



PLANT SCIENCE BULLETIN

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A PUBLICATION OF THE BOTANICAL SOCIETY OF AMERICA



Botany 2019: A Fantastic Time in Tucson!



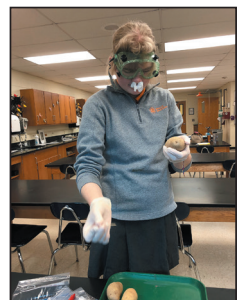
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From the Editor

Greetings,

I hope that those of you who made the trip to Tucson found this year's Botany meeting to be productive and stimulating. It was my first time in Arizona and I particularly enjoyed the landscape. As always, we are pleased to list the winners of awards that were presented during the meeting. Congratulations to all!

I want to highlight a pair of articles in this issue that address botanical education for general audiences—one looking back at the work of influential past botanists and the other focusing on using modern social media tools to engage the community. It is important and inspiring to consider those who use creative and contemporary resources to promote plant and environmental science. Many in our professional community are doing incredible outreach with both local and global audiences. At *PSB*, we are always pleased to highlight those projects, either as articles or as features in the Education News and Notes section.



Mackenzie

PLANT SCIENCE BULLETIN Editorial Committee Volume 65



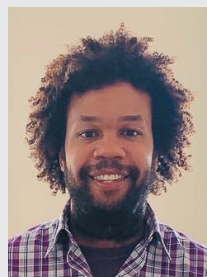
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SOCIETY NEWS

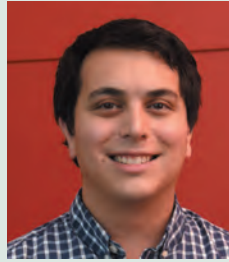
Public Policy Committee Report Supporting Evidence-Based Policy Through Public Comments

During the past year, we have highlighted ways that BSA members can support science-friendly candidates and legislation to increase the capacity for botanical expertise in the federal workforce (*PSB* 65[1]: 2019). Winners of this year's (BSA) Public Policy Awards, (ASPT) Congressional Visits Day Award and (BSA/ASPT) Botany Advocacy Leadership Award have also described their experiences reaching out to elected officials (*PSB* 65[2]: 2019). Another way our members have engaged in public policy is by providing public comments on proposed rules or rule changes.

Public comments can be a highly effective way of leveraging your subject matter expertise to create positive change. However, many scientists are unaware of what a public comment is or how governments use them.

While new laws are introduced by parts of the legislative branch (e.g., the federal House of Representatives), proposed rules are created by parts of the executive branch (e.g., the Environmental Protection Agency) in order to carry out existing laws (e.g., the Endangered Species Act). Because civil servants with technical expertise are often involved in proposing and altering rules, public comments can be surprisingly similar to writing or orally presenting research findings to a scientific audience. Here we provide some tips for how to get started with your first public comment.

IDENTIFYING YOUR SUBJECT MATTER EXPERTISE



By BSA PPC Co-Chairs Krissa Skogen (*Chicago Botanic Garden*) and Kal Tuominen (*Metropolitan State University*) and ASPT PPC Chair Andrew Pais (*North Carolina State University*)

Within the scientific community, we often assume that our subject matter expertise begins and ends with our own research. In the context of public policy, however, that expertise is far broader. What graduate-level STEM courses have you completed or do you teach? What topics did your graduate committee expect you to

discuss during comprehensive exams? Have you been a co-author on any side projects? Have you used your scientific training to help a nonprofit organization become more effective? How do you explain the relevance of your work to friends and neighbors? The answers to these questions can help you identify what your subject matter expertise looks like to elected officials. It is likely that you have expertise in many subjects, or that you have not fully constructed the nature of your expertise in the context of a particular policy issue that interests you!

IDENTIFYING PROPOSED RULES OR RULE CHANGES

While many scientists become aware of proposed rules or changes directly through their own research, by law most governments in the United States must publicly announce such proposals. The federal government makes these announcements in the Federal Register (www.federalregister.gov), and StateScape provides links to state registers (<http://www.statescape.com/resources/regulatory/registers/>). If you are interested in science policy but unsure about how to leverage your scientific knowledge, try searching one of these registers to identify opportunities to comment based on your location, subject matter expertise, agency, and comment deadline.

WRITE AND SPEAK

While federal public comments are typically submitted in writing, state and local governments often hold community hearings to take verbal testimony in addition to a venue for submitting written comments. Attending a community hearing is an excellent way to become familiar with the rule-making process and to learn deeply in a short amount of

time about multiple viewpoints on the issue. Any verbal testimony you provide will be documented and made public, so prepare as you would for a conference presentation or course lecture. The number and geographic locations of hearings tends to be limited, so if you are unable to travel on a specific day, providing a written comment is still a good option. In our experience, written comment periods typically last 60 to 90 days; your state or local government may have different expectations. If you need assistance writing your first public comment, the Public Comment Project provides more detailed guidelines and templates (<https://publiccommentproject.org/how-to>).

