Botanical Society Of America

Plant Science Bulletin

Summer 2013 Volume 59 Number 2

1st Place

Triarch Botanical Images
Student Travel Awards

Ricardo Kriebel

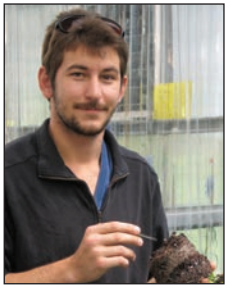
The New York
Botanical Garden

Flower of Miconia arboricola (Melastomataceae: Miconieae) in late anthesis

In This Issue.....

Dr. Thomas Ranker and others elected to serve the BSA.....p. 35

The BSA awards many for their contributions.....p. 36



PLANTS Recipients excel in botany .....p. 15

From the Editor

Every year this is one of my favorite issues of *Plant Science Bulletin* because we get to recognize the accomplishments of some of our most worthy members. The Merit Awardees have been elected to the most select group of professional botanists in North America. Begun at the Fiftieth Anniversary meeting, 55 years ago, the Merit Award recognizes individuals for their outstanding contributions to the mission of the Botanical Society. These are people whose names we recognize from their publications, presentations, and service to the society. They are leaders at their own institutions, in the Botanical Society and in other scientific organizations.

What I find more interesting, though, are the younger members being recognized for their potential. These are graduate students beginning to make their mark in botanical research and being invested with the opportunity to help direct the evolution of the Society. They are also undergraduates being recognized by their mentors for their initiative, enthusiasm and drive to make discoveries and share their love of plants with others. There is excitement here that can drive the Society forward through its second century.

Particularly striking are two trends apparent in our Young Botanist awardees. The first was originally identified by Victor Gruelach in the first issue of *Plant Science Bulletin*. He noticed that while large research universities produced 29% of undergraduate botanists, liberal arts colleges were next at 23%. Some things haven't changed much in the past 60 years! It's also evident that individual mentors have a major impact on students. Again, there is nothing new here—Past-President Neil Stevens noted this in 1944 (*Agronomy Journa*l 36: 324-336). Nevertheless, the lesson for us is that we can all make a difference —lets do!

-Marsh

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Letter to the Editor

To Engage, Challenge, and Excite all of our Students

Your statement in the Spring 2013 *Plant Science Bulletin* (http://issuu.com/botanicalsocietyofamerica/docs/psb_59_1_2013, p. 2) that our task is to engage, challenge, and excite all of our students is a point well taken. It is likewise important to recognize those successes and avenues toward achieving that goal. Efforts to provide opportunities for underrepresented groups in the American professoriate include those offered by the Ford Foundation Fellowship Program. This Program offers predoctoral fellowships in a national competition administered by the National Research Council (NRC). Awards recognize superior academic achievement, a commitment to teaching and research at the college or university level, the promise of scholarly achievement, and ability to use diversity as a resource for enriching the education of all students. Among the criteria for selection are membership in an underrepresented group in the American professoriate, sustained personal engagement with underrepresented groups, and likelihood of using the diversity of human experience as an educational resource.

Ms. Jessica Orozco, Graduate Student in Botany at Rancho Santa Ana Botanic Garden, was recently awarded one of the predoctoral fellowships in this highly competitive program. Jessica will study the evolutionary history and diversity of culturally significant plants and describe the relationships between Native Americans and the native flora. This knowledge will be used to further conservation efforts.

We should celebrate the successes of students like Jessica, a Native American recognized by a Ford Foundation Fellowship. We can also celebrate the commitment of the Ford Foundation for lending a helping hand to those from underrepresented groups who will come after her. Our task has been accomplished: she is engaged, challenged, and very excited about her research and career prospects.

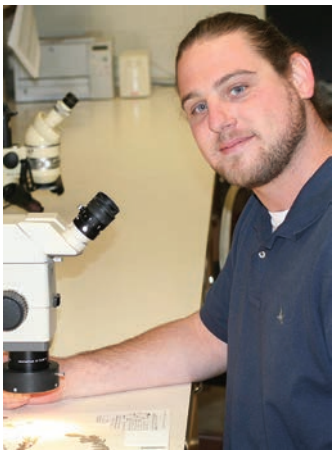
---G.D. Wallace, Research Associate, Rancho Santa Ana Botanic Garden, Claremont, CA

Looking to the Future

Congratulations to the new officers of the Botanical Society of America

President -Elect
Thomas Ranker

Treasurer
Joe williams



Student
Representative
Jon Giddens

Council Chair
Cindy Jones

Director-at-Large
Publications
Sean Graham

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, 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 2013 BSA Merit Award recipients are:

Dr. Lucinda McDade
Rancho Santa Ana Botanic Garden

Dr. Lucinda McDade is a scholar, teacher, and leader of scientific institutions. She is currently Director of Research at the Rancho Santa Ana Botanic Garden, where she has also recently stepped in as Interim Director of the Institution. At RSA she is also curator of the herbarium, a post that she previously held at the University of Arizona and at the Academy of Natural Sciences in Philadelphia. At all three institutions, her energy and dedication were effective in modernization and development of the collections. Dr. McDade has published on a wide range of topics but may be best known for her work on detecting hybridization in phylogenetic analysis, and for her career of studying the systematics of Acanthaceae. Her research is noted for its care and rigor. She has also had considerable impact as an educator. For seven years, she was Scientific Coordinator for the Organization for Tropical Studies and as such coordinated the educational programs in Costa Rica. In addition, she has taught extensively at the undergraduate and graduate level throughout her career. In her nomination letter, however, the role that appears again and again is her skill as a mentor to all her colleagues and students. She has provided encouragement and direction. One former student noted that "[i]t is Lucinda's generosity that I am left with …" Finally, her service to the community has been extensive and varied, with too many contributions to list in this short space. To quote again from the letter of nomination, "what sets Lucinda apart... is her sense of community, and her tireless labor on project that benefit the greater good."

Dr. Charles Beck
University of Michigan

Dr. Charles Beck is a distinguished paleontologist who has made remarkable discoveries in the history of land plants. He discovered that the fern-like leaves of the genus *Archaeopteris* were in fact borne on a tree (Callixylon) with the anatomy of a gymnosperm. This showed clearly that see plants must have been derived from free-sporing plants, and led to the identification of the progymnosperms, a group now included with gymnosperms and angiosperms in the larger clade, the lignophytes. One of the people who nominated Dr. Beck for the award quoted Henry Andrews in saying that this discovery "blazed a rough trail through a dark forest where no recognizable path existed before." In addition, Dr. Beck is a skilled anatomist. After he "retired" from his position as Professor of Botany at University of Michigan, he continued research. In addition, he wrote a textbook, *An introduction to plant structure and development*, now in its second edition. Dr. Beck has also served as Chair of his department, Director of the Museum of Paleontology, and as President of the International Organization of Paleobotany, and as Chair of the Paleobotanical Section of the BSA.

Dr. Patrick Herendeen
Chicago Botanic Garden

By linking paleontology and neontology, Dr. Pat Herendeen, Co-Director of the Division of Plant Science and Conservation at the Chicago Botanic Garden, has made significant contributions to our understanding of the evolutionary history of the angiosperms, particularly the Leguminosae. He has edited three symposium volumes on the family, in addition to producing a steady stream of careful publications on fossil and extant legumes. In addition to his steady productive research, Dr. Herendeen has developed a truly remarkable career of service to the field of botany. He has been Chair of the Paleobotanical Section of BSA, Editor of the Bibliography of American Paleobotany, and chair of the BSA Publications Committee. For four years he was Managing Editor of *Systematic Botany*, and served another four years as Editor-in-Chief. He took over the editorship at a time when the journal was facing considerable challenges; his efforts to steer the journal to calmer waters were largely behind the scenes but ultimately completely successful. Most recently he has become Editor-in-Chief of the *International Journal of Plant Science*. In addition, he is in his second term as Program Chair for the ASPT, a group that constitutes nearly half the attendees at the BSA meeting each year; thus Pat's efforts are seen every summer in the success of the annual meeting. As one of his nominators noted, "… there can be few research active and well-respected plant scientists who have given as much service to the Botanical Society of America and to the broader botanical community…"

Bessey Award

Dr. Shona Ellis
University of British Columbia

Dr. Shona Ellis, Professor of Teaching and Associate Head of Biology, Botany Department, University of British Columbia (UBC). Shona has been faculty member in the Botany Department since 1994 teaching courses from Freshman Biology through upper division and graduate-level Plant Anatomy. She is active in the scholarship of teaching and learning with numerous publications and presentations in both basic botany (predominantly bryophytes and phytochemistry) and botanical education. She was twice awarded the Killam teaching award, UBC's highest teaching commendation, as well as an award from the Society of Canadian Women in Science and Technology for her efforts promoting women in STEM. She has developed many online resources for her courses and for the general public (see http://www.botany.ubc.ca/bryophyte). In cooperation with the UBC Centre for Teaching and Academic Growth and the Science Centre for Learning and Teaching, she has developed an e-portfolio project for students. As all good teachers, she leads by example.

2013 J. S. Karling Graduate Student Research Award Recipient

Gregory W. Stull

Florida Museum of Natural History and the University of Florida

Integrating genomic, morphological, and fossil data for phylogenetic and biogeographic reconstruction in the basal lamiid family Icacinaceae

2013 BSA Graduate Student Research Award Recipients

Rafael E. Arévalo B., University of Wisconsin - Madison - Advisor, Dr. Kenneth M. Cameron, Phylogeny, Flower Micro-Morphology, and Floral Fragrances in *Mormolyca* (Orchidaceae)

Angelita Ashbacher, University of California Santa Cruz - Advisor, Dr. Bethany K. Zolman, Effects of climate change on California wildflower community composition: The role of plant-pollinator interactions

John H. Chau, University of Washington - Advisor, Dr. Richard Olmstead, Molecular phylogenetics, inflorescence evolution, and historical biogeography in the genus *Buddleja* L. (Scrophulariaceae)

Hanna E. Dorman, Mississippi State University - Advisor, Dr. Lisa Wallace, Geographical variation in rhizobia associated with the Partridge Pea, *Chamaecrista fasciculata* (Fabaceae)

M. Kate Gallagher, University of California, Irvine - Advisor, Dr. Diane Campbell, Global climate change induced shifts in abiotic resources may alter pollination success: A test with *Mertensia ciliata* (Boraginaceae)

Richard Hodel, University of Florida - Advisors, Drs. Pamela and Douglas Soltis, Phylogeography and Conservation Genetics of Neo-tropical Mangroves (*Avicennia germinans, Laguncularia racemosa* and *Rhizophora mangle*)

Susan Yvonne Jaconis, University of Cincinnati - Advisor, Dr. Theresa M. Culley, Susceptibility of Plants to Diesel-Generated Particulate Matter in the Environment: Effects on Plant Growth, Ecophysiology and Reproduction

Carrie Kiel, Rancho Santa Ana Botanic Garden/ Claremont Graduate University - Advisor, Dr. Lucinda A. McDade, Pollinator Mediated Trait Evolution and Floral Diversification of Neotropical *Justicia* (Acanthaceae)

Rob Massatti, University of Michigan - Advisor, Dr. Tony Reznicek, Montane plant diversification on a continental scale: A dynamic barrier's influence on the montane floras of Asia and North America

Kelly Matsunaga, Humboldt State University - Advisor, Dr. Alexandru M.F. Tomescu, The Beartooth Butte Formation flora of Wyoming: A window into Early Devonian plant diversity and basal lycopsid evolution

Theresa Melhem, Northwestern University and Chicago Botanic Garden - Advisor, Dr. Nyree Zerega, The Diversity and Origins of Jackfruit (*Artocarpus heterophyllus* Lam.) in the Western Ghats of India

Diego F. Morales-Briones, University of Idaho - Advisor, Dr. David C. Tank, Phylogeny and systematics of the genus *Lachemilla* (Rosaceae) in the Andes

Meagan F. Oldfather, University of California, Berkeley - Advisor, Dr. David Ackerly, Demographic stability in the trailing edge of a California alpine species

Audrey C. Ragsac, University of Washington - Advisor, Dr. Richard Olmstead, Is it easier to move or evolve? Assessing the role of biome conservatism in Bignoniaceae diversification

Angela J. Rein, Oklahoma State University - Advisor, Dr. Mark Fishbein, Enigmatic Non-Twining Vines: Evolution and Systematics of *Matelea* subgenus *Chthamalia* (Gonolobinae, Apocynaceae)

Marisol Sánchez-García, University of Tennessee - Advisor, Dr. Edward E. Schilling, Systematics and evolution of the tribe Leucopaxilleae (Fungi: Agaricales)

Brandon T. Sinn, Ohio State University - Advisor, Dr. John V. Freudenstein, Species of A New Generation: The Integration of Next Generation Sequencing, Morphological and Distributional Data for Species Discovery, Delimitation, and Reproductive Biology Characterization

Sally Marie Stevens, Purdue University - Advisor, Dr. Nancy C. Emery, Testing for Local Adaptation and Dispersal Limitation in a Plant Species Endemic to the Appalachian Mountains

Maria Wang, Northwestern University and Chicago Botanic Garden - Advisor, Dr. Nyree Zerega, The Diversity and Origins of Chempedak (*Artocarpus integer*, Moraceae)

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.

Sarangi Athukorala, University of Manitoba - Advisor: Dr. Michele Piercey-Normore - Botany 2013 presentation: Quantitative comparison of morphology and gene expression of *Cladonia rangiferina* during the interaction with compatible and incompatible algae" Co-authors, E. Huebner and M.D. Piercey-Normore

Julien Massoni, University Paris Sud - Advisor: Hervé Sauquet - Botany 2013 presentation: "Fossil calibration of Magnoliidae: thorough background research significantly improves reliability of molecular age estimates" Co-authors, Maria von Balthazar, Laetitia Carrive, Thomas Couvreur, Juerg Schoenenberger, Yannick Staedler and Hervé Sauquet

Kelly Matsunaga, Humboldt State University - Advisor: Dr. Alexandru M.F. Tomescu - Botany 2013 presentation: "Early Devonian *Drepanophycus* from the Beartooth Butte Formation of Wyoming" Co-author, Alexandru M.F. Tomescu

Stephanie Ranks, University of California, Berkeley - Advisor: Dr. Cindy Looy - Botany 2013 presentation: "Autorotating winged seeds: what they tell us about tree height in extant and fossil conifers" Co-authors, Dori Contreras, Charles R. Marshall and Cindy V. Looy

Triarch "Botanical Images" Student Travel Awards

This award provides acknowledgment and travel support to BSA meetings for outstanding student work coupling digital botanical images with scientific explanations/descriptions designed for the general public (see front cover and p. 43).

