations and posters, and the PlantingScience mixer. Check the website for schedule updates. <http://www.2014.botanyconference.org>

## MEET THE NEW EDITORS!



### MACKENZIE TAYLOR NAMED NEW EDITOR FOR *PLANT SCIENCE BULLETIN*

Dr. Mackenzie Taylor (Creighton University) has agreed to assume the editorship of the *Plant Science Bulletin* beginning in January 2015 with Volume 61. Mackenzie has a strong connection to the Society, having served on the Esau awards committee, the BSA investment committee, the BSA strategic planning committee, and the *AJB* editor-in-chief search committee. She also served as the first student representative to the BSA executive committee.

Mackenzie is an excellent young researcher (PhD in 2011) with nine published journal articles, including co-author of an *AJB* Centennial Review article in the April *American Journal of Botany*, a book chapter and several education and outreach publications.

Dr. Taylor indicated that as a student she read every issue of *Plant Science Bulletin* “from cover to cover” and continues to value it as a source of information about the Society and a resource for teaching. Her vision for the future of the Bulletin is both as a vehicle for maintaining connections across different fields of botany, including education and outreach, and as an access point for people outside the society. She foresees strategies for expanding the reach of the *PSB* through social media, and the possible addition of student- or postdoc-driven sections of the Bulletin while continuing to make sure that the Bulletin speaks broadly for the society in terms of teaching, outreach, and research.

### PAM DIGGLE NAMED NEW EDITOR-IN-CHIEF OF *AMERICAN JOURNAL OF BOTANY*

The *American Journal of Botany* is pleased to announce that Pamela Diggle (University of Connecticut) will serve as the new Editor-in-Chief for the journal beginning in January 2015.

Pam is a plant evolutionary biologist who just recently (2014) became the Associate Head of the Department of Ecology and Evolutionary Biology at the University of Connecticut having come from the Department of Ecology and Evolutionary Biology at the University of Colorado (1997-2013), and being a Visiting Professor in the Department of Organismic and Evolutionary Biology at Harvard University (2011-2013). Pam has an outstanding service record for the Botanical Society of America. Her association with the society began when she was a graduate student – in 1987 she won the Katherine Esau Award, and she has since served the society in many capacities, from being a member for a variety of committees to assuming leadership roles such as Chair of the Development and Structure Section (2002-2004), Council Representative (2003-2007), Society Secretary (2009-2011) and, most recently and most notably, as President of the Society (2013-2014).

Pam has had a very active research career for the past three decades, and she continues to pursue a wide array of interests in plant biology. While focusing on plant development and evolution, Pam’s research touches on a broad span of disciplines, from morphology, development, ecology, evolution, genetics, and floral development, as well as a number of different plant species.

Her publications have been in high-profile, broad-based, and high-quality journals, such as *Proceedings of the National Academy of Sciences* and *New Phytologist*, and of course the *American Journal of Botany*. In fact, as an active researcher and prodigious author of 49 scientific papers, Pam has published 19 articles in the *American Journal of Botany* since 1983 and her BSA presidential address from the 2013 Botany Meeting in New Orleans was published in the *Plant Science Bulletin* (issue 59: 150-157).

Pam clearly understands the value of high quality research and will bring both the perspective of an author as well as the experience as an editor to the table in the publication process. She has collaborated with many students, post-docs, and colleagues in her research and publications and has served as editor for the *Annals of Botany* and *International Journal of Plant Sciences*, making her an excellent fit to serve as Editor-in-Chief for the *American Journal of Botany*.



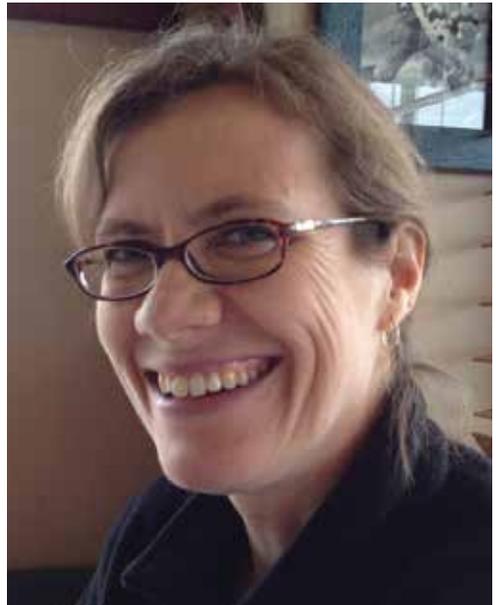
**UP CLOSE WITH THERESA  
CULLEY: THE LATEST ON THE BSA'S  
NEWEST JOURNAL, *APPLICATIONS  
IN PLANT SCIENCES***

*The PSB's Chris Martine catches up with Theresa Culley, editor-in-chief of Applications in Plant Sciences, to talk about the journal's first year and a half of publication and to find out what's coming up.*

**CM: If most BSA members are like me, they've heard a lot of buzz about *APPS*, but are not 100% certain how to define what it is. Can you summarize what the mission of the journal is? And explain why the BSA made the move to start a new journal like it?**

TC: I am really excited by *APPS* because it is a great opportunity for plant scientists to share their technological discoveries. The mission of *APPS* is to disseminate newly developed, innovative tools and protocols in the plant sciences—this includes genetics as well as all other areas (such as ecology and morphology), and also encompasses the breadth of botany, from angiosperms and gymnosperms to ferns, mosses, lichens, fungi, and algae. As such, we are more inclusive than other technique journals that focus on only a single area of the plant sciences. The journal is also open access, so that it is accessible without a subscription to readers worldwide. I believe that this broader coverage and accessibility makes *APPS* of interest to many plant biologists, while still providing in-depth detail within individual articles.

Why did the BSA start *APPS*? Although the journal was officially launched in 2013, the idea for it first came about years earlier when the BSA Strategic Planning Committee recognized the need for a new publishing outlet for innovative tools and techniques. At that time, it was becoming difficult to publish primer notes because of new restrictions imposed by some journals. For example, monomorphic primers were often excluded and at least one journal began grouping primer notes into summary articles instead of individual papers (so authors had to transfer first authorship to a journal consortium). Concerned about how this might impact research and scientists, Pam Soltis, Kent Holsinger, and I developed the basic concept of a new publishing alternative during a cab ride to the airport after the Strategic Planning meeting. It first appeared in 2009 as an online-only section of the *American Journal of Botany*, called *Primer Notes*



and *Protocols in the Plant Sciences*. It immediately drew in a number of submissions, but over time we realized the potential for the online section to be much more than a repository for genetic markers. In 2012, the BSA made the decision to spin off the online section as *APPS* in part so that papers could address *all* areas of the plant sciences. Although we continue to welcome molecular biology and genetic submissions and we still accept primer notes, we have also purposely expanded into other areas of the plant sciences. So if you have a new technique that you would like to share, please let us know!

**CM: You've been *APPS*'s editor-in-chief since its first issue in January 2013. What excites you both as an editor and as a reader of *APPS*?**

TC: As an editor, it is incredibly exciting to see the many different techniques, protocols, and ideas that other researchers have developed and wish to share with others. I am also amazed by the sense of community that many authors have in wishing to publish their work to assist others. On at least one occasion, I heard a researcher mention that he wanted to help others not make the same mistakes he did. To me, this is the very essence of what *APPS* is all about—to facilitate communication among plant biologists in moving our respective fields forward. I also greatly enjoy working with such a wonderful group of Associate Editors, Reviewing Editors, and of course, our excellent support staff, including our Managing Editor, Beth Parada.