KNOW YOUR RIGHTS

Scientists speaking publicly on politically challenging topics such as climate change experience political and sometimes legal opposition. Depending on your professional role, the sort of information you may legally provide in a public comment may also be limited. Organizations such as the American Institute of Biological Sciences (www.aibs.org), the Climate Science Legal Defense Fund (csldf.org), and the government affairs office at your institution can help you navigate the less familiar aspects of using your First Amendment rights and your professional expertise for the betterment of society.

BSA Presents Author Workshop at the XXI Congreso Mexicano de Botánica in Aguascalientes, Mexico

In support of the Society's commitment to greater international collaboration, the BSA publications group and Wiley, our publishing partner, hosted a free author workshop at the XXI Congreso Mexicano de Botánica on October 23, 2019, in Aguascalientes, Mexico. Like the workshop held at the XII Congreso Latinoamericano de Botánica in Quito, Ecuador (2018), this workshop focused on what researchers can do to improve their chances of getting published in a scientific journal—and then what they can do after their paper is published to make sure it is discovered by the larger community. Topics covered included: Choosing a journal, writing the paper clearly and concisely, and convincing the editor it should go out for review; understanding what happens during peer review and revision; making your paper “discoverable” to search engines and promoting your own work through various channels; learning about ethical issues in publishing; and getting advice for publishing in foreign language (primarily English) journals.

The presenters at the workshop were Amy McPherson, BSA Director of Publications and *AJB* managing editor; Gillian Greenough, Executive Editor, Life and Physical Sciences, Research & Society Services at Wiley; and Marcelo Rodrigo Pace, Investigador Asociado at the Universidad Nacional Autónoma de México and Editor-in-Chief of the *IAWA Journal*. The presentation was given mostly in English, with slides translated into Spanish as a handout for attendees. Pace provided advice from his own publishing experience and helped with the Q&A in Spanish. Heather Cacanindin, Executive Director of the Botanical Society of America, attended the Congreso in support of botanical colleagues in Mexico and provided information about the benefits of joining BSA.

We look forward to continuing to expand the BSA's international outreach at upcoming conferences.



Marcelo Pace, AJB Managing Editor Amy McPherson, and Wiley Representative Gillian Greenough [front row center] led the author workshop at XXI Congreso Mexicano de Botánica.

New *AJB Reviews* feature coming in 2020

AJB Reviews is set to launch in 2020! These reviews will expand the coverage and reach of the journal by providing timely syntheses of major issues, and new insights or perspectives to guide future research.

AJB Reviews, headed by Drs. Jannice Friedman, Emily Sessa, and Pamela Diggle, place topics in context while being forward-thinking and insightful. They can develop new hypotheses and propose general models that help move the field forward. Original interdisciplinary syntheses and articles that cover newly emerging fields are welcomed. Authors can express a personal perspective while maintaining a balanced view of the field.

Anyone interested in submitting to *AJB Reviews* should provide a preliminary summary of up to 250 words. A decision on whether to invite a full review rests with the Editorial Board. All contributions will be fully peer-reviewed, in line with other *AJB* manuscripts. For more information, go to <https://bit.ly/2LvM1BE> or e-mail the Reviews Editor at reviews@botany.org.



BSA MEMBERS PARTICIPATE IN 2019 CLIMATE STRIKE

The 2019 Climate Strike attracted BSA members from around the globe. Here, Dr. David Ehret participated in the Climate Strike in Victoria, BC, Canada. “I thought it was important to add my voice to the chorus of others demanding climate action,” Ehret said. “I was most impressed by all the millennials and Gen Zers at the protest. It was so inspiring to see such passion and commitment among the young.”

Botanical Society of America's Award Winners (Part 2)

The BSA was pleased to announce its annual award winners in the last issue of the Plant Science Bulletin. We now present the rest of the awards available at press time.

CONGRATULATIONS TO 2019 BESSEY AWARD WINNER SUZANNE KOPTUR!



This year the BSA recognized Dr. Suzanne Koptur, Professor at Florida International University, with the Charles Edwin Bessey Teaching Award. This award recognizes outstanding contributions made to botanical instruction and celebrates individuals whose work has improved the quality of botanical education at a regional, national, or international level. The Bessey Award is the

highest honor for Teaching and Educational Outreach given by the Botanical Society of America.

Suzanne has been an active member of the BSA since graduate school. She has presented over 40 papers at BSA conferences over the years, both ecological and educational, and is a member of the Teaching, Ecology, and Tropical Biology sections.

Suzanne is a clear fit with the qualities recognized by the Charles Edwin Bessey Teaching Award. During her career she has mentored an exceptional number of graduate and undergraduate students, including many from groups under-represented in the sciences. She actively seeks funding to provide early opportunities for her students, providing opportunities for undergraduate researchers to join her and her graduate students in the lab and field, supporting and encouraging them to attend and present at botanical meetings, and to be involved in the PLANTS mentoring program and other career-building opportunities. In 2017 she was awarded the FIU University Graduate Student Provost Award for Mentorship of Graduate Students recognizing her mentoring efforts. One of her former students writes: "Through her vocation to training the next generation of botanists, she has left a lasting legacy. Every one of us that has had the great fortune in having Suzanne as a teacher will go forth as emissaries for science, creating a ripple effect that will spread her passion for plants far and wide throughout the world."

