



PLANT SCIENCE BULLETIN

SUMMER 2011 VOLUME 57 NUMBER 2



1ST PLACE
TRIARCH BOTANICAL IMAGES
STUDENT TRAVEL AWARDS

JAMES RISER
WASHINGTON STATE UNIVERSITY

SHOWY MILKWEED AND HAWK
MOTH

IN THIS ISSUE.....



*PlantingScienceWins prestigious
SPORE Award from AAAS. Page 49*



*Matthew Koski wins the
J. S. Karling Student Research
Award. Congratulations
Winnerspg 42*



*BSA Election Results -
Congratulations all!..... Page 48*

FROM THE EDITOR

KUDOS to the PlantingScience team and a quartet of outstanding botanists!

The PlantingScience website won the 2011 AAAS SPORE Award, announced in the 25 March issue of *Science* 331(6024): 1535-1536. See BSA Education News and Notes, p. 49, for a brief description and a link to the *Science* article. AAAS also recognized three BSA members, Ned Friedman, Roger Hangarter and Jonathan Wendel, as 2011 AAAS Fellows and Jeffrey Ross-Ibarra was presented a Presidential Early Career Award for Scientists and Engineers. See the Personalia section, pp. 54-5. for more information about the awardees.

The main focus of this issue, however, is preparing for the 2011 meeting in St. Louis where the theme will be economic botany. To set the tone we feature two articles with different approaches to the theme. In Market Botany, Chris Martine provides a different twist to engaging students in the role of plants in modern life. The field trip he outlines is not the usual anatomical/morphological foray to the produce section of the local supermarket. Instead it is an analysis of product labels, not just food, with an eye toward the taxonomic distribution of economically useful plants. An eye-opener to be sure!

Our second article is another in our recent series of notable botanists, this time of one of the founders of the field of ethnobotany, Richard Evans Schultes. As author Rainer Bussman notes, for an ethnobotanist, talking about Schultes "is like talking about god." I am not one of the chosen, being a disciple of Esau's Anatomy, but Bussman's interpretation of the world according to Schultes certainly gave me a

greater appreciation for this alternative botanical perspective. I hope you will find it just as rewarding and that you will "Meet me in St. Louis."

-Marsh



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Register NOW...



www.botanyconference.org



BOTANICAL SOCIETY OF AMERICA AWARDS 2011



We are pleased to announce the recipients of the 2011 awards provided by the Botanical Society of America. Here we provide recognition for outstanding efforts and contributions to the science of botany. We thank you for your support of these programs.

DARBAKER PRIZE

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

DR. SALLIE (PENNY) CHISHOLM
MASSACHUSETTS INSTITUTE OF
TECHNOLOGY

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.

JESSICA BUDKE
UNIVERSITY OF CONNECTICUT

Advisor: Dr. Cynthia S. Jones - Botany 2011 presentation: "Experimental Manipulation of the Moss Calyptra: The effect of cuticle removal and desiccation on sporophyte development in *Funaria hygrometrica*." Co-authors, Bernard Goffinet and Cynthia Jones

DAVID DUARTE
CAL POLY POMONA

Advisor: Frank Ewers - Botany 2011 presentation: "Seasonal changes in the vessel anatomy of adults and sprouts of California black walnut trees following wildfire" Co-authors, Edward Bobich, Sarah Pak, Shawn Pham, Yasuhiro Utsumi and Frank Ewers

ARI NOVY
RUTGERS UNIVERSITY

Advisor: Dr. Jean Marie Hartman - Botany 2011 presentation: "Rapid evolution of phenology during invasion of the grass *Microstegium vimineum* in North America." Co-authors, Luke Flory and Jean Marie Hartman

CHI-CHIH WU

UNIVERSITY OF COLORADO, BOULDER

Advisor: Dr. Pamela Diggle - Botany 2011 presentation: "The impact of the lower genetic relatedness of endosperm to its compatriot embryo on maize seed development" Co-authors, Pamela Diggle and William Friedman

THE BSA GRADUATE STUDENT RESEARCH AWARDS

The BSA Graduate Student Research Awards support graduate student research and are made on the basis of research proposals and letters of recommendations. Withing the award group is the Karling Graduate Student Research Award. This award was instituted by the Society in 1997 with funds derived through a generous gift from the estate of the eminent mycologist, John Sidney Karling (1897-1994), and supports and promotes graduate student research in the botanical sciences. The 2011 award recipients are:

J. S. KARLING GRADUATE STUDENT RESEARCH AWARD

MATTHEW KOSKI
UNIVERSITY OF PITTSBURGH

Advisor, Dr. Tia-Lynn Ashman, Breaking boundaries of human visual bias: selection on ultraviolet floral traits

BSA GRADUATE STUDENT RESEARCH AWARDS

GERARDO ACERO-GOMEZ
UNIVERSITY OF PITTSBURGH

Advisor, Dr. Tia-Lynn Ashman, Long live the flower: increasing flower longevity and outcrossing rate with increasing community diversity

LAVANYA CHALLAGUNDLA
MISSISSIPPI STATE UNIVERSITY

Advisor, Dr. Lisa Wallace, Evolution of B chromosomes in the Genome of *Xanthisma gracile* (Asteraceae)

GRANT T. GODDEN
UNIVERSITY OF FLORIDA

Advisor, Dr. Pamela S. Soltis, Out of the bushes and into the trees: Alternative approaches to a problematic mint phylogeny

DANIEL M. GRIFFITH
WAKE FOREST UNIVERSITY

Advisor, Dr. T. Michael Anderson, Adaptive Significance of Sodium and Grazing Tolerance in Serengeti Grasses

STEPHANIE PIMM LYON
UNIVERSITY OF WISCONSIN-MADISON

Advisor, Dr. Thomas J. Givnish, Systematics and biogeography of *Corybas* (Orchidaceae)

RHIANNON PEERY
UNIVERSITY OF ILLINOIS AT
URBANA-CHAMPAIGN

Advisor, Dr. Stephen R. Downie, Understanding genome interactions within the carrot family (Apiaceae) using phylogenetic methods

DANIEL SPALINK
UNIVERSITY OF WISCONSIN-
MADISON

Advisor, Dr. Kenneth J. Sytsma, Phylogeny, biogeography, ecology, and population genetics of the North American bulrushes (*Scirpus*, Cyperaceae): assessing the implications of endemism in a changing climate

SIMON URIBE-CONVERS
UNIVERSITY OF IDAHO

Advisor, Dr. David C. Tank, Inferring Patterns of Biodiversity in a young Andean ecosystem: developing a novel high throughput sequencing approach for phylogenetic and phylogeographic studies in *Bartsia* (Orobanchaceae)

JOSE D. ZUNIGA
CLAREMONT GRADUATE UNIVERSITY
& RANCHO SANTA ANA BOTANIC
GARDEN

Advisor, Dr. Lucinda A. McDade, Systematics and biogeography of Sabiaceae with emphasis on Neotropical *Meliosma*.

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 2011 award recipients are:

KERI L CAUDLE
FORT HAYS STATE UNIVERSITY

Advisor, Dr. Brian R. Maricle

JENNIFER COLLINS
SUNY PLATTSBURGH

Advisor, Dr. Christopher T. Martine

JACQUELINE RICE
UNIVERSITY OF FLORIDA

Advisor, Dr. Pamela Soltis

ERIC TABER
COLGATE UNIVERSITY

Advisor, Dr. Eddie Watkins

MEGAN WARD
SUNY PLATTSBURGH

Advisor, Dr. Christopher T. Martine

DEVELOPMENTAL & STRUCTURAL
SECTION STUDENT TRAVEL AWARDS

KELLY MATSUNAGA
HUMBOLDT STATE UNIVERSITY

Advisor, Dr. Alexandru Tomescu

Botany 2011 presentation: "Nectary Structure of *Scoliopus bigelovii* (Liliaceae)." Co-authors: Michael R. Meslerand Alexandru Tomescu

ROBERT BAKER
UNIVERSITY OF COLORADO, BOULDER

Advisor, Dr. Pamela Diggle

Botany 2011 presentation: "Making branches in *Mimulus*: intraspecific developmental variation in shoot architecture." Co-author: Pamela Diggle

GERALDINE BOYDEN
ST. JOHN'S UNIVERSITY

Advisor, Dr. Dianella Howarth

Botany 2011 presentation: "CYCLOIDEA-like genes are implicated in development and floral patterning in *Fedia cornucopiae* (Valerianaceae)." Co-authors: Diane Hardej, Amy Litt and Dianella Howarth x

MICHAEL MALAHY
OKLAHOMA STATE UNIVERSITY

Advisor, Dr. Andrew Doust

Botany 2011 presentation: "Pattern of vegetative architectural development in green millet (*Setaria viridis*) under varied planting densities." Co-author: Andrew Doust

ANA MARIA ALMEIDA
UNIVERSITY OF CALIFORNIA, BERKELEY

Advisor, Dr. Chelsea Specht - Botany 2011 presentation: "Gingers BCs: The role of MADS-box genes in floral evolution in the Zingiberales." Co-authors: Wagner Otoni, Roxana Yocktenga and Chelsea Specht

IRMA ORTIZ
UNIVERSITY OF CALIFORNIA, LOS ANGELES

Advisor, Dr. Ann M. Hirsch

Botany 2011 presentation: "A *Bacillus* strain isolated by undergraduate students at UCLA promotes plant growth by procuring soil nutrients and may also serve as a biological control agent." Co-authors: Allison Schwartz, Erin R. Sanders, Andrew C. Diener and Ann M. Hirsch

ALLISON SCHWARTZ
UNIVERSITY OF CALIFORNIA, LOS ANGELES

Advisor, Dr. Ann M. Hirsch

Botany 2011 presentation: "A newly isolated *Bacillus* strain affects legume plant architecture and pea nodule morphology by secreting auxin." Co-authors: Irma Ortiz, Erin R. Sanders, Darleen Demason and Ann M. Hirsch

ECOLOGY SECTION STUDENT
TRAVEL AWARDS
RUPESH KARIYAT

PENNSYLVANIA STATE UNIVERSITY

Advisor, Dr. Andrew Stephenson - Botany 2011 presentation: "Volatile mediated indirect defense signaling is disrupted by inbreeding and genetic variation in Horsenettle (*Solanum carolinense* L)." Co-author: Andrew Stephenson

BENJAMIN VANDERWEIDE
KANSAS STATE UNIVERSITY

Advisor, Dr. David C. Hartnett - Botany 2011 presentation: "Mark-recapture analysis of herbarium data from the northern Flint Hills of Kansas, USA." Co-authors: Brett Sandercock and Carolyn Ferguson

GENETICS SECTION STUDENT
RESEARCH AWARDS

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

GUADALUPE BORJA
OKLAHOMA STATE UNIVERSITY

Masters Student Award - Advisor: Dr. Andrew Doust, for the proposal titled "Integrating phylogeny and population genetics: distinguishing incomplete lineage sorting and gene flow to infer the evolution of the Southeastern bladderpods (*Paysonia* spp.)."

KIM THOMPSON
UNIVERSITY OF CINCINNATI

Graduate Student Award - Advisor: Dr. David Lentz, for the proposal titled "Chloroplast Microsatellite Analysis of *Manilkara zapota* (Sapotaceae), a Tropical Fruit and Timber Tree."

GENETICS SECTION STUDENT
TRAVEL AWARDS

ARI NOVY
RUTGERS UNIVERSITY

Advisor, Dr. Jean Marie Hartman - Botany 2011 presentation: "Genetic Variation of *Spartina alterniflora* Loisel. in the New York Metropolitan Area and Its Relevance for Marsh Restoration." Co-authors, Peter E. Smouse, Jean Marie Hartman, Lena Struwe, Joshua Honig, Chris Miller, and Stacy Bonos

SEAN RYAN
SAN DIEGO STATE UNIVERSITY

Advisor, Dr. Michael G. Simpson - Botany
2011 presentation: "Molecular Phylogenetic Relationships and Character Evolution of *Fritillaria* subgenus *Liliorhiza*." Co-author, Michael G. Simpson

MYCOLOGICAL SECTION STUDENT
TRAVEL AWARDS

CARLA HARPER
UNIVERSITY OF KANSAS

Advisor, Dr. Thomas Taylor - Botany 2011
presentation: "Fungi from the Permian and Triassic of Antarctica." Co-authors, Thomas Taylor and Michael Krings

WITTAYA KAONONGBUA
INDIANA UNIVERSITY

Advisor, Dr. James D. Bever - Botany 2011
presentation: "*Xerospora xerophila* gen. et sp. nov., a new arbuscular mycorrhizal fungus from a semi-arid region of North America." Co-author, James D. Bever

PHYCOLOGICAL SECTION
STUDENT TRAVEL AWARD

TIMOTHY ROCWELL
ILLINOIS STATE UNIVERSITY

Advisor, Dr. Martha Cook - Botany 2011
presentation: "Cell division in the charophycean green alga *Entransia fimbriata*."

PHYTOCHEMICAL SECTION
STUDENT TRAVEL AWARD

JANNA ROSE
FLORIDA INTERNATIONAL
UNIVERSITY

Advisor, Dr. Bradley Bennett - Botany 2011
presentation: "Isolation of Ellagic acid from the Bioassay-Guided Fractionation of Methanolic Crude Extracts of *Rosa canina* L. Galls."

ANGELLE BULLARD-ROBERTS
FLORIDA INTERNATIONAL
UNIVERSITY

Advisor, Dr. Bradley Bennett - Botany 2011
presentation: "Treating Sugar: Antidiabetic herbal remedies in Trinidad and Tobago." Co-author, Bradley Bennett

HOLLY SUMMERS
CORNELL UNIVERSITY

Advisor, Dr. Robert Raguso - Botany 2011
presentation: "Intraspecific variation in floral display and breeding system in *Oenothera flava* (Onagraceae)." Co-author, Robert Raguso

LINDSEY TUOMINENX
UNIVERSITY OF GEORGIA

Advisor, Dr. Chung-Jui Tsai - Botany 2011
presentation: "Perturbation of *Populus* Phenylpropanoid Metabolism in Suspension Cell Cultures." Co-authors, Raja S. Payyavula, Scott A. Harding and Chung-Jui Tsai

PTERIDOLOGICAL SECTION &
AMERICAN FERN SOCIETY
STUDENT TRAVEL AWARDS

FERNANDO MATOS
NEW YORK BOTANICAL GARDEN

Advisor, Dr. Robbin Moran - Botany 2011
presentation: "The ferns and lycophytes of a montane tropical forest in southern Bahia, Brazil." Co-authors, Paulo Henrique Labiak and Andre, Amorim

MONIQUE MCHENRY
UNIVERSITY OF VERMONT

Advisor, Dr. David Barrington - Botany 2011
presentation: "Investigating morphological diversity of Andean *Polystichum* (Dryopteridaceae): seeking explanations for incongruence between sequence variation and morphological variation." Co-author, Dr. David Barrington

TRIARCH "BOTANICAL IMAGES" STUDENT TRAVEL AWARDS

This award provides acknowledgement and travel support to BSA meetings for outstanding student work coupling digital images (botanical) with scientific explanations/descriptions designed for the general public. (See front cover for this years 1st Place Winner!)