As a reader of *APPS*, I am constantly looking for new techniques and applications that I can use in my own work, whether it be in genetics, pollination biology, or ecophysiology. One of the best features of *APPS* is that it is not specific to one field of plant biology, but instead covers everything! In addition, articles in *APPS* are especially bench- or field-friendly. For example, protocol articles have step-by-step, “tear-out”-ready instructions (including a list of materials) that can be used immediately by the reader, and in several cases, videos illustrate difficult-to-describe techniques (just a click away).

**CM: What kind of readership and distribution is *APPS* currently receiving (i.e., number of hits, and areas of the world where *APPS* is being highly read)?**

TC: As an online-only publication freely available on BioOne, *APPS* has a worldwide distribution. For example, *APPS* received 38,078 online hits during 2013, and in January 2014, received nearly 13,000 hits that month alone. During 2013, nearly half of access to the full-text of articles came from within the United States, followed by China, Canada, Brazil, India, Japan, Germany, the United Kingdom, and Australia; hits were also recorded from 111 other countries!

**CM: Where is *APPS* currently indexed?**

TC: In addition to being available through the BioOne website, *APPS* is currently indexed in CAB Abstracts, AGRICOLA, CrossRef, Google Scholar, the Directory of Open Access Journals, and WorldCat. I am pleased to report that the journal was recently accepted for inclusion in PubMed Central, where full-text articles will soon appear, and abstracts will be available in PubMed itself by June. We are also being evaluated for indexing by the Science Citation Index/Web of Science (owned by Thomson Reuters, which also provides journal impact factors). The timeframe for selection in SCI is longer than for most indexing services as they take time to assess factors like timeliness of publication, stature of authors publishing with the journal, and the overall contribution that the journal is making within the scientific community. We are in regular contact with Thomson Reuters and hope to have news this summer.

**CM: What is the process of submission and how likely is it that a paper may be accepted?**

TC: It is relatively easy to submit a manuscript to *APPS*, as described in the Instructions for Authors [available at: <http://www.botany.org/APPS/>

[APPS\\_Author\\_Instructions.html](#)]. Manuscripts are submitted online at our site on Editorial Manager [<http://www.editorialmanager.com/apps/>] and are assigned to an Associate Editor, who invites at least two outside reviewers. In the case of Primer Notes, a member of the *APPS* Reviewing Editor Board is also involved with manuscript review. Manuscripts are accepted following a positive review and after authors have suitably addressed all comments. Currently, our average time from submission to first decision is four weeks, although specially invited manuscripts are placed on a fast track. Manuscripts move into the production stage soon after acceptance and are available online at BioOne after the galley proof is approved. Our current acceptance rate of manuscripts is about 81%; we prescreen papers carefully, and have clear instructions for authors, which helps authors prepare acceptable papers.

**CM: What articles stand out to you from the first 18 issues of *APPS*? (As part of this, what do you think makes a good *APPS* submission?)**

TC: This is not easy to answer, as we have published a number of really interesting papers in our first year and a half of publication. But if I had to pick, I enjoyed Gee’s article on microCT and 3D visualization of fossilized conifer seed cones [Vol. 1, Issue 11]. This paper involves multiple elements of what I consider a good article—it addresses a concrete problem in plant biology (how to look inside silicified conifer seed cones without damaging them) and presents a reasonable and well-written solution, complete with sample data and accompanying videos. One of my other favorite articles also appears to be popular with others—the article from our second issue by Stull et al. [2013], “A targeted enrichment strategy for massively parallel sequencing of angiosperm plastid genomes,” is our most frequently downloaded paper with nearly 3,400 hits. I also find it interesting that several of our top 15 most-accessed articles include non-genetic papers, such as using high-resolution time-lapse photography for ecosystem research [Nichols et al., 2013; Vol. 1, Issue 9], how to better measure and quantify color variation [Smith, 2014; Vol. 2, Issue 3], and using dendrometer bands to measure growth in trees [Anemaet & Middleton, 2013; Vol. 1, Issue 9].

**CM: What can readers look forward to in upcoming issues?**

TC: One of the perks of my job is that I know what will be appearing shortly and I am especially

enthusiastic about the next few issues. Currently we are putting together our very first Special Issue that will be focused on Bioinformatic and Biometric Methods in Plant Morphology, representing a colloquium at Botany 2013 organized by Surangi Punyasena and Selena Smith. This issue is slated to appear later this summer. I am also excited by a protocol article appearing in the June issue on 3D plant cell architecture using a specialized SEM method, and a review article for July on sequence-related amplified polymorphism (SRAP) markers. We also have received many promising responses to our recent Call for Papers. So upcoming issues will certainly be interesting and will include more protocols, application articles, and review papers.

**CM: What are the challenges of publishing an online-only, open access journal like APPS? And how about the benefits? Is there something about the type of journal that APPS is that makes it more appropriate as an e-journal?**

TC: Yes, publishing as an online-only journal certainly has benefits and disadvantages. One benefit is that our online-only status allows us to publish articles quickly and to quickly respond to the needs of our authors. We also have a greater flexibility in incorporating multimedia content which can greatly enhance the reader's experience. We can also more fully track reader access to individual articles relative to all other articles in a volume; this can be helpful for authors needing to show their administrators the importance of their papers within the scientific community. For example, some APPS articles now have Altmetric scores (think of an impact factor, of sorts, for an article rather than a journal). [For more about Altmetrics, see the sidebar.] Our open access status is critical because it enables researchers from all over the world to easily download APPS articles with the click of a button, without having to pay fees. This means that APPS articles have a potentially wider readership than articles at subscription-based journals. Members of the BSA also receive a substantial discount on the open access fee, so it ends up being a very good deal all around. Ultimately, I would like APPS to be a resource that researchers can easily access on a mobile device at the bench or in the field to follow step-by-step techniques; being both online and open access fits perfectly with this vision.

The main challenge of being an online-only journal is the need to stand out from the ever-increasing number of online-only journals today. As an author, I am flooded daily with emails from

many different journals and I can see where it can be difficult to tell the respectable, peer-reviewed journals apart from predatory journals with a questionable track record. So I consider it essential that we continue to spread the word that APPS is a forward-thinking, peer-reviewed, online journal with a solid publication record, backed by the BSA.

**CM: What kinds of submissions are you looking for at this point, and how do you see APPS evolving over the next few years? (The perception of some is that APPS is only for molecular-based techniques. Is this the case?)**

TC: Although APPS originally focused on molecular and genetic techniques, it has now become so much more, and I see the journal continuing to grow and encompass all areas of the plant sciences, while still serving as a home for molecular-based methods. Personally, I would really like to see more review papers that address topics of interest to other plant biologists and that will serve as an entry point for researchers just starting in the field. For example, a review paper focusing on methods to measure plant volatiles could potentially be a valuable resource for pollination ecologists wishing to quantify floral scents, chemical ecologists examining responses to plant damage, and even bioprospectors seeking new medicinal sources. We are actively soliciting ideas from the community on review papers or methods focusing on areas where they see a gap in current scholarship. My vision for APPS is that it would become a valued resource as scientists seek new approaches and techniques to advance their own research programs or break into a new area of botany that they otherwise might have avoided.