Suzanne is an active and engaged teacher who embraces new teaching techniques like active learning, flipped courses, and online teaching. She was active in creating a new FIU initiative, Quantifying Biology in the Classroom (QBIC), to help biology students develop quantitative skills to help them succeed. She served as the QBIC director from 2012-2016, and continues to serve this program as co-director. She contributes to the research on teaching and has made great impact in developing and supporting a culture of teaching innovation within her department.

In addition to her work at FIU, she is active in community outreach. She has been a supporter and proponent of Fairchild Tropical Botanic Garden's Connect to Protect program encouraging citizens and schools to help create habitat corridors between the endangered South Florida Pine Rocklands.

She has worked with local schools to build butterfly gardens, organizes several conferences that bring researchers and natural resource management professionals together, and serves on county committees to develop conservation initiatives.

The Bessey Award is given annually in honor of one of the great developers of botanical education, Dr. Charles Edwin Bessey. Dr. Bessey served first as professor of botany and horticulture, and later as dean at the University of Nebraska. His work and dedication to improving the educational aspects of Botany are most noted in what Nebraskans call "The Bessey Era" (1886-1915), during which Nebraska developed an extraordinary program in botany and ranked among the top five schools in the United States for the number of its undergraduates who became famous botanists.

Past Bessey award winners include: Lena Struwe, J. Phil Gibson, Bruce K. Kirchoff, Shona Ellis, Paul H. Williams, Les Hickock and Thomas R. Warne, Susan Singer, Geoff Burrows, Chris Martine, Roger Hangarter, Beverly Brown, Michael Pollan, Thomas Rost, James Wandersee, W. Hardy Eshbaugh, David W. Lee, Donald Kaplan, Joseph Novak, William Jensen, Joseph E. Armstrong, Marshall D. Sundberg, Gordon Uno, Barbara W. Saigo and Roy H. Saigo, and Samuel Noel Postlethwait.

BSA CORRESPONDING MEMBERS AWARD

Corresponding members are distinguished senior scientists who have made outstanding contributions to plant science and who live and work outside of the United States of America. Corresponding members are nominated by the Council, which reviews recommendations and credentials submitted by members, and elected by the membership at the annual BSA business meeting. Corresponding members have all the privileges of lifetime members.

Dr. Richard Abbott, University of St Andrews, London, United Kingdom

Dr. Lucia Lohmann, Universidade de São Paulo (USP), Sao Paulo, Brazil

Dr. Jefferson Prado, Instituto de Botânica, Herbário, Sao Paulo, Brazil

Dr. Victor Rico-Gray, Universidad Veracruzana, Veracruz Mexico

Dr. Fernando Zuloaga, Instituto de Botánica Darwinion, San Isidro, Argentina

DONALD R. KAPLAN MEMORIAL LECTURE

Dr. John Z. Kiss, University of North Carolina, Greensboro

John's interest in space biology has led to past spaceflight projects which used microgravity as a tool to understand the mechanisms of tropistic responses. Currently, his team has been approved by NASA for several new experiments on the International Space Station to investigate plant tropisms. His long-term goal is to understand how plants integrate sensory input from multiple light and gravity perception systems.

MARGARET MENZEL AWARD (GENETICS SECTION)

The Margaret Menzel Award is presented by the Genetics Section for the outstanding paper presented in the contributed papers sessions of the annual meetings.

Erika Frangione, University of Toronto Mississauga, for her presentation: Comparative transcriptomics of repeated reticulate evolution in the genus *Cuscuta* (Convolvulaceae). Co-author: Saša Stefanović

EDGAR T. WHERRY AWARD (PTERIDOLOGICAL SECTION AND THE AMERICAN FERN SOCIETY)

The Edgar T. Wherry Award is given for the best paper presented during the contributed papers session of the Pteridological Section. This award is in honor of Dr. Wherry's many contributions to the floristics and patterns of evolution in ferns.

Hannah Ranft, Johns Hopkins University, for the presentation: Sometimes it only takes one to tango: using natural history collections to assess the impact of asexuality in the fern genus *Pteris*. Co-authors: Kathryn Picard, Amanda Grusz, Michael Windham, Eric Schuettpelz

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.

Blake Fauskee, The University of Minnesota-Duluth, for the proposal: Could RNA editing explain phylogenetic rate heterogeneity in seed-free vascular plants?

Brianna Reynolds, The University of Tennessee-Knoxville, for the proposal: Identifying Fungal Endophytes in a Myrmecochore, *Chelidonium majus*

Susana Vega, University of Antioquia, Colombia, for the proposal: Taxonomic Revision of the Genus *Selaginella* P. Beauv. (Selaginellaceae) in the Department of Antioquia, Columbia.