2ND PLACE - \$250 BOTANY 2011 STUDENT TRAVEL AWARD

ALLISON SCHWARTZ

UNIVERSITY OF CALIFORNIA, LOS ANGELES

Top view of a root nodule from *Pisum sativum* with DR5::GUS auxin responsive reporter construct.

This image is a top view of a nodule on the root of a pea plant inoculated with symbiotic rhizobia. In order to study how the development of root nodules is influenced by *Bacillus simplex* 30N-5, a beneficial soil bacteria capable of secreting the plant hormone auxin, we used a pea plant with a reporter construct that is responsive to auxin. This DR5::GUS responsive element drives the beta-glucuronidase (GUS) reporter gene, ultimately resulting in a blue stain in areas responding to auxin. The "eyes" of this happy nodule are actually the ends of two prongs that connect to a single vein down the side of the nodule and end at the root's xylem. These blue vein-like structures later become the vascular tissue of the nodule, allowing the nitrogen-fixing rhizobia inside access to water. Interestingly, pea roots co-inoculated with both rhizobia and and *B. simplex* 30N-5 have larger nodules that develop more proto-vascular "veins" around the sides of the nodule. This is likely due to the auxin that *B. simplex* can secrete when associated with plant roots.



3RD PLACE (TIE) \$150 BOTANY 2011 STUDENT TRAVEL AWARD

ALAN FRANCK,

UNIVERSITY OF SOUTH FLORIDA

One night only.

The nocturnal flowers of *Harrisia regelii* are quite large (ca. 17 cm long x 10 cm wide) compared to the elongate stem (ca. 1-2 cm wide) which can be seen in the background on the right. From initial bud formation, the flowers may take a month to effloresce. Despite this they last only one night and begin to close and wilt the next day. Studying their flowers can be difficult unless under constant supervision, as here in cultivation.



TOMAS ZAVADA

UNIVERSITY OF MASSACHUSETTS

Pollinating chicory

Cichorium intybus (chicory) is a self-incompatible species, owing its genetic variety to the outcrossing nature. It means that pollen has to come from other chicory plants in order to produce seeds. This process creates genetic diversity in next generations. The closely related domesticated species *Cichorium endivia* (endive) is self-compatible. Endive is a crop only known from cultivation and has much lower genetic diversity compared to chicory. Genetically uniform crop strains are in wide use and one of the big challenges these days is to maintain the disappearing diverse varieties of crops and their wild ancestors.



THE BSA YOUNG BOTANIST AWARDS

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

The 2011 “Certificate of Special Achievement” award recipients are:

- Gracie Benson-Martin, University Of California, Berkeley - Advisor, Dr. Chelsea D. Specht
- Amanda Bieber, Old Dominion University- Advisor, Dr. Lytton John Musselman
- Melanie Brusky, University of Cincinnati - Advisor, Dr. Theresa Culley
- Sasha Dow-Kitson, State University of New York at Plattsburgh - Advisor, Dr. Christopher T. Martine
- Joseph Gallagher, University of Florida- Advisor, Dr. Douglas Soltis
- Rachel Germain, University of Guelph - Advisor, Dr. Christina M. Caruso
- Arthur Grupe II, Humboldt State University - Advisor, Dr. Terry W. Henkel
- Guillaume Chomicki-Bayada, University of Manchester - Advisor, Dr. Simon Turner
- Alexandra Knight, Walsh University - Advisor, Dr. Jennifer A. Clevinger
- Matthew Lettre, University of Tennessee - Advisor, Dr. Joe Williams
- Starr Matsushita, University of Puget Sound - Advisor, Dr. John Hanson
- William McKnight Moore, University of California, Riverside - Advisor, Dr. Darleen DeMason
- Irma Ortiz, University of California, Los Angeles - Advisor, Dr. Ann M. Hirsch
- Jaime Patzer, Willamette University - Advisor, Dr. Susan Kephart
- Nikisha Patel University of Connecticut - Advisor, Dr. Kent E. Holsinger
- Kristin Pearson, Colorado College - Advisor, Dr. Tass Kelso
- Megan Philpott, University of Cincinnati - Advisor, Dr. Theresa Culley
- Melanie Poole, Connecticut College - Advisor, Dr. T. Page Owen Jr.
- Gerald Presley, Eastern Illinois University - Advisor, Dr. Andrew S. Methven
- Alex Scharf, State University of New York at Plattsburgh - Advisor, Dr. Christopher T. Martine
- Klara Scharnagl, Florida International University - Advisor, Dr. Suzanne Koptur
- Lilly Schelling, State University of New York at Plattsburgh - Advisor, Dr. Christopher T. Martine
- Emily Scherbatskoy, University of Colorado, Boulder - Advisor, Dr. Pamela K Diggel
- Paige Swanson, University of Colorado, Boulder - Advisor, Dr. Stephanie Mayer
- Ericka Veliz, Salisbury University - Advisor, Dr. Ryan Taylor
- Seana Walsh, University of Hawai'i at Manoa - Advisor, Dr. Tom A. Ranker
- Keir Wefferling, University of Wisconsin, Milwaukee - Advisor, Dr. Sara Hoot
- Amanda Wildenberg, Eastern Illinois University - Advisor, Dr. Janice M. Coons
- Lindsey Worcester, Kansas State University - Advisor, Dr. Carolyn J. Ferguson

**CONGRATULATIONS TO ALL OF THIS
YEAR'S WINNERS!**



AMERICAN JOURNAL OF BOTANY: PUBMED, WEB 2.0, AND REVIEWING EDITOR BOARD

After many long months and with the strong support of BSA members and the Publications Committee, the *American Journal of Botany* has been selected to be indexed and included in the Medline/PubMed database (<http://www.ncbi.nlm.nih.gov/pubmed/>). This is good news for authors and researchers: PubMed is one of the leading sites used by researchers when conducting literature searches, and it is anticipated that BSA members and authors will reap great benefits from the increased and varied exposure provided. Deposits to PubMed will begin in June, and plans are in place to include previously published issues (back to late 1997, when *AJB* first officially went online). The *AJB* staff thanks everyone in the BSA who helped make this possible, including all the authors, editors, and reviewers who contribute to the journal on a regular basis, as well as those who submitted letters of support on our behalf as part of the application process.

Additionally, the *AJB*, with the help of the journal's online host, HighWire Press, is now a Web 2.0 site. Visitors to <http://www.amjbot.org> will immediately notice that the site is streamlined to be more user-friendly and to offer more features than in the previous Web 1.0 site. The flexible three-column design places many features at the visitor's fingertips without taking attention away from the core article content. Features most closely associated with the page content are placed closest to it, and this new platform allows the editorial staff more direct control over the site. Feedback and suggestions are welcome. Please contact the editorial staff at ajb@botany.org.

And finally, the editors and staff thank all of the applicants for the Reviewing Editor Board positions for the *AJB* Primer Notes & Protocols online-only section. The response to the call for applicants was fantastic. With the success and popularity of this section continuing to increase, these enthusiastic and knowledgeable graduate students and post-docs will help to strengthen the quality and turnaround time of papers and in return they will gain reviewing experience and mentorship from the section editors, as well as acknowledgment in the journal.



BSA ELECTION RESULTS LATE BREAKING NEWS



Congratulations - Toby and all!

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STUDENT REPRESENTATIVE
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STATE UNIVERSITY OF NEW YORK - PLATTSBURGH



BSA SCIENCE EDUCATION NEWS & NOTES



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

PLANTINGSCIENCE — BSA-LED STUDENT RESEARCH AND SCIENCE
MENTORING PROGRAM

PLANTINGSCIENCE RECEIVES PRESTIGIOUS SPORE AWARD

What an honor! What a tribute to scientist mentors! What an amazing journey! PlantingScience was honored to receive the AAAS Science Prize for Online Resources in Education (SPORE) Award. A key reason cited by Science for selecting PlantingScience is its effectiveness at bringing the science process to students in online collaboration with plant biologists. So this award belongs to the scientists and 14+ partner Societies.

Looking back to the Botany 2003 meetings when Dr. Bruce Alberts, then president of the National Academies of Science, challenged the BSA to help enhance science experiences in classrooms, the journey has been amazingly rewarding and timely. Education research documents the effectiveness of inquiry learning and the short-shrift plants receive. Agencies place cyberlearning as a priority, both for policy and funding initiatives. Teachers are clearly seeking out this kind of opportunity for their students to actively and productively participate in authentic science experiences (see example of student team projects). And, fortunately, botanists are unabashedly enamored with plants and eager to promote botanical literacy within science literacy concerns. Moreover, societies with an interest in plants see benefits of collaborating on outreach initiatives on education challenges of a national scope and scale.

It is thrilling to share this recognition with you. But it was a struggle to keep secret the good news we received back in August 2010 until the article was published on March 25, 2011.

Read the *Building Botanical Literacy* essay: <http://www.sciencemag.org/content/331/6024/1535.full>



ADDITIONAL PLANTINGSCIENCE ACADEMIC YEAR HIGHLIGHTS

Thank you! Much of the success of PlantingScience lies in your volunteer efforts, which bring students and their teachers into the science enterprise of doing science in collaboration with scientists. PlantingScience grew again this year, and brought plants to 63 classes across the country and even internationally. Over the Fall 2010 and Spring 2011 sessions, students in 15 middle school, 45 high school, and 3 college classes conducted plant investigations with online mentors.

We are extremely grateful to the dedicated scientists from the Botanical Society of America and our 14 Scientific Society partners who make PlantingScience possible.

Thanks for this unique learning experience about plants also come directly from the students to their mentors:

"... now i will take home the water [plant]and grow it to it's maximum! it was nice talking to you and i would be happy to let you know the results of the water plant after further research! thank you for helping us and challenging us to think" — Anderson School (middle school) student

"... Before this experiment I never really thought about plants and how they grow. But this was very interesting to me in seeing how factors like temperature effect germination and plant growth. Thanks for taking time out of your day to help us." — Kamehameha School (high school) student

"We just did our presentation to the class and I'd say it went pretty well! ... We all thank you so much for allowing us to explore the world of biology and plants! We were so lucky to get such a friendly and consistent mentor!" — C. Milton Wright High School student

"This project was a lot of fun and I learned a lot more than I thought I would. It was very cool to see our plants go from mere seeds to flowers in weeks. People like to think that humans are the most complex form of life, but in my opinion all living things are extremely complex and wonderful. Thank you for being our tutor. I'm grateful I had the chance to do this, it gave me an interest I never thought I'd have." — Nassau Community College student

During this academic year, the Brassica Foundations of Genetics module joined the Wonder of Seeds and Power of Sunlight as open to any interested teacher to choose. Field-testing, led by Curriculum Development Coordinator Teresa Woods, also continued this year on four modules: pollination, Celery Challenge, C-Fern®, and Arabidopsis genetics. An exciting international collaboration was part of the C-Fern® field-testing this spring.



BECOME A MENTOR - GET INVOLVED!
WWW.PLANTINGSCIENCE.ORG

STUDENTS GROW FERNS AND
FRIENDSHIP ACROSS THE ATLANTIC,
CONTRIBUTED BY T. WOODS

When spores from a special kind of fern were carried to The Netherlands this winter for the first time, more than plants grew. Sixth grade students from The Netherlands and Tampa, Florida, also developed friendships in an international collaboration by sharing their experiences growing ferns. Their work culminated in a videoconference between the students held Thursday, April 7. (see figure of Ferrell students viewing Dutch class and T. Woods images projected on large screen.)

After corresponding online for a number of weeks, the 12 to 13-year olds finally had the chance to speak to each other live on camera. They introduced themselves and shared about their science inquiries. At first a little nervous and very excited, students settled into asking each other questions about growing ferns, robotics competitions, daily living, and other interests. Students were well prepared with the help of their teachers: Sherri Cerni at Ferrell Middle Magnet in Tampa; and Arjan de Graaf at Bonhoeffercollege in Castricum, The Netherlands.

De Graaf reports, "PlantingScience feels like education for the 21st century, with plants and computers on the same table. The students enjoy working in a community showing their results to the world. There is much laughter in the classroom – science, knowledge, fun and creativity. For the first time I really regret having only two hours of biology in a week!" (see image of Dutch students asking Florida students a question via SKYPE.)



The project gave students "the chance to work in real biological lab conditions and provided an experience that has made them the envy of the entire sixth grade!" says Stan Kosmoski, science leader from the Ferrell Middle Magnet Center for Language Exploration and Global Communication in Tampa, Florida.

In February 2010, a Dutch web platform for PlantingScience (<http://www.nl.plantingscience.org/>) was launched by Edith Jonker from the Bonhoeffercollege. Wanting to learn more about PlantingScience, Jonker attended a two-week institute for teachers in Texas sponsored by the Botanical Society of America and Texas A&M University last summer.

Kosmoski and Jonker met last summer at the PlantingScience institute, and agreed to take the fern inquiry a step further and introduce their students online to each other. The thirty-two students from The Netherlands had a chance to practice their English, and those from Tampa, Florida, learned a lot about a small country across the Atlantic Ocean. Kosmoski notes that many of the twenty-one students of Ferrell Middle Magnet Center have never ventured beyond Tampa. "This opportunity allows my students to not only meet students from another country but also to find out that they really aren't all that different."



PLANT SCIENCE BULLETIN 57(2) 2011
PLANTINGSCIENCE SUMMER MEETINGS

June 23-30, 2011. College Station, TX: Summer Institute for Teachers

This June is the last Summer Institute for Teachers under our current NSF award (DRL-0733280). And what a wonderful capstone inquiry immersion experience is being planned by scientists Marsh Sundberg and Larry Griffing along with teacher leaders Kim Parfitt and Randy Dix! Carol Stuessy and her graduate students at Texas A&M University continue their fine job handling site coordination and education research.