**CM: What makes APPS different from other journals? As an author, why should one choose APPS as a landing spot over other places for a methods paper?**

TC: Compared to other journals, APPS has a much broader scope across all fields of the plant sciences, its articles are easily accessible because of Open Access, and APPS receives strong support as a publication of the BSA. Authors also benefit because APPS uses Creative Commons licensing, meaning that authors retain the copyright to the article. Another benefit to authors is that certain articles can be highlighted with a press release, which we distribute through EurekAlert!, the BSA Facebook page, and Twitter feed, among other avenues. In addition, we also provide an opportunity for advanced graduate students and post-docs to

receive training in the editorial process as Reviewing Editors, who are mentored by Associate Editors. This experience enables Reviewing Editors to better understand the inner workings of the publishing process so they can become better authors themselves. So, I strongly recommend *APPS* as the best landing spot for those authors with great ideas who are looking for a relatively fast publication outlet and who wish to publish in an innovative, responsive journal that has a broad international readership, along with strong author support. At *APPS*, we are always interested in hearing new ideas, so please contact us with your suggestions for future publications—we are listening!

### A CRASH COURSE IN ARTICLE-LEVEL METRICS AND ALTMETRICS

Traditionally, impact of scholarly research has been measured at the journal level (i.e., impact factor) by tracking citations of articles published in a particular journal. However, as online publication of research has become the norm, it's become possible (and desirable) to track the impact of individual articles separate from the journal of publication. Thus, article-level metrics (ALM) were born. ALMs incorporate citations, but also track usage stats (article views and downloads) and mentions in contemporary data sources like news coverage, blog posts, tweets, and Facebook likes.

Altmetrics differ from ALMs in that they do not track article citations; instead, they measure article-level impact through those newer data sources: social media (Twitter, Facebook, Pinterest, etc.), blogs, social bookmarking (e.g., Mendeley, CiteULike), online comments in scientific publications, and inclusion in mainstream media (including both English and non-English newspapers and magazines).

Altmetric scores are provided for *APPS* articles through Altmetric.com. These appear as a “badge” in the abstract and full-text view on the right-hand side of the article text (see Figure). Clicking on the badge brings up details of where the article has been mentioned.

If you're interested in delving deeper into article-level metrics, see the primer from the Scholarly Publishing and Academic Resources Coalition (SPARC) at: <http://www.sparc.arl.org/sites/default/files/sparc-alm-primer.pdf>

**Pick new articles:** Summary report Articles Activity

**Altmetric score of 99** ✕

- Picked up by 10 news outlet(s)
- Blogged by 3
- Tweeted by 7
- On 2 Facebook page(s)
- Mentioned in 1 Google+ post(s)
- 43 readers on Mendeley
- 0 readers on Connotea
- 1 readers on CiteULike

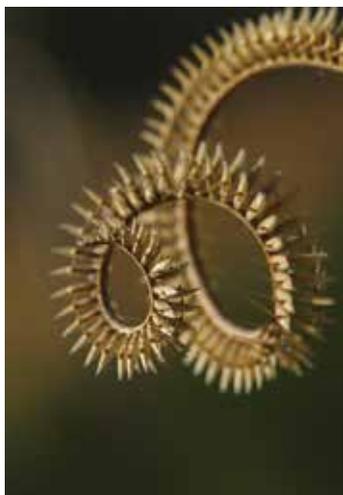
Click for more details

The evolutionary-developmental origins of multicellularity  
American Journal of Botany

1 month  
3 months  
6 months

# TRIARCH "BOTANICAL IMAGES" STUDENT TRAVEL AWARDS

Established by Dr. Paul Conant, and supported by TRIARCH Incorporated, this award provides acknowledgement and travel support to BSA meetings for outstanding student work coupling digital images (botanical) with scientific explanations/descriptions designed for the general public.



1ST PLACE,  
GRACEFUL AGING

DANIEL MCNAIR  
UNIVERSITY OF SOUTHERN MISSISSIPPI

THE REMAINS OF A TOOTHACHE GRASS  
INFLORESCENCE

Toothache grass, named for the numbing effect of the isobutylamides it contains, is endemic to the Coastal Plain of the southeastern United States where it grows in wet pine savannas. Like many other plants within the longleaf pine ecosystem, toothache grass usually flowers in response to fire. Young inflorescences appear relatively straight but begin to curl as they age and drop their seeds.

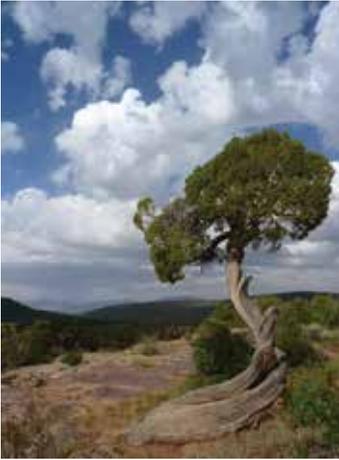


2ND PLACE  
LONGLEAF PINE IN THE DESOTO NATIONAL  
FOREST

DANIEL MCNAIR  
UNIVERSITY OF SOUTHERN MISSISSIPPI

This photograph was taken in the DeSoto National Forest in Mississippi, one of the few remaining tracks of intact longleaf pine savanna. Within a one mile radius of this particular location, the candling of Red-cockaded Woodpeckers can be seen on 100-year-old pines, gopher tortoise burrows litter the tops of sandy hills, and pitcher plant bogs thrive in response to controlled fires (naturally occurring fires rarely reach the now fragmented savannas). Less than 3% of longleaf pine ecosystems remain intact.

SEE ALL THE 2014 ENTRIES AT  
[BOTANY.ORG/PLANTIMAGES/CONANTSTA2014.PHP](http://BOTANY.ORG/PLANTIMAGES/CONANTSTA2014.PHP)



3RD PLACE ABBY GLAUSER  
UNIVERSITY OF KANSAS  
RESILIENCE

THE UTAH JUNIPER TWISTING UPWARD FROM THE  
DESERT SOIL

Native to the southwestern United States, *Juniperus osteosperma*, the Utah Juniper, has evolved several strategies to endure the harsh conditions of desert ecosystems. This particular Utah Juniper was found nestled near the canyon rim in Black Canyon of the Gunnison National Park, where it must periodically withstand extreme heat, drought, and intense winds. First in its line of defense against arid conditions is the growth of a taproot. Extending up to 25 feet in depth, this large root grows vertically downward into the earth in search of moisture. The taproot also provides stability for the tree.

In fact, even when toppled by wind or storms the Utah Juniper may continue to grow. Additional roots may extend laterally up to 100 feet away from their source to scavenge for limited resources, which allow these trees to be very competitive and often more successful than neighboring vegetation. The beautifully twisting trunk and branches of the Utah Juniper are the result of a drought resistance strategy, as well. The tree is capable of self-pruning, sacrificing entire limbs to conserve resources and instead allocate them to survival. Blocking the flow of nutrients to specific areas stops growth and kills the tissue, resulting in the aesthetically captivating morphology for which this desert species is commonly recognized.