Paige Wiebe, Kansas State University, for the proposal: Niche divergence in big bluestem grass ecotypes in response to experimental drought: Mechanisms of local adaptation

Noah Yawn, Auburn University, for the proposal: Reassessment of the Endangered Alabama Canebrake Pitcher Plant, *Sarracenia Alabamensis*, Populations and Occurrences in Collaboration with the Atlanta Botanical Garden

KATHERINE ESAU AWARD (DEVELOPMENTAL AND STRUCTURAL SECTION)

This award was established in 1985 with a gift from Dr. Esau and is augmented by ongoing contributions from Section members. It is given to the graduate student who presents the outstanding paper in developmental and structural botany at the annual meeting.

Joyce Chery, University of California-Berkeley, for the presentation: Evolution of strange wood development in a large group of neotropical lianas, *Paullinia* (Sapindaceae). Co-authors: Marcelo Pace, Pedro Acevedo-Rodriguez, Carl Rothfels, Chelsea Specht

PHYSIOLOGICAL SECTION LI-COR PRIZE

Lauren Tucker and **Amanda Salvi** tied for the **LI-COR Prize for an Oral Paper**

Laurent Tucker, California State Polytechnic University, Pomona, for the presentation: Recovery of California black walnut trees following drought induced dieback. Co-authors: Frank Ewers, Stephen Davis, Edward Bobich

Amanda Salvi, University of Wisconsin - Madison, for the presentation: Mesophyll photosynthetic sensitivity to leaf water potential increases in Eucalyptus species native to moister Australian climates: a new dimension of plant adaptation to drought. Co-authors: Duncan D. Smith, Kate McCulloh, Thomas Givnish

Steven Augustine and **Katie Krogmeier** for the LI-COR Prize for Best Poster

Steven Augustine, University of Wisconsin - Madison, for the poster: Going for broke: carbon and water relations of germinant conifer seedlings exposed to drought. Co-author: Kate McCulloh

Katie Krogmeier, Appalachian State University, for the poster: Investigating potential impacts of polyploidy on the ecophysiological responses of *Solidago altissima* to climate change. Co-authors: Howard Neufeld, Erica Pauer

PHYSIOLOGICAL SECTION STUDENT PRESENTATION AWARD

Helen Holmlund, University of California, Santa Cruz, for the Best Oral Presentation: High-resolution computed tomography reveals dynamics of desiccation and rehydration in a desiccation-tolerant fern. Co-authors: Brandon Pratt, Anna Jacobsen, Stephen Davis, Jarmila Pittermann

Botany 2019

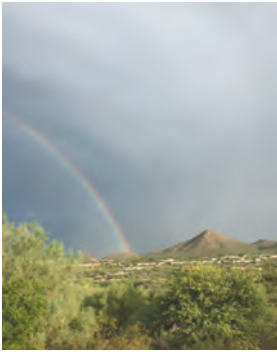
July 27-31
Tucson, Arizona
Sky Islands & Desert Seas

It's more than just another scientific conference!

This year 1200 people from all over the world came together in Tucson, Arizona as colleagues, collaborators, students, and friends of Botany!

Friendships are formed, science is shared, knowledge is expanded!

It's more than a scientific meeting - it's a yearly reunion of people with the same interests and passion for science - with a lot of fun thrown in!





Botany 2019 Beverages by the Numbers

1121 Servings of Craft and Domestic Beer

1227 Glasses of Wine

923 Gallons of Coffee

49 Gallons of Fruited Water

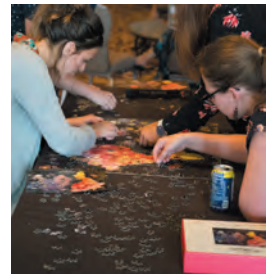


Botany 2019 in your words.....



- It was both scientifically stimulating and lots of fun
- Crop wild relative conservation field trip is very nice!
- I enjoyed the conference, and it was really nice to be able to go hiking right from the hotel.
- Culture of botany conference is very pleasant and inviting, contributes to enjoyable experiences speaking with a wide range of botanically inclined folks.

- I attended probably the best symposium since I began coming to BSA...the Land Plant Evolution symposium was outstanding.
- It was a stunning setting, which made the stay very pleasant.
- I attended the in-service at the Mission Garden. I loved the experience, and am happy I had the opportunity to participate!
- I really enjoy the friendly atmosphere and the chance to see cool talks and catch up with colleagues!



- This was one of the best meetings ever. The energy was great. Personally, I think it is because participants could get outside easily, and because they could hike so readily. I went out for an hour or more every morning but one. Those hikes left me high for the rest of the day.
- Loved the venue, we should consider going back there in a few years. You did a good job providing vegan food this time (usually there are no options, or the options aren't very good). The student housing rates were adequate enough to encourage students to attend.
- I think the PLANTS program and travel grants are extremely valuable. I have participated as a PLANTS mentor for 3 years, and I plan to continue participating whenever possible.