The BSA Undergraduate Student Research Awards

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

Gemma Dugan, Bucknell University - Advisor, Dr. Chris Martine, Insect selection of dioecious Australian *Solanum*

Anna Freundlich, Bucknell University - Advisor, Dr. Chris Martine, Effects of Invasive Species on Riparian Communities in the Susquehanna

Alexandra Boni, Bucknell University - Advisor, Dr. Chris Martine, Genetic variation within and among populations of dioecious *Solanum* in Northern Australia

Margarita Hernandez, University of Florida - Advisor, Dr. Pamela S. Soltis, Phylogeny Reconstruction and Character Mapping in *Leptosiphon*

Caitlin Maraist, Portland State University - Advisor, Dr. Mitch Cruzan, Phenotypic plasticity in functional traits related to water use between native and invasive populations of *Brachypodium sylvaticum* (false brome)

Theresa Ann Barosh, Willamette University - Advisors, Dr. Susan Kephart and Kathryn Theiss, Herbivory and Pollination: Examining the relationship between galling and pollinator visitation in *Camassia* (Agavaceae)

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 2013 Certificate of Special Achievement award recipients are:

John T. Bickel, James Madison University - Advisor, Conley K. McMullen, Ph.D., FLS

Hillary M. Karbowski, Central Michigan University - Advisor, Anna K. Monfils, Ph.D.

M. Madeleine Ray, Ohio University - Advisor, Jared L. DeForest, Ph.D.

Krystal Payne, Campbell University - Advisor, J. Christopher Havran, PhD.

Jaclyn Parker, Weber State University - Advisor, Ron Deckert Ph.D.

Emily Becks, University of Florida - Advisor, Pamela S. Soltis, Ph.D.

Maria Beatriz Cortez, University of Florida - Advisor, Pamela S. Soltis, Ph.D.

Tyler McCann, University of Florida - Advisor, Pamela S. Soltis, Ph.D.

Laurel Hoffman, Humboldt State University - Advisor, A. Mihail Tomescu

Casey A. Jones, University of Hawai'i at Manoa - Advisor, Don Drake

Dylan Davis, University of Hawai'i at Manoa - Advisor, Don Drake

Talaya Rachels, University of Hawai'i at Manoa - Advisor, Don Drake

Kobey Tokigawa, University of Hawai'i at Manoa - Advisor, Don Drake

Arianna C. Goodman, Oberlin College - Advisor, Michael J. Moore

Spencer Wight, Oberlin College - Advisor, Michael J. Moore

Lila Leatherman, Oberlin College - Advisor, Michael J. Moore

Rebecca Mostow, Oberlin College - Advisor, Michael J. Moore

Jacob Edwards, University of Tennessee, Knoxville - Advisor, Dr. Joseph H. Williams

Adam Ramsey, University of Tennessee, Knoxville - Advisor, Dr. Joseph H. Williams

Teresa M. Byrd, Willamette University - Advisor, Dr. Susan R. Kephart

Erin Banks Rusby, Willamette University - Advisor, Dr. Susan R. Kephart

Anne Kathleen Johnson, Duke University - Advisor, Dr. Kathleen Pryer

Stephanie Fong, University of California, Los Angeles - Advisor, Dr. Ann M. Hirsch

Genetics Section Student Research Awards

These awards provide $500 for research funding and an additional $500 for attendance at a future BSA meeting.

Richard Hodel, University of Florida - Graduate Student Award - Advisors: Drs. Douglas and Pamela Soltis, for the proposal titled "Phylogeography and Conservation Genetics of Neo-tropical Mangroves (A*vicennia germinans, Laguncularia racemosa* and *Rhizophora mangle*)"

Sandra Mardonovich, Miami University - Masters Student Award - Advisor: Dr. Richard C. Moore for the proposal titled "Investigation of natural populations of *Carica papaya's* morphological and genetic structure throughout Mesoamerica"

Genetics Section Student Travel Awards

Daniel Gates, University of Nebraska - Advisor, Dr. Stacey Smith, for the paper "Anthocyanin regulating MYB transcription factor evolution in four Solanaceous species" Co-author: Stacey Smith

Christine McAllister, Saint Louis University-Advisor, Dr. Allison Miller, for the paper "Environmental Correlates of Cytotype Diversity in Big Bluestem (*Andropogon gerardii*)" Co-authors: Russell Blaine, Paul Kron, Brent Bennett, Anna Glotzbach, Jennifer Kidson, Heidi Garrett, Blanda Matzenbacher and Allison Miller

Pteridological Section & American Fern Society Student Travel Awards

Anthony Baniaga, University of Arizona - Advisor, Dr. Mike Barker, for the paper "Genomics of Allopolyploidy and Hybridization in *Selaginella* subg. *Tetragonostachys*" Co-authors: Nils Arrigo and Michael Barker

Laura Klein, Saint Louis University - Advisor, Dr. R. James Hickey, for the paper "Morphology and Introgressive Hybridization in North American *Diphasiastrum*"

Fernando Matos, New York Botanical Garden - Advisor, Dr. Robbin C. Moran, for the paper "Systematic Studies of *Elaphoglossum* section *Polytrichia* (Dryopteridaceae)" Co-author: Robbin Moran

Tai-Chung Wu, National Taiwan University - Advisor, Dr. Wen-Yuan Kao, for the poster "Stomatal response in leaves of *Marsilea crenata*, an amphibious fern" Co-author: Wen-Yuan Kao

Ecology Section Student Travel Award

Melissa Ha, University of Massachusetts, Amherst - Advisor, Dr. Lynn Adler, for the paper "Pollinator-mediated interactions between *Clarkia unguiculata* and its neighbors are context-dependent" Co-author: Christopher T. Ivey

Robert Harbert, Cornell University - Advisor, Dr. Kevin Nixon, for the paper "Climate niche, invasiveness, and allopolyploidy: The case of perennial *Glycine* (Leguminosae)" Co-author: Jeff Doyle

2013 PLANTS Grant Recipients

- **Richard Shawn Abrahams**, University of Florida, Dr. Stuart McDaniel
- **Dayvis Blasini**, Northeastern Illinois University, Dr. Pamela Geddes
- **Laquita Bolden**, Cleveland State University, Dr. Barbara K. Modney
- **Bianca Bonilla,** Florida International University, Dr. Bradley Bennett
- **Joyce Chery**, Cornell University, Dr. Melissa Luckow
- **Jessel Gutierrez**, Texas A&M International University, Dr. Jim Cohen
- **Elizabeth McWilliams**, Oregon State University, Dr. Richard Halse
- **Livingstone Nganga**, University of Missouri-St. Louis, Bethany K. Zolman
- **Angelica Nunez**, University of California-Riverside, Louis Santiago
- **Crista O'Conner**, University of Idaho, Dr. David Tank
- **Anthony Parson,** Humboldt State University, Dr. Jacquelyn Bolman
- **Hevony Rodriguez**, Texas A&M International University, Dr. Jim Cohen
- **Angel Rogers,** Howard University, Dr. Hemayut Ullah
- **DeAna Smalls**, Howard University, Dr. Hemayut Ullah
- **David Sycle II**, Central Michigan University, Dr. Brad Swanson

PLANTS
Supporting human diversity in the botanical sciences

Triarch 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 in the area of creating botanical digital images. and combing with scientific explanations or descriptions designed for the general public. See the front cover for this year's 1st place winner!

2nd Place

Meriel Melendrez
University of California - Berkeley

Beautiful Strangler–
A strangler fig wrapping around its host

Even amid the teeming tropical diversity of a Costa Rican cloud forest, the strangler fig (*Ficus tuerckheimii*) stands out as striking and strange. It has an exclusive partnership with its pollinator, in which a wasp species spends nearly its entire life cycle within the fig. This fruit grows so abundantly that it merits the title "keystone species" for all of the animals it feeds. The animals disperse the seeds high in the canopy of another tree, and the strangler fig spends the next several hundred years slowly choking its host to death (as in the picture). The cycle begins again. Bizarre natural history aside, I became interested in where these trees grow. A local observation/legend purported that they tend to grow in clusters, so off I went with GPS and camera in hand. Several weeks and miles of transect later, I compared stranger fig occurrence to a random spatial distribution. The trees did not grow significantly clustered together within the Monteverde valley. However, I observed that they did not grow above 1750m in elevation, where the "Elfin Forest" began. High winds off the mountain crest may prevent germination of the figs, or even the arrival of their tiny pollinators. A different ficus species grew on the other side of the ridge. Furthermore, I noted many strangler figs standing in pastures, spared by the ranchers' chainsaws for their filigree beauty and function of shading cows. If pastures reverted to secondary forests, as in the 1970s, the mature stranglers would stand out among the saplings and appear "clustered" to the casual observer.

3rd Place

Jeff Benca

University of California, Berkeley

Where Red Ferns Grow

Unfurling frond of Ama'u, found at the world's highest bog (the Alakai Swamp, Kauai)

Lacking garish flowers, ferns seldom gain the aesthetic notoriety of flowering plants. However, members of the Hawaiian endemic fern genus Sadleria (Ama'u) may counter this trend. The extreme colors displayed in this 3-foot frond of Sadleria cyatheoides result from the presence of pigments called anthocyanins, which function as a sunblock for the plant, absorbing harmful wavelengths of ultraviolet-B radiation. However, this brilliant show does not last long, limited to the tender stages of cell division as the frond unfurls. In this image, the display draws to a close, as the earliest portions of the frond that unfurl harden and flush chartreuse green. This trait equips Sadleria for colonizing open, UV-stressed environments such as recently hardened lava flows or upland tangle-fern prairies, like this one–fringing the world's highest bog, the Alakai Swamp of Kauai.

To see the complete gallery of all photographic art submitted for the 2013 Triarch Awards see the website at: http://www.botany.org/plantimages/ConantSTA2013.php

PLANTS Program Encourages URM Students to Become Part of the Scientific Community

Science will not thrive unless it is equally accessible to students from all backgrounds, including those from groups that are currently underrepresented. Access involves knowing about the discipline, understanding the culture of science, feeling welcome as a participant in scientific endeavors and as a member of the scientific community, and understanding job opportunities in the area. With the generous donation of time, energy, and commitment of many society members who serve as mentors, the current NSF-funded PLANTS (Preparing Leaders and Nurturing Tomorrow's Scientists) program continues to carry on the tradition begun ten years ago to diversify the pool of undergraduates attending the BOTANY meetings.

The PLANTS program is an outgrowth of the National Science Foundation Undergraduate Mentoring in Environmental Biology award led by **Karen Renzaglia** (PI) and **Jeff Osborn** (Co-PI), which brought underrepresented minority students to the BOTANY 2003-2008 meetings (UMEB: Increasing Diversity at the Annual Botanical Society of America Meetings, NSF DEB-0227696). The BSA felt that the results of that grant were so significant and important to the future of the Society and to the botanical sciences that the Society used its own funds to support a small cohort of undergraduates to attend BOTANY 2010. In 2011, the BSA was awarded a five-year grant from the NSF (PLANTS [Preparing Leaders and Nurturing Tomorrow's Scientists]: Increasing the diversity of plant scientists, NSF DEB-1137471) with **Ann Sakai** (University of California-Irvine) and **Ann Hirsch** (University of California-Los Angeles) as Co-PIs.

The PLANTS program funds up to 12 undergraduates a year from a diversity of backgrounds to attend the annual joint meetings of the Botanical Society of America (BSA) and other participating organizations. The goal of this program is to increase the number of undergraduates from underrepresented (URM) groups who attend these meetings, and to increase their level of academic excellence and motivation to pursue advanced degrees in the plant sciences.

At the core of PLANTS is a mentoring program that assigns two mentors to each student, one peer mentor (advanced undergraduate or graduate student), and one senior mentor (postdoc, faculty, or equivalent). Mentors contact students before the meeting, attend social activities and scientific

PLANTS Students and mentors at Botany 2012 in Columbus, Ohio

talks with them, and help the students network with other students and faculty at the meeting. In general, the mentors point out the broader relevance and application of the discipline to the students, encourage involvement, and pass on genuine intellectual excitement generated by attending scientific sessions together.

All students are required to attend a PLANTS orientation meeting and mixer and a PLANTS debriefing meeting at the end of the conference. They also attend a professional development workshop on how to apply to graduate school and the graduate school experience, the Student Involvement in Botany luncheon, the Enhancing Scientist Diversity in Plant Biology talk and luncheon (with mentors), the Plenary Lecture (with mentors), the All Society mixer (with mentors), and the All Society banquet (with mentors). A critical part of the program is attendance and discussion of scientific presentations by the students with their mentors. Optional events include the student/new member mixer, individual society dinners, and field trips.

Before and after the BOTANY meetings, PLANTS participants have their own private Facebook group where they can share information. BSA staff, the PLANTS mentors, and the PIs of the grant keep in touch with the students as much as possible. In many cases, PLANTS students have continued to receive mentoring as they apply for graduate student fellowships.

We are beginning to see the lasting impact that the program has had on the PLANTS undergraduate participants who were juniors and seniors when they participated in the program in 2011. At least eight of the nine 2011 PLANTS recipients have gone on to pursue graduate degrees and careers in the plant sciences. They are also excelling. Several alumni of the PLANTS program (**Kate LeCroy**, 2010; **James McDaniel**, 2011; **Jon Richey**, 2011; **Clayton Visger,** 2011) were recently awarded NSF Graduate Research Fellowship Program (NSF GRFP) awards in 2013. The GRFP provides three years of support for the graduate education of individuals who have demonstrated their potential for significant achievements in science and engineering research. Another PLANTS recipient, **Irma Ortiz** (2011), was awarded a prestigious Ford Foundation Fellowship.