3RD PLACE  
CARLA HARPER  
UNIVERSITY OF KANSAS

260 MILLION YEAR OLD (PERMIAN) VESICULAR  
ARBUSCULAR PARIS-TYPE MYCORRHIZAL FUNGI  
IN THE SEED FERN GLOSSOPTERIS, FROM  
ANTARCTICA

Mycorrhizal (mycos = fungus, rhiza = root) associations are a type of mutualistic symbiotic relationship between a fungus and a plant. Each partner benefits from this exchange, i.e., the plant receives nutrients from the fungus, and the fungus receives carbon from the plant. This plant-fungal relationship occurs in ~80-90% of plant families living today. This ancient relationship has been found in ~400-million-year-old plants. It has also been hypothesized that mycorrhizae were essential to the establishment of early plants on land, and were as crucial in paleoecosystems as they are today. As the field and study of fossil fungi advances, we are becoming increasingly aware that fossil mycorrhizae are associated with many ancient plants. Permian (~260-million-year-old) Antarctic fossils provide exceptional examples of anatomically preserved plants. Included within these ancient groups are the Glossopterids. Glossopteris is a type of extinct plant called a seed-fern, a plant that had fern-like leaves, but produced seeds (ferns today only produce spores) that lived during the Permian. It was also an important fossil used as evidence for the theory of continental drift. This image represents the first mycorrhizal association with seed ferns, specifically Glossopteris. The picture is a longitudinal section of a young Glossopteris rootlet with coiling mycorrhizal fungal hyphae within and penetrating through root cells. The image is a composite of 50+ microscope images, digitally stitched together using Adobe Photoshop. Today, mycorrhizae are classified into two principle morphologies: Arum-type and Paris-type. Due to the coiling nature of the fungus, this mycorrhiza is a Paris-type and is the oldest in the fossil record. This important discovery provides insight into the evolution and microbial interactions of the Glossopterids and seed ferns during the Permian of Antarctica.

MISSOURI BOTANICAL  
GARDEN HERBARIUM COLLECTION  
REACHES 6.5 MILLION SPECIMENS

GARDEN RESEARCHER'S NEWLY  
DESCRIBED GENUS IS LATEST SPECIMEN

(ST. LOUIS) The Missouri Botanical Garden's Herbarium collection reached 6.5 million specimens with the addition of a new genus described by Garden curator Dr. Carmen Ulloa in collaboration with Dr. Fabián Michelangeli and Karla Sosa of The New York Botanical Garden. Their discovery, "Quipuanthus, a New Genus of Melastomataceae from the foothills of the Andes in Ecuador and Peru" was recently published in the scientific journal *Systematic Botany*.

In November 2012, Ulloa and her colleagues were examining melastome specimens in the herbarium when they discovered some specimens with peculiar inflorescences from a rosette-like plant that did not match any currently known name species in the plant family. The collections, some gathered more than three decades ago, had been moved from one genus to another without a suitable match. The researchers discovered the flowers had a single series of stamens, a rare characteristic in the melastome family that usually has stamens in double the number of petals. Additional morphological studies, along with anatomical and molecular research, led the authors to describe this new genus with only one known species named *Quipuanthus epipetricus* Michelangeli & C.Ulloa.

"The Garden's herbarium is one of the largest and fastest growing in the world and an essential foundation for botanical research," said Dr. James Solomon, herbarium curator. "The herbarium allows researchers from all over the world to compare dried plant specimens that grow in different regions side by side resulting in exciting discoveries such as this one."

The authors chose a combination of the Quecha word *quipu* (meaning record-keeping cords) and the Greek word *anthos* (flower) to formally name their discovery. Quipu were long-knotted strings of fiber used by pre-colonial Andean societies to encode information. The species name *epipetricus* refers to the fact that all collections of this herb have been found growing on rocks.

"The overall appearance of the flowers and fruits arranged like knots on strings and the unique combination of characters in this genus reminded us of this enigmatic record system used by Andean societies long before the arrival of the Spanish writing system," said Ulloa.

Only two populations of the species are known and both are located on the foothills of the Eastern Andes Mountains: one in Ecuador and one in northern Peru. It has been recognized as Endangered according to the conservation status by the International Union for Conservation of Nature. The collection commemorating this herbarium milestone that led to this discovery was collected in Peru in 1996 during a Missouri Botanical Garden-sponsored expedition.

The Missouri Botanical Garden is one of the three largest plant science programs in the world. The Garden focuses its work on areas that are rich in biodiversity yet threatened by habitat destruction, and operates the world's most active research and training programs in tropical botany. Garden scientists collaborate with local institutions, schools and indigenous peoples to understand plants, create awareness, offer alternatives and craft conservation strategies. The Missouri Botanical Garden is striving for a world that can sustain us without sacrificing prosperity for future generations, a world where people share a commitment to managing biological diversity for the common benefit. Learn more at [www.mobot.org](http://www.mobot.org).



## ***Putting PhDs to work: Career planning for today's scientist.***

Hobin, Jennifer A., Philip S. Clifford, Ben M. Dunn, Susan Rich and Louis B. Justement. 2014. *CBE-Life Sciences Education* 13:49-53.

Individual development plan (IDP)? What is this? As a mentor of graduate students, I should know—but I didn't. Graduate students and post-docs should know—but most don't. We all acknowledge that it's not like the old days where we, the professors, were basically concerned only with training our replacements for academic positions. What other options are available? That's where the IDP comes into play. According to this paper, fewer than 50% of post-docs and only 20% of mentors are even aware of IDPs, but for those who reported creating an IDP, the process helped to identify skills and abilities that could match young scientists to a variety of careers outside of traditional academe. Although not a "nuts and bolts" outline of how to create an IDP, the paper does provide a number of recommendations for post-docs/graduate students and mentors to begin the process, as well as the necessary references to proceed.

## ***Development of a meiosis concept inventory.***

Kalas, Pamela, Angie O'Neill, Carol Pollock, and Gülnur Birol. 2013. *CBE-Life Sciences Education* 12: 655-664.

Meiosis: we teach it in every introductory class from high school through college and review it in many upper division and graduate courses. Yet, how many graduate students could actually diagram the salient features of this nuclear division on a prelim exam? In my experience, about 50% provide an adequate response. In this paper the authors identify six basic underlying concepts responsible for the difficulty students have in understanding the process. The instrument they developed is an excellent formative tool to identify specific problems confronting your students and thus make it easier for you to target remediation or refine your teaching approaches.



## **Geocaching as a means to teach botany to the public**

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**Acknowledgments:** The author thanks Simone Heinke for establishing the geocaches at the Botanical Garden Oldenburg.

Do you find it difficult to get your students to go to the library? Or to get them excited about studying course material about botany when they think everything they need to know is in their smartphones? Isn't it even more challenging to get the general public to use botany books in the library and raise interest in botany? Yes, but now ways to include smartphones and GPS devices in education suddenly make plants cool to study and attractive for a broader audience. There are many applications and worldwide initiatives that use smartphones and GPS devices to teach students in elementary schools (Huang, Lin, and Cheng, 2010), high schools (March, 2012) and universities (Santos, Hernández-Leo, and Blat, in press) about plants. One aspect all those initiatives have in common is that they are established in regular courses, and students have the incentive to get a good grade at the end. But smartphones and GPS devices may also hold promise for educating the general public. What is their incentive? For many people searching for and finding a treasure outside is incentive enough. And they are willing to go some distance literally and intellectually for the most prized ones in a relatively new activity called geocaching.

Geocaching has become a favorite outdoor activity of more than 6 million people around the world ([www.geocaching.com](http://www.geocaching.com)) since its invention by American Dave Ulmer in the forests near Portland, Oregon in May 2000 (<http://geocaching.gpsgames.org>). It is a modern type of treasure hunting in which participants search for more than 2 million

containers of various kinds, called "caches." Geocaching requires a GPS-enabled device and internet access to acquire the information (GPS coordinates) about the cache's location. Several internet sites provide such cache information, with [www.geocaching.com](http://www.geocaching.com) being by far the largest. On the site, you search for a cache in the area you would like to go and note the coordinates and all other information given. Then you go out in the field and navigate to the coordinates. The location of a cache can be in a crowded place or in a very isolated spot. Finding the cache at the coordinates may still be a considerable task since they are hidden from sight for the normal public strolling by.