SPECIAL FEATURES

Old Trees Meet New Technology

If my own childhood is any indication, many a child has grown up wishing that trees could talk. In fact, recent events suggest that it is not just children, but adults too, who wish this were so. In 2010, the European magazine *Eos* launched “The EOS Talking Tree.” They fitted an urban tree with various sensors and used these to give the tree emotions and opinions (Galle, 2016). The tree’s website was visited over 350,000 times (Galle, 2016). Shortly after, another public-tree event took place in Australia (Lafrance, 2015). In 2013, a government tree-servicing program, intended to improve tree maintenance in the city of Melbourne, took an odd turn. When given the opportunity to use unique tree-codes to e-mail the city and inform workers of maintenance needs, citizens instead wrote thousands of love letters to the city’s trees (Lafrance, 2015).

Then, in the summer of 2018, an agave plant in the Halifax Public Gardens became a local celebrity and took the city by storm (Berry, 2019).

These examples point to a human desire to connect to, and communicate with, nature. Though novel in Western thought, communication across different species is featured in many Indigenous oral traditions (Legge and Robinson, 2017). Unfortunately, research suggests that modern people are more disconnected, both emotionally and physically, from nature than previous generations (Barlett, 2008; Vining et al., 2008). With over 80% of Canada’s population residing in urban areas (Statistics Canada, 2014), access to and engagement with urban nature is important now more than ever. Understanding public values and testing engagement strategies is, then, vital to urban-forest management (Ordoñez et al., 2017).



By Julietta Sorensen Kass

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www.halifaxtreeproject.com/textatree

On July 7, 2019, a team of volunteers and I launched Text-A-Tree: one part public engagement and one part academic study (Figs. 1, 2). Text-A-Tree serves as the final project in my Master’s of Resource and Environmental Management at Dalhousie University, under the supervision of Dr. Peter Duinker. An underlying theory behind the initiative is that if we want to encourage people



Figure 1. *Julietta Sorensen Kass (left) and Anna Irwin-Borg spent many an hour discussing logistics and media strategies.*

to develop relationships with trees, we should emulate the way we develop relationships with each other. For many of us, that now involves texting. So, from July 7 to August 31, visitors to the Halifax Public Gardens can text several trees and receive unique responses within 24 hours. Participants can also engage through our social media platforms using @TextATreeHalifax.

Text-A-Tree hopes to determine whether texting and social media can be used to engage people with urban trees. The results of the study will help inform future engagement strategies relating to urban forests or urban nature. As described by Ordóñez et al. (2017), understanding public values relating to urban forests can help guide and broaden effective management. The project will determine the utility of text-based engagement compared with Instagram and Facebook engagement, providing insight into communication strategies. Analysis of text conversations will add to the growing research on how Canadians perceive and value urban forests (Ordóñez et al., 2016).



Figure 2. *When Text-A-Tree was first conceived, it was a crazy idea and a few sketches. We wanted our logo to reflect where the journey began.*

“Texting trees” are denoted by wooden signs (Figs. 3 and 4). Each sign displays the tree’s phone number and information regarding the project, study, and consent. Fourteen trees, each with their own volunteer tree-speaker and personality, are spread throughout the Gardens. There is also a silent Wish Tree, which people can send their wishes to via text. Communication is enabled through a cloud-based system called Zendesk and monitored by the project head. Each volunteer was provided with training on the communications system.



Figure 3. *The first tree we named was a yellow birch called Tree Tree O’Hara, named after a famous drag queen, due to the tree possessing both male and female flowers.*



Figure 4. *Volunteers were heavily involved from the beginning. Here we are preparing all 15 signs for our textable trees at the Halifax Public Gardens.*

Volunteers were also briefed on urban forest research, biological and cultural information regarding their tree species, and facts pertaining to their unique tree. Using this information, volunteers created personalities, complete with pronouns. The entire process was designed to help participants in the project recognize trees as individuals, allowing them to develop a relationship with trees, and view them as living members of the community.

Attributing trees with personhood may appear strange in dominant Western culture, but such a view has roots across time and space (Boyer, 1996; Bird-David, 1999; Tam et al., 2013; Tam, 2014; Legge and Robinson, 2017). One example with particular significance to Halifax is that of the Mi'kmaq concept of *Msit No'kmaq* (translated to "all my relations"). In this, animals, plants, and even geographic locations are recognized as having an identity, personality, and spirit (Robinson, 2014). These entities are considered persons, in that they

experience their existence in the first person (Legge and Robinson, 2017).

Mi'kmaq culture was further incorporated into the project, with 4 of the 15 trees being selected due to their cultural significance. These trees boast both their English and Mi'kmaq names on their signs and initiate texts to participants with the word "Kwe," a Mi'kmaq greeting meaning "I am here" (T. Christmas, personal communication, June 2019). Through their conversations with participants, the volunteers representing these trees share how trees have contributed to culture in Nova Scotia.