As we enter Year 3 of the PLANTS program, we encourage all BSA members to welcome these students (identified by their PLANTS ribbon) at the BOTANY conference this summer. Consider attending the Diversity Luncheon on Tuesday, July 30 in New Orleans at BOTANY 2013 where **Dr. Muriel Poston** will be our special invited speaker. Look for more updates on the PLANTS program in future issues of the *Plant Science Bulletin*.

-Submitted by Dr. Ann Sakai and Heather Cacanindin

Congratulations to BSA members
Lindsey Tuominen & Kate LeCroy
on receiving BSA Public Policy Awards to
attend BESC Congressional Visits Day

BSA Science Education News and Notes

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

Society Initiatives and Members in Action

Congratulations, Shona Ellis!

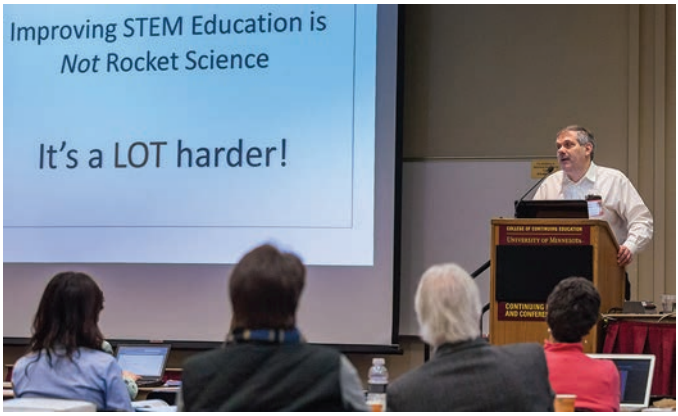
The Charles Edwin Bessey Teaching Award, recognizing substantial contributions to botanical education, is among the Society's highest honors. Our congratulations this year go to **Shona Ellis**, Teaching Professor at the University of British Columbia. Please see the Awards section in this issue for biographical information and read more about Shona's work in her blog (http://blogs.ubc.ca/shonaellis/).

Life Discovery-Doing Science Conference

"Improving Science Education is Not *Rocket Science. It's* a LOT *Harder."* Jay Labov introduced humor along with key recent education reports and research in his keynote address at the inaugural Life Discovery-Doing Science Conference in March. The conference complements the digital library developed in collaboration with the Botanical Society of America, Ecological Society of America, Society for the Study of Evolution, and Society for Economic Botany.

The innovative active-learning approaches shared at the conference were suitable for high school to college classrooms as well as out-of-school and online learning environments. BSA members were well represented among the attendees and presenters. For example, **Lena Strewe** shared about the online campus flora project that involves Rutgers students documenting the local flora and contributing to the Consortium of Northeastern Herbaria. **Steve Saupe** and two undergraduates demonstrated how to create time-lapse videos of plant for the classroom. **Kathleen Shea** described a range of questions students could ask about carbon accumulation, biomass, and ecology using a permanent plot project. **Stokes Baker** presented examples of using digital image analysis, particularly with fluorescence, to integrate mathematics into laboratories. **Kara Butterworth** was a panel speaker about Building Pathways and Partnerships between K-12 and College.

If you missed the March 2013 conference, slides from the keynote, workshop, and session presentations are available at: http://www.esa.org/ldc/program/presentations/.



PlantingScience

As the Spring session closes, the PlantingScience team wishes to add our thanks to the many scientists who shared their passion and expertise with the 20 participating middle and high school classes. You make a difference to how students experience science! Just consider these comments:

Student responses:

Thank you very much for helping us with our project. we were very lucky to have such an awesome mentor. honestly I hope we have another project like this in the near future :)" -Greater Nanticoke Area High School Student

Thank you for your help with our experiment! We really appreciate your knowledge on plants... I will definitely consider plant biology as a possible career." -Springfield Central High School Student

"*We just wanna say thank you for all your help and comments! We've enjoyed working together! We're sad that this project is finished.*" -Bonhoeffer College Student

Teacher responses:

Student: "Mrs. Parfitt could we do a secondary experiment because we wonder what would happen if…." That's what I'm talking about! **-Mrs. Parfitt**

"Thanks for all of your help; this has been the best session yet for brainstorming and interaction between student teams and mentors…. Some students moaned when I told them this would be the last week for PS. Thank you for taking time to work with my students." **-Mrs. Indriolo**

"…Know that I truly appreciate all you have done to challenge, question, and excite my students. This is a group of inner city kids who have never done anything remotely like functioning in a sterile lab environment, so the experience and the foundation we have laid for them in the scientific process is something they would never have received anywhere else in my District." **-Mr. Kosmoski**

This spring we hosted a number of videoconferences for classes and several mentors. We also offered a star project award for teams with exemplary aspects of their projects. Team members receive a certificate and t-shirt. Check out winning star projects from nominations this spring at http://tinyurl.com/caktwtb

Recent Publications and News Around the Nation

Scientific Societies Supporting STEM Faculty

What do we know about how STEM faculty programs offered by scientific societies are structured and their effectiveness? That question is addressed in *The Role of Scientific Societies in STEM Faculty Workshops* report, which expands on the 2012 conference that brought together leaders of seven programs and two education researchers. Comparisons across the biology, geosciences, chemistry, engineering, mathematics, and physics programs are informative, as are the future directions and advice for other disciplinary societies.

http://www.aapt.org/Conferences/newfaculty/upload/STEM_REPORT-2.pdf

Perspectives on the Broader Impacts Criteria

Have you written or reviewed proposals submitted to the National Science Foundation lately and noticed the 2012 changes to the Broader Impact Criterion? Perhaps you wondered just what kinds of broader impact activities were proposed under the original view of Criterion 2 and what the new view of the broader impact criterion might mean.

Two recent publications offer perspectives. In the February 2013 issue of *Frontiers in Ecology and the Environment*, Nadkarni and Stasch call for new mechanisms to make grantees accountable for broader impacts activities and pathways for positive feedback (http://www.deepdyve.com/lp/ecological-society-of-america/how-broad-are-our-broader-impacts-an-analysis-of-the-national-science-685vxS1nkD). Their analysis of projects funded by the NSF Ecosystems Studies Program (2000-2010) revealed that most proposed to reach audiences close to academics through teaching and training activities. In the March 2013 issue of *BioScience*, Frodeman and colleagues pick up that thread and exhort individual scientists and collaborative groups to view the new broader impact criteria as an opportunity to go beyond supporting graduate students and developing websites (http://www.bioone.org/doi/abs/10.1525/bio.2013.63.3.2?af=R&). What are your views on effective broader impacts and how they can be developed and sustained?

Final Next Generation Science Standards Released

After extensive community comment and review, the Next Generation Science Standards (NGSS) have been released in their final form. The executive summary describes reasoning behind a major design shift to organize the standards around the dimensions of Disciplinary Core Ideas, Scientific and Engineering Practices, and Cross Cutting Ideas: coupling science practices with content gives the learning context. And it reflects how science is actually practiced. For more background behind the standards and to download PDFs of the standards arranged by Disciplinary Core Ideas, visit http://www.nextgenscience.org.

Upcoming Opportunities to Enhance Teaching and Learning

Attend the Society for the Advancement of Biology Education Research 2013 National Meeting, July 11-14 in Minnesota.

http://saber-biologyeducationresearch.wikispaces.com/home

Join the PULSE community of educators working toward change in undergraduate life science education.

http://www.pulsecommunity.org

Don't miss BOTANY 2013: Celebrating Diversity!

July 27-31 in New Orleans

http://www.botanyconference.org

An excellent line-up of education, outreach, and training offerings awaits:

Sunday

- Workshops on genomics, visual learning, botanical art, citizen science, virtual herbaria, graduate school and beyond, writing, publishing, and more.
- *Restoring the Bayou,* Botany-in-Action Service Project
- *Celebrating diversity in the understanding of science: Botanists as ambassadors to a spectrum of humans*, Plenary Address by Nalini Nadkarni

Monday

- *Public Participation in Scientific Research: Emerging Resources for Botany*, Symposium organized by Austin Mast, Sarah Newman
- *Herbarium Digitization for Research, Teaching, and the Public*, Symposium organized by Eric Ribbens
- *Yes, Bobby, Evolution is Real*, Symposium organized by Marshall Sundberg, Joseph Armstrong

Tuesday

- *Broadening Participation – Recruiting and Retaining Outstanding Scientists in the Botanical Sciences*, Symposium organized by Anna Monfils, Ann Sakai
- Enhancing Scientist Diversity in Plant Biology Luncheon (ticketed event)
- *Changes in the STEM Classroom. What do we need to do?* Roundtable organized by Phil Gibson

And, of course, there will be the Teaching Section presentations and posters, PlantingScience mixer. Check the website for schedule updates.

Transformation is Possible if a University Really Cares.

Mervis, J. 2013. *Science* 340: 292-296.

You may remember the "Regional Botany Special Lecture: Science Education for the 21st Century: Using the tools of science to teach science" during the Botany 2008 meeting at the University of British Columbia (*PSB* 54(3): 95) http://botany.org/plantsciencebulletin/psb-2008-54-3.php#news2). In that presentation Carl Wieman, Nobel laureate in Physics, offered some of the "tricks of the trade" he had been experimenting with to improve student learning. In this introduction to a Special Section on "Grand Challenges in Science Education," Mervis describes Wieman's efforts to convince universities (faculty, departments, and administrators) to start being scientific about STEM education. Those of you following "The History of Botanical Education in the U.S." know this "Vision" is an old story (*PSB* 57(4): 134-158; 58(3): 101-131), but "Change" hasn't happened yet! Wieman is trying hard to change that. If you're still teaching your courses the way you were 10 years ago, I challenge you to read this article as a scientist, skeptically, but considering the evidence. Then follow your conclusion. As Susan Singer is quoted in the article, "…we should stop doing STEM talent selection and start doing STEM talent development…." For more information on Wieman's educational efforts, see: http://www.cwsei.ubc.ca/.

Keeping a Digital Eye on Nature's Clock: Students Use Digital Cameras to Monitor Plant Phenology.

Magney, T., K. Eitel, J. Eitel, V. Jansen, J. Schon, R. Rittenburg, and L. Vierling. 2013. *The Science Teacher* 80: 37-43.

Tracking the emergence of leaf flush, flowering, or other phenological variables has been a part of plant studies for centuries. New tools and citizen science projects allow students to participate in phenological studies. This article outlines how high school students have used digital cameras and ImageJ software to study seasonal changes in leaf color. It could easily be adapted to younger or older students.

Integrating Inquiry-Based Teaching with Faculty Research.

Kukami, T. 2013. *Science* 339: 1536-1537.

Opportunity knocks – in this case, re-design of the introductory biology laboratory courses presented the author with the chance to involve students in research on ecological interactions among *Mimulus aurantiacus*, its pollinators, and the microoganisms that inhabit its nectar. A Science Prize for Inquiry-Based Instruction, this essay illustrates how to include local resources and your research interests into laboratory courses in ways that enhance student learning and departmental offerings. http://www.sciencemag.org/content/339/6127/1536.full?sid=ace97844-fcee-4140-a74c-6d644e5faf7d

Seed Storage Proteins as a System for Teaching Protein Identification by Mass Spectrometry in Biochemistry Laboratory.

Wilson, K. A. and A. Tan-Wilson. 2013. *Biochemistry and Molecular Biology Education* 41: 79-86.

The authors describe a laboratory designed for undergraduates to identify soybean seed storage proteins by mass spectrometry and to deduce post-translational modifications that occurred on germination. Online mass spectral data and tutorials supplement the laboratory module.

In Memoriam

Rivka Dulberger
1922-2012

Dr. Rivka Dulberger (Tel Aviv University) was a leading expert on the reproductive biology of flowering plants, particularly those with sexual polymorphisms. Sadly, her life ended on December 7, 2012 in Tel Aviv after a long and productive career. She was a scientist, teacher, wife, mother, grandmother, friend and mentor who throughout her career maintained a fascination for the biology of flowers. Here, we provide a short account of her scientific contributions and remarkable life. We are grateful to her son Dan for providing information about her early life and wartime experiences.

Rivka was born on May 7, 1922, in the village of Briceni, Moldovia (formerly Romania). She attended high school in the city of Czernowitz, in southwestern Ukraine. In July 1941 the Nazis took over Czernowitz from the Soviets and established a ghetto from which 50,000 Jews were deported. In October 1941, together with hundreds of thousands of other Jews, Rivka and her family were forced to walk 250 km from Czernowitz to Bersad, a notorious camp with little food or shelter. Rivka endured 27 months of extreme physical and mental hardship in the camp and lost family members. While managing to survive under the most cruel and inhumane conditions, Rivka met another prisoner – Ascher Dulberger – who would later become her husband. The two were partners until his death in 2006. In March 1944 Bersad was liberated by the Red Army and, of the approximately 21,000 people who entered the Nazi camp, 18,000 perished. Although this horrific experience shaped many aspects of Rivka's identity and gave her a strong and independent personality, like many survivors she rarely spoke about her wartime experiences. After WWII, Rivka and Ascher lived in Bucharest where she completed her first degree in biology. In 1950 they married and immigrated to Israel and are survived by their son Dan and grandchildren Itay and Tair.

Rivka received her Ph.D. in 1967 from the Hebrew University in Jerusalem. The thesis "*Pollination Systems in Plants of Israel*" was conducted under the guidance of the renowned plant evolutionist Professor Daniel Zohary. In 1951 Rivka started working in the Tel Aviv Biological-Pedagogical Institute, which five years later served as the basis for the Faculty of Life Sciences in the newly formed Tel Aviv University. Rivka remained at Tel Aviv for the remainder of her career and was known as a passionate teacher of classes in morphology, taxonomy and systematics for 40 years. During this time she published over 30 papers and book chapters, many of which were in top-tier journals. Rivka's publications were imaginative and characterized by a careful attention to detail that often revealed important insights on reproductive mechanisms. In particular, her training in structural botany and skills in microscopy resulted in many novel observations that allowed her to relate floral form to function. She trained a handful of graduate students at Tel Aviv and provided valuable advice to many others, both in Israel and overseas. All valued her detailed knowledge of the morphology and physiology of flowers and her willingness to freely share her ideas.