Caches can be as small as a few milliliters and as large as 20 liters. They can be nondescript capsule or small artworks. Once you have found the cache, you sign in the log book within the cache. They usually contain also some kind of treasure, usually small toys, which may be exchanged but not taken away without replacement, so that others can enjoy the feeling of finding a hidden treasure. Once you have found a cache, you may log it at the respective internet site and record your finding as well as provide information on how you liked the cache and how difficult it was to find it. Traditional caches are simple containers directly at the coordinates given, but there are also more complex and more creative ways of hiding the caches.

Whole books have been written about geocaching, its technology (Sherman, 2004) and its application in education (Lo, 2010). Geocaching has been recognized as a good method for accidental, informal learning (Clough, 2010) for a group of people who may be interested not only in experiencing nature, but also in learning about it (Schneider, Silverberg, and Chavez, 2011). Therefore, many national parks, nature reserves, and archaeological parks have installed geocaches as a new way to transmit knowledge about their sites. I would argue that geocaching also offers opportunities for small botanical gardens and botany institutions. Here, I explain what we have established at the Botanischer Garten Oldenburg and comment on our experiences.

Several different types of caches could be used in a botanical garden to get more people from the general public to come to the garden and learn about plants. Traditional caches, with their coordinates given on geocaching websites, are a

good way to attract people to places in the garden that are rarely visited. For example, to attract public to a little-known downtown orchard, in which local conservationist exhibit traditional fruit varieties, we have installed a traditional cache there at N 53° 07.358 E 008° 12.257. Multi-caches have their starting point given on a website, and once there, participants get the next set of coordinates; this is the preferred cache for a nature trail. Mystery caches do not provide complete coordinates but instead a riddle must be solved or questions must be answered to obtain them. More than 2 million caches exist worldwide, and in a city like Oldenburg with about 160,000 inhabitants, there are close to 500 caches, with 15 in the 2 square kilometers around the botanical garden (Fig. 1).

feeling that they have learned something about some important native trees.

Another multi-mystery cache starts at the dining hall of the University of Oldenburg. From there, geocachers are directed about one mile to the Botanical Garden, since they were “told” at the internet site (under the title “Not am Herd” [= emergency at the stove]) that they need to provide six edible items for the dining hall chef from the Oldenburg Botanical Garden. They are also given the coordinates of the final cache (located in the botanical garden) at N53 08.ABC E 08 11.DEF. Once they find the edible plants in the garden small signs at the plant (such as A=8) will help them complete the coordinates. This cache is a great



Fig. 1: Map of Oldenburg with caches in the vicinity of the Botanical Garden Oldenburg (from [www.geocaching.com](http://www.geocaching.com)).

Together with a local nature conservation group, we have installed a multi-mystery cache (“Oldenburger Baumpfad” [= Oldenburg tree trail]) along eight prominent trees within the city of Oldenburg, Germany. Starting at N53 08.902 E8 12.701 near a birch tree, geocachers must solve multiple-choice questions about the tree to complete the coordinates N53 08.A38 E8 12.5B3, where A and B can be determined only by answering the questions. To do this, the treasure-hunters must really look at the tree and touch and/or smell it. For example, which of the detail photos (downloadable from the geocaching site) does not belong to birch? Photo 1 (A =5), photo 2 (A =7), photo 3 (A =8), or photo 4 (A =0)? At the end, not just the treasure awaits the geocacher, but also the

way to make people stroll around the garden and actually look for plants they may only know from their table, such as bamboo, vanilla (Fig. 2), potato, rice, or various spices. To counter the problem of plants being available only part of the year, we have designed both a summer and a winter version of the cache.

The success of this cache stimulated us to plan a geocache called “Botanik 1.1” (= Botany 101). Here, the starting coordinates are placed right in the lecture hall of the university, but participants don’t actually have to physically go there. Instead they are directed to the PDF file on our university website with the first botany lesson. At the end of each lesson, geocachers will be directed to another



Fig.2: Geocacher searching for vanilla in our tropical greenhouse.

PDF file with a new lesson, and each time a question must be answered to get the internet address of the next lesson. For example, in the lesson on leaves, all the different leaf tissues are explained and cross-references with a letter. At the end, a diagram of a leaf cross-section is given with numbers for each tissue (Fig. 3). To get the correct address of the next lesson, the numbers in the diagram have to be matched and replaced by the letters in the text. We have assembled eight lessons regarding the following “Botany 101” topics: essential characters of life, essential characters of plants, evolution of plants (introducing mosses, ferns, gymnosperms, angiosperms as the main groups of land plants and explaining their species richness and characteristics), the basic bauplan of angiosperms (what are roots, stems, leaves and how can they be modified?), energy budget (explaining the basics of photosynthesis), water balance (how is it transported in the plant?), and reproduction (what different pollination types and fruit types are there?). After finishing the last lesson, “students” are directed to a PDF congratulating them and providing the coordinates of the real cache. So, after studying for about 45 to 60 minutes in front of the computer performing this exercise, it is time to go outside, find the cache, and enjoy some real plants.

A great part of geocaching is that after finding a treasure, people will register and sign when they have completed a cache and give comments on it. In the one-and-a-half years since the start of this program, we had 52 (tree trail), 58 (Botany 101), 60 (Emergency at the stove), and 165 (orchard) geocachers recording that they found the cache. Based on an additional survey, we learned that the geocachers are two thirds male, 80% with a

university degree, and on average 40 years old. About 15% responded that they hadn’t known about the Botanical Garden, and 40% visited the garden for the first time. Thirty percent promised to return even without a new cache.

The success of a cache is visible by checking how many participants called the cache a favorite. For every ten caches logged, geocachers are allowed to call one a favorite. For our caches, the traditional cache at the orchard had 20% favorite rating, whereas the mystery caches (Botany 101, Emergency at the stove) had 30% and the tree trail through Oldenburg as much as a 35% favorite rating. Apart from these statistics, the internet site is a great way to get feedback and a good opportunity to improve your caches. In particular, you get immediate feedback when the cache or hints are destroyed. Also, geocachers reported when they considered parts too difficult. For our “Botany 101” course, many people responded how fascinating it was to learn about plants in such a challenging and



Fig. 3: Leaf cross-section used for the “exam” in the lecture on leaves (figure from Nabors and Schiebe [2007]).

rewarding way, even if solving the whole lecture series took some participants more than an hour.

So, do you finally want to meet your “students”? Then plan an event cache! Our event cache at the end of November attracted a group of more than 40 geocachers. Like everyone else, geocachers like to socialize with others who share their hobby. Therefore, event caches are given with coordinates as well as the time and date when people will gather with food and drink and share their experiences with each other. And they are more than willing to give you feedback on your caches and what kind

of lesson they would like to learn about next time. Feedback at our event cache and at the geocaching website demonstrated that we attracted a group of people rarely seen in a botanical garden before and most were enthusiastic about what they learned about plants. So, maybe we should plan for Botany 201 next year.

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# BOOK REVIEWS



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### ECOLOGICAL

#### **Plant and Animal Endemism in California**

Susan P. Harrison

2013. ISBN-13: 978-0-520-27554-6

Cloth, US\$49.95. 189 pp.