Both the Halifax Public Gardens and the City of Halifax itself also have a connection to Japan, which made Japanese culture important to incorporate as well. Again, 4 of the 15 trees were selected based on significance to Japanese culture, and these trees now greet participants with *Kon'nichiwa* (hello!) and share cultural information (Fig. 5). As an additional recognition of Japanese



Figure 5. *An early summer shot of Maggie the Magnolia, one of our 15 textable trees, and a nod to Japanese culture.*

culture, Text-A-Tree was launched on July 7 to coincide with the *Tanabata* festival. We partnered with the Dalhousie Japanese Society to put on a small celebration, including Japanese crafts, games, and stories. In keeping with tradition, members of the public were invited to wish upon the Wish Tree, although with their phones rather than the customary *tanzaku* (long strips of paper). The Wish Tree has continued to receive wishes and will do so throughout the project. Anonymous wishes are posted daily on Facebook and Instagram (@TextATreeHalifax).

The emphasis on culture is intended to make Text-A-Tree accessible to the diverse peoples living in and visiting Halifax. By celebrating different cultures, we hope to create a space for people from any background to participate and share their values. Previous studies have engaged in street-side interception surveys, which, by necessity, capture information from individuals old enough (over 18) and comfortable with surveys (e.g., Ordóñez et al., 2016, 2017). Building on the foundation of this work, we propose that text messaging might allow younger participants and those less comfortable with English, or perhaps intimidated by the prospect of an interview with university members, to express their views as well.

Though proper analysis has just begun in September 2019, initial engagement seems promising. One week after the launch of Text-A-Tree, volunteers had engaged in over 1000 unique conversations from participants. While some have been clear in voicing why trees are of value---for example, through comments on beauty, shade, and health---others have responded with questions and have been delighted by the information provided by our volunteers. The data will likely reveal more surprises still, but for now,

it seems there is hope that technology may help people reconnect with urban nature.

ACKNOWLEDGMENTS

This project was made possible thanks to the support of the Nova Scotia department of Communities, Culture, and Heritage, the Suellen Murray Educational Bursary, and The Friends of the Public Gardens.

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FROM THE *PSB* ARCHIVES

60 years ago: "A survey has been made of what bacteriology teaching and research assistants were being paid at 34 colleges and universities during the year 1958-59 [. . .]

For teaching assistants the number of hours of work per week ranges from 8 to 22 with most places requiring 15 to 20. Just half of the institutions use teaching assistants for 9 months. About half of the remainder have 10 months appointments, the rest 12 months. There is great variation in the number of hours of graduate work that assistants are allowed to carry, but an estimate would be that two courses through the year is what the figures mean. Fifteen institutions charge teaching assistants no fees. In the others, particularly those with charges for out-of-state students, fees may run as high as \$400 for the academic year (and these institutions do not necessarily have the highest stipends for teaching assistants). [. . .]

The stipends for Teaching Assistantships for 9 months run from under \$1000 (2 institutions) to just over \$2000 (1 institution).

- Creighton, Harriot B. "ASSISTANTS' SALARIES 1958-59" *PSB* 5(5): 7

[*Editor's Note:* Online inflation calculators (e.g. Calculator.net) indicate that this would be approximately \$8,700 to \$17,500 in 2019 dollars.]

50 years ago: "Dr. Charles Heimsch, retiring Editor of the American Journal of Botany, presented a report on the current status of the Journal and a summary of certain aspects of the Journal operation during his 5-year tenure as Editor." In 1969, 153 manuscripts were published and 28 were rejected.

- Starr, Richard C. "Minutes of the Business Meeting" *PSB* 15(4): 7

Inspirational Voices in Early Botanical Education

Nature study, as we have come to understand it in the 21st century, is an umbrella term used to encompass education about our environmental world. It is a course of biological study that introduces the curious student to introductory levels of botany, zoology, entomology, and the study of other living systems. Nature study may be the initiation of an educator's enthusiasm, in any of these disciplines, to raise his or her students' curiosity.

Here, I seek to tell the story of a collective group of nature educators, with a predilection toward botany, who were inspired and influenced by Cornell University nature study educator, Anna Botsford Comstock, and her husband John Henry Comstock, entomologist and educator, at the turn of the 20th century. The three notable educators—Liberty Hyde Bailey, Anna Botsford Comstock, and John Walton Spencer (Fig. 1)—mentored four young women to seek their own paths and establish their botanical legacy. (It is noteworthy that Bailey was an early member



Figure 1. *John Walton Spencer, Anna Botsford Comstock, and Liberty Hyde Bailey circa 1904.*

and past-president of the BSA.) The stories, or at least the botanical marks, of Alice Gertrude McCloskey, sisters Julia Rogers and Mary Rogers Miller, and Ada Eljiva Georgia are preserved in Mrs. Comstock's original unpublished autobiographical manuscript. The 1953 autobiography, *The Comstocks of Cornell*, was drastically altered when Mrs. Comstock's manuscript was culled in the years following both Comstocks' death by several Cornell personalities who sought to elevate Prof. John Henry Comstock's entomological legacy (St. Clair, 2017) at the expense of Anna B. Comstock's own legacy. The collective botanical and nature study work of this group of seven educators overlapped in their individual projects and through collective ventures. Following their stories is a bit convoluted, yet astonishing in the closeness of their connection. Here I hope to bring their stories back into the light, and to recognize them for their contributions, as Anna B. Comstock intended.