Rivka Dulberger is most well known for her studies of the floral polymorphism heterostyly. Populations of heterostylous plants contain two or three style morphs (mating types) that differ reciprocally in stigma and anther height. Her major contribution to this area, based on experimental studies of *Linum* and members of the Plumbaginaceae[1,2], was to focus attention on the important role of physical and biochemical interactions between pollen grains and stigmatic papillae in governing incompatibility reactions. She proposed that topographical complementarity between these structures' functions to promote compatible crosses and reduce incompatible

pollinations. Her work on heterostyly was novel because it integrated morphological, developmental and physiological facets of the polymorphism in an effort to understand the adaptive significance of ancillary pollen and stigma characters in the syndrome. Her review on the functional significance of floral polymorphisms[3] represents the major synthesis on this topic and should be required reading for anyone interested in heterostyly.

In addition to working on heterostyly, Rivka also made important contributions to our understanding of several other problems in floral biology. These included the genetic basis of gender polymorphism in *Silene*[4] (with Auguste Horovitz), pollination mechanisms in various legumes, including *Cassia*[5], and the function of andromonoecy in *Solanum*[6]. She was also the first to discover late-acting ovarian incompatibility in dimorphic *Narcissus*[7]. This finding made during her thesis research and subsequently published in *Evolution* set the stage for much subsequent work by other laboratories on floral polymorphisms in the genus. In the mid 1970s, Rivka spent a productive research leave at the University of California, Berkeley working with Professor Robert Ornduff on the problem of the function of mirror-image flowers (enantiostyly). Their publications on the South African genera *Wachendorfia*[8] and *Cyanella*[9] stimulated later work on this intriguing floral polymorphism. Indeed, it is notable that Rivka was often the first to identify interesting reproductive systems, and her studies frequently provided basic information that became the foundation for subsequent work by others.

According to her son Dan, plants were Rivka's great love and all the pictures in the family home were botanical in nature. However, she also had a passion for literature and music and impressively spoke seven languages (Hebrew, Russian, German, Yiddish, English, French, and Romanian). We both had the great pleasure to get to know Rivka personally at important stages in our careers and these interactions were influential. SCHB was a graduate student at Berkeley when Rivka visited. Earnest discussions on the function of traits in the heterostylous syndrome left a lasting impression and led to Rivka's sabbatical at the University of Toronto with him in the late 80s. LMW was a postdoctoral fellow at the Hebrew University in Jerusalem in the mid 1990s and during this period interacted with Rivka frequently to discuss science as well as life in Israel. These discussions, sometimes arguments, could be very challenging as Rivka loved to question orthodoxy and had an unswerving directness that one rarely encounters in North American culture. Nevertheless, a verbal jousting match with Rivka about science or politics was never personal and she was an enduring friend and generous mentor to us both. We will miss her greatly, and botany in Israel has lost one of its earliest and most valued pioneers.

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-Lorne M. Wolfe, Georgia Southern University
-Spencer C. H. Barrett: University of Toronto.

Congratulations to Kate LeCroy and James McDaniel, Jon Richey, Clayton Visger, all BSA members who are winners of the NSF Graduate Research Fellowship Award! These are past PLANTS program participants and we are extremely proud of them.

Kate LeCroy

I plan to study how climate warming may disrupt the dynamics of pollination communities. How will climate change alter insect pollination? This question has not been fully empirically answered from a community perspective. Plant species with overlapping phenologies may indirectly interact via shared pollinators, and these interactions can have negative (competition -,-; e.g. for pollinator visits or increased heterospecific pollen transfer) or positive (facilitation +,0; +,+; e.g. simultaneous facilitation or sequential facilitation) effects. Disruption of these interactions can have consequences for quantity and quality of pollen received and thus could affect reproductive fitness. Previous research also projects altered pollinator phenology or pollinator loss, which could further exacerbate disruption of these interactions. I will analyze pollination quantity and quality in manipulated plant communities that reflect projected scenarios of climate warming for plants and pollinators. This research will be conducted in the serpentine seep communities of northern California, an ecosystem type that is highly vulnerable to biodiversity loss. My experimental work will answer the call to solve outstanding questions concerning how climate change will affect plant phenological overlap, plant-pollinator interactions, and plant fitness.

James McDaniel

As a graduate student in Ken Cameron's lab at the University of Wisconsin-Madison, I have started collecting preliminary data on the genus *Porroglossum* within the orchid subtribe Pleurothallidinae. My original intent was to work with the genus *Zootrophion*; however, I have quickly discovered that the rarity of this genus in the wild and cultivation makes it impractical to work with. As a result, I have switched gears to the genus *Porroglossum*, which is more accessible in regards to gathering data. *Porroglossum* is fascinating because the plants have an active labellum that, when stimulated by an insect, snaps shut. This mechanism allows *Porroglossum* to entrap insects as a means of ensuring that pollination occurs. Of the 48 species in the genus, I have DNA from ca. 75% of them from which I have successfully amplified three gene regions: nrITS, *trnL-F* and *ycf1*. My plan is to construct a fully resolved phylogeny for the entire genus using Maximum likelihood and Bayesian methods. From there, I will use the phylogeny to address ecological and evolutionary questions. Ultimately, I plan to discover the mechanism(s) responsible for active movement in the labellum, shed light on pollinator-plant relationships, characterize floral fragrance profiles using GC/MS, and test clade hypotheses set forth by Carl Luer in his monograph *Icones Pleurothallidinarum IV*.

Jon Richey

My research interests are carbon cycle perturbations, variations in atmospheric CO_2 throughout Earth's history, climate sensitivity, and the use of fossil plants to explain aspects of the carbon cycle. I am using a botanical method known as Stomatal Index (SI) to look at variation in CO_2 at the Albian-Cenomanian Boundary. Stomatal Index is the proportion of epidermal cells that are stomata (gas exchange pores) in the leaves of plants. SI varies inversely with CO_2 levels because at high atmospheric CO_2 levels, an individual plant can maintain a high level of photosynthesis while minimizing H_2O loss by having fewer stomata. Epidermal cells and stomata are counted in modern materials, such as fossil, subfossil, and herbarium specimens, which are then compared to known CO_2 levels from when they were collected, and plants subjected to greatly elevated CO_2 levels in growth chambers. From these data, a graph of changes in SI vs. changes in atmospheric CO_2 is produced and an equation is generated that describes this relationship. I have recently obtained fossil cuticle (the waxy covering of the epidermis of leaves which is highly decay resistant and can be recovered in rock dating back to the first land plants) from the only continental rock sequence currently known to preserve Ocean Anoxic Event 1d, a carbon cycle perturbation event that marks the Albian-Cenomanian Boundary. I will calculate SI in this fossil cuticle, which will be plugged into the equation derived from modern material to infer CO_2 levels throughout this event. The late Cretaceous is thought to be an analog for Earth's future climate given current climatic trends. In addition, Ocean Anoxic Events have been relatively common during hot climates of the geologic past such as the Cretaceous, and Ocean Anoxic Event 1d is analogous in some ways to the current injection of large amounts of CO_2 to the atmosphere by humans. Due to these facts, my research will yield important data to assist in the fight against climate change.

Clayton Visger

For my dissertation I will be exploring the evolutionary consequences of whole genome duplication within the Pacific Northwest genus *Tolmiea* (Saxifragaceae). *Tolmiea* appears to have undergone a single autopolyploidization, which resulted in a primarily allopatric distribution of the diploid *T. diplomenziesii* and autotetraploid, *T. menziesii*. To assess the role autopolyploidy has played in this natural speciation event differences in niche, physiology, and gene expression between the diploid progenitor and tetraploid derivative will be evaluated.

Dr. Bruce Kirchoff Wins First Ever American Society of Plant Taxonomists Innovations in Plant Systematics Education Prize

UNCG Biology Professor, Dr. Bruce Kirchoff, was recently awarded the first ever "Innovations in Plant Systematics Education" prize by the American Society of Plant Taxonomists. Dr. Kirchoff won for his "innovative application of research in cognitive psychology to teach plant identification skills" and his "record of pedagogical research and use of technology to interact with students." The award letter goes on further to say his work "is an exceptional example of combining science and education effectively. It is a wonderful model for our membership in this inaugural year of the award." Dr. Kirchoff will be honored at the annual American Society of Plant Taxonomists banquet at the BOTANY 2013 meeting.

Dr. Kirchoff sees tremendous value in visual learning, and he helps his students harness its power to learn biology.

Here is an example: In his plant diversity class, students must master the intricate life cycles of the algae, fungi and land plants. Instead of having his students memorize the details of these cycles, he has created standardized ways of representing them visually, and software to teach these representations. "Don't memorize – picture the life cycle," he tells his students. The picture is a schema that summarizes a large amount of information.

Trying to memorize the individual parts of the cycle can drive students nuts, he says. Where does the gametophyte go? The archegonium? What about the carposporophyte? And this is just the beginning. Visual learning provides a better way.

In some ways his software is like using flashcards to help memorize and learn—but it's much more effective.

"I am teaching my students to think visually," he says, to build up and see patterns in their minds eye. When they can "see" the pattern, they can work back to the facts. The pattern is a visual summary of the facts.

With research centering on plant structure and development, and on visual learning, Kirchoff has been a member of UNCG's biology faculty since 1986.

His work with visual learning has led him to become an entrepreneur. The UNCG Office of Innovation and Commercialization advised him on starting a company around his proprietary software. The UNCG Teaching and Learning Center (now the FTLC) funded some of its initial development. As a result, the software technology is offered free to any course at UNCG. Any faculty member who'd like more information may contact him at kirchoff@uncg.edu, and more information is available at http://www.metisllc.com/.

In another class he has created a version of the software that teaches plant recognition. "You learn to identify plants using the same part of your brain that you use when you look at faces," Kirchoff says. Students can see and learn the plants at home, on their own time. They come to class prepared to learn at an advanced level, and they do better on their exams.

The software can be used in any class, wherever visual learning is appropriate.

Classes at the Wagga Wagga campus of Charles Sturt University in Australia use the software. Medical residents in neuropathology at Stanford Medical School use it. Dr. Catherine Matthews (Education) and Ann Somers (Biology) are developing a version as part of their NSF-funded HERP project. Leaders of a Science Olympiad team in Honolulu are using it. UNCG chemistry professor Dr. Mitchell Croat is developing a version for organic chemistry, and using it in his classes.

These techniques also have use outside the sciences. Kirchoff asks, is a work of art—even an abstract piece—to be seen as a whole, or as composed of parts? "The answer is… both." The parts interact to create the whole, but they are only parts—they only have their form and place in the work—because they are "of the whole." This is the part–whole relationship in art. The same relationship occurs in organisms.

The great German poet and scientist, Goethe, saw this clearly, and it influenced all of his work. He coined the term "morphology," which is the study of the structure of living things, and Kirchoff's field of study. Goethe basically said that organisms are like works of art. There is an integral wholeness to the organism. They are composed of parts, but they are not just the parts.

Is what he teaches like the visual expertise described in the book "Blink"? Yes, the first chapter of that popular book dovetails with what

he is hoping to achieve. The idea is to be able to be both quick and accurate, with one look. Visual experts do this, and he is teaching his students to do it too. "Using the software, we can get the instant recognition effect with only a short amount of training."

-*Used with permission By* Campus Weekly

Stan Kosmoski, K-12 classroom member.

Stan took home 1st place at the Hillsborough County, Florida, Tech Fair for an exhibit about the Planting Science project online this spring and with Edith and Arjan in the Netherlands. The prize is an indefinite loan of a Windows 8, HP Elite Pad 900 for classroom use. He reports that he has been asked to write a lesson plan for the 10 middle schools in the STEM initiative for Planting Science this summer and he is looking for partner schools to do mirror modules (although the actual experimental design may be different) so sister schools can Skype when completed to share their research. Note: Sibling schools need not be in a different country (although that is really fun!!!!)

Please contact Stan at skosmoskijr@yahoo.com if you, or a middle school teacher you know, are interested in becoming a sibling school so he can add you to the lesson plan this summer.

Karl Niklas Named Weiss Presidential Fellow

Karl Niklas has been named a Stephen H. Weiss Presidential Fellow at Cornell. The Weiss Presidential Fellowship is awarded for excellence in teaching and advising undergraduates. The award is named for Stephen H. Weiss '57, former chair of the Cornell Board of Trustees. The recipients will be honored by the Cornell Board of Trustees in the Spring of 2013.

MISSOURI BOTANICAL GARDEN PROGRAM ANNOUCES COLLABORATION WITH L'HERBORETUM

Partnership Allows Sacred Seeds Program to Expand to Europe

(ST. LOUIS): Sacred Seeds, an international non-profit that supports plant conservation and addresses the rapid loss of biodiversity and cultural knowledge, has extended its reach to Europe through collaboration with L'Herboretum whose international headquarters are in Saint-Ay, France. Sacred Seeds is a network of plant gardens devoted to preserving plants of medicinal and cultural significance. The program is administered by the Missouri Botanical Garden's William L. Brown Center.

Sacred Seeds also works to foster the traditional uses and knowledge of these treasured plant species, honoring their sacred roles in indigenous communities. Currently, the program connects 28 gardens in 13 countries on six continents.

"L'Herboretum is one of the leading forces in international plant conservation, and its garden in Saint-Ay is a treasure of French ethnobotany," said Thomas Newmark, founder of Sacred Seeds. "L'Herboretum is the first European partner in the Sacred Seeds network, and we are thrilled to be collaborating with the visionary leaders of this great association."