University of California Press, Oakland, California, USA

California is a hotspot, not only in the world of popular culture, but also in the biotic realm. About 70% of the state is contained in its own biogeographic region, the California Floristic Province; this province reaches up into Oregon and sweeps down into Baja California. This is one of five regions on the globe where the Mediterranean climate, and hence Mediterranean flora, is found. Something about a long hot dry summer and a rainy cool winter results in outstanding botanical diversity; indeed, the California Floristic Province contains 20% of the world's vascular plants in only 2% of the world's land area.

Endemism is the restriction of a taxon to a particular geographic area. In the California Floristic Province, high endemism equals biotic richness. Of the combined total of 6,506 genera and species known in the state of California, 2,264 species, or nearly 35%, are endemic. If considering taxa only on the species level, 28% are endemic. This high biodiversity extends itself to the animal kingdom as well, as fish, amphibians, and a few groups of invertebrates also show high levels of endemism in

California. Indeed, with these numbers, one could see how high endemism gives this state its biotic uniqueness and justifies it as a biological hotspot.

*Plant and Animal Endemism in California* by Susan P. Harrison is an engaging treatise on biological endemism in the 31st state of the Union. The book is divided into six major topics: the biotic uniqueness of the California flora and fauna; the history of geology, climate, and floristics; the patterns and causes of plant endemism; animal endemism in California; biological conservation; and synthesis and conclusions.

Taking a closer look, this 189-page volume opens by explaining what endemism is, clarifying its meaning and definition, and then describes patterns of species richness and endemism on the state, regional, and global levels. The second chapter recounts previous theories on the origins and development of the California flora that were mainly put forth by Raven and Axelrod in their scholarly treatise in 1978. In Chapter 3, these now classical ideas are examined in the light of new scientific studies on the geologic history of California; development of the Mediterranean climate as a driving force for plant adaptations to long, hot, dry summers; internal barriers that may promote endemism; and long-term climatic stability. The fourth chapter covers animal endemism, while the fifth chapter discusses the urgent need for conservation as well as conservation issues concerning an endemics-rich region such as the California Floristic Province.

While Harrison's discussion on endemism is fascinating throughout the book, it turns out that the last chapter—the one with the dry title

of “Synthesis and Conclusions”—has the juiciest contents. For it is Chapter 6 that contains the intriguing results of Harrison’s many years of work on California endemism. At the risk of being a “spoiler,” I will mention only a few teasers here (skip to the next paragraph if you don’t want me to give away the ending): Plant endemism does not seem to stimulate animal endemism. Plants are not animals and were affected differently by the forces driving endemism. Elevated speciation and low extinction rates played important roles, while biogeographic barriers did not. In fact, geomorphological heterogeneity, which is always associated with present-day California (think: beaches and rocky shorelines, deserts, foothills, rugged mountain ranges, and fertile wide-bottomed valleys), is not the key to the high endemism in this state.

*Plant and Animal Endemism in California* is a well-written and well-documented scholarly treatise on biological endemism in the California Floristic Province. The development of topics is logical and seamless, taking the reader smoothly through the book. It helps to have such good explanatory figures and tables. In the first four chapters of the book, hardly a page goes by without such an illustration. There are over 24 black-and-white figures, which are mostly maps, but also include graphs, charts, drawings, and photos, as well as 15 tables. The last 30 pages of the volume are dedicated to listing the thousands of plant species that are endemic to the California Floristic Province, organized by family and with a note on their present-day biogeography (i.e., found in California, Oregon, or Baja).

I love the retro look of this hardbound book. In its size and graphic design, it has the clean lines of a 1960s primer in California—my formative years in school. The book cover is thick and creamy to the touch. Featured on the front is a photo of three plant genera rich in California endemic species: *Allium falcifolium* (sickle-leaved onion), *Sedum oreganum* (Oregon stonecrop), and *Lewisia cotyledon* (Siskiyou bitterroot). The pop of fresh color provided by the striped pink and white flowers and deep pink inflorescence peduncle of the bitterroot, the rosy pink leaves of the two succulents, and the spring green of the leaves is accentuated by the pink and green stripes at the bottom of the book cover.

While the subject matter of this book will be most appealing to specialists and students in botany, ecology, and biogeography, *Plant and Animal Endemism in California* will also be of great use to zoologists interested in California endemism.

Similarly, the chapter on conservation is a must for policymakers and nature lovers who value the biotic richness and uniqueness of this western state. Furthermore, the list price of less than \$50 for this scholarly and beautifully hardbound book makes it easy for libraries and museums all over the world to obtain this volume, especially during these financially restrictive times.

The main reason, though, to get your hands on a copy of *Plant and Animal Endemism in California* is because it is a landmark in the study of plant and animal endemism that will surely form the basis for future studies to come in ecology, biogeography, floristics, and endemism.

—Carole T. Gee, on sabbatical at Huntington Botanical Gardens, San Marino, California, and at the Natural History Museum of Los Angeles County, Los Angeles, California, USA

## ECONOMIC BOTANY

### **Caper: The Genus *Capparis***

Ephraim Philip Lansky, Helena Maaria Paavilainen, and Shifra Lansky

2013. ISBN-13: 978-1-4398-6136-3

Hardcover, US\$ 129.95. xxiv + 317 pp.

Traditional Herbal Medicines for Modern Times vol. 12

CRC Press, Boca Raton, Florida, USA

Mythopoesis. No, I had never seen this word either. According to the dictionary, the title of Chapter 1 means “the creation of myths.” Okay, though I wouldn’t have thought a serious piece of academic research would care much about myth-making. The authors are concerned with explaining the derivation of the common name and the genus name of the book’s title, which they claim both derive from the word for goat (language unspecified). Only this much is surely true, that the word caper is derived from the Latin *capparis*.

In Latin, the domesticated goat is *Capra aegagrus*, and the word comes into English in, for example, Isle of Capri. I can find no dictionary, including the *Oxford English Dictionary*, that derives *caper* (in the sense of “stunt” or “criminal behavior”) or *caprice* (“whim”) from the Latin for goat. In any case, Quattrocchi, in *CRC World Dictionary of*

*Plant Names*, suggests that the Latin *capparis* is derived from the Greek *kapros*, meaning “a wild boar, provided with tusks.” This etymology at least keeps the vowels and consonants in order, which the authors’ myth-making does not. The source of the foodstuff capers, the flower buds of *Capparis spinosa*, is a shrub with its stipules converted to hard, sharp spines—tusks, with a bit of imagination. (Chapter 28 is a page and a half of recipes for capers. The “recipes” are devoid of any measurements whatever, and are addressed to creative cooks and chefs.)

The authors assert that there are between 250 and 400 species in the genus, mostly tropical. That range of numbers immediately says that there is no modern monograph available. This raises the question of how the sixty or so species covered in detail in this book were identified. It appears that the authors simply adopted the name used in the article they are citing, as is common in the literature of plant biochemistry and herbal medicine—these are the topics that occupy the bulk of the book. The various species contain an extensive array of phytochemicals that may be effective against all manner of inflammations, as well as high blood pressure, seizures, and even Alzheimer’s disease. The literature is very large, and the authors give the full literature citation at the end of each chapter, rather than at the end of the book before the index. This leads to some duplication, but I think readers will appreciate this approach, just as they and librarians will appreciate that article titles and the titles of both periodicals and books are given in full, without abbreviations.

The book closes with Chapter 29, “Breaking Advances in Medical Capparology,” and Chapter 30, “Centers of Capparology” (meaning universities and research institutions). The neologism “capparology” combines a Latin root with a Greek suffix, perhaps unavoidably. Kaprology, anyone?