July 9-13, 2011. St. Louis, MO: Botany 2011

Attend the Teaching Section presentations at Botany 2011 to hear perspectives on PlantingScience from a classroom teacher and education researchers. Kara Butterworth will share her students' experiences and showcase their projects. Co-PI Carol Stuessy and her graduate student Cheryl Ann Peterson present analyses of online interactions on the PlantingScience website and classroom observations of teacher implementations.

July 30, 2011. Melbourne, Australia: International Botanical Congress

Marsh Sundberg organized the "Rebuilding Botanical Capacity" Symposium at this summer's IBC. Claire Hemingway and Marsh Sundberg will share lessons learned thus far in PlantingScience by synthesizing project findings and research components conducted by Texas A&M University and BSCS collaborators.

THE PLANTS HAVE IT!
THE APRIL/MAY 2011 ISSUE OF *SCIENCE SCOPE*,
NSTA'S MIDDLE SCHOOL JOURNAL,
IS DEVOTED TO BOTANY.

**Biocultural Collections:
Establishing Curation Standards**

A workshop to be held during
the annual BSA/SEB meeting

**Botany 2011:
Healing the Planet**

July 9 & 11, 2011
Chase Park Plaza
Saint Louis, MO

For more information:
<http://ceeb.econbot.org/>

Sponsored by



Participants

Catrina Adams, Botanical Society of America
Serge Bahuchet, National History Museum, Paris
Michael Balick, The New York Botanical Garden
Robert Bye, National Autonomous
University of Mexico
Neil Crouch, Kirstenbosch National
Botanical Garden, South Africa
Sangay Demie, National Biodiversity
Centre, Britain
David Diarig, USDA National Center
for Genetic Resources Preservation
Chris Freeland, Missouri Botanical Garden
Gayle Fritz, Washington University
Vicki Funk, Smithsonian Institution
K. David Harrison, Swarthmore College
Peter Wyse Jackson, Missouri Botanical Garden
Linda Different Cloud, Montana
State University
Katie Konehar, Missouri Botanical Garden
Alyse Kuhlman, Missouri Botanical Garden
Etelmiria Linares, National Autonomous
University of Mexico
Terrance Martin, Illinois State Museum
Will McClatchey, Biocultural Research
Institute of Texas
Charles McManis, Washington University
Janie McPlesant, Cornell University
Mark Nesbitt, Royal Botanic Gardens, Kew
Deborah Pearnsall, University of
Missouri-Columbia
Matthew Robb, St. Louis Art Museum
Pai Shengji, Kunming Institute of Botany
Jan Salick, Missouri Botanical Garden
David Spooner, University of
Wisconsin-Madison/USDA
Jan Timbrook, Santa Barbara Museum of
Natural History



Doing an Ethnobotanical Survey in the Life Sciences Classroom

De Beer, J., and B.-E. van Wyk. 2011. *American Biology Teacher* 73(3): 90-97.

The Power of Plants: Introducing Ethnobotany and Biophilia into Your Biology Class.

Babian, C. and P. Twig. 2011. *American Biology Teacher* 73(4): 217-221.

Teaching Cultural and Botanical Connections: Ethnobotany with Tea.

Poli, D. 2011. *American Biology Teacher* 73(4): 242.

Are looking for an interdisciplinary in-road for botany in your courses? Consider ethnobotany. The three articles above provide a variety of ideas for diverse activities, to engage students with plants.

Moonstruck by Herbaria

Flannery, Maura C. *American Biology Teacher* 73(5):291-294.

As Maura notes, she is not a botanist, but she has recently been drawn to botany (and attended last year's BSA meeting in Providence) and to herbaria in particular. This "outsiders view" of herbaria is very perceptive and a concise argument for the value of herbaria to society, for science, and for education. It provides some history and background as well as some current trends and uses.

Teaching Principles of Experimental Design While Testing Optimal Foraging Theory

Schwagmeyer, P.L. and S.A. Strickler 2011. *American Biology Teacher* 73(4): 238-241.

For nectar-feeding insects, it is all about the food reward to maximize net energy gain per unit time, according to optimal foraging theory. The authors present an outdoor laboratory exercise manipulating nutritive value of flowers to aid students' understanding of designing and interpreting experiments.

Engaging Students in Natural Variation in the Introductory Biology Laboratory via a Statistics-based Inquiry Approach

Thompson, E.D., Bowling, B.V., Whitson, M., and R.F.C. Nazi. 2011. *American Biology Teacher* 73(2): 100-104.

Variation is core to students' understanding of diversity, and the diversity leaf morphology lends itself to student investigations. Seeking to make introductory biology lab activities more than show-and-tell, the authors describe a guided-inquiry that draws on plants of the Ohio River Valley, but could be adapted to other areas and to high school classes.

EVERYONE IS WELCOME!

SECOND ANNUAL
KAPLAN MEMORIAL LECTURE IN COMPARATIVE
DEVELOPMENT IN BOTANY 2011



The Kaplan Memorial Lecture Committee is proud to announce the Second Annual Kaplan Memorial Lecture in Comparative Development at Botany 2011. This year's speaker is Professor Ralph S. Quatrano who will speak on "Mechanisms of cellular polarity: a comparative approach from mosses to seed plants."

A ticketed cocktail reception will follow. Sign up at www.botanyconference.org



WHITE HOUSE AWARD FOR PLANT RESEARCH PRESENTED TO JEFFREY ROSS-IBARRA

Jeffrey Ross-Ibarra has been selected to receive the prestigious Presidential Early Career Award for Scientists and Engineers. Ross-Ibarra, an assistant professor in the Department of Plant Sciences at the University of California - Davis, and BSA member, was among 85 researchers chosen by President Barack Obama to receive the award, the nation's highest honor for professionals in the early stages of their scientific research careers. He will receive the award at a later date during a White House ceremony.

"I am quite humbled to be receiving such an honor in only my second year at UC Davis," said Ross-Ibarra.

He was nominated for the award by the U.S. Department of Agriculture for a research project that uses a novel approach, based on population genetics, to identify genes that would be useful in improving varieties of maize, also known as corn.

In this research project, Ross-Ibarra and his team plan to identify the genotype, or genetic profile, of 60,000 single nucleotide polymorphisms. These are genetic variations that occur when just a single nucleotide or building block in the DNA sequence differs.

As part of its nomination, the U.S. Department of Agriculture will provide Ross-Ibarra's project with \$150,000 in annual support for three years.

Ross-Ibarra's research program deals with the evolutionary genetics of adaptation in plants, with a particular focus on the study of plant domestication and the evolution of crop plants. His laboratory uses maize as a model crop for these studies.

"Much of this work uses population genetic modeling to investigate the importance of natural selection, gene flow and demographic history in patterning diversity and divergence in the maize genome," he said.

In addition to work on identifying genes important for maize domestication and improvement, Ross-Ibarra's lab is currently collaborating on a number of projects, including work on chromosome evolution and studies of natural populations of the wild ancestor of maize in Mexico.

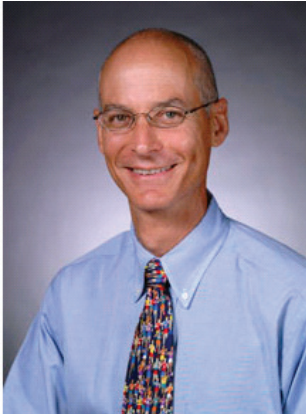
Ross-Ibarra's nomination from the U.S. Department of Agriculture noted that the plant geneticist has "an excellent track record of productivity ... and professional service." It added that, by focusing on maize, one of the most important crops for the U.S. economy, and on techniques that can be used with other important cereal crops, Ross-Ibarra's research will help "promote sustainability of U.S. agriculture and international food security, while enhancing the environment by reducing pressure on cultivatable land resources."

Ross-Ibarra and colleagues also are working to facilitate international scientific exchange through a program that will bring students from Mexico to work in U.S. laboratories, where they will study chromosome biology in maize. The exchange program is part of a research project, funded by the National Science Foundation, that focuses on completing the sequence and assembly of maize centromeres, the central region of chromosomes.

After earning his doctoral degree in genetics from the University of Georgia in 2006, Ross-Ibarra completed his postdoctoral research at UC Irvine. He also received a master's degree in botany in 2000 and a bachelor's degree in botany in 1998, both from UC Riverside. He joined the UC Davis faculty in 2009.



2011 AAAS FELLOWS



JONATHAN WENDEL

Wendel's research interests encompass molecular & genome evolution, phylogenetics, and phenotypic evolution of higher plants. He uses a diverse set of technologies and approaches to explore the manner in which genomes change over evolutionary time, as well as the relationship between these events and morphological change. His particular interest is in the mysterious and common phenomenon of polyploidy, with a special focus on the cotton genus



ROGER HANGARTER

Hangarter is interested in the physiological and molecular mechanisms by which plants perceive and respond to environmental stimuli. Together, light and gravity have profound effects on plant development and much of his research focuses on how plants integrate the information from these environmental stimuli in order to understand how various environmental sensory responses function and interact to coordinately regulate plant growth and development. Hangarter is also the lead creator of sLowlife, a dynamic multi-media exhibition that features time-lapse movies to show plants as living beings, sensing and responding to their environment.



WILLIAM (NED)
FRIEDMAN

Friedman's research is devoted to investigating the origin and early evolution of flowering plants (Darwin's abominable mystery). His primary focus is on the evolution of double fertilization and endosperm, two of the most important and defining features of flowering plants. He also has a strong interest in the first major radiation of photosynthetic life on land, that of the vascular plants.

CONGRATULATIONS, GENTLEMEN!



ANNOUNCEMENTS



COMING UP SHORT: ONLY 39 PERCENT OF NORTH AMERICAN ENDANGERED PLANT SPECIES ARE PROTECTED IN COLLECTIONS

The first comprehensive baseline knowledge on North America's plant conservation efforts just published

Washington, D.C. – Only 39 percent of the nearly 10,000 North American plant species threatened with extinction are protected by being maintained in collections, according to the first comprehensive listing of the threatened plant species in Canada, Mexico and the United States. Seed banks or living collections maintained by public gardens and conservation organizations across North America provide an insurance policy against extinction for many threatened species.

The North American Collections Assessment – conducted collaboratively by Botanic Gardens Conservation International U.S., the U.S. Botanic Garden, and Harvard University's Arnold Arboretum – found that 3,681 of 9,494 of North America's most threatened plant species are maintained in 230 collections. Much more collaborative work is needed to conserve North America's botanical wealth and to provide true protection against extinction, say the report's authors.

Andrea Kramer, Botanic Gardens Conservation International U.S. executive director, said, "These assessment results are hopeful, but also a call to action. For many public gardens, this report marks the first time their potential to assist in the conservation effort has been recognized. We hope this is a watershed moment."

"As the U.S. Botanic Garden, we felt a critical need for a common baseline of understanding among the entire conservation community," said Holly Shimizu, U.S. Botanic Garden executive director. "To move forward together to protect North America's native plants, we have to understand where we are today. Now that we know both what is threatened and what needs to be protected, there is a solid foundation on which to build future conservation work."

"One of the lessons we learned from this

assessment is how important it is to curate for conservation," said Michael Dosmann, curator of living collections at the Arnold Arboretum. "Curators and horticulturists have not always considered conservation value as they go about their routines. Yet by participating in this assessment, many for the very first time saw the direct value of their plants in bolstering efforts to conserve our threatened flora. We hope this becomes a new paradigm in collections management."

Assessment results indicate that North America did not reach the Global Strategy for Plant Conservation's (GSPC) Target 8 goal set in 2002 of protecting 60 percent of threatened plant species in collections by 2010. While botanical organizations across Canada, Mexico and the United States are making progress to achieve these targets, the report found that 3,500 or more additional threatened plant species will need to be added to current collections to meet the new GSPC goal of conserving 75 percent of known threatened species in North America by 2020. This will require nearly doubling the current capacity.

The assessment calls for the strengthening of conservation networks and collaboration in conservation planning and data sharing. Institutions are urged to contribute plant lists to BGCI's PlantSearch database and update them regularly. It is crucial to increase cooperation and coordination among a broad and diverse network of gardens and conservation organizations with different expertise and resources. To win this race against extinction, conservation organizations will need to prioritize the development of genetically diverse and secure collections to ensure meaningful protection of threatened plants.

Additional information and the full North American Collections Assessment can be found at www.bgci.org/usa/MakeYourCollectionsCount.

THE CATALINA ISLAND CONSERVANCY HERBARIUM (CATA) – CALL FOR INSTITUTIONAL EXCHANGES

Catalina Island is one of the eight California Channel Islands, located approximately 35 km southwest of Los Angeles. At 194 km², 88% of which is managed by the non-profit land trust Catalina Island Conservancy, Catalina is the third largest Channel Island and is the second tallest with an elevation of 639 meters. Mediterranean in climate, at least 8 defined plant communities (and up to 16) have been identified on the island, from coastal marsh, to island woodlands, to open grasslands. Over 400 species of plants are native to the island and nearly 200 non-native plants have become naturalized or are invasive on the island. The staff of the Catalina Island Conservancy Herbarium (CATA) is responsible for cataloging the plant diversity of Catalina Island as part of a long term, integrated plant management and conservation program. In addition to documenting the unique and varied plants of the island, CATA staff is interested in building the herbarium as a research and education tool. Herbaria specializing in plants of the California Floristic Province as well as herbaria with Mediterranean climate floras are encouraged to enter into reciprocal exchanges with CATA. For more information about CATA please see our listing at Index Herbariorum, <http://sweetgum.nybg.org/ih/herbarium.php?irn=158628>. For additional information on the Conservancy and Catalina Island or to establish an exchange, please contact the curator, John R. Clark, Ph.D., at herbarium@catalinaconservancy.org, 310.510.9544, PO Box 2739, Avalon, CA 90704, USA.



WELCOME NEW BSA STAFF MEMBERS



DR. CATRINA ADAMS
EDUCATION TECHNOLOGY COORDINATOR

Catrina joined the BSA in March 2011 after working as an instructor for the Missouri Botanical Gardens, where she helped to run a field science training program for St. Louis area high school students and taught classes on the ethnobotany of native Missouri plants. In 2009, Catrina received her Ph.D. from Washington University with a focus in paleoethnobotany. For her dissertation she studied seed remains from a Viking Age/Medieval farm site in Scotland's Orkney Islands to learn more about agricultural and land use changes over time. She has a strong interest in inquiry learning, teaching technologies, and helping students to experience authentic scientific research. Her focus at the BSA is to continue to grow and improve the PlantingScience program and to enhance interactions among the program's scientists, teachers, and students.