"The staff at L'Herboretum clearly has a passion for ethnobotanical knowledge on both a local and global level. They make an ideal European hub for sharing the need to preserve threatened knowledge and plants, and for celebrating the innovation and dedication of conservationists around the world," said Ashley Glenn, a research specialist at the William L. Brown Center.

L'Herboretum, through The Herboretum Network of gardens, is the leading botanical association in France and is dedicated to conserving medicinal, cosmetic and sacred plants. It maintains a 22-acre garden on the heart of the Loire Valley and is an historic landmark. Leading scholars and business leaders have joined in The Herboretum Association, and it enjoys the patronage of The Alban Muller Group, a leading specialist in natural extracts in France. Alban Muller, President of The Alban Muller Group, expressed his enthusiastic support for the collaboration with Sacred Seeds. "Sacred Seeds has an exceptional international network of Sacred Seeds Sanctuaries, and together with L'Herboretum's network we will have participating gardens around the world. Both organizations feel the deep responsibility to protect the biodiversity of life, and we have pledged to share knowledge, skills, and resources to more rapidly achieve our shared missions."

Sacred Seeds is managed at the William L. Brown Center at the Missouri Botanical Garden, one of the largest and most active botanical research institutes in the world. Visit www.sacredseedssanctuary.org to learn more. The William L. Brown Center of the Missouri Botanical Garden is dedicated to the study of useful plants and the relationships between humans, plants and the environment. Scientists strive to conserve plant species for the benefit of future generations.

The Missouri Botanical Garden is one of the three largest plant science programs in the world. The Garden's work 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.

A PLANT ANATOMY DICTIONARY OF LAST RESORT

One of the refreshing surprises of teaching a specialty course is to cross paths with a student who is coming from a different place and who provides a...well, novel perspective. Don Casadonte is a doctoral student in music whose interest in what makes a good clarinet reed brought him to Plant Anatomy. After hearing snickers from students all quarter from his area of the lab, I confronted him and he fessed up to having compiled a list of "informal" definitions of terms from an outsider's point of view. What follows are some of the more printable and less groanable of his creations, including his snappy preamble. The responsibility for all the groans that remain is strictly his, as I, the teacher, just played the part of the straight man.

We offer for your perusal a selection from the previously unavailable (indeed unwritten) book *Knock Wood: A Plant Anatomy Dictionary of Last Resort*. One may wonder why this is a dictionary of last resort, but after a quick scanning of its contents, we're sure you'll agree with us that this is indeed the last place to go to resolve your anatomical difficulties. Nevertheless, we hope that you enjoy this excerpt and remember the famous words of the plant, which exclaimed on seeing its first fly, "That looks like `a gnat to me'...".

-Contributed by Fred Sack, University of British Columbia

- *Phyllotaxis* What you're required to do every year by April 15.
- *Siphonostele* An activity a gasoline thief engages in.
- *Idioblast* A party thrown the night before a final exam.
- *Rhytidome* The opposite of a Leftidome.
- *Auxin* The city where the University of Exas is located.
- *Eukaryotic* What you say to an otic when you want them to transport something.
- *Stone Cell* A drunk tank.
- *Plastichron*™ A rubber clock for those hurried people who wish they could stretch time just a bit.
- *Anomalous secondary growth* Razor stubble.
- *A-pical cells* Extra large cells that taste good on hamburgers.
- *Mesophyll* Opposite of mesoempty.
- *Bulliform cell* The place to lock up people who think they're Teddy Roosevelt.
- *Callus* The most often used word by the director of the Plant Follies of 1942. See also *Don't Callus...*
- *Phellogen* A "manly" drink. Opposite of Galogen.
- *Storied wood* A tree that's heard it all.
- *Slime body* Noun. See also *mud wrestling*.
- *Axillary "Bud"* The C.B. nickname for the first person to be inducted into the Truck Driver's Hall of Fame.
- *Casparian strip* What the friendly ghost does before taking a shower.
- *Companion cell* Tonto's tent.
- *Diarch* What you do after being hit by lightning.
- *Pistillate* The usual reason why people lose gun fights.
- *Prop roots* Scenery for Tarzan.
- *Sapwood* A really stupid tree.

Early 19th-century expressions of popular botany through sentimentalism in American gift books and annuals

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ABSTRACT

Through my study of 19th-century American gift books and annuals, I conclude that botany, the first socially acceptable science for American women's study, permeated media beyond traditionally assumed origins such as textbooks, field manuals, and lectures, but that it was embedded in the sentimental language of gift books written for young women in early middle- and upper middle–class culture. While scholars of botany and scholars of 19th-century gift books and annuals attribute floral imagery and floral gift books as a sentimental continuation per usual of this period (1825-1865), there is a manifestation of popular botanical culture (botanical literature) within the identity of gift books that is overlooked by this assertion. Furthermore, this botanical literature is a valuable component for connecting the target audience of gift books (young women) to botanical study as much as allowed by their "delicate sensibilities."

Key words: American Antiquarian Society; annual; botanical history; botanical literature; gift book; Library of Congress; popular botany; women in science; 19th-century botany

The United States experienced the wildly popular literary phenomenon of "gift books" and "annuals" between 1826 and 1865. These mass-produced books were usually comprised of an attractive collection of sentimental (highly emotional) short stories, sketches, poems, essays, illustrations, and songs. Gift books and annuals were typically

Figure 1. Photographs of American gift books and annuals 1825-1865, used with permission from the Library of Congress (A, B, D, E) and the American Antiquarian Society (C, F). (A) Front cover, The Iris, *est. 1820-1840. (B) Frontispiece of* The Iris, *est. 1820-1840. (C) Colored plate. (D) Front cover,* The Hyacinth, *1846. (E) Frontispiece,* The Young Lady's Companion, *1844. (F) Presentation page,* The Lady's Book of Flowers & Poetry, *1842.*

printed on high-quality, hand-gilded paper and bound with leather or cardboard, and embossed with handmade, gilded imprints on the covers and endpapers to complete the look (Faxon, 1973) (Figure 1). Cindy Dickinson describes in her 1996 article "Creating a world of books, friends, and flowers: gift books and inscriptions" that while the writings "were meant to engage the mind and heart, the physical presentation was intended to captivate the eye" (p. 54). These books took on personal meaning for the recipient as a gift: it gave the reader an object of good taste meant for refinement and self-improvement through its sentimental and intellectual contents.

Whereas gift books consisted of contributed works from many writers that were often written for the specific gift book, annuals were compilations of previously published pieces in magazines and periodicals of the time, rarely with new works. Both gift books and annuals were meant to serve as gifts for special occasions such as birthdays, Christmas presents, and tokens of gratitude for teachers from their students (Faxon, 1973). Because gift books and annuals served the same purpose in this culture and do not differ significantly in content, I will refer to both gift books and annuals as gift books.

Along with gift books, another growing phenomenon during this period of the early 19th-century was popular botany. Elizabeth Keeney's *The Botanizers: Amateur Scientists in Nineteenth-Century America* gives a highly detailed account of how botany developed throughout 19th-century America, which is marked by two groups that initially shared a common passion but diverged by the beginning of the 20th century. These groups were "botanizers" and "professionals." "Botanizers" enjoyed botanical study as a pastime and used it for means of social reform and personal improvement. "Professionals" contributed to the increasing wealth of information needed to understand the complexity of botany. Modern historians view the botanical culture of the botanizers as a religious and valuable practice for positively cultivating the mind and soul, while they define professionals as those who focused on correspondence with other scientists and publishing new findings in professional journals (Keeney, 1972). The 19th-century practice of the botanizers was popular at the same time of the gift book–publishing era of 1825 to 1865.

Botany caught America's attention by the traveling lecturers, social reformers, ministers, and educators who asserted the goodness of botany. Communications that praised the benefits of studying plants have been termed "botanical literature" (Keeney, 1992). This botanical literature pervaded many outlets of media, including but not limited to newspapers, children's textbooks, sermons, university courses, visiting lecturers, and essays. The messages in botanical literature emphasized the important reasons for botanical study: gentility, utility, and piety. Botanical literature championed these aspirations and was pervasive in the popular media. Indeed, from an account of 14,200 Americans who were highly active in the botanical community from 1800 to 1850, 11,000 identified themselves as "cultivators," meaning those who pursued botany for other reasons beside scientific progress (Keeney, 1992). The results of this survey suggest this "botanical literature" that championed the goodness of botanical study reached a large audience and impacted American education and culture, emphasizing the importance of botanical study concomitant to the reason of scientific advancement.

CULTURAL ASPIRATIONS BEHIND BOTANY AND GIFT BOOKS: GENTILITY, UTILITY, AND PIETY

Both Elizabeth Keeney, a historian of science, and gift book scholar Richard Thompson respectively credit the increase in attractiveness of practicing botany and the growing market for gift books to the overwhelming American drive to create a cultural identity of a refined, pious, and accomplished people. In particular, gift books and botany largely targeted women audiences. Gift book scholars consider these books an important symbol of a cultural aspiration that championed refinement and good taste by affirming clear lines between class, race, religion, and gender; these poems, essays, sketches, stories, and embellishments were all snapshots of current American perspectives of the beautiful, the right, and the good (Bushman, 1992), and they could be easily placed on the parlor table for any visitor in the home to see. In *The Refinement of America,* historian of 19th-century America Richard Bushman notes that although "the contents of gift books were hardly distinguished, giving a gift book the title 'Gems of Prose and Poetry' implied the giver's commitment to refinement through literature and a presumption of the recipient's taste for the pleasures of mental culture" (p. 284).

In the same way, developing refinement could be achieved by what popular botany inherently demanded—meticulous, diligent observation and critical thinking skills—and what it inspires in the intellectual and the "cultured" mind: a poetic sensibility for the gentler aspects of nature, a sense of order, appreciation of God in general terms of protestant natural theology, exercise, and an appropriate scientific endeavor for young women (Keeney, 1992). Indeed, botany addressed the common and overwhelming 19th-century concerns of female invalidism, which was the thought that women have unusually delicate health and are more prone to illness than men (Wood, 1973). In a culture where being outside was considered hazardous for women, botany opened once-closed doors to explore nature in a socially acceptable manner (though women often traveled with a male supervisor to assist in collecting field specimens) (Keeney, 1992). In her *Familial Lectures on Botany* (1845), Almira Lincoln Phelps emphasized its suitability for females in this sense:

"Botany seems peculiarly adapted to females; the objects of its investigation are beautiful and delicate; its pursuits, leading to exercise in the open air, are conducive to health and cheerfulness. It is not a sedentary study which can be acquired in the library, but the objects of the science are scattered over the surface of the earth, along the banks of the winding brooks, on the borders of precipices, the sides of mountains, and the depths of the forest" (p. 14).

According to Keeney, botany was a method for improving gentility, utility, and piety, and in consequence the practice of botany fashioned a more polished community (Keeney, 1972 p. 60). I argue that this incredibly powerful 19th-century idea of personal improvement that Thompson, Bushman, and Keeney discuss is present in botanical literature in both practicing botany and reading gift books.

These two trends of gift book readership and botanical education experienced most of their popularity between 1825 and 1865. The participants of both were literate, came from the upper half of American society, valued gentility and culture, and had some means of education (Thompson, 1936, pp. 3-4; Keeney, 1972, pp. 11-13). Another elemental component of both enterprises was their suitability and attractiveness to women and the new opportunities they gave to women's activities. In female private schools, catalogs from 1825 to 1860 show an increase in the amount of botany courses offered, and a survey from pre-1830 and

Figure 2. Engraved plates. (A) Plate titled "The Passion Flower" from The Young Botanist*, a botany manual from 1835. (Image in public domain.) (B) Plate titled "Kate in the Fields" accompanying story "Emily's New Pastime" in the gift book* The Dahlia*, 1842. (Used with permission from the Library of Congress.)*

post-1830 course offerings for female seminaries and girls' schools show an especially high increase in the percentage of these schools offering botany courses (Keeney, 1972, pp. 54-55). Plates from both botanical textbooks and gift books often portray young women actively engaging in botany (Figure 2).

After a preliminary search through an annotated bibliography of gift books, I found that there are an abundance of gift books that incorporate various writings about plant life. Looking from an aesthetic lens, many gift books have flowers, trees, and leaves found on bindings, titles, inscription pages, and embellishments throughout its contents. According to Ralph Thompson's index of gift books, many of the books were dedicated to flowers. There are approximately 50 gift books found that are devoted to floral themes of the beauty of flowers and their meanings (Thompson, 1936, p. 6). However, many more gift books also have titles simply of plant names, including *The Magnolia*, *The Hyacinth, The Lily of the Valley*, *The Rose Bud, The Iris,* and *The Evergreen*. I found approximately 130 titles of gift books from the 469 titles (books often republished under the same titles, totaling 977 books) listed in the *Indices* that were plant related, with most of them named after wildflowers. However, this ornamentation of title is not necessarily as botanically enriching as the stories about the morals of studying botany and embarking into botanical culture.

BOTANICAL CULTURE AND BOTANICAL LITERATURE

The popular botanical literature of the botanizers used non-scientific language in its writing and used the common American early 19th-century literary style of sentimentalism to assert the virtues of botanical study. Sentimentalism is characterized by its emphasis of emotion over reason and action; it uses moral tales that juxtapose good and bad characters (both often children or young women) by rewarding the good character with true love or happiness while punishing the bad character with a doomed ending; and there is often a concluding statement written directly to the reader to emphasize the morality and applicability of the tale to the reader's own life (Gutjahr, 2001). I argue that historians of botany have not recognized botanical literature when it is shrouded in this sentimental language and thereby miss an important connection to women's botanical immersion in the works of gift books. For example, in *The Language of Flowers: A History*, botanical historian Beverly Seaton (1995) details in part how flower language has developed throughout the 19th-century. Seaton discusses the context of "flower books," which includes a portion of gift books devoted to flower meanings. These flower books contain many illustrations and poems about certain flowers. The author emphasizes the sentimentality and purpose of these flower books, even quoting an advertisement for *The Rural Wreath; or Life Among the Flowers*: "It is not pretended… to treat upon the science of Botany… it is designed… as a Table Book for the Parlor, of a sentimental character…" (Seaton, 1995, p. 19). Seaton uses this advertisement to suggest that gift books and practicing botany were in two different spheres: the flowers have been historical objects of sentiment, and this new scientific study of plants will not change its sentimentality or perception by its readers.