–Neil A. Harriman, *Biology Department, University of Wisconsin-Oshkosh, Oshkosh, Wisconsin, USA.*  
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## Honey in Traditional and Modern Medicine

Laid Boukraâ (ed.)

2014. ISBN-13: 978-1-4398-4016-0 (Cloth, US\$139.95. 470 pp.)

eISBN-13: 978-1-4398-4017-7 (e-book US\$97.00)

Traditional Herbal Medicines for Modern Times vol. 11

CRC Press, Boca Raton, Florida, USA

*Honey in Traditional and Modern Medicine* provides a comprehensive look at the traditional and medicinal applications of honey. The volume nicely bridges the gap between modern applications of honey and its ancient and traditional uses. The editor has done a commendable job in bringing together academics, researchers, and investigators from around the globe working on medicinal aspects of honey research.

The volume comprises 19 chapters, with a smooth transition between ethnomedicinal and traditional studies on honey to modern-day medicinal applications. Uses of honey in different branches of modern medicine (such as pediatrics, gastrointestinal and cardiovascular diseases, diabetic ulcers, and cancer, to mention only a few) are well documented. Traditional medicinal uses of honey are documented from cultures across the globe, with a chapter devoted to Ayurvedic medicine. Two chapters that illustrate the diversity of subjects covered in the volume are “Biochemistry and Physicochemical Properties of Honey,” which explores the latest approaches of chemical analysis of honey, and “Mad Honey: The Reality,” which was an interesting read from both a historical and a medicinal perspective. Each chapter stands independently, providing tables, schematic charts, graphs, word diagrams, and illustrations. The division of chapters into different subtopics adds variety and interest for readers, and color illustrations help to explain key concepts. In addition, the bibliography provided at the end of each chapter, along with the helpful index at the end of the book, will be quite useful for researchers.

This volume highlights how honey has become an important component of the nutraceutical and functional food industry—covering its culinary uses, promoting honey as a source of nutrients, and describing its use across the globe in modern drug

formulations. Some repetitions of information were observed across different chapters, but that is not unexpected in a multi-chapter, multi-author volume on a narrow topic. One shortcoming is the lack of any mention of the use of honey in traditional Chinese medicine or its use in South and Central American tribal medicinal practices. Suggested improvements to increase usability for future editions include dividing the volume into three or four thematic subsections, as well as the addition of a short section at the end of each chapter highlighting key summary points.

This volume will be extremely useful as a reference volume for both undergraduate and postgraduate students in the disciplines of apiculture, economic zoology and botany, economic geography, biological chemistry, food sciences and food technology, ethnobotany, ethnomedicine, preventive and social medicine, and pharmacology. It will also be useful for general readers who are interested in exploring both traditional and modern applications of honey for promoting better health. The editor deserves special credit for maintaining a balance of information throughout the volume that prevents the content from becoming overwhelming and hence provides an enjoyable reading experience and resource.

–Saikat Kumar Basu, Department of Biological Sciences, University of Lethbridge, Lethbridge, Alberta, Canada

## **The Savage Garden: Cultivating Carnivorous Plants, revised edition**

Peter D'Amato

2013. ISBN-13: 978-1-60774-410-8

Paperback, US\$25.99. 384 pp.

Ten Speed Press, Emeryville, California, USA

Upon opening the newly revised edition of *The Savage Garden: Cultivating Carnivorous Plants*, one risks falling into a mesmerizing pitcher plant or getting stuck on a dainty but deadly sundew leaf. This is exactly what author Peter D'Amato intended, as the entrapped reader has no choice but to read on and learn more about these remarkable organisms. Throughout this book, vivid photographs of “CPs” and the author’s entertaining and colorful prose highlight a beautiful, diverse, and often unfamiliar group of plants.

Like the original *The Savage Garden* (D'Amato, 1998), this revised version is organized into three major sections. The first provides general information about cultivating carnivorous plants: soil ingredients, light and water requirements, fertilizing and feeding, and pest control. The second section discusses where to grow these plants, including information about spaces as varied as outdoor bog gardens, windowsills, and greenhouses. Both chapters assume little or no prior horticultural experience, and thus the book is quite beginner friendly. The third section is by far the longest, and contains information about the carnivorous plants available to gardeners. Each chapter in this section addresses a particular genus, providing historical information, brief descriptions of species and some cultivars, and extremely thorough propagation and cultivation instructions. These instructions are judiciously illustrated to clarify unique pollination or vegetative propagation techniques. The dimensions of *The Savage Garden* contribute to its utility as a horticultural reference: The book measures 23 × 15 × 2.5 centimeters (9 × 6 × 1 inches) and weighs 868 grams (1.9 pounds), an ideal size to be carried through the nursery while examining potential purchases.

The revised version has several significant advantages over its predecessor. All measurements are now in both US customary and SI units, which should make this useful book accessible to a wider audience. Spelling mistakes from the original (Myers-Rice, 1998) have been corrected, although a few typographical errors are present in the new version. Dozens of species and cultivars discovered or registered since the first publication are included here, as are many new color photographs. Most importantly, though, the authoritative cultivation recommendations that stem from D'Amato's decades of experience remain the central focus of the book.

Although this book is an excellent horticultural resource, it is not without flaws and limitations. It is quite clear that most of the book is drawn from the author's extensive personal experience, but D'Amato still frequently references other works, including several taxonomic monographs. A reference list at the end of the book would make it easier for readers to locate these primary sources. (A brief “Selected Reading” list was included as an appendix to the first edition of *The Savage Garden*, but was removed in the revised edition.) The descriptions and photographs provided for

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## SYSTEMATICS

**Colorado Rocky Mountain Wildflowers. App for Apple and Android**

Al Schneider and Whitney Tilt 2012.

US\$9.99 High Country Apps: <http://www.highcountryapps.com/>

Botanical enthusiasts have varying levels of experience. Some are casual weekend hikers looking to identify the flowers they are photographing, while others are professional botanists who spend their careers identifying specimens. The “Colorado Rocky Mountain Wildflowers” app created by Al Schneider and Whitney Tilt is an excellent resource, particularly for those on the more casual end of this spectrum. I was excited to review this after many visits to Schneider’s website (<http://www.swcoloradowildflowers.com/>) and was pleased to find that the app has the same excellent photos, thorough descriptions, and interesting commentary. There are numerous images for most of the plant species, including photos of habitat, growth form, flowers, and fruits. Distribution maps and habitat information help the user evaluate where the plant can be found. Experts and amateurs alike will appreciate these features. Unlike the website, the app is extremely portable as it loads onto an iPhone, iPad, Android, or Kindle Fire device and can be taken far from internet availability. This alone is worth the cost for me.

While this app has features that anyone will appreciate, it is directed more toward casual users. Botanical experts will find that the app lacks the dichotomous keys necessary to key difficult species and, since it only directly covers 520 species, experts may be frustrated that the app may not include a species of interest. The app relies on a multi-

some species are not sufficient for identification. Finally, D’Amato’s brief treatment of carnivorous plant evolution makes no mention of adaptation or selection, and never addresses any hypotheses about why carnivory has evolved. Furthermore, the phylogenetic diversity of carnivorous plants (and therefore the idea that carnivory has arisen multiple times in plant evolutionary history) is not discussed. At several points the author hints at relationships between carnivorous plant genera, but relatedness at the family or order level is not explicitly discussed. While knowing that American pitcher plants are in the Ericales while tropical pitcher plants are in the Caryophyllales is not essential for proper cultivation, it does make gardening more interesting.