BIRGIT SPEARS
DEVELOPMENT DIRECTOR

Birgit brings a broad set of skills to the BSA with her combined experience in development and marketing communications. Prior to joining the BSA, Birgit helped design and launch a comprehensive brand and capital campaign plan for a non-profit broadcast and media arts organization in St. Louis. Earlier in her career, she launched a non-profit visual and performing arts organization in New York City that served artists from around the world. In addition to her non-profit experience, she has also worked in the private sector with marketing agencies and international technology companies where she was responsible for communications strategies and business development. Birgit's focus at BSA will be to assist with developing relationships to increase awareness and funding opportunities through corporate and foundation giving, and to further develop strategic partnerships, and committee memberships that will help achieve the long-term goals of the BSA.





MEETINGS



CYCAD 2011 MEETING IN SHENZHEN, CHINA.

The 9th International Conference on Cycad Biology is being hosted by Fairylake Botanic Garden in Shenzhen, China, on December 1-7, 2011. Held every three years, this cycad meeting brings together scientists, professionals, and dedicated enthusiasts to share their work, catch up with each other and learn the latest findings from the field, garden and laboratory. Under the auspices of the IUCN, the Cycad Specialist Group also holds their regular meeting at this conference. Cycad 2011 is truly a “rare event,” with so many world cycad experts and enthusiasts together in such a unique place. We write to enthusiastically encourage you to be a part of Cycad 2011. No other meeting this year will focus on this beloved group of plants, with such depth, breadth, expertise and interest.

THE CONFERENCE PROGRAM

The Cycad 2011 Organizing Committee is building the conference around eight themes: (1) Genetics and Genomics, (2) Conservation, (3) Taxonomy and Phylogeny, (4) Ecology, (5) Horticulture, (6) Toxicology, (7) Economic Botany, and (8) Information Management. In addition to presentations, Cycad 2011 will include networking opportunities, cultural events, a tour of Fairylake Botanic Garden and the Chinese National Cycad Conservation Center, and a field visit to a native *Cycas fairylakea* population. A Post-Conference Field Tour will also feature visits to native populations of *Cycas debaoensis*, *C. dolichophylla*, *C. ferruginea*, *C. sexseminifera*, *C. segmentifida* and other species.

FAIRYLAKE BOTANICAL GARDEN

Fairylake Botanical Garden is a world-class horticultural treasure which sees millions of visitors per year, in a unique tropical landsite covering 590 hectares (1,457 acres). As part of the Chinese Academy of Science, a very active and robust research program at Fairylake focuses on plant biology and horticulture, and this augments the garden's conservation efforts. The Chinese National Cycad Conservation Center is located at Fairylake Botanical Garden, and includes extensive conservation plantings in a beautiful valley setting, as well as a collection of spectacular dwarf cycads on display in a unique courtyard as well as an extensive horticulture program. The cycad

collection at Fairylake is unique in breadth, depth and beauty. Extensive conservation horticulture of *Cycas debaoensis* is a leading project, among many other rare *Cycas* species being propagated at Fairylake. Fairylake Botanical Garden also hosts the Shenzhen Paleontological Museum, home to many spectacular fossils centered on an enormous 20 meter Sauropod, *Mamenchisaurus jingyanensis*. The museum's outdoor exhibition features one of the world's finest collections of fossilized wood from China and around the world, beautifully arranged as living forest, and landscaped with tree ferns, cycads, podocarps and other architectural plantings.

SHENZHEN

Shenzhen is a young, vibrant city that has been recognized for its foresight in city planning and its leadership in civic horticulture. Extensive space is devoted to public parks, well-designed roadside landscapes, vibrant floral displays and impressive groves of palms and flowering trees. Shenzhen is a leader in innovating “Green Roofs,” and rooftop gardens are increasingly common. Shenzhen has recently been recognized as a “Garden City” and a “Green City” for these accomplishments.



TRAVEL TO CYCAD 2011

Travel to Shenzhen is quite easy. Shenzhen city is situated adjacent to Hong Kong in south China. A ferry terminal located within Hong Kong International Airport (HKIA) offers regular service without clearing Hong Kong customs. Ferry service from HKIA to the Shekou port takes just under one hour, and runs more or less hourly between 9:00 and 21:20. Visitors can check luggage directly to Shekou Port. Visitors will require a Chinese visa, which is easily obtained through a number of service providers. Fairylake Botanical Garden is arranging transport for conference delegates from the Shekou port to the Conference hotel. In addition, express or MTR (Mass Transit Railway) is also available from HKIA to Shenzhen Luohu Station or Huanggang Customs, or directly to some hotels.

For more information

Please see the conference website at www.cycad2011.com for more information, including dates, registration info, and important conference announcements.

We look forward to seeing you

Please make your plans right away -- We look forward to seeing you at Cycad 2011!

GLOBAL STRATEGY FOR PLANT
CONSERVATION CONFERENCE
TO TAKE PLACE AT THE
MISSOURI BOTANICAL GARDEN
CONFERENCE TO ADDRESS
WORLDWIDE GOAL TO ADVANCE
PLANT CONSERVATION

The Missouri Botanical Garden will host the 2011 Conference of the Global Strategy for Plant Conservation, bringing together plant conservation scientists, policy makers and practitioners from all over the world to share methods and results that will advance plant conservation measurably. This conference, titled "Supporting the worldwide implementation of the Global Strategy for Plant Conservation," is organized by the Global Partnership for Plant Conservation (GPPC) in association with the Secretariat of the Convention on Biological Diversity (CBD) and Botanic Gardens Conservation International (BGCI). The conference is expected to attract a wide range of participants to share their experiences and further the development of plant conservation action in this the U.N. Decade of Biological Diversity.

"The adoption of the updated Global Strategy for Plant Conservation in 2010 provided a new challenge for the world to halt the loss of plants by the year 2020," said Missouri Botanical Garden President Peter Wyse Jackson. "If we are to be successful in this work, we need to be clear about our individual priorities and responsibilities."



In October 2010 in Nagoya, Japan, the 10th Conference of the Parties of the Convention on Biological Diversity adopted a decision incorporating a consolidated update of the Global Strategy for Plant Conservation (GSPC) from 2011 through 2020, including 16 targets for plant conservation to be achieved by 2020. The role of the Global Partnership for Plant Conservation is recognized by the CBD in supporting GSPC implementation worldwide; the conference at the Garden aims to help guide future plant conservation priorities.

The conference will assist in efforts made to expand and evaluate progress in implementing the GSPC from 2002 to 2010 and how these experiences can support enhanced implementation over the coming decade. Examples will be shared from around the world on GSPC implementation, particularly during the period 2002 to 2010, to provide guidance and support for national and regional GSPC implementation entering into the new phase. Sharing experiences will assist those that are setting national targets for plant conservation or using the GSPC and CBD Strategic Plan to provide a flexible

framework for their efforts in plant conservation at all levels.

Attendees will support the ongoing efforts to consider and develop further the technical rationales, milestones and indicators for the GSPC up to 2020 and synchronize with the Strategic Plan for Biodiversity 2011-2020. In addition, attendees will help evaluate a draft GSPC toolkit that is being prepared to support GSPC implementation at all levels prior to its submission for review by the Convention.

The conference will also provide an opportunity for strategic discussion on mainstreaming plant conservation in national development agendas, such as including links to the implementation of the CBD's Strategic Plan as well as providing guidance and suggestions for countries that are updating National Biodiversity Strategies and Action Plans (NBSAPs) to include the targets of the GSPC.

Finally, the conference aims to build leadership amongst the participating organizations for monitoring and delivery of the GSPC targets going forward.

"I have no doubt that this conference will help to set a working agenda for many participating organizations worldwide," said Wyse Jackson.

With scientists working on six continents in 35 countries around the globe, the Missouri Botanical Garden has one of the three largest plant science programs in the world, along with The New York Botanical Garden and the Royal Botanic Gardens, Kew (outside London). The Garden focuses its work on areas that are rich in biodiversity yet threatened by habitat destruction, and operates the world's most active research and training programs in tropical botany. Garden scientists collaborate with local institutions, schools and indigenous peoples to understand plants, create awareness, offer alternatives and craft conservation strategies. The Garden is striving for a world that can sustain us without sacrificing prosperity for future generation, a world where people share a commitment to manage biological diversity for the common benefit.

For more information on the Global Strategy for Plant Conservation Conference, visit: www.mobot.org/gppc2011

For more information about the Missouri Botanical Garden visit: www.mobot.org. The Missouri Botanical Garden is located at 4344 Shaw Blvd., St. Louis, Missouri, 63110

NOTICE FOR A RECENTLY PUBLISHED
ETHNOBOTANICAL STUDY

***That Hard Hot Land: Botanical
Collecting Expedition in the Anglo-
Egyptian Sudan, 1933-1934.***

Mary L. Keenan.

2011. ISBN: 978-0-9564910-0-8 (Cloth
£52plus post & package)

416 pages, 22 maps, 270 photographs.

Published by the author.

Between December 1933 and April 1934 three very different men travelled 6000 miles through western and southern Sudan by train, motor car, lorry, river steamer, donkey, and on foot. The expedition aimed to investigate the relationship between the vegetation and soil through a strip of country with similar temperatures but with great variations in rainfall.

James Edgar Dandy, botanist at the British Museum, Natural History Department (later Head Keeper of Botany), wrote a diary, took over 300 photographs and collected over 700 plants. Dunstan Skilbeck, lecturer in Soil Science at Oxford University (later Principal of Wye College, London), collected numerous soil samples and wrote a diary. Cecil Graham Traquair Morison, lecturer in Soil Science at Oxford University, was leader of the expedition (continued to lecture at Oxford, and undertook further ecological surveys in Africa, including the Sudan).

Accompanying them were six local men, employed as cook, drivers, and servants. Dandy's diary and field notebook, short and to the point, are supplemented by his photographs and letters, and complement Skilbeck's longer, more colourful and descriptive diary. The diaries record the work undertaken, the terrain, people met, daily hardships, humour, aggravations, conversations, soul searching, and life changing events.

A ten day trek to the volcanic caldera of Jebel Marra, Darfur is described with geological, botanical, and ethnographical observations. Journeys are described, hunting with local tribes, fishing, and shooting for bushmeat. Tribes and their customs, chiefs, government officials, governors, district commissioners, doctors, teachers, tourists, missionaries, and all others met during the expedition; as well as agriculture, water, cotton growing, salt mining, experimental fruit farms, roads and railways, hospitals, schools, and much more, are described and researched.



REPORTS AND REVIEWS



Market Botany: A plant biodiversity lab module

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Submitted 24 January, 2011

Accepted 26 April, 2011

ABSTRACT

Market Botany is a variation on an approach many instructors of plant diversity have employed: using the grocery store as a teaching space (see Appendix A). This version, included as a module in my Field Botany (BIO 345) course at the State University of New York at Plattsburgh since 2007, meets experiential curriculum objectives by employing a group research experience during which the grocery store is used as “the field” for a biodiversity survey. Students are introduced to general concepts in community ecology, in concert with learning objectives related to plant diversity and economic botany.

OBJECTIVES:

- Students recognize the diversity of plant species/groups we use as foods and in other products through an experiential learning process.
- Students evaluate the importance of certain plants over others in terms of human usage.
- Students become familiar with the taxonomic hierarchy of the Plant Kingdom, including key families and orders.
- Students learn to compute and compare measures of species richness and relative abundance.
- Students access and utilize current hard copy and electronic resources for taxonomic information.

CENTRAL CONCEPTS:

Humans use an impressive number of species, but we also rely heavily on only a small number of species/families for much of our caloric intake.

The importance of certain taxonomic groups above others is perhaps less about chance than it is related to the combination of evolutionary history within lineages and thousands of years of agricultural and horticultural activities (including the selection of desirable characteristics within crops) by humans.

Communities of organisms (the market plant “community” used as a proxy) can be quantified in terms of the taxa of which they consist. These calculations can be useful in drawing comparisons within and between communities, and can generate new hypotheses.

MATERIALS:

- Recording materials (notebooks/writing boards, pencils/pens)
- Taxonomic resources (books and computer access)
- Excel or other spreadsheet software
- Transportation to site (we use institutional vans)

INTRODUCTION

The Market Botany lab module has been run with up to 20 students at a time. The activity can be used as a field trip in any botany course above the 100 level or modified and used as a lab-based activity (and then perhaps serve a larger class size). As presented here, the module consists of three parts, the first two completed during a 3-hour lab period and the third done for homework.

An underlying pedagogical concept here is one I try to employ in all of my botany coursework: Students are more likely to remember subject matter if they have a personal connection with the material. The value of this approach was impressed on me as an undergraduate student by Dr. Roger Locandro, Rutgers University, who never missed an opportunity to feed to us the very things we were learning about. Although students are not eating from the shelves during this module, per se, this activity does connect taxonomic/biological concepts and names with their personal experiences of familiar foods and products.

Permission from the store should be sought for the market survey. I contact the manager of our local grocery store a few weeks before our scheduled visits so that he can clear the activity with the chain's corporate office. I have never been denied permission, in part because we do not violate the three main requests of the store manager: 1) No photos are taken in the store, 2) The activity should not interfere with customer access to products (time of day can be an important factor), and 3) When we leave, shelves and displays look the same as they did when we arrived. The latter request is easily met by reminding students to put products back exactly as they were found, including facing the fronts of packages/cans out.

ACTIVITY:

PART ONE (STORE SURVEY) 60-80 MINUTES (NOT INCLUDING TRAVEL TIME):

Summary: Students explore the diversity of plant-based products available for sale at a local grocery store by recording the names of plant products they encounter. How botanically diverse are the products we use everyday?

METHODS:

After a brief introduction to the activity and the goals of the visit, students/teams are given pre-assigned sections of the store (usually by aisle). This is easiest to do if you are already familiar with the store you visit for class, something that is possible through one pre-class visit. Deciding who to assign where and who will work individually is an important step and should be done based on your knowledge of each student's ability and personal interests – and with some attention to who works well with who.

Students are told to keep a cumulative list of the species they encounter in their assigned aisle by reading labels and ingredient lists. Given the content of my course, the students already know something about the use of common versus Latin names – including how to properly format the latter. Because of this they quickly recognize the inconsistencies in the way plant names are included in product ingredient lists (the bane of nomenclaturally-inclined botanists everywhere!).