Although Seaton uses an important primary resource to show how gift books and botany use flowers in different contexts, I think there is unexplored territory where botanical literature resides in gift books. This is where Seaton emphasizes the supposedly impassable line of sentimentality and downplays the overall impact of pure botany past the language of flowers and their traditional use in story imagery and general ornamentation. I would argue that women botanizers walked in and out of these two areas of sentimentality and science, and they created a space of their own to consume botanical culture inside of gift books.

From my survey of gift books and annuals, I found plenty of short stories, essays, and illustrations that show what I see as the interplay between a new botanical culture and the sentimental nature of gift books. I conducted my research in 2011 and 2012 through the online resources of the Internet Archive (www.archive.org) and through Google Books (www.books.google.com) and in physical libraries at the American Antiquarian Society Library in Worcester, MA, USA and at the Library of Congress in Washington, D.C. USA. I read 222 gift books available through these services and documented 50 gift books with the use of botanical literature in at least one of its short stories, essays, engravings, songs, or poems. Table 1 presents a summary of all titles with examples of botanical literature. With a total of 977 titles published in the United States between 1826 and 1865, Figure 3 demonstrates the rise and fall of gift book publishing and contextualizes the portion

Example of botanical literature within contents	Number of gift books with example	Titles
Depiction of young girl(s) who practice(s) or begins to practice botany as a hobby, written as heroine(s) of tale, may uplift a male downtrodden character by introducing him to botany	14	*The Lily* (1831), *The Child's Annual* (1834), *The Week-Day Book* (1835), *The Violet* (1937), *The Dahlia* (1842), *The Lady's Book of Flowers and Poetry* (1842), *Rose of Sharon* (1844), *The Parlor Book* (1845), *The Hyacinth* (1846), *The Moss Rose* (1850), *The Amaranth* (1850), *The Young Ladies' Oasis* (1851), *The Lily of the Valley* (1858)
Description and image of a plant or garden with a statement encouraging botanical study	14	*The Parent's Cabinet* (1832), *Flora's Interpreter* (1839), *Floral Emblems* (1845), *Boudoir Annual* (1846), *The Juvenile Gem* (1846), *The Lady's Book of Flowers and Poetry* (1846), *Boudoir Botany* (1847), *The Literary Annual* (1948), *The Youth's Sketch Book* (1849), *The Hyacinth* (1851), *The Lady's Companion* (1851) *The Gift* (1854), *Book of Gems* (1858), *The Floral Offering* (1859), *Parlor Book* (no date)
Sermon, poem or essay about the goodness of observing and studying plant life	11	*The Book of Flowers,* (1836), *The Laurel* (1837), *The Parlor Book* (1838), *The Young Lady's Companion* (1839), *The Charleston Book* (1845), *The Poetry of Flowers* (1845), *Love's Garland* (1848), *The Winter Bloom* (1850), *The Magnolia* (1847), *The Hyacinth* (1845), *The Pearl* (1853), *The Ladies' Keepsake* (no date)
Positive account of a historical figure or protagonist of story, explicitly states studying botany as one of his/her accomplishments	11	*The Atlantic Souvenir* (1827, 1828, 1829, 1830, 1859), *The Casket* (1829), *The Pearl* (1829), *The Gift* (1840), *The Opal* (1849), *The Odd-Fellows' Offering* (1852), *The Amaranth* (1855)

Table 1. Summary of botanical literature in gift books and annuals, 1826-1865. Of the 222 gift books that were analyzed, 50 gift books contained examples of botanical literature. Titles are sorted into representative expressions of botanical literature. The multiple dates of The Atlantic Souvenir represent different, individual instances of botanical literature and do not represent re-published material.

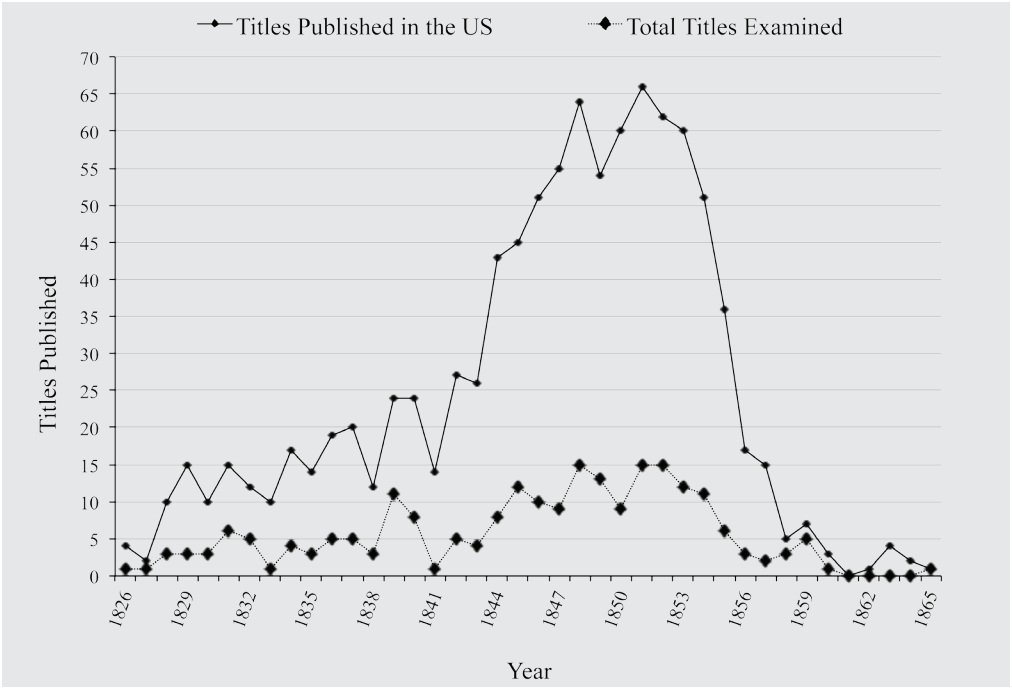

Figure 3. The rise and fall of gift books and annuals, 1826-1865. Data gathered from Faxon, 1973. There were 977 titles published over this time period, and this figure shows the number of gift book and annual titles published each year.

of gift books of which I read and searched for botanical literature. The elements of this botanical literature—still couched in an arguably required tone of sentimentality—fully recognizes the values of natural history and reflects upon young women's increasing participation in botany.

CASE SCENARIOS OF BOTANICAL LITERATURE

One example of botanical literature within gift books is a story from *The Lily*, published in 1831, with a story titled "Rosalie" by Derwent Conway. The character Rosalie has a passion for collecting and preserving plants:

"…Neither was Rosalie's pursuit the collection of insects—she was too tender-hearted for this; for, if she caught a beautiful insect, it was with the light touch of gentleness, only to admire its purple wing and let it go. Rosalie's pursuit was, to gather and preserve wild flowers, which she dried in so perfect a manner, that almost every charm remained with them but, beside this Rosalie had found the art of taking such perfect impressions from them, upon silk… that the grace—the tints of freshness—the fragrance of the flowers… continued to live in these impressions" (*The Lily,* 1831, p. 222).

Rosalie brought her *herbier* (plant press) to the market in her village, and women stopped by exclaimed over the botanical "treasures." A wealthy father employs Rosalie to teach his daughters how to preserve wildflower specimens. Their father slips a large sum of money into her plant press, and at the conclusion of the story, Rosalie finds the money and "stood, with burning cheeks, down which tears of gratitude and joy rapidly followed one another" (*The Lily,* 1831, p. 227). Sentimentality and the rewards of botanical interest are here in plain sight.

A second example is from *The Hyacinth: or Affection's Gift. A Christmas, New-Year's, and Birthday Present* from 1846. From the preface, this gift book's chief object is "intellectual and moral improvement" (*The Hyacinth,* 1846, p. ii). In a short story called "A Visit to the Botanic Garden of St. Vincent," the Maxwell Children visit the "West Indies" with their family. Jane and Susan Maxwell are 10 and 12, and another family, the Pophams and their children, are also scheduled to visit at the same time. However, these Popham children are not as well behaved as the Maxwells, with their parents missing the most important part of their education, which was "teaching their children the

virtues of obedience, truth, self-denial, humility, and gentleness" (p. 179).

These badly behaved Popham girls named Lucy and Harriet (the same ages as the Maxwell children) are invited by the Maxwells to tour the St. Vincent Botanic Garden with Mr. Elliot, the head botanist. They scoff, reacting to the Maxwell girls' invitation "with stupid surprise… as if the Popham girls could have said 'what fun is there in hearing Mr. Elliot talk about plants?'" (p. 189). This story then demonstrates through their actions that the Popham girls are not cultivated enough to understand the value of learning new things, especially about the natural world. The Popham girls instead sneak off to eat mangoes, staining their new beautiful dresses, like badly behaved children in the 19th century would (p. 193). The Popham girls were indignant at touring with a botanist: "… [T]he daughters thought that the Maxwells could not play; but they were quite mistaken—they could enjoy a game of fun as much as any boy or girl, but they had also a strong thirst for knowledge, and that, combined with true good-breeding, taught them that going off to play at such a time would have proved them to be very silly" (p. 193).

The author concludes, "I can assure you my… readers, that neither talent nor genius of any description can ever be put to their best use without good principles and industry" (p. 197). There is a fitting resolution to where Harriet and Lucy Popham go and race in their flamboyant frocks and pale blue shoes in the mud, whereas Jane and Susan wear their humble white frocks and economic black shoes while obediently staying with their father mother and listening to conversation with Mr. Elliot the botanist (p. 196). Sentimental justice is served upon those who do not listen to botanists and subscribe to meaningful activities.

These are just two examples within 50 published titles where I observed botanical literature that asserts the goodness of botanical study and at times demonstrates the moral downfall of those who do not have the good judgment to recognize botany as a valuable activity (Table 1). With this manner of close inspection, we can find that there is indeed a space where gift books and botanical literature coincide.

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Developmental and Structural

Images of the Morphology and Anatomy of Seedless Vascular Plants and Gymnosperms

R. Larry Peterson, Dean P. Whittier, and Lewis H. Melville
2011. ISBN-13: 978-0-9877172-0-7
DVD. Can$34.95
Canadian Science Publishing, NRC Research Press, Ottawa, Ontario, Canada

Many of us have built up impressive slide collections through our careers. We have photographed plants in our travels, we have prepared specimens both as part of our research and our teaching, and we have exchanged photographs with colleagues. Larry Peterson and Dean Whittier have gone a step further by making their personal collections available to a broader audience. They teamed with Lewis Melville to produce a DVD-ROM of their own images, supplemented minimally with photographs of slides from others. The collection, *Images of the Morphology and Anatomy of Seedless Vascular Plants and Gymnosperms*, is published by Canadian Science Publishing and available for less than $30.00 from Amazon.

The collection spans the diversity of these plants with a catalog that is very easily browsable, but not searchable. As the DVD-ROM opens, a menu appears with the plants organized into five classes: Lycopsida, Psilotopsida, Marattiopsida, Equisetopsida, and Polypodiopsida. The gymnosperms are accidentally grouped under the Polypodiopsida, and the higher classification of these plants is in a perpetual state of revision, but neither of these detracts from the ease with which the slide collection is used. Orders are listed within each class, and clicking on an order opens a list of the families and the genera available. Clicking on an individual genus provides up to three choices: sporophyte anatomy, sporophyte morphology, and gametophytes, depending on what is available. Each choice then leads to thumbnails of the images available in the category. Only 12 thumbnails are on a page, so if there are more, one must open the next page of thumbnails. It is easy to navigate from image to image, from menu to menu, and from genus to genus. Furthermore, the authors encourage users to save and copy the images for educational purposes.

While I was excited to review this DVD-ROM, I was also a little hesitant. Images for teaching are available from so many sources that I wondered whether this collection really would offer something different and worth the money. I was not disappointed. The gross morphology images are good, and for the most part, not unique to this collection. However, the anatomical images and gametophyte images make it a gem. They show some of the most meticulously prepared and

excellently prepared sections I have ever seen. As these images are all of gymnosperms and seedless vascular plants, the utility of this collection is more suited to a typical comparative morphology or anatomy course than a systematic botany course or a broad survey of all botanical diversity, but it has gems to offer nearly all organismal botany courses. Many of the captions note how they were stained (usually phloroglucinol-HCl or Toluidine Blue O), and a large portion of images have arrows and letters indicating the location of specific structures. There are even a few SEM images.

There are a few weaknesses with the DVD, but they only minimally detract from it. Most specimens are identified to species, but a few are only identified to genus, and none of the field images note locality. A further weakness is a lack of scale on many images. Additionally, some might find the coverage to be a bit sporadic. For example, within the ferns, there are many images of stem cross sections, but relatively few of sporangia. And while nine genera of cycads are represented, there are anatomical images of only *Cycas* and *Zamia*. These weaknesses are all understandable, noting the origin and purpose of the collection itself, and I doubt any of them are particularly problematic for most practicing botanists.

Overall, this is an excellent collection of images to use for teaching diversity and anatomy. The specimens are very well prepared, especially the anatomical sections, and I highly encourage anyone to consider using this as a supplement to their own slide collection or as an atlas for students to use in their study.

–Douglas P. Jensen, Converse College, Spartanburg, South Carolina, USA

The Life of a Leaf

Steven Vogel
2012. ISBN-13: 978-0-226-85939-2
Hardcover, US$35.00. 293 pp.
The University of Georgia Press, Athens, Georgia, USA

The title of this book is misleading. The dustjacket cover shows an unrolling crozier of a fern, yet ferns are never mentioned (and other herbaceous plants only rarely). And this is not a book devoted to the developmental life of a leaf. However, it is a very readable book about many aspects of the physiological life of a plant. The life of the leaf itself comprises a small part of the many explanations of the inner workings and environmental interactions of the mostly woody plants that they are attached to. Vogel clearly enjoys explaining such mechanical and physio-chemical interactions of the plant with the world as they ultimately affect the leaf, and he succeeds in offering a fascinating view of many of the physical processes that are necessary for leaf function.