However, these faults should not be given too much weight. This book is not meant to be an introduction to the scientific literature, nor an exhaustive identification resource, nor a book about evolution. In the introduction to *The Savage Garden*, Peter D’Amato emphasizes that his book is “a practical guide to growing carnivorous plants.” The flaws discussed above do not detract from that objective in the slightest, although their omission may be a missed opportunity to use horticulture as a medium for broader education about botany. For a carnivorous plant bibliography or discussion of evolution, *Carnivorous Plants and Their Habitats* (McPherson, 2010) is a good place to begin, but for a book about cultivation *The Savage Garden* is essential.

As a wonderful horticultural resource and an introduction to the morphological diversity of carnivorous plants, this book belongs on the shelf of gardeners, greenhouse managers, and anyone broadly interested in botany. Now that I’ve read it, I can provide more than guesses the next time a friend asks me how to keep a Venus flytrap alive.

–Ian D. Medeiros, *College of the Atlantic, Bar Harbor, Maine, USA*

entry key where the user inputs characteristics of the plant (such as flower color, plant habit, leaf shape, and a host of other characteristics) and the app creates a list of potential species. Schneider and Tilt are clearly expert botanists who have worked hard to make these keys accessible to the general public. Their app is better than many other popular wildflower guides and the large number of characteristics in the multi-entry key allows the user to rapidly narrow down possible species. The commentary page often describes similar species, allowing easy comparison of plants that may superficially look similar. While the keys are useful and likely sufficient for most casual botanists, as someone who teaches plant identification I miss the inclusion of technical keys and the lack of exhaustive coverage of plants of the area.

The app covers most of the common species in the Rocky Mountains. The authors have hand-selected species, but the app is far from exhaustive and the target area could use clarification. The inclusion of some foothill species and the lack of certain high alpine species make it difficult to assess what the boundaries of this guide are. For example, *Penstemon mensarum* is a common species at 9,000 feet on the Grand Mesa in western Colorado, but a botanist on the Grand Mesa will not find it in the app. Most casual users may not need an exhaustive key, but if you are set on identifying a plant and it is a member of a difficult taxonomic group with many endemic species, such as a *Penstemon*, the app will not be sufficient to confidently key it to species. This app is useful for general interest and will satisfy most curious minds but will not be a stand-alone tool for more serious botanists.

For \$9.99, this app is a wonderful investment and starting place for beginning botanists. It is much less intimidating than technical keys, and those using it will be satisfied when they can confidently key out their plants. The photographs, commentary, and portability mean that this app is likely the first and last tool that casual botanical enthusiasts might use to identify a plant. As a professional botanist and someone who teaches plant identification courses, this application will not replace the technical keys and floras that are the heart of our profession. In the future, it would be wonderful if Schneider and Tilt combined the stellar pictures and commentary already present in this app with one of the wonderful technical keys available for understanding and identifying the plants of the Colorado Rockies. I hope both for myself and for

my students that this dream soon becomes a reality!

–Stephen Stern, Department of Biological Sciences, Colorado Mesa University, Grand Junction, Colorado, USA

### **The Ferns and Lycophytes of Texas**

George M. Diggs Jr. and Barney L. Lipscomb  
2014. ISBN-13: 978-1-889878-37-9  
Flexbound, US\$29.95. xii + 380 pp.  
Botanical Research Institute of Texas and  
Austin College, Fort Worth, Texas, USA

Cover 2: Vegetational areas of Texas

Front endpaper: Areas of high fern and lycophyte diversity [with county names]

Back endpaper: Families and genera [with page numbers]

Cover 3: Summary data and comparisons with other pteridophyte floras

These are listed here because they are excellent uses of what would otherwise be blank space. The full-color cover that extends across the spine to cover 4 is titled “Fern Habitat in the Pineywoods of East Texas”. It features *Osmundastrum cinnamomeum* and (on cover 4 and on p. 46) the Eastern phoebe; the species are all explained on p. iv. The Texas leaf-cutter ant is barely visible on the cover 1 flap, but it is shown in the upper left portion of the illustration opposite of page 1. (The cover painting, when replicated within the book, is a mirror image.) It’s a beautiful picture, and one can almost hear the midsummer swarms of mosquitoes in this bald-cypress swamp. A county locator of Texas, given on pp. 378–379, is essential because there are 254 of them.

There are 127 recognized species in this work, and it is claimed that this is the most of any state in the continental United States. I think that’s true; however, Texas (268,820 square miles) is 4.5 times as large as Georgia (59,425 square miles), which claims 119 species (Snyder and Bruce, 1986). The Texans’ claim is strained.

A feature I’ve never seen in a fern book is Table 1: Texas “Record-Holders” and “Prize Winners.” This includes “Worst Weed,” *Salvinia molesta*, which also wins the prize for “Fastest Reproducer,” and

“Oldest Species,” *Onoclea sensibilis*; this latter, it is explained on p. 175, is essentially unchanged from 57-million-year-old Paleocene fossils.

The molecular evidence for the overall classification adopted in this book is reviewed extensively and lucidly. Both the generic names and the specific epithets for each recognized species are translated or explained. Even the common names are explained, to the extent possible. One appreciates that the family names, which are Latin plurals, are treated grammatically as plural.

Every species is illustrated in a line drawing, together with one or more color photographs in most cases. The Texas distribution is shown by county dot-maps, and the general distribution in the USA is shown by dots or shading, as appropriate. Further distributional details are appended to the species' descriptions. In the descriptions, words that might be unfamiliar to the reader (such as “lithophytic,” “rhizophores,” and other such arcana) are defined in plain English. There is a full-scale glossary as well.

There is a section toward the end of the volume (p. 375) labeled Colophon (“A brief description

of publication or production notes relevant to the edition”), wherein the technical details of book creation and production are explained—the art and science behind it all. Here, it is not brief. There were 1500 copies printed; buy one, before they're all gone.

Biographical details of the authors, including exact dates of birth, are given on p. 376. Page 377 gives “biographies” of Austin College (Diggs) and BRIT (Lipscomb). Their book is a credit to the long-established educational and research traditions of both institutions. It is a fine piece of scholarship that will appeal to the specialist as well as to fern lovers in general.

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

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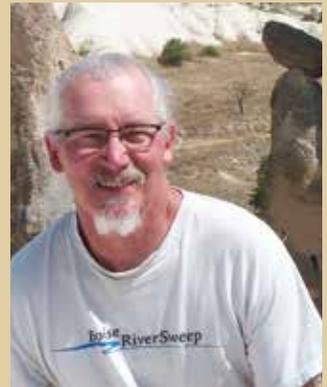


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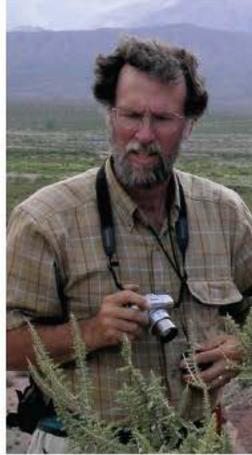
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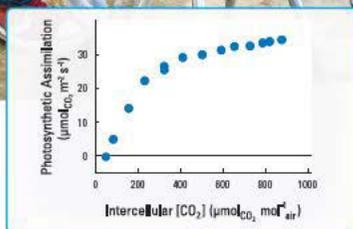
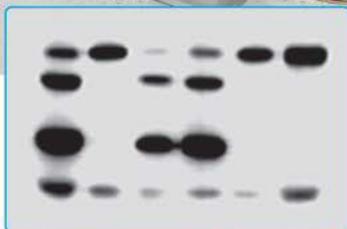


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