Once the students record a species they should not do so again. While many plant names will be obvious, others might be more difficult to recognize. I tell them it is better to record something they think could be a plant name then to leave it out; quality control can wait until the master list is compiled back in the lab. Although they are sent blindly into the data collection, there is a benefit to this approach (see later). My role during the survey is to move throughout the store, checking on each group/student and occasionally offering assistance or making sure that they have recorded rare-occurrence species that might otherwise be missed (e.g., “Did you get this guarana soda over here?”).

The students are highly unlikely to catch every species, given the short timeframe and their varying levels of knowledge. My goal in the activity is not to make an exhaustive list, but to gather enough data points such that the results can be accepted with confidence.

I prefer to let the students record their data in the fashion they find most agreeable, but a standardized datasheet could just as easily be generated and provided. The keys are to gather the data quickly, prevent your participants from feeling frustrated or overwhelmed, and encourage them to become invested in the quality and comprehensiveness of their datasets.

The class is typically divided among the following aisles of the store (and these then become categories of use to be evaluated later):

1. Deli/bakery
2. Produce
3. Pharmacy and health
4. Beauty/cleaning
5. Pet and baby
6. Chips/soda/seasonal
7. Candy/nuts/crackers
8. Pasta/canned vegetables/condiments
9. Tea/ethnic/soups
10. Baking, spices + Dairy/beer (2 aisles)
11. Cereal/juices/canned fruits
12. Bread/jellies/frozen desserts
13. Frozen vegetables/entrees

Not assigned: Floral (plenty of interesting things, but too many species without identification labels).

Some sections are more challenging than others, whether by the volume of products or diversity of ingredients they contain (e.g., pharmacy, ethnic). The produce section has many species, but they are all obvious and easy to record. Other sections might be more difficult, so I find it best to try to match those assignments to students with a strong botanical background or specific interests. Pharmacy/health is both rich in plant products and inclusive of “oddball” species that may not be recognizable to all students; this is a good assignment for the student(s) with an interest in pharmacology, medicine or other health-related fields. Pet Food is surprisingly species-rich and a good match for the student with an interest in veterinary or animal science. Well-travelled students, lovers of ethnic food and international students do well in the Tea/Ethnic section. The beer section..... Well, that one isn't hard to find a match for (actually, it's a great assignment for a home-brewer).

My students are usually wrapping things up within about an hour and will record on the order of 230 species in that time. This may seem surprisingly rapid, but the cumulative nature of the lists makes for many unrecorded repeats. The first students to finish their sections are sent to assist classmates who are still working. Once most groups are done, I send them to the coffee counter (store managers like it when you also spend some money before you leave) and help anyone still recording to finish up.

Once all of the data are collected and just before we leave the store I ask them to spend the trip back to campus discussing what they observed and what they think the most important groups might be. Then we're in the vans and back to the classroom for Part Two (which could just as effectively be done on a later class day).

If transporting your class to a store is problematic, here are two options: 1) Collect the data yourself (or offer extra credit for a group of students to gather the data), then start the process at Part Two, or 2) Create your own “market” in the lab by stocking selected products in the teaching space, an approach by which one could limit the number of species recorded and/or drive the direction of the analysis.

PART TWO (TAXONOMIC RESEARCH AND DATA ENTRY), 45-80 MINUTES:

Summary: Students research the taxonomy of the plants they recorded during the survey and enter that information into a common spreadsheet. Do our data support the observations/assumptions we made while recording?

METHODS:

In the classroom/lab, the list of species is now actively entered into a common spreadsheet managed by the instructor and projected onto a screen so the class can follow along. The spreadsheet has the following headings: species name, family, order, upper taxonomic group (see below), and one heading per category of use (in this case, each use category is an aisle of the store).

TASKS:

Record the occurrence of each species (and the sections in which each was recorded) on the common spreadsheet, using one row per species and one column per survey team (so one column per store aisle). An individual species may thus be recorded (by entering a “1”) in more than one survey column, thus providing us with both a list of species and a record of the total occurrences of each species. Using a “1” for each occurrence allows the students to easily sum up columns later (just by clicking the column). As each student/team reports this information to the instructor, the class starts searching for and recording:

- Latin name for each species.
- Family each species belongs to.
- Order each family belongs to. (It is worth noting here that Family and Order definitions may vary depending on the resources the students use. My tendency is to lean towards the designations used in the latest edition of the textbook I use in our plant systematic course (currently Judd, et al.) in order to maintain consistency.
- “Upper Taxonomy” of each Order (Algae, Bryophytes, Fern Allies, Ferns, Gymnosperms, Monocot Angiosperms, Non-monocot Angiosperms. (It is a given that “algae,” “fern allies,” “ferns,” and “dicots” are all problematic names. “Non-monocot angiosperms” can be used in place of the now-obsolete term, “dicots,” but the others are still used here – and addressed by me in this and other courses as appropriate.)

Resources (Truncated list; many others appropriate):

Key books in the lab include:

- Judd, et al., *Plant Systematics*, Sinauer
- Simpson, *Plant Systematics*, Elsevier
- Zomlefer, *Flowering Plant Families*, Chapel Hill
- *The Complete Food Guide*, Könemann
- Mabberley, *The Plant Book*, Cambridge
- Vaughan and Geissler, *New Oxford Book of Food Plants*, Oxford U. Press

We also book the departmental computer lab for this period and encourage the use of key web resources, including:

- International Plant Names Index (IPNI)
- USDA PLANTS Database
- Tropicos (Missouri Botanical Garden)

The process of making the list takes time, patience, and organization. I find that the process is done most efficiently if I am the only recorder, with the students reporting to me. I can keep track of what species have been entered, where each species was recorded, and, later, serve as the check point and quality control for taxonomic entries. In cases where the information they find is conflicting, I act as final arbiter.

The research process is where I see the benefit of not telling the students anything about the plants before they started making lists. It is far better for them to discover on their own the several crops that come from Brassica oleracea, or the multiple varieties of the same species of Citrus or Malus, or that cilantro and coriander are the same taxon.

PART THREE – ANALYSIS (HOMEWORK):

Summary: Students quantify their results by calculating measures of species richness and relative abundance. Do some groups contribute more species for our use?

METHODS:

The final Excel datasheet is posted on-line and downloaded by each student. The posted data are used to determine the following:

- Richness: Count the number of species occurring in the community. How many species are recorded for each Upper Taxonomic Group, Order, and Family?
- Relative abundance: Count the number of species occurrences (how many columns each species is recorded in), then calculate the percentage a species contributes to the total number of occurrences. Occurrence in an aisle/section is treated the same as would be the occurrence of an individual of a species in a wild community.

The students are asked to prepare a 2-3-page summary of their results, including a discussion of what the most economically important groups are across all taxonomic levels (as defined by how common they were in the store). They are also asked to compare the conclusions they reach from each of the two community measurements. Do we learn something different if we consider not just whether a species is present (is used by people), but how often it occurs (used in multiple ways)? The concept of the “ecological community” is something we use throughout my Field Botany course, so the students are familiar with it and are able to make the leap required to apply the concept here. In another type of course students may need additional clarification on what communities are and the measurements used to describe them.

OUTCOMES:

Most students expect to find that the grass groups (Poales, Poaceae) will lead the lists for both richness and abundance – in part because of all they have heard about the dominance of corn, rice, and other grains in terms of agricultural input and annual calories consumed. Although they are surprised by the importance of other groups, their awareness of Poales/Poaceae facilitates a better understanding of the differences between richness and relative abundance (see results below). Both Poales and Poaceae move up their lists of most important groups when considering abundance rather than richness. A truly comprehensive survey of every Poales/Poaceae occurrence in the store (by product rather than aisle) would surely send those groups to the very top of the abundance lists.

Many students also casually hypothesize that the number of species encountered should be relatively

low, having read books like Michael Pollan's "Omnivore's Dilemma." To their astonishment, my fall 2010 group listed 234 species (even while missing some species that were present). This outcome gave them a greater appreciation for the diversity of plants we use, even though the community calculations provide evidence that much of that use comes from only a handful of taxonomic groups. An additional worthwhile discussion could focus on the fact that the total number of species they encounter in one store, while impressive, is still but a fraction of the potentially-useful plants on Earth.

EXAMPLE RESULTS (FALL 2010 SEMESTER)

Richness:

Total: 234 species (from 78 families)

Upper Taxonomic Group

- Non-monocot Angiosperms: 189 species (80.8% of total)
- Monocot Angiosperms: 37 (15.8%)
- Gymnosperms: 4 (1.7%)
- Algae: 4 (1.7%)

Top Orders

- Asterales: 20 species (8.6% of total)
- Fabales: 20 (8.6%)
- Lamiales: 15 (6.4%)
- Rosales: 14 (6.0%)
- Poales: 13 (5.6%)
- Brassicales: 13 (5.6%)
- Violales: 13 (5.6%)

Top Families

- Asteraceae: 20 species (8.6%)
- Fabaceae: 17 (7.3%)
- Rosaceae: 14 (6.0%)
- Lamiaceae: 14 (6.0%)
- Poaceae: 13 (5.6%)
- Brassicaceae: 12 (5.1%)

Relative Abundance:

Total occurrences: 868

Top Upper Taxonomic Group:

- Non-monocot Angiosperms: 65.0% (563 of 868)

Top Orders:

- Rosales: 35.0% (82 of 868)
- Poales: 28.6% (67)
- Fabales: 20.5% (48)
- Lamiales: 18.3% (43)
- Asterales: 17.0% (40)

Top Families:

- Rosaceae: 34.1% (80)
- Poaceae: 28.6% (67)
- Fabaceae: 18.3% (43)
- Lamiaceae: 17.9% (42)
- Asteraceae: 17.0% (40)

Top Grocery Aisles (percentage of total species occurring in a given aisle)

- Produce: 38.9%
- Tea/Ethnic/Soup: 33.3%
- Pharmacy/Health: 33.3%
- Cereal/Juices/Canned fruits: 23.9%

FINAL THOUGHTS:

Students in my Field Botany course, a semester-long experience that includes visits to numerous sites in the Adirondack and Lake Champlain regions, consistently rate the Market Botany module as one of their favorite activities. Perhaps more importantly, they also consider it to be one of the course experiences where they learn the most. The module usually changes the students' view of their world, generating comments like, "I will never walk through the grocery store the same way again."

There are numerous potential extensions to this module, including:

- Choose a commonly used family and offer example products for tasting/smelling. Ask the students to consider why this group has become commonly used and whether the reasons are tied to the phylogenetic history of the group (e.g., secondary compounds in Brassicaceae and Lamiaceae and whether the biochemical characters are synapomorphies for each family).
- Closely examine the horticultural history and

cultivated varieties of a species like Brassica oleracea, using the multiple forms as case studies in plant morphology or breeding.

- Run the same survey and analysis in a second grocery/market in a different geographic, cultural or socioeconomic locality and compare the results; or have a discussion of how the results would differ if the study was done in a different place.
- Reconsider the list of plant species recorded and separate them by whether they are consumed or used in some other fashion. Do the calculations change?
- Discuss the causes and consequences of reliance on a relatively few species/groups, perhaps by integrating films such as “King Corn,” or “Botany of Desire.”
- Expand the community analysis component by also generating diversity indices and measures of dominance; or compare the results of the market survey with results generated by a true field survey.

Thanks to Curt Gervich, F. Daniel Vogt and three anonymous reviewers for comments on the manuscript; and to Casey Binggeli, Jillian Post, Alex Scharf, Tim Shearman and Megan Ward for sharing thoughts about participating in the module as students.

Appendix A. Selected references for previously-published articles relating to the use of markets/stores as learning spaces for biology courses.

Arnott, H.J. 1965. Supermarket plant anatomy. *American Biology Teacher* 27: 104-105.

Burrows, G.E. and J.D.I. Harper. 2009. Supermarket botany. *Teaching Science* 55: 47-50.

Clifford, H.T. 2010. Seeds and shopping centres. *The Victorian Naturalist* 127: 11-14.

Irwin, H.S. 1977. Grocery store botany. *The Curator* 20: 5-14.

Thompson, L.K. 1993. Grocery store botany. *Tested Studies for Laboratory Teaching* 14.

Rahn, J.E. 1974. *Grocery Store Botany*. New York: Atheneum.

Reflections on the life and legacy of Richard Evans Schultes

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For many ethnobotanists, talking about Richard Evans Schultes is like talking about god – and how could one even attempt such a thing, especially so when one has never had the privilege to meet the man? This was a challenge I faced when being asked to contribute a lecture on Richard Schultes to the “Botanists in New England” Symposium of the Economic Botany and History Sections of the Botanical Society of America in 2010. My initial strategy, and perhaps the only way to appreciate Schulte’s thinking, was to simply head out into the field, somewhere in the upper Amazon, to collect plants and think about how to meet this challenge.

Apart from “One River”, Wade Davis’ biography of Schultes (Davis, 1996), astonishingly little has been written about the founder of modern ethnobotany. Even the most complete bibliography in the obituary by Prance (2001) is far from presenting a complete picture of Richard Schultes’ extensive writing. How could it happen that the “father of ethnobotany” is nowadays often unknown to students, and maybe only vaguely known to colleagues, despite his reputation as the man who “discovered” almost every single psychoactive species known in the New World?

For example take myself. When starting my ethnobotanical work, a friend asked me “So, do you know Richard Scholtees?” (at least that is how his name sounded to me, and the mispronunciation certainly did not help I simply had no clue who that might be). So, “Richard who?” was my understandable answer. Schultes himself would most certainly have flinched at the mangling of his name. He was very well known for insisting on the correct spelling and pronunciation of Latin, Greek, and any other language.

Who was this man, who collected over 25,000 botanical specimens, wrote two dozen books and almost 500 scientific papers?

Schultes, pronounced like the “u” like “o” in “who”, and the “e” like “e” in “the,” had an unlikely background for someone who was to become the world’s most famous ethnobotanist. Born in 1915 to a poor working class family in East Boston with German and English roots, , Schultes excelled at school, especially in the Classics, and ultimately earned a stipend to attend Harvard Medical School in 1934. Looking to fulfill his pre-med science requirements, he happened to walk into Oakes Ames’ Economic Botany class, a fateful event that determined the course of the rest of his life.

When asked to review an ethnobotanical study for a class assignment, Schultes, hard pressed for time, grabbed the thinnest volume on the book desk: “Mescal – the divine plant and its psychoactive effects” by Heinrich Kluever, and literally got hooked. The very next class Schultes asked Ames if he could write his thesis about the plant, and from this point his research life inevitably took on a different character.