This book was not light reading for me as I had left physics formulas and experiments behind in my freshman year of college to pursue the wider world of plant ecology. However, for a botanist, plants can be used to provide insights into how physics control function. Vogel explains it all quite lucidly despite unavoidable references to the various laws and formulas of physics such as Fick's law (diffusion) or the Hagen-Poiseuille equation (flow through pipes). Vogel thoughtfully relegates the more mathematically challenging details to footnotes, and makes the concepts come alive with illustrations and a series of images and diagrams of experiments and simple "do it yourself" projects. Vogel starts with light, and then talks about the various interactions of the plant with gases, water, and temperature (both hot and cold).

Most often he addresses the subject through questions that a keen plant observer may have thought about but not known how to answer—such as why maple saps run in the spring or what the ultimate limit in height for a tree is and why, or why aspen leaves quake, or why there are so many different leaf shapes and folding patterns, or why very rounded droplets of water form on some leaves but not others, or why some trees fall in a storm while others are uprooted. Of particular interest to those who work in hurricane-prone areas is a chapter on the various ways that woody plants and their leaves deal with wind, including descriptions of wind tunnel experiments (very challenging to do with large plants). He also provides several physical explanations for how plants combat herbivory.

Undergraduates in a botany course would certainly benefit from several of the explanations and illustrations of subjects often only briefly mentioned in basic texts, and the whole book would be an excellent supplement to the usually much drier textbooks used in plant physiology courses. But I also think that structural engineering students would benefit from reading this book, as it provides living examples of so many elements of our built environment.

In his introduction, Vogel says that the book is about the interactions of a plant with the physical world—"a world that limits them, one that they can't much alter, but of which they can take all sorts of subtle advantages." It reads as though the author of a book called "Life of the Human" were to describe the lives of people living on an upper floor of a very tall apartment building by describing all of the physical processes that result in their being able to survive in that habitat, such as the design of the windows for light access, how the cooling and heating systems work, how water and energy are brought up, why the building doesn't blow over, what the transportation and digestion of food entails, and how wastes are carried down through the building and away. After reading and learning so much from Vogel's book about the plants I've studied for so long, I'd look forward to a similar book by structural engineers using humans as the lens through which to view physical processes.

–Joanne Sharpe, Sharplex Services, Edgecomb, Maine, USA

Ecological

The World of Northern Evergreens, 2nd ed.

E. C. Pielou
2011. ISBN-13: 978-08014-7740-9
Paperback, US$19.95, 168 pp.
Cornell University Press, Ithaca, New York, USA

The World of Northern Evergreens is a guide to the natural history of the boreal conifer forests of North America. Conversational but botanically accurate, complete but not overladen with scientific trivia, it is meant for the naturalists in all of us. Indeed, these days, it is a rare thing to find a professional botanist who can actually see the forest for the trees, so very specialized are we all.

This handy paperback is not really a classical field guide in the sense of having color plant identification photos with telegraphic descriptions and a waterproof binding. No, it is meant for those who yearn for a more holistic view of the northern evergreen forest, and want to see both the forest *and* the trees. How did the boreal forests come about during the Ice Age? What kinds of conifers make up the forests? How do conifers live and grow? What sorts of the broadleaved trees can you also find in these forests? These topics form the focus of the first six chapters of the book.

I have to confess that I was excited to find the answer to a question that has plagued me all of my botanical life. While I can still recite the reasons for the upward pull of water in tracheids that I learned in Intro Botany—root pressure, capillary action, water-molecule cohesion, and transpiration—these factors seem to come up short next to the majestic heights attained by conifers. (The tallest tree in Canada is a 95-m high Sitka spruce in Carmanah Walbran Provincial Park.) Pielou finally satisfied my curiosity with a more detailed explanation from the point where plant science meets molecular physics. After a germinating seed pulls up water a short distance by capillary action from the soil through its root hairs, the water column continues to flow upwards through each of the new, lengthening tracheids as an unbroken column, staying intact by intermolecular attraction as the tree grows. Ah, I said to myself, another mystery of the natural world solved.

Seriously, though, what is I find particularly pleasing about Pielou's approach in guiding the reader through the boreal forest is how the conifer trees take their rightful place as the major players in this northern biome. Angiosperms, fungi, parasites, insects, mammals, birds, and even fire are explained in reference to the trees and forest. These subsidiary topics make up the second part of the book, along with concluding chapters on forest biogeography in northern North America, and on global warming and its effect on the boreal forests.

E. C. Pielou is one of the great plant scientists of our time, a mathematical ecologist who has produced six scholarly textbooks on numerical ecology, ecological diversity, and biogeography, as well as several popular books. *The World of Northern Evergreens* is actually the second edition of the original that was published in 1988 and can take its place proudly on the bookshelf alongside other popular books written by Pielou on glaciated North America, the naturalist's guide to the Arctic, freshwater, and the energy of nature. This second edition of *The World of Northern Evergreens* differs from the first by describing the contrast between conifers and angiosperms in the boreal forest and by broadening the book's scope with discussions about the forest floor, the geographical extent of different forest ecosytems, and the dire consequences of logging and climate change on northern conifers.

I think that most botanists may find *The World of Northern Evergreens* a bit too "lite," but Pielou aims to explain forest ecology to "naturalists, hikers, backpackers, canoeists, cross-country skiers," as she says in the preface. Still, I can also see how the book can be put to good use as supplementary reading in a non-majors botany or biology course. Even for a majors course, *The World of Northern Evergreens* would do a good job of integrating botanical and ecological information on plants, trees, and forests to end up with something that is more than the sum of its parts. For all readers, accompanying Pielou on her tour of the natural history of the boreal forest will be instructive and interesting, and, as depicted on the book's cover, as stirring and refreshing as a walk among the giant evergreens when the sun breaks through the early morning mist.

–Carole T. Gee, Steinmann Institute, Division of Paleontology, University of Bonn, Bonn, Germany

Economic Botany

The Beauty of Houseplants

Tom Gough and David Longman
2011. ISBN-13: 978-1-889878-30-0
Cloth, US$22.95. 118 pp.
Botanical Research Institute of Texas, Fort Worth, Texas, USA

The Beauty of Houseplants is an attractive coffee table book with nice quality photographs of houseplants that will be familiar to most readers. The common and scientific names are given for approximately 70 houseplants, along with a single-page description of the proper care and optimal conditions for growing each particular species. Data on the geographic origin and the natural history are also provided, and the information on each plant species seems to be accurate. There is also a section on choosing plants for each room of the typical home and another section on common pests that includes recommended treatments for pests and diseases. A history of how these houseplants were discovered as well as information on propagation make this book interesting. I found this attractive book fun to read and believe it will be useful to amateur botanists, gardeners, and anyone who uses plants to decorate the home.

–John Z. Kiss, Department of Biology and Graduate School, University of Mississippi, Oxford, Mississippi, USA

World Economic Plants: A Standard Reference, 2nd ed.

John H. Wiersema and Blanca León
2013. ISBN-13: 978-1-4398-2142-8
Cloth. US$149.95. 1300 pp.
CRC Press, Taylor & Francis Group, Boca Raton, Florida, USA

The first edition of *World Economic Plants*, published in 1999, provided basic reference data for over 9500 vascular plant taxa of commercial importance. This second edition provides additional data on a total of 12,235 economically important vascular plants. Levels of detail vary from entry to entry, but for the majority of the taxa the most common synonyms, common names in up to 20 languages, economic importance, and geographical distributions are provided. Native, naturalized, adventive, and cultivated distribution ranges are distinguished. Most of the included taxa are used as ornamentals (5361), medicinal plants (2997), gene sources (1907), food (1725), timber (1253), and animal food (929). About 18% (2136 taxa) are classified as weeds and about 13% (1589) as vertebrate poisons. Not only economically useful but also economically harmful species are included (e.g., 22 species of *Cuscuta* and 10 species of *Orobanche*). An index of common names in English and, to some extent, in 26 other languages represents almost half of the volume (562 pages). Nearly 200 taxonomists and agricultural specialists reviewed entries for individual families. Taxonomy and nomenclature are up-to-date. For example, *Acer* is in Sapindaceae, *Sambucus* in Adoxaceae, and the widespread weedy taxon usually called *Lantana camara* L. is correctly named as *L. strigocamara* R. W. Sanders.

How complete is this reference? To get an idea, I looked at two large genera, *Acacia* and *Pinus*. A total of 53 *Acacia* species are included, 12 of them correctly classified as weeds. There are 23 Australian *Acacia* species currently recognized as invasive (spreading in areas where they were introduced by people; Richardson and Rejmánek, 2011). Six of them are not among the 53 species treated in this reference. The coverage for pines is much better: all 24 *Pinus* species currently recognized as invasive are included among 81 species covered in this volume. From 25 naturalized Melastomataceae (Meyer and Medeiros, 2011), only 12 are included. However, the omitted species are, in general, not common. There are two general shortcomings I can

think of: First, it would be useful to add a short life form characteristic for each taxon. Some of the taxa are not very common, and one can only guess their life form from characteristics of their economic importance. Second, the distinction between "naturalized" and "adventive" is not explained. This would be desirable because the second term may have several meanings (Pyšek et al., 2005). Also, references to particular monographs where individual cultivars are described would be very helpful (e.g., Auders and Spicer, 2012). One may argue about minor details in the geographical distribution characteristics (*Abutilon theophrastii* may be native, not naturalized in China; more is currently known about original distributions of *Chrysophyllum cainito* and *Cocos nucifera*; Petersen et al., 2012; Gunn et al., 2011), but, in general, distributional data seem to be accurate.

Several dictionaries and checklists of economic plants were available before the publication of this volume. The amount of information in this reference, however, supersedes all previous attempts. It is a monumental achivement, and I am sure that it will be heavily used for many years to come.

–Marcel Rejmánek, University of California, Davis, Davis, California, USA

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Medicinal Plants and the Legacy of Richard E. Schultes

Bruce E. Ponman and Rainer W. Bussmann, eds.
2012. ISBN-13: 978-0-9848415-2-3
Paperback, US$24.95. 138 pp.
The William L. Brown Center at the Missouri Botanical Garden, St. Louis, Missouri, USA

This short volume comprises the proceedings of the Society for Economic Botany's "Botany 2011 Symposium Honoring Dr. Richard E. Schultes" held at the Missouri Botanical Garden. Presuming that being at the symposium would have been more enjoyable and more interesting that simply reading about it, I guess this little book is the next best thing to having been there. I agreed to read and review the book because I was aware that Richard E. Schultes had been a prominent ethnobotanist, but I knew little more than comments I had heard from the late Dr. Bernard Lowy, a mycologist and ethnobotanist in the Department of Botany at Louisiana State University. I now regret having missed the original symposium, but am delighted with having agreed to review the book. The eleven papers include two that do not deal with Schultes per se, but rather with directly related topics. One deals with stand protocol for gathering ethnobotanical data and socioeconomic variables, and the other with biodiversity as a resource. In the context of the symposium, these were appropriate additions, but the real importance of this book is found in the papers, which provide a glimpse into the life, career, and personality of Schultes.

The symposium was the first to honor Schultes and was held on the 10-year anniversary of his death, which is very appropriate; however, as soon as I

read the wonderful preface by Rainer W. Bussmann, I was struck with the notion that I wished there had been a similar symposium honoring Schultes during his lifetime. I wished this not only because it was immediately clear that Schultes deserved such an honor while he was alive to enjoy it, but also because presumably more of his colleagues would have been alive and physically able to participate in the event. It is sad that there had not been an earlier symposium, and it is equally sad that some of the authors allude to Schultes's important and impressive collections sitting "all but neglected in some attic at Harvard." Alas.

Jumping back to the topic, the real importance of this book is getting to know Richard Evans Shultes. All of the authors who discuss Schultes offer similar "pictures" of the man. Because Schultes was the focus of the symposium and this book, here are some examples (all taken from the book) of how he is described by those who knew him and worked with him: "one of the most important ethnobotanists of the 20th century"; "most iconic colleague"; "was the first ethnobotanist to step off the academic cloud and to respect and value the deep traditional knowledge his indigenous counterparts held"; "a most unusual person, a great thinker, and an individual who viewed life as an opportunity to carry out the dreams of his early youth"; "he could read, write, or speak 10 languages including two Amazonian languages"; "[a] great man, whose intelligence, courage, sense of humor, vision, and accomplishments were so inspiring"; "well known for insisting on the correct spelling and pronunciation of Latin, Greek, and any other language"; "perfectly groomed"; "always conservatively and correctly dressed, rather more like a Victorian professor"; "[he] propelled ethnobotany and economic botany to resolve concrete problems"; "lifelong mentor and continuing source of inspiration"; "highly supportive"; "a field botanist and a Harvard man through and through"; "one of the 'last Victorian explorers'"; "a complex scientist"; "an ethnobotanist…plant taxonomist, an economic botanist, a conservation botanist, and an ethnopharmacologist"; "incredibly supportive of his students"; "the great man"; and "a walking encyclopedia." His colleagues noted his "inspiration, discipline, and vision"; "humility, sense of humor, respect for indigenous peoples, love for Amazonia and Columbia"; and "his dry sense of humor."

This book is a wonderful first encounter for those people who, like me, did not know much about Schultes. An added delight of the book is reading the wonderful excerpts from letters written to Schultes by his mentor Dr. Oakes Ames. Not only is it interesting to read some of the fatherly advice that Ames offered, but reading his satirical description of how many students choose their topics and develop their theses or dissertations is a true delight. Less amusing are the frequent comments on the lack of concern for the preservation of the tropical forest in particular and biodiversity in general. Similarly, the unnecessary loss of Schultes's rubber tree seed collection at a time when disease is once again threatening natural rubber production is a painful example of how the value of collections is ignored until those lost collections are truly needed. Similarly, there is an all too true reference to the loss of trained botanists despite the fact that the importance of plants to humankind remains undiminished from that day, long ago, when green algae conquered the land and gave rise to the land flora upon which we and kindred animals all depend! Despite these unpleasant truths duly reported in some of the papers, this is a wonderful little book because Richard Evans Shultes was a wonderful person. I strongly recommend it and am happy to report that it won a James A. Duke Excellence in Botanical Literature Award from the American Botanical Council in February 2013.