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LIBERTY HYDE BAILEY, ANNA BOTSFORD COMSTOCK, AND JOHN WALTON SPENCER

Anna B. Comstock began her career at Cornell University in the late 19th century, in collaboration with the entomological research of her husband, John Henry Comstock, and spread collaterally when she partnered with the agrarian zeal of Bailey. The scope of Bailey's work is an article unto itself. For our purposes here, it will suffice to say that Bailey came to Cornell in 1888 as Chair of Practical and Experimental Horticulture. His work in nature education and outreach, during the early 20th century, came at the heels of an accomplished botany and horticulture education, including a two-year herbarium assistantship to the distinguished botanist, Asa Gray, at Harvard University (Lawrence, 1955). Bailey wrote six botany textbooks between 1898 and 1909; however, one of his first books, *Talks Afield* (1885), was a botany book written for the farmer and non-scientist. Bailey founded the College of Agriculture at Cornell, and served as the dean of the New York State College of Agriculture from 1903 until his retirement from the University in 1913 (Lawrence, 1955).

The ink of the Nixon Act of 1896, which allowed funding for extension courses in horticulture, had barely dried as Bailey and Anna B. Comstock traveled by horse and buggy visiting rural schools of New York State (Anna B. Comstock, unpublished). In meeting with teachers in Cattaraugus County, New York, they discovered John Walton Spencer in Westfield, New York, and believed him to be a man who seemed to have the qualities needed to develop further

work on the Nature Study program (Palmer, 1944). Spencer came to Cornell University on a voluntary basis in 1896, at the behest of Bailey. The Nature Study movement from Cornell took off like a firestorm around the country upon Spencer's inclusion. Letters from superintendents around the country proclaimed enthusiastically to procure from Spencer every copy of the Nature Study circular letter for all their teachers (Spencer, 1898). This circular was developed by Spencer while at Cornell University.

Spencer was passionate about his work in Nature Study and lectured around New York State in various schools of local townships. He wrote about several topics regarding Nature Study, and particularly with plant-based lessons such as *The Apprentice Class in Gardening out of door work*; *Elementary Gardens out of doors*; *Sowing a Seed*; *Plant Life*; *Soils*; *Autobiography of a Corn Stalk*; *Fall Planting for Outdoor Growth*; *Plants that prepare lunches for their offspring*; *Seed dispersal*; *Perennials for the School Ground*; *A Bulb Garden*; and *How to Help Plants Grow* (Spencer, 1898).

In addition to impact among adults, Spencer's essays and circulars were important for promoting gardening and nature study among the youth. In his essay *What is Nature-Study?*, Bailey stated that Spencer was largely responsible for the fruition of the children's garden movement in New York largely due to his efforts to put children in touch with nature in their daily lives through the development of Junior Naturalist Programs. This program was a subscription-based incentive for teachers and students to get pamphlets and information about nature studies. It is here where we are first introduced to Alice Gertrude McCloskey, who, with Spencer, organized Junior Naturalist Clubs with the idea of organizing children

into clubs for the study of plants and animals, and other outdoor subjects (Bailey, 1897).

ALICE GERTRUDE MCCLOSKEY

John Spencer first met Alice Gertrude McCloskey in Saratoga Springs, NY during his travels around the state for his Junior Naturalist Programs. She had so impressed Spencer with her work in nature education in the schools that he recruited her to come to Cornell University to assist in answering the inquiries that were coming in from his junior naturalists. McCloskey came to Cornell in the fall of 1899 and was appointed an Assistant in Nature Study (Cornell Alumnae Club, 1915). At the instigation of Bailey, Spencer, with McCloskey, encouraged Cornell agricultural faculty to write to children in the country in an effort to build comradery between farm families and the University. McCloskey was the one “who first used the phrase” *Cornell Rural School Leaflet* (quote from Palmer, 1944).

In an unpublished account from July 1900, during a summer session at Chautauqua Institute for Nature Study teaching, Anna B. Comstock observed, “Mr. John Spencer and Alice McCloskey were also there for the Junior Naturalist and gardening work. I saw Mr. Spencer give a practical lesson in gardening to kindergarten children and I marveled at this success and his charm for the little folk.” (Anna B. Comstock, unpublished).

Overlapping this work, from 1899 to 1904, McCloskey was co-editor of the *Junior Naturalist Monthly* with Comstock, and worked with Spencer on developing and implementing lessons (Anna B. Comstock,

unpublished Chapter 10, p. 18). McCloskey, Anna B. Comstock, Rogers, and Spencer also collaborated on the *Cornell Reading-Course for Farmers* as part of their extension work. At the time a group of 20 people represented the New York Experiment Station and University Extension Staff. In 1900, members of this staff were already working together on the *Home Nature-Study Course* as part of the *Cornell Reading-Course for Farmers* (Cornell University, 1902 [Cornell Ag Exp St, 1894-1911]).