In 1936, Schultes, together with colleague Weston LeBarre, piled into an old Studebaker and headed west from Massachusetts to Oklahoma to study peyote use amongst the Kiowa. It is hard to imagine how difficult it must have been in those days to make such a trip. Over endless days on rutted roads the car broke down constantly. What also made the trip unusual was to have a botanist going into the field to talk to people. Botanists traditionally ventured out to collect plants. “Collecting stories” was more the task of anthropologists or linguists - “soft scientists” - as many molecular oriented biologists still believe. On this trip, a botanist and an anthropologist were working together! For Schultes, the experience of being in a strange setting under the full effects of the *Lophophora* compounds, must have quite profound. Photographs from the journey, nevertheless, always show a perfectly groomed Schultes, while LeBarre definitely shows the effects of all-night Peyote ceremonies. This was to become a trademark of Schultes: always conservatively and correctly dressed, rather more like a Victorian professor than somebody who during the 60s would lecture on mind-altering substances. Only one year after his first trip to the Kiowa, the young Schultes was found testifying to congress in support of the legalization of peyote in traditional ceremonies. Quite a stand for a young, unknown botanist.

Despite his conservative appearance (Schultes is rumored to have always voted in presidential

elections for Elizabeth II as a write-in candidate and always lectured in coat, tie, flannel trousers and a white lab coat) Schultes was a great advocate for personal choice. He abhorred government interference in one’s personal life and decisions, and despised the Kennedy clan, whose patriarch made his fortune in bootlegging during prohibition, when the brewery Schultes’ father was working at was forced to shut down.

After finishing his undergraduate thesis on the Kiowa’s plant use, young Schultes immediately embarked on another project, the identification of “Teonanacatl” and “Ololiqui”, two plants sacred to the Aztecs that so far had defied attempts to scientifically identify them. The task led Schultes, by any kind of transport imaginable, deep into the then most remote corners of Mexico. In a remarkably short time, the young botanist managed to solve a mystery that had confounded colleagues for centuries. Teonanacatl turned out to be a group of mushrooms, mostly *Psilocybe* spp. and *Panaeolus* spp., while Ololiqui was identified as *Turbinia corymbosa* (L.) Raf., a Morning Glory. Both contained essentially the same psychoactive compounds chemically similar to LSD, and it would take more than 60 years to prove that the Psilocybin in the seeds of *Turbinia*, identical to the compound found in “magic mushrooms,” is in fact produced by a fungus that frequently infects the plant, rather than by the vine itself. The re-discovery of the identity of these two Mexican hallucinogens by Schultes earned him a PhD. in 1941; his work would later become the foundation of the psychedelic era, when colleagues like Timothy Leary dug up Schultes’ papers on the subject, started to experiment with the plants, and made the properties of the plants known to the public. Schultes himself would always criticize the recreational use of plants and their psychoactive compounds. This, however, did not keep him from traveling the states to defend students accused of smoking Marijuana. His argument was simply that *Cannabis indica* (the prohibited species) was in a ground up stage not distinguishable from *Cannabis sativa*, which was still widely grown for fibers and perfectly legal at that time. This effort certainly added to Schultes’ fame amongst students and colleague.

After finishing his PhD in 1941, Dr. Schultes faced two choices: Either start teaching at a small college, or accept a government assignment to head to the Amazon to collect data on arrow poisons. Taking Oakes Ames’ advice - “If I were a young man

beginning my career all over again, I should try through intensive research in economic botany and ethnobotany to bring more light into the intellectual realm and to take my place, not in a laboratory cubicle, but in the world..." (Oakes Ames to Schultes 1941; Ames et al. 1980). Schultes fortunately chose the latter, of course not knowing that this would keep him in the Columbian Amazon almost without interruption until 1953.

America's entry into WWII found Schultes deep in the tropical forest. Returning to Bogotá to volunteer, he was rapidly incorporated into the war effort. Natural rubber supplies came at that time, and still come, mainly from plantations in SE Asia. These were occupied by the Japanese in 1942. Although the US petrochemical industry started a synthetic rubber program, and the USDA planted rubber yielding plants, especially Dandelions (*Taraxacum officinale*), in almost every state, rubber from *Hevea* spp. was simply irreplaceable. Planting the species in the new world (e.g., in the humongous *Hevea* plantations at "Fordlandia" in Brazil), had failed because of rampant leaf blight infections. To remedy this situation, the US government established the Rubber Reserve Company, obtaining all recyclable scraps of rubber, and finding new sources in nature. What was needed were blight resistant varieties, as well as a way to again extract rubber from natural populations found in the Amazon basin. Both tasks were part of the assignment given to Schultes that would keep him busy for most of the next 14 years. During this time, Schultes traveled an area the size of Belgium, mostly on foot and dugout canoe, mapping thousands of individual rubber trees and providing seeds for the establishment of blight resistant trial plantations in Colombia and Central America. At the same time, he managed to collect almost 25,000 herbarium numbers, and documented the uses of 2,000 plant species among two dozen different tribes. The attitude that made his task possible was certainly his willingness to respect everybody, treat them fairly, and honor the value of local knowledge. This work, in particular in the first half of the 1950s, would be the basis for over 400 papers and two dozen books.

In 1953 the government suddenly reversed its position on natural rubber. Some bureaucrat decided that, with the end of the war and the advance of synthetic rubber, the natural rubber program was no longer needed. Schultes and colleagues had to wrap up work and leave. The trial plantations were ultimately cut down, the collected material was forgotten. This would prove a rather

shortsighted decision, as we will see later.

Schultes returned to Harvard and in 1953 became Curator of Oaks Ames' Orchid Herbarium. As a result he had to concentrate all his efforts on Orchids, which left virtually no time for ethnobotanical work. In 1958, Schultes was finally given the position of Curator of Economic Botany. Despite his tireless work, however, it took another decade before he was named Executive Director of the Harvard Botanical Museum in 1967, and Director in 1970. During his tenure at Harvard, Schultes worked tirelessly on the ethnobotany of the Northwestern Amazon, describing a plethora of new species from his collections, and publishing the results of his long term Amazonian studies.

Although Schultes for many years taught one of the most popular courses at Harvard, and had found his real vocation in teaching and advising students, he only became a professor in 1973. Many of his students went on to become well known ethnobotanists and medicinal practitioners, including Tim Plowman (deceased), Mike Balick (New York Botanical Garden), Bob Bye (Universidad Nacional Autónoma de México), Djaja Soejarto (Chicago Field Museum), Jim Zarucchi (Missouri Botanical Garden), Andrew Weil (Weil Lifestyle), Mark Plotkin (Amazon Conservation Team) and Wade Davis (Explorer in Residence at National Geographic Society).

Schultes encouraged students to follow their dreams, rather than working on thesis subjects of the kind described by Oakes Ames in a letter to Schultes in 1940: "...cover the procedure under which some of these lads write..." 1. Find some topic devoid of human interest. 2. Sift out every spark of human interest and write so badly...that your ambiguity seems to imply erudition. 3. If you are capable of giving birth to a single worth-while idea, conceal. 4. Write a cryptic summary." (Ames et al. 1980).

Among his many accomplishments, Schultes published the "Harvard Botanical Leaflets" for decades, was editor of Economic Botany for 15 years, wrote hundreds of book reviews for the journal, and was a leading figure not only in the establishment of the Society for Economic Botany, but also in the creation of the International Society for Ethnopharmacology. Simultaneous to his academic work, Schultes started to advocate the need for conservation in areas like the Amazon, as well as the traditional knowledge associated with plants found there. During his career, Schultes received countless honors, including becoming

one of the first Distinguished Economic Botanists (1979), Tyler Ecology Prize (1987), Gold medals of both the Linnaean Society and the World Wildlife Fund (1992), election as a Global 500 Forum laureate (1994), and the highest order of Columbia given to both civilians and military.

However, despite his publication and teaching record, and despite all national and international recognition Schultes received, Harvard did not see it necessary to maintain his legacy. As soon as he retired in 1985, his journal was closed, his famous lab dismantled, and his huge collection of ethnobotanical material placed in an attic, where it remains, largely uncurated, to this day.

One of the plants Schultes' students worked on intensively was Coca (*Erythroxylon novogranatense* (Morris) Hieron and *E. coca* Lam.), the sacred leaf of the Andes and today the notorious source of cocaine. Schultes' students noted decades ago that the traditional use of the plant is in fact harmless, contributes to a balanced nutrition, and had nothing whatsoever to do with drug use and production. The plant has nevertheless now become the central focus of the so called "war on drugs." Rather than addressing the social problems that foster drug use in the "developed" world, including the US, we have spent billions of dollars in recent decades to wage chemical war, fumigating millions of acres of coca fields, especially in Columbia. This effort very much reminds me of the use of Agent Orange in the Vietnam war, and coincidentally the herbicides used in the war on drugs are produced by the same companies that supplied defoliants to the military during the 1960s and 1970s. Unfortunately, the coca eradication program destroys not only coca, but all other crops, like coffee and corn, and has detrimental effects of the health of the local population. Ultimately, the chemicals affect the whole ecosystem, and with it the traditional knowledge Schultes took great care in documenting.

This brings us back to Schultes' original rubber work in the Amazon. Despite the advances in synthetic rubber production, natural rubber remains the material of choice for highest quality products and applications, from gaskets, space and military applications to surgical gloves and condoms. Even radial tires cannot be produced without natural rubber, and 95% of the production is still coming from plantations in SE Asia. Unfortunately, due to faster transport possibilities in a global economy, leaf blight has finally reached that region, and while outbreaks have been small,

the danger exists that the supply of one of the most important commercial and strategically important natural products could be disrupted by a large scale outbreak of blight, whether "natural" or caused by an act of bioterrorism.

Sadly enough, the blight-resistant clones Schultes and colleagues collected have been destroyed, and his priceless collection is slowly turning to dust. Once lost, the material will be hard to replace, because botanists who can correctly identify the material are themselves critically endangered; most Botany programs in the US have been replaced by "more useful" molecular science. The regions where Schultes collected, even if collection permits were issued, which is very unlikely; given that the US still has not ratified the Convention of Biological Diversity, are coincidentally exactly the areas that we have systematically fumigated in our ill advised strategy to eradicate Coca, and little of the natural vegetation remains.

German colleagues have already reverted to what *The Economist*, oblivious to the efforts of the Rubber Reserve Program, named one of "The 50 best inventions 2009:

"DANDELOIN Rubber: A fast-spreading fungus is ravaging the world's rubber trees. But thanks to researchers at Germany's Fraunhofer Institute for Molecular Biology and Applied Ecology, there's now an alternative: dandelions. Scientists have long known that the weed's sap contains latex, but it's difficult to harvest because dandelion ooze polymerizes — goes gummy — when it hits the air. The Fraunhofer team overcame that sticky problem by switching off a key enzyme. The new, improved dandelion produces 500% more usable latex than the old weed does."

Welcome to the past....

Richard Schultes died 10 years ago, and it is high time to honor his legacy and make sure that his groundbreaking work is no longer neglected.

Ames Plimpton, P., G. Plimpton. 1980. *Oakes Ames: Jottings of a Harvard Botanist*. Botanical Museum of Harvard University, Cambridge, MA.

Davis, W. 1996. *One River – explorations and discoveries in the Amazon rainforest*. Touchstone, New York.

Prance, G. 2001. Richard Evans Schultes (12 January 1915 – 10 April 2001): A Tribute. *Economic Botany* 55(3), 347-362.



BOOK REVIEWS



BOOKS REVIEWED

Developmental and Structural

An Introduction to Plant Structure and Development: Plant Anatomy for the Twenty-First Century. Charles B. Beck. - William B. Saunders 70

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In Splendid Isolation: A history of the Willie Commelin Scholten Phytopathology Laboratory 1894-1992. 73

Systematic

National Wildlife Federation Field Guide to Wildflowers of North America. - Michael A. Vincent..... 73

Trees of Panama and Costa Rica. 74

Wildflowers of Southern Western Australia. 75

DEVELOPMENTAL & STRUCTURAL

An Introduction to Plant Structure and Development: Plant Anatomy for the Twenty-First Century

Charles B. Beck.

Second edition. 2010. Cambridge University Press, Cambridge, UK.

This book is an overview of plant anatomy that does not attempt to directly compete in the shade beneath Esau's dated yet still authoritative reference text. Slimmer in detail and more selective in its coverage, it thrives, as innovative genotypes do, in a somewhat different niche. What this work attempts, and substantially accomplishes, is the connection of key topics in plant anatomy with contemporary knowledge in contiguous disciplines, particularly cell biology, plant physiology and to some extent genetics.

The book is well-provided with figures that include light and electron micrographs as well as drawings. Most of them are excellent, although in a number of cases one regrets the micrographs were not printed larger (The book's format is not small, but a wide margin along the unbound edge takes up more than one-third of the page area). Each individual chapter has two separate lists of bibliography under

the headings *References* and *Further Reading*. The former is apparently intended to include work cited in the text, the latter additional relevant sources. However, some works cited in the first chapters (Hoffmeister [*sic*] 1867; Sharp 1906) do not appear in either list. Many recent publications on various aspects of plant biology are included, making this account both contemporary and integrative.

Certain statements, however, seem a little out of synch with the heralded "twenty-first century" perspective. In reference to mitochondria and chloroplasts (p. 47): "...it has been suggested that these organelles might have evolved from bacterial symbionts (e.g. Cohen 1970, Raven 1970)." Surely a less tentative statement and more contemporary bibliography is warranted from the last forty years of research on this fundamental topic. Reference is made to "double fertilization in both *Gnetum* and *Ephedra* and the light it throws on the phylogenetic relationship of these taxa to the angiosperms" (p. 362), but no mention is given to the controversy following that developmental interpretation nor the repeated failure of DNA sequence data to support its phylogenetic assertions. The details of plication and leaflet separation in palm leaf development are described as "controversial," citing works from the early 1960's (p. 339), while studies published two decades later contributed much toward resolving these controversies (one is listed under *Further Reading* but not cited or discussed). On page one we are told that "shared features comprise the

major evidence that vascular plants, possibly also bryophytes, evolved from green algae...” leaving a contemporary reader to wonder what other origins are conceivable for bryophytes. Indeed, what alternatives are envisioned in the book’s first sentence, which states that land plants are represented “largely” by bryophytes and vascular plants?