The wonderful preface by Rainer W. Bussmann (mentioned above) includes a poem in Spanish written for the symposium in spring 2011 by Isidoro Cabrera (who had been a field assistant for Schultes in the 1950s). I thought a translation might have been provided for those us who have not mastered as many foreign languages as did Schultes. My colleagues, Dr. Juan Manuel Lopez-Bautista of the University of Alabama, Tuscaloosa, and Dr. Joseph V. Ricapito of Louisiana State University, Baton Rouge, and I offer our translation to close this review:

TO RICHARD EVANS SCHULTES

***IN MEMORIAM* EXCELSIOR**

Indefatigable explorer

Of the extensive Amazonia

Who worked with passion

Studying its harmony.

His life, truly endangered,
In torrential rivers
With its impetuous twists and turns
In winters and summer times.

Wise, with strong character
Subjected to many trials
Challenging even death
Gave to science new plants.
He recorded his experience
With sound observations
For the scientists
Of future generations

Under the deep jungle
Which enclosing its secrets
Unknown and fertile
Covers part of the earth.

He wrote his history
Forever into the future
And on his glorious pedestal
Remains unharmed and safe.

— Russell L. Chapman, Professor Emeritus and Founding Dean, School of the Coast and Environment, Louisiana State University, Baton Rouge, Louisiana, USA

Ethnobotany

Ginkgo: *The Tree that Time Forgot*

Peter Crane
2013. ISBN-13: 978-0-300-18751-9
Hardcover, US$40.00. 384 pp.
Yale University Press, New Haven, Connecticut, USA

Ginkgo is an artifact of the prehistoric past, noteworthy for its symbolism, e.g., endurance, survival, persistence. Inspired by the historic ginkgo that has thrived at the Royal Botanic Gardens, Kew, since the 1760s, distinguished botanist Sir Peter Crane explores the evolutionary history of ginkgo from its origin through its spread, drastic decline, and eventual resurgence.

Motivated to prepare this volume by his appreciation for the portraits of economically important plants by economic botanist Charles Heiser in an accessible style of science writing for the popular audience (references cited below), Sir Peter Crane highlights the cultural and social significance of *Ginkgo*: its medicinal and nutritional uses, its power as a source of artistic and religious inspiration, and its importance as one of the world's most popular street trees. Sir Peter Crane—Missouri Botanical Garden Trustee, former Head of Kew Gardens, and current Head of Forestry at Yale—stated in his presentation about *Ginkgo* at the Ridgeway Center, Missouri Botanical Garden on 11 March 2013, that his position at Yale School of Forestry influenced his choice of topic. Writing began while Sir Peter Crane was director of the Royal Botanic Gardens, Kew, continued at the University of Chicago, and was completed at Yale; much of the writing was prepared in Seoul in the summers of 2009, 2010, and 2011, surrounded by *Ginkgo* trees.

In his prologue, Sir Peter Crane calls the book a biographical sketch. His narrative incorporates botany, medicine, and geological sciences, crossing the globe culturally and historically. Weaving his life experiences, his observations of *Ginkgo* during his travels, his career at Kew, visits to the New York Botanical Garden, journeys in East Asia (China, Japan, South Korea, etc.), this volume popularizes botany for serious lay readers as well as informing botanist colleagues.

One can't help but write about *Ginkgo* using clichés: a most distinctive tree… unique among seed plants… the earth's oldest… unchanged for more than two hundred million years… a living fossil…

link to the age of dinosaurs… it survived the great ice ages as a relic in China… beloved for its elegant, fan-shaped leaves with veins radiating out into the leaf blades, often gilded for jewelry… appreciated for its edible nuts, and venerated for its longevity. *Ginkgo* is an ancient Chinese tree—sacred to the Chinese and Japanese and grown for centuries in their temple courts—that has been cultivated and held sacred for its health-promoting properties. A long-lived shade tree, it is resistant to fungus disease and insect pests that afflict most other ornamental trees. Once thought to be extinct, *Ginkgo* was re-discovered in China in the mid-1700s, and is now dispersed throughout the world, having lived on earth for over 150 million years.

Coverage of the ethnobotany of Ginkgo will appeal to a diverse readership. It draws from a wide range of sources, reflecting the author's broad experiences. We learn that the Department of Plant Sciences of Cambridge University chose a logo that surrounds a ginkgo leaf with a stylized double helix of DNA, reflecting the site of the old Cavendish Laboratory where the structure of DNA was first worked out; we welcome a well-deserved tribute to Weimar, Germany, one of the historic preservation centers of cultural Ginkgo memorabilia; Frank Lloyd Wright, whose architecture used natural forms that blended with the environment, built his own home and studio in Chicago's Oak Park around a Ginkgo *tree*; the architect worked around it as he extended his home, and that house museum today features a Ginkgo bookshop.

Despite the fact that this book will have popular appeal, the treatment is far from superficial. The volume features a 27-page bibliography, 20-page index, and an additional 50 pages of notes supplementing the text. Illustrations that enrich the book are unique, e.g., a Buddhist shrine at the base of an ancient Ginkgo; a stylized ginkgo leaf carved into the planks of a wooden bridge and painted yellow, marking the way to the great ginkgo at Yongmunsa Temple, South Korea; the portrait of *Ginkgo* painted on board made from Ginkgo wood and framed with young Ginkgo branches, made by C. Kato for Tokyo University in 1878; stalactite-like outgrowths bound with prayer ribbons demonstrating the Ginkgo's link with fertility. Each chapter opens with a select proverb, verse, or text written by a noted naturalist, shedding light on the author's personal philosophy.

Some readers might wish that the ethnopharmacology of *Ginkgo biloba* L. was described more exhaustively. There is substantial experimental evidence to support the view that *G. biloba* extracts have neuroprotective properties under conditions such as hypoxia/ischemia, seizure activity, and peripheral nerve damage, as reviewed by Smith et al. (1996). One of the components of *G. biloba*, ginkgolide B, is a potent platelet-activating factor (PAF) antagonist. Although the terpene fraction of *G. biloba*, which contains the ginkgolides, may contribute to the neuroprotective properties of the *G. biloba* leaf, it is also likely that the flavonoid fraction, containing free radical scavengers, is important in this respect. Taken together, the evidence suggests that *G. biloba* extracts are worthy of further investigation as potential neuroprotectant agents. Extracts of ginkgo leaves contain flavonoid glycosides (myricetin and quercetin) and terpenoids (ginkgolides, bilobalides) that have been used pharmaceutically, exhibiting reversible, nonselective monoamine oxidase inhibition.

It was tantalizing to find sesame listed in the Appendix, "List of Common Plant Names Used in the Text and Latin Equivalents" (pp. 279–283), but since that entry was not included in the index, it left this reader disappointed to search unsuccessfully for those relevant passages.

–Dorothea Bedigian, Research Associate, Missouri Botanical Garden, St. Louis, Missouri, USA

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Systematics

Hardy Cypripedium: Species, Hybrids and Cultivation

Werner Frosch and Phillip Cribb
2012. ISBN-13: 978-1-84246-464-9
Hardcover, US$74.00. 156 pp.
Kew Publishing, Royal Botanic Gardens,
Kew, Richmond, United Kingdom

Cypripedium flowers are every bit as beautiful as those of the related diandrous genus, *Paphiopedilum*—possibly more so. However, they are not common in orchid collections because they have a reputation of being difficult to grow (perhaps), are not easy to obtain from legal sources (yes), may be hard to hybridize (no), and have not attracted enough attention (certainly).

One of five genera of so-called slipper orchids, *Cypripedium* is circumboreal in distribution and extends from Alaska to as far south as Guatemala in the New World; from Siberia to the Himalayas, southwestern China, and Japan in Asia; and from Northeast England to the Urals in Europe.

The genus *Cypripedium* consists of 46 species, 32 of which are found in China and about 12 in North America. Current classification divides the genus into 13 sections. Two of these sections, *Aculia* and *Californica*, consist of a single genus each, the North American *C. acaule* and *C. californicum*, respectively. The largest section, *Cypripedium*, contains 19 species with the type being *C. calceolus*.

The first color illustration of a species in the genus (of *C. calceolus*) is by Conrad Gesner (who was also the first to draw orchid seeds), whereas the earliest description of a slipper orchid is by Rembet Dodoens (1568). However, the genus has received limited attention over the years. What may be the first taxonomic treatments of the group were by Ernst Hugo Heinrich Pfitzer (1846–1906) in 1889 and 1903, and Robert Allen Rolfe (1855–1921) in 1896. Two books published at about the same time and now primarily of historical interest treated *Cypripedium* as a genus that combined *Paphiopedilum* and *Cypripedium* (Desbois, 1888; Pucci, 1891). An extensive book-length consideration was published 100 years later (Cribb, 1997). This review of the genus, although informative, suffers from being illustrated mainly with line drawings, paintings, and about 100 small (and not always good) color photographs. The book under consideration here is the first to cover *Cypripedium* in a large, lavishly illustrated format that is as pleasing to the eye as it is satisfying to the orchid lover, instructive to potential growers, and informative for the scientist.

Many orchid books contain sections on history and orchid biology. These sections are often shallow, repetitive from book to book, and unnecessary. In this book, the introduction (pp. 1–15) covers these topics, but here the information is fresh, new, necessary, and informative because so little of it is known and/or has been collected in one place. In places the information is qualified by "probably," but this is inevitable and should serve as a challenge to orchid scientists and graduate students. There is much in need of research in this genus. Grab it!

Most of the book is devoted to taxonomy of species (pp. 16–113) and natural (pp. 114–117) and artificial (pp. 118–427) hybrids. Descriptions include nomenclature and information about size, distribution, and habitat. Habitats are indicated by red areas on dark gray maps. High-quality photographs of entire plants, immediate habitats, and flowers accompany every description. Unfortunately, no data are provided about the magnification factors of photographs.

Carson Whitlow, an American orchid grower, was the first to register a *Cypripedium* hybrid in 1987. He was followed by Werner Frosch (a retired German civil engineer specializing in telecommunications), one of the authors of this book who made his first hybrid in 1989 and produced many more after that (pp. 118–120 and http://www.w-frosch.de).

Only eight pages (pp. 139–146) are devoted to cultivation and propagation. The information presented on these pages is entirely sufficient to be instructive for anyone who may wish to grow these orchids. Unfortunately, the only information about a culture medium for seed germination is that it contains "high levels of various sugars." This is completely insufficient, a very serious omission, and a major fault of the book because temperate terrestrial orchids are not easy to germinate from seed and propagate clonally from explants taken from mature plants. If media have been formulated for seed germination and micropropagation of *Cypripedium* they should (no, not "should," but "must") be published in detail.

Pages 147–148 are devoted to a glossary that is

sufficient, but contains an error of omission. It fails to mention that "pod: commonly used term referring to a seed capsule" may be common, but is wrong.

No book is free of typographical errors. A glaring one in this book is *Cypripedium×colombianum*, which should be *Cypripedium×columbianum* because the name refers to British Columbia in Canada, not the country of Colombia.

Altogether this is a beautiful and informative book that deserves to be highly recommended. *Cypripedium* plants are not easy to find. Legal, artificially propagated, well-grown plants are available from very few reliable and legal sources. One source that I visited for several (very cold) days and can vouch for is Hengduan Mountains Biotechnology Ltd. in Sichuan, China (http://hengduanbiotech.com/, holger.perner@gmail.com). It is operated in Chengdu, Sichuan, by the German *Cypripedium* expert Dr. Perner Holger and his wife Wenqing.

–Joseph Arditti, Department of Developmental and Cell Biology, University of California, Irvine, Irvine, California, USA

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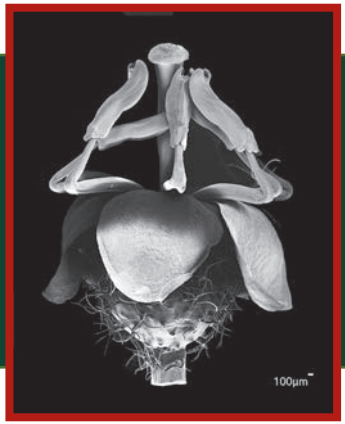
Plant Science Bulletin

Featured Image

1st Place Triarch Botanical Images Student Travel Awards

Ricardo Kriebel
The New York Botanical Garden



Flower of Miconia arboricola (Melastomataceae: Miconieae) in late anthesis.

Among high elevation shrubs and trees of the family Melastomataceae in Central America and the Andes, a group comprised of species in Miconia section Cremanium tend to have small white flowers with broad anther pores. After observing these plants in their habitat it became apparent that the flowers in this example species *Miconia arboricola* start with the stamens erect and as time passes the stamens bend inward and fall on or near the stigma. This image was helpful to document the strong angle in the middle of the filaments that appears to allow for this to happen. In addition, the image documents the relatively short style and the broad anther pores. Most Melastomataceae have yellow anthers with small anther pores, exerted styles and are buzz pollinated. It is possible that species such as *M. arboricola* have evolved totally white flowers with shorter styles, filaments that bend inwards and broad anther pores to allow for self pollination, assuring seed production in the absence of bees. Indeed it is known that there are fewer bee species at high elevations and flies and butterflies have been observed visiting relatives of *M. arboricola* with very similar flowers. Short styles are not as uncommon as is thought in the Melastomataceae and in technical terms they represent the loss of herkogamy. Herkogamy is the separation of sexual parts (stamens and stigma) in space within flowers. As fascinating as this sounds, because styles are usually white and skinny they continue to be overlooked and thus herkogamy or its loss also continues to be overlooked. I hope that this image, which is the first to my knowledge of a Scanning Electron Micrograph of a whole flower in the family Melastomataceae, will call attention to a reality: plants have style!

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