A title is a negligibly small part of a book, but the choice has its implications. Here the title and subtitle conflate plant structure with plant anatomy, and the subsequent blurb describes this book as providing “a comprehensive coverage of plant structure...” One would hope it unnecessary to have to point out that the study of plant structure and its development is also the province of plant morphology, a discipline distinct from but no less significant than that of plant anatomy. The principles of morphological organization and morphogenesis, and the fundamental concerns of plant morphology, are for the most part unrepresented in this book. (It defines *sympodium* as “a vascular bundle of the stem and the associated leaf trace.”) The author does, quite helpfully, begin an early chapter by contrasting the cell and organismal theories corresponding to these two different levels of organization. That the book chooses to consider structure almost entirely from the perspective of cells can hardly be considered a shortcoming; it is an impressive enough achievement to have summarized a single discipline effectively. A less ambitious title would render such criticisms irrelevant.

And yet there are a few places where more attention to morphology would be helpful. For example, the author repeatedly contrasts animal and plant development in terms of histogenesis (p.12; p. 83.): “That is, plants have the ability to add new cells and tissues...as long as the plant lives.” “As a consequence [of apical meristems] plants have the potential to increase in size at regular intervals throughout their lives...” Yet many animals have these capabilities as well. A clearer distinction can be made at the morphogenetic level: animals do not continually form *new organs* throughout their lives. In Figure 6.11 and its legend, the terms *embryophytes* and *embryophyta* are used disconcertingly as synonyms for “seed plants,” to the exclusion of other land plant groups.

Imperfections aside, *An Introduction to Plant Structure and Development: Plant Anatomy for the Twenty-first Century* is a significant and informative synthesis. Those interested in plant structure are likely to find it a valuable reference worth owning. For me, it is already proving its usefulness in both teaching and research.

-William B. Sanders, Florida Gulf Coast University.

ECOLOGICAL

Tropical Rain Forest Ecology, Diversity, and Conservation.

Ghazoul, J., and D. Sheil.

ISBN 978-0-19-928587-7 (Cloth £65.00) 516 pp.

Oxford University Press, Great Clarendon Street, Oxford OX2 6DP, Great Britain.

In writing *Tropical Rain Forest Ecology, Diversity, and Conservation*, Ghazoul & Sheil hoped that their text would offer “something of value in all sections for all readers” and we fully agree that it did. With surprising success the authors conveyed uncompromising passion for the field of tropical ecology and effectively articulated contemporary ecological and conservation issues. Their book was divided into three sections. Section I presented an excellent and broad survey of the natural history of biological diversity within tropical rainforests. Section II focused on tropical rainforests from evolutionary, biogeographical, and ecological perspectives. Section III outlined the history and impact of humans with tropical rain forests. The main goals of the book (p. 5) were to “evaluate past and current ecological debates,” to “outline major patterns and underlying processes,” and “consider future challenges and possible responses.” Though these were ambitious goals, we unanimously concur that the authors met these goals and produced a well-written text. In particular this book would be particularly valuable for new graduate students wanting an excellent introduction to tropical forest ecology.

The first section of the book focused on taxonomy and natural history and was divided into four chapters: plants, microorganisms, vertebrates, and invertebrates. These chapters were well organized, thoughtful, and informative and each showcased the uniqueness of tropical rain forests by exploring the complexity and diversity of organisms. The strength of these chapters centered on inspiring descriptions and “cool” anecdotes. Side boxes highlighted stimulating material about particular species, processes, and patterns. For example, Box 4.2 described the widespread behavior of geophagy among organisms ranging from invertebrates to humans. Overall, these introductory chapters were up-to-date, informative, and just a “good read.” Moreover, they stress how little is actually known about the diversity and ecological importance of

tropical rainforests. We were surprised to learn that even in the 21st century “more than 2,000 species and 90 new genera are described” each year, and that these new discoveries show “no sign of declining.” Indeed, in Borneo somewhere between 15 and 35% of the flora remains undescribed (p. 10). We felt these chapters made for an enjoyable and enlightening stroll through the incredible biodiversity of the tropics.

Section II reviewed the origins, patterns, and processes of tropical rain forests. The strength of each chapter varied fairly widely, from particularly comprehensive syntheses on geologic land formation and flowering plants (chapters 6 and 12, respectively) to comparatively weaker chapters on ecological processes and biotic interactions (chapters 9 and 13). At times, the patterns that were reviewed were not tightly linked to underlying processes. For example, the authors described changes in vegetation patterns observed along an elevation gradient in wet tropical mountains: “The canopy gets progressively lower and lianas become increasingly scarce then disappear and are replaced by dense moss and other bryophytes, straggling lichens, bamboos, and tree ferns” (p. 133). Unfortunately, there was little mention of the processes that might generate these patterns. In chapter eight, “So many species, so many theories,” Ghazoul & Sheil did an admirable job of addressing the hyperdiversity of tropical rainforests, which for many is the Holy Grail of tropical ecology. We felt that this chapter provided a thorough list of the theories and mechanisms that underlie the evolution and maintenance of diversity but we had hoped for a bit more synthesis here. Still, the authors were quick to remind us that many of these “mechanisms are likely to operate together” and “we should not lose sight of the historical environmental changes that have influenced dispersal, speciation and extinction processes” (p. 177). These were important take home messages.

Lastly, Section III delved into the history of human interactions with tropical forests, explored how these interactions have influenced tropical forests worldwide, and reviewed current and potential conservation efforts. The final three chapters read as a call to action to conserve tropical rainforests in the name of biodiversity. The authors avoided the dogmatic tone that often accompanies this perspective. They pointed out that rainforests are crucial to the livelihoods of millions of people and thus a purely preservationist approach is

unworkable. These chapters were presented in a consistently objective way and the authors typically provided sound scientific and anthropological findings from the primary literature to support their views. Their upbeat message was bolstered by a great sense of humor. They explained how safe sex with Natex condoms could help save the rainforest (Box 17.2) and included a figure (18.2) depicting small do-it-yourself “Grow Your Own Rainforest Kits” with the caption “All may not be lost.”

The format of the book could be improved by reducing the number of boxes and copious footnotes. While useful in some cases, many times these were distracting and inconsistent in content. For example, some boxes detailed specific ideas already discussed elsewhere (e.g., Boxes 11.3, 14.2 and 15.5), while the information in others would be best incorporated into the main text (e.g., Boxes 16.5 and 17.7). Doing so would create a more cohesive flow within chapters and prevent cumbersome switches among the main text, footnotes, and boxes.

In a few places Ghazoul and Sheil made fairly strong generalizations but failed to provide citations. For example, in chapter 10 the authors stated, “the availability of moisture is the single most important factor determining the distribution of major biomes in the tropics including the rain forests.” While we have no reason to doubt this, a source would seem mandatory. Other examples lacking citations occurred in chapter 7, where the authors stated “In African forests lianas are more abundant than in other regions -- but this may simply reflect climatic conditions or past disturbance history” (p. 146) and later in chapter 10, where the authors asserted “light is probably the main factor explaining variation in plant form and dynamics within any given forest site” (p. 227). Overall, it remains unclear how much support there are for these claims. Nonetheless, however, this problem was not common and in total the book was well referenced and current.

Tropical Rain Forest Ecology, Diversity, and Conservation was read and reviewed as part of a graduate-level seminar course. Without exception, we all enjoyed this book and felt it was quite an achievement; most readers will be satisfied and challenged by it. Overall, the authors incorporated ideas and evidence from multiple fields of scientific study including biogeography, evolution, climatology, geography, and population genetics. In addition, Ghazoul and Sheil explored the use and future impact of modern molecular

and genetic techniques in tropical research (e.g., section 12.3), approaches which have only recently been introduced to the field. We certainly hope and encourage the authors to update this book in the future. This text would be excellent for an advanced undergraduate course in tropical ecology or a graduate course with supplemental reading from the primary literature. In total, we highly recommend this book.

- Griffin, E.A., R. Bendis, N. Brouwer, J. Hua, M. Koski, G. Meindl, & W.P. Carson, University of Pittsburgh.

MYCOLOGICAL

In Splendid Isolation: A history of the Willie Commelin Scholten Phytopathology Laboratory 1894-1992.

Faasse, Patricia, E. 2009
ISBN 13:9789069845418 (Cloth US\$60.00)
304 pp. *Edita-the Publishing House of the Royal Netherlands Academy of Arts and Sciences.* Distributed by the University of Chicago Press, 1427 E. 60th Street Chicago, IL 60637.

Have you ever wondered how Dutch elm disease became known as Dutch? It is because it was studied extensively in the Netherlands. Patricia Faasse describes this and many other intricacies of the history of phytopathology research in the Netherlands in her book "In Splendid Isolation". She delves into the personal and intimate aspects of the story of the Willie Commelin Scholten laboratory, which she has uncovered through searching and exploring for the bits of history that remain on this laboratory. The history of phytopathology research would be incomplete without mention of the Netherlands based Willie Commelin Scholten laboratory. This laboratory was born out of the tragic death of Willie Commelin Scholten and the determination of his parents to develop a laboratory devoted to the scientific work that their son so enjoyed. The laboratory was founded on the work of female scientists on Dutch elm disease in the nineteenth century. It continued for nearly an entire century, evolving into a university affiliated research center before being dismantled and distributed between universities.

This book is one of a series called "The History of Science and Scholarship in the Netherlands." This book, along with the series, is an excellent form of historic preservation and succeeds in sharing the rich scientific history of the Netherlands. Being a person interested in the history of scientific disciplines and how they evolve, reading about some of the foundation of phytopathology was intriguing. For those studying phytopathology today, some of the goals remain the same as when the Willie Commelin Scholten Phytopathology Laboratory was founded in 1894. Plants today continue to experience pests and diseases to which they are often ill adapted to respond to. This is becoming an increasing concern as globalization and the spread of invasive and alien species continues to rise. This book would be particularly interesting for those who study these topics and search for solutions to problems caused by such movements around the globe. This history is accessible and informative, reading like a novel that is packed with rich information about the nuances of the lab's development and ultimate decline, and most importantly the science that resulted from the hard work of a devoted group of women and men alike.

-Katherine E. Kovach, Department of Biology, Duke University.

SYSTEMATIC

National Wildlife Federation Field Guide to Wildflowers of North America

David M. Brandenburg.
2010. ISBN: 978-1-4027-4154-8 (paperback, \$19.95) 673 pp., Andrew Sterling Publishing Co., New York, New York.

What a remarkable book! From front cover to back, this field guide is absolutely crammed full of beautiful illustrations, maps, descriptions, and useful information. This is one volume that any naturalist should have on the bookshelf, in the car, or in the backpack.

This hefty volume (weighing in at over 2.25 pounds) is a great size for a field companion to the wildflowers. It is encased in a waterproof binding which appears well attached and durable. Immediately inside the front cover are a foldout page of descriptive diagrams of botanical terms, and a scale-bar in inches and centimeters. After

this is an introduction to the volume which spells out the scope of the volume (North America north of Mexico), followed by discussions of names, nomenclature, classification (this guide follows more “traditional” family delimitations), habitats, and conservation. Next is a description of how the volume is laid out, and then descriptions and diagrams of terms useful in identification of wildflowers. An ingenious key follows, which utilizes a combination of flower color and shape, coupled with thumbnail photographs of flowers, to lead the reader through the identification process. The bulk of the remainder of the text is the descriptive section, arranged alphabetically by plant family, with brief family descriptions and maps, descriptions of species (arranged in genera) listed by common and Latin names, with maps and color photographs of each. While not comprehensive in its coverage of all species, the book is astoundingly complete in what it does include (over 2200 species!). Additional descriptive information is included for some families, such as line drawings of schizocarps in Apiaceae, cypselas in Asteraceae, and fruit types in Malvaceae. A separate section of 38 pages contains descriptions and illustrations of introduced species that are likely to be more generally distributed. The volume concludes with references, a synonymy list, extensive photo credits, and an index.

The descriptions and maps are very helpful for identification purposes, and separation of similar species is made easier by small comparisons. Great care was obviously taken with selection of the more than 4000 photographs, and the result is a magnificent array of images that delight the eye and are a tremendous aid to identification. I find it astonishing that a tome so filled with beautiful plates is priced so inexpensively, and the author and publisher are to be thanked for this, since it makes the book accessible to many more people than the dozens of less inclusive, but more expensive, wildflower books currently available.

This book is perfect for anyone interested in wildflowers, whether beginning enthusiast or more seasoned expert, and would serve as field manual for classes in most areas of North America. I will be buying copies for my students, friends, and family. I congratulate David Brandenburg for his superb job with the construction of such a manual!

-Michael A. Vincent, *Department of Botany, Miami University, Oxford, OH 45056-1879 USA. email: vincenma@muohio.edu*

Trees of Panama and Costa Rica.

Condit, Richard, Rolando Pérez, & Nefertaris Daguerre.

ISBN 978-0-691-14710-9 (paperback, US\$45) 494 pp. Princeton Field Guides; Princeton University Press, 41 William Street, Princeton, NJ 08540.

There are said to be 2321 tree species native to Panama, with “tree” defined as a woody, single-stemmed plant at least 2 m tall. There are possibly the same number in Costa Rica. Of these, this guide treats nearly 500 species, distributed among 83 families. The species shown with distribution maps, color photographs, and brief descriptions are the most common and most accessible ones. The authors collectively have many decades of experience in the Central American tropics, and one surely can trust their judgment.

There are no keys. The arrangement throughout is alphabetical, by family, genus, and species. The binomials are given without authors, unusual in botanical works, but these can easily be got from the Tropicos website, along with a great deal more information, including total known range. Common names are given, virtually all in Spanish, and these are fully indexed at the end of the book, along with the Latin binomials. (There are five quite unrelated species called “limoncillo,” for example. There are two species of *Pouteria*, Sapotaceae, called “faldita de puta”; nowhere are the common names translated, which is probably just as well.)

The species not treated and pictured are given mention, even if only a few words. There are no references anywhere in the book to more technical literature on the genus or family under consideration, not even to the Flora of Panama series in the Annals of the Missouri Botanical Garden. One infers that the “field guide” format forces the authors to eschew literature references. There is no synonymy given in the body of the book, but a few synonyms are included in the Index. The authors make the point that “Scientists have precise rules about Latin names; indeed, only one name can be the officially accepted name.” There are certainly times when one wishes this were so; alas, it can never be.

The book in paperback (6” × 9”) weighs just over one kilogram. I think this book as a backpack item is going to get awfully heavy after a day in the tropical sun. But, as the authors point out, the

species diversity in the tropics is overwhelming – in places, 200 or more species of trees can be found on a walk of a few hundred meters. They could scarcely have made the book smaller or lighter.

Quite rightly, the publisher claims there is no other book like this one. It well merits a long life in the hands of nature lovers of all stripes.

–Neil A. Harriman, *Biology Department, University of Wisconsin-Oshkosh, Oshkosh, Wisconsin 54901.*
harriman@uwosh.edu

Wildflowers of Southern Western Australia

Corrick, Margaret G. and Bruce A. Fuhrer. 2009. ISBN 9781877058844 (Paper US\$39.95) 224 pp. Rosenberg Publishing Pty Ltd. PO Box 6125, Dural Delivery Centre NSW 2158, Australia.

If you are heading “Down Under” for the International Botanical Congress in Melbourne this year and plan to botanize in the western half of the country, you would be keen to pack along the third edition of *Wildflowers of Southern Western Australia* by Margaret G. Corrick and Bruce A. Fuhrer. This book highlights over 750 of the common angiosperms found in the Southwest Botanical Province, a global hotspot of plant diversity, as well as portions of the Eremaean and Northern Botanical Provinces. Included maps outline the major botanical provinces and districts of the region, which are referred to in each plant description, as well as local towns and major geographical features. The concise introduction describes the major vegetation communities of the region and some background on climate, geological history and floristic composition, though overreliance on common names is frustrating yet endearing to North American readers anxious to see their first blackbutt, mulla mulla, or triggerplant. A selected list of references is given, but a more comprehensive review of floristic treatments in the area and scholarly papers written about the evolution of the flora would be helpful to a wider scientific audience.

While written to be usable by amateurs, the botanical descriptions, habitat information and abundant accompanying photographs are substantial enough to assist in identification, particularly when in flower. The photographs of

both floral and vegetative aspects of each included species are uniformly excellent. Descriptions of species and families are sprinkled with interesting tidbits about Aboriginal uses of plants, ecology, etc. The book unfortunately does not contain keys and is basically organized alphabetically. The descriptions of the included plant families are a bit lacking and a more expansive botanical description and placement into the broader classification would have been appreciated by those of us unfamiliar with endemic groups such as Gyrostemonaceae and Chloanthaceae. Similarly, recent taxonomic changes have not been comprehensively incorporated into this latest edition. Those new to the flora of Western Australia will want to consider checking other more comprehensive botanical keys and descriptions at Florabase (<http://florabase.dec.wa.gov.au>) and Australia's Virtual Herbarium (<http://avh.rbg.vic.gov.au/avh/>) but this book will be a welcome field companion for many and the photography alone is enough to get any botanist excited for the trip to Australia.

–Rachel Schmidt Jabaily, *Ph.D. Postdoctoral Researcher, Department of Biological Sciences, 110 Mills Godwin Building, Old Dominion University, Norfolk, VA 23529*

The Botanical Species Concept - - Augustin-Pyramus De Candolle

“...the collection of all the individuals who resemble one another more than they resemble others; who are able, by reciprocal fecundation, to produce fertile individuals; and who reproduce by generation, such kind as one may by analogy suppose that all came down originally from one single individual.” (take note of that Ernst Mayr!)

Théorie élémentaire de la botanique, ou exposition des principes de la classification naturelle et de l'art de décrire et d'étudier les végétaux. 2nd ed.; Paris, 1819.



BOOKS RECEIVED



Bromeliads for Home and Garden. Kramer, Jack. 2011. ISBN 978-0-8130-3544-4. (Paper US\$26.95) 176pp. University Press of Florida.

Bryophyte Ecology and Climate Change. Tuba, Zoltán, Nancy G. Slack, Lloyd R. Stark. 2011. ISBN 978-0-521-7577-5 (Paper US\$60.00) 506pp. Cambridge University Press, 32 Avenue of the Americas, New York, NY 10013.

Distribution of Grasses in Texas. Shaw, Robert B., Barron S. Rector, Amanda M. Dube. 2011. ISBN 978-1-889878-32-4 (Paper US\$20.00) 196pp. Botanical Research Institute of Texas, 1700 Universit Drive, Fort Worth, TX 76107-3400.

A Field Guide to the Ferns and Lycophytes of Louisiana. Neyland, Ray. 2011. (Paper US\$24.95) 89 pp. Louisiana State University Press, 3990 West Lakeshore Drive, Baton Rouge, LA 70808.

Life of Earth: Portrait of a Beautiful, Middle-Aged, Stressed-Out World. Rice, Stanley A. 2011. ISBN 978-1-61614-225-4. (Cloth US\$28.00) 255pp. Prometheus Books, 59 John Glenn Drive, Amherst, New York 14228-2119.

Light and Photosynthesis in Aquatic Ecosystems, 3rd ed. Kirk, John T.O. 2011. ISBN 978-0-521-15175-7 (Paper US\$90.00) 649 pp. Cambridge University Press, 32 Avenue of the Americas, New York, NY 10013.

Marianne North: A Very Intrepid Painter. Payne, Michelle. 2011. ISBN 978-1-84246-430-4. (Paper, US\$17.00) 96 pp. Royal Botanic Gardens, Kew, distributed by University of Chicago Press, 1427 East 60th Street, Chicago, Illinois, 60637-2954.

Plant Chromosome Engineering: Methods and Protocols. Methods in Molecular Biology 701. Birchler, James A. 2010. ISBN 978-1-61377-956-7 (Cloth US\$139.00) 340 pp. Humana Press 333 Meadowlands Parkway, Secaucus, NJ 07094.

Reaching for the Sun: How Plants Work. King, John. 2011. ISBN 978-0-521-73668-8 (Paper US\$39.99). 298 pp. Cambridge University Press, 32 Avenue of the Americas, New York, NY 10013.

The Shaping of Life: The Generation of Biological Pattern. Harrison, Lionel G. 2011. ISBN 978-0-521-55350-6 (Cloth US\$99.00) 247pp. Cambridge University Press, 32 Avenue of the Americas, New York, NY 10013.

Wildflowers and Plant Communities of the Southern Appalachian Mountains and Piedmont: A Naturalist's Guide to the Carolinas, Virginia, Tennessee, and Georgia. Spira, Timothy P. 2011. ISBN 978-0-8078-3440-4 (Cloth US\$50.00) 540 pp. The University of North Carolina Press, 116 South Boundary Street, Chapel Hill, NC 27514-3808.

TO OUR LEGACY SOCIETY MEMBERS



Dear Legacy Society Members,

We'd like to invite you to the BSA Legacy Society reception at the Botany 2011 Conference in St. Louis on Wednesday afternoon, July 13, from 5 – 6 pm. Please RSVP to Bill Dahl at WDahl@Botany.org.

The Legacy Society was founded in 2006 as an active way for you, a Society member, to register support for the BSA as a component in your legacy planning. For more information, please go to <http://www.botany.org/> if asked/.

Join us and learn how the BSA “in perpetuity” **gift subscriptions** are expanding the reach of botany and botanical research. What is an “**in perpetuity**” gift subscription you ask, learn more at <http://www.botany.org/> if asked/If asked-4.php.

Your Society is already hard at work supporting the upcoming Botany Conference, and as I write this note, we have funded over \$15,000 in **student research and travel grants** for the year, and we're just getting started. Your Board has set a goal of adding another \$20,000 in research grants for students over the next five years.

The Preparing Leaders and Nurturing Tomorrows Scientists (PLANTS) grant program, is taking off and is led by Dr. Ann Sakia and supported by Dr. Ann Hirsch. This is adding \$20,000 per year into our travel grant program supporting “**undergraduate**” attendance at the Botany Conference.

In another move supporting botany, a team of people, led by Dr. Dick Olmstead, put in an NSF grant supporting travel to the International Botanical Congress in Melbourne. In conjunction with ASPT, ABLs and AFS, we'll fund over \$60,000 in **student/early career support** to this important botanical gathering.

Remember, there's more to our mission in relation to awards. Here's a note from Dr. Chelsea D. Specht, University of California, Berkeley, talking about the excitement an the non-monetary “Young Botanist Award” created for her student, Ms. Gracie Benson-Martin, a 2011 award recipient.

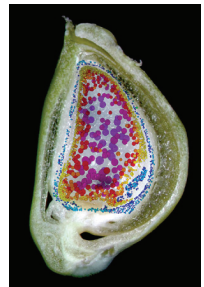
I put in the following story on Gracie's getting Young Botanist Award, and it has been picked up by The Berkeleyan newsletter (news feed) and is rotating on the home page of berkeley.edu! Lots and lots of hits for both of these news sources. People are stopping Gracie all across campus and congratulating her, and i'm getting emails from other faculty and even graduate students to congratulate her. Gracie is thrilled! I think it's really significant that the campus news community picked up on this and made it such a highlight, demonstrating the importance of these sorts of awards not only to the undergraduate who receives them, but to the campus community at large. Thanks to you for continuing to support and direct these awards.

I never really thought about it as a very big deal before, but the way the university picked up the story and ran with it makes me feel like people are starved for this sort of feel-good, healthy, productive, positive news. Nice that BSA can contribute!

All of our awards are a BIG DEAL. They run to the core of our mission as a Society, and may very well be the spark that ignites someone's career!

And we hope you've heard about how BSA support for **educational outreach** has taken botany and plants into middle and high school classrooms around the country and the world. Programs like *PlantingScience* and *myPlant IT* have allowed BSA educational leaders to begin the slow process of taking plants and botany back into the curriculum. They have also allowed the Society a place at many tables where future education policy and educational concepts are developed.

All of these great programs are possible due to the for-sight of BSA leaders and members who have gone before us. These men and women, as do the members of the **Legacy Society**, consider the work the Society important enough to ensure we were a part of their legacy planning. Importantly, they built a strong financial base for the Society. We can't stress enough how critical having a strong endowment and financial position is to the BSA.



The tradition continues amongst our peers, and we invite you to join us and play an important part in the future of the BSA.

Thank you for your time, and we'll see **you** in St. Louis!

Dr. Dennis Stevenson
BSA Board Member
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Dr. Ed Schneider
Chair, Development
Committee

Dr. Linda Graham
Incoming BSA Board Member
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“One morning [in 1839] [Asa] Gray and Joe Hooker went to the College of Surgeons [in London] to see the great Hunterian Museum, which was the best the American traveler had seen. Their primary object was to pay respects to Professor Richard Owen, but in the course of the visit they ‘there met Mr. Darwin, the naturalist who accompanied Captain King [sic] in the Beagle.’ The heavy-browed young explorer made small impression compared with Owen, a ‘profound scientific scholar’ whom Gray thought ‘the best comparative anatomist living, still young, and one of the most mild, gentle, childlike men I ever saw.’ Twenty-one years later Olympian thunder would have accompanied a meeting of Darwin, Owen, Hooker, and Gray.”

A. Hunter Dupree, Asa Gray. 1959. p. 81



Come share your research with the friendliest faces in Botany and advance your science, enrich your career and extend your network in St. Louis, MO from July 9-13. This is the joint annual meeting of the Botanical Society of America, the Society for Economic Botany, the American Society of Plant Taxonomists and the American Fern Society. We would love to see you there!

THE LOCATION:

The conference is being held July 9-13 at the Chase Park Plaza, located in the vibrant Central West End of St. Louis - close to a fabulous line up of restaurants and pubs for after science socializing. In addition, it is directly across from Forest Park, home to the St. Louis Zoo (free admission!) and the St. Louis Science Center as well as acres and acres to explore. St. Louis is the perfect place to plan your vacation around the BOTANY 2011 conference with plenty of things for all ages to do! One of the major jewels of St. Louis is the Missouri Botanical Garden and no trip to the city would be complete without a visit - so for all attendees of the conference we have arranged for FREE admission to the Garden with your conference badge!

WORKSHOPS:

A collection of FREE workshops on Sunday, July 10 will cover a wide diversity of topics for your educational development. From Plant Genome Analysis and DNA Barcoding to Preparing Your Manuscript for Publication and Sustainable Teaching, the BOTANY Conference will provide a valuable learning experience for students, professionals, and educators.

FIELD TRIPS:

Sign up for one or more of the fantastic field trip opportunities for BOTANY 2011! From Shaw Nature Reserve, to the revival of Forest Park, an economic botany tour of St. Louis City, a tour of Monsanto or the Missouri Botanical Garden. If it's botanical, we have it here at BOTANY CONFERENCE in St. Louis! <http://www.2011.botanyconference.org/Info/fieldtrips.php>

FEATURED SPEAKERS & SYMPOSIA:

Plenary Address - Dr. Peter H. Raven, one of the world's leading botanists and advocates of conservation and biodiversity

Regional Botany Lecture - Dr. Matthew Albrecht is Assistant Curator for Conservation Biology in the Center for Conservation & Sustainable Development of the Missouri Botanical Garden

Enhancing Scientist Diversity in Plant Biology Luncheon - Dr. Mary Clutter, former assistant director of the National Science Foundation (NSF)

Kaplan Memorial Lecture in Comparative Development - Dr. Ralph S. Quatrano, Dean of the School of Engineering & Applied Science at Washington University

Healing the Planet: Medicinal Plants and the Legacy of Richard E. Schultes - a terrific line up of leading professionals in economic botany

Annals of Botany Lecture - Dr. Pam Soltis on "Angiosperm Phylogeny: The Role of Polyploidy in Diversification and Genome Evolution"

Visit the Botany 2011 Conference Website to register and view the abstracts and schedule online. If you are into social media, check out the ASPT, BSA, or SEB Facebook pages and become a fan. We regularly post breaking and important meeting information on the Facebook pages. In addition, you can find us on Twitter at "botanical_" where we will be tweeting the latest information on ticketed conference events, local restaurants, and meeting happenings during the conference.

WE LOOK FORWARD TO SEEING YOU IN ST. LOUIS!

QUESTIONS? WE ARE ALWAYS HERE TO HELP!

CONTACT: JOHANNE STOGRAN, DIRECTOR OF CONFERENCES,

(740) 927-8501 OR JOHANNE@BOTANY.ORG

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PLANT SCIENCE BULLETIN
FEATURED IMAGE

1ST PLACE - \$500
BOTANY 2011 STUDENT TRAVEL AWARD
JAMES RISER
WASHINGTON STATE UNIVERSITY



A HAWK MOTH TAKING NECTAR FROM THE
BLOOMS OF SHOWY MILKWEED (*ASCLEPIAS
SPECIOSA*)

Showy milkweed flowers are an important source of nectar for many insects. If large enough to remove the pollinia, some insects act as pollinators. This hawk moth is unlikely a pollinator as it never lands on the milkweed flowers. Instead it takes nectar while hovering like a hummingbird. This picture taken during the Botany2010 meeting.

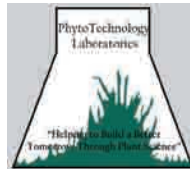
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