The Reading-Courses were precursors to the *Cornell Nature-Study Leaflets*, which were later distributed by Bailey. McCloskey contributed 20 of the 30 leaflets written for children with Bailey, Anna B. Comstock, Spencer, and others covering the remaining 10. The individual educational leaflets were succinct and guided the educator through basic methods of instruction and encouraged observation by the child. Half of the 30 children’s leaflets are botanically focused. McCloskey wrote half of these botanical modules herself, which included *Maple Trees in Autumn* (1903), *A Corn Stalk* (1903), *In the Corn Fields* (1903), *Jack-in-the-Pulpit* (1903), *Twigs in Later Winter* (1904), *Pruning* (1904), *The Hepatica* (1904), and *Dandelion* [with Bailey] (1904) (New York State Department of Agriculture, 1904).

MARTHA VAN RENSSELAER AND THE BOYS AND GIRLS LEGACY

The Comstock-Bailey association was the synergistic catalyst that also pulled Martha Van Rensselaer to Cornell. Recruited by

Bailey, at the request of Anna B. Comstock, to come help organize a reading course for farmers' wives, Van Rensselaer was a New York State native in her third term as School Commissioner for Cattaraugus County. She already had early contact with Spencer, asking for circulars to distribute at a forthcoming meeting of the Teacher's Association (Fig. 2). Van Rensselaer held such a staunch commitment to the Cornell nature and rural education programs that she wrote Spencer of her readiness to answer the call to come help (Spencer, 1897-1912, Box 2).



Figure 2. An etching gifted to Martha Van Rensselaer by Anna B. Comstock (“To Martha Van Rensselaer – with love – from the engraver & artist-”).

Under Spencer, part of the reorganization of educational efforts in 1902 included Anna B. Comstock and Van Rensselaer with their collective venture of the *Boys and Girls* magazine. It is at this point that McCloskey returned to her classes at the University, although she also contributed eight articles to *Boys and Girls* magazine, on other nature topics, until it ceased publication in 1907.

Anna B. Comstock, Spencer, and Van Rensselaer's early nature writing, through their joint publication of *Boys and Girls*, maintained their educational base in nature study at Cornell. This annual publication served as a platform for botanists, horticulturalists, zoologists, and agricultural specialists to interact with parents, teachers, and children in distant communities. The *Boys and Girls* nature magazine was not only an important source to reach children outside of New York State, but also served as a stepping stone of publication for young women under the direct influence of both Spencer and Anna B. Comstock. First published in 1901, *Boys and Girls* was the brain-child of Van Rensselaer in conjunction with Spencer (Percival, 1956). At the beginning of her auspicious career, Van Rensselaer, already acquainted with Spencer from her early Commissioner days, approached him with the idea of producing a publication about garden, home, and nature education. Anna B. Comstock, in turn, was approached by Spencer with a proposal to join as editor, adding not only her own stories and artwork, but the “Comstock” name to the venture. Unlike the Home-Nature Study Course, under the general direction of Mary Rogers Miller (see below), running concurrently at the time, the idea for the *Boys and Girls* publication was one that would interact directly with children. Building on the “Uncle John” precedent of the Junior Naturalist Clubs, the goal of this new format would be to endeavor to reach children beyond New York State.

The little magazine was published for five years with Van Rensselaer taking over as editor in 1903 as Anna B. Comstock shifted her energies to the Home Nature Study Course leaflets at Miller's resignation (Anna B. Comstock, 1907).¹ Comstock maintained her influence on *Boys and Girls* not only with

her own submissions, but also as a direct channel for other young women to have a means to have their own writing published. McCloskey,² Miller (“Woodland Flowers in Spring,” *Boys and Girls*, April 1904), and Julia Rogers (“A Winter Landscape,” *Boys and Girls*, February 1904) all submitted articles and essays to *Boys and Girls*, contributing to nature study education movement into the early 20th century.

MARY FARRAND ROGERS MILLER

Mary Farrand Rogers Miller was the younger of the two Rogers sisters who held a lifelong relationship with the Comstocks (Fig. 3). Miller was born and raised on a farm in Dallas County, Iowa in the mid-1860s. Her strong roots in rural life gelled compatibly with the surging nature study education movement of the time. Miller taught in rural, village, and city schools both in Iowa and Minnesota from the age of 17 (*Cornell Alumnae*, 1909). Miller came to Cornell University in 1893, choosing to “study the facts of life in biology laboratory with men and women working together matter-of-factly” (Miller, 1954). Miller met John Comstock almost immediately at the beginning of the Spring 1893 session at Sage Hall, where Miller lived and Comstock took his meals when his wife traveled (Anna B. Comstock, unpublished Chapter 9, pp. 14–15). An excellent student, Miller became determined by the following spring of 1894 to study entomology. She and her colleagues kept the professor on his toes as he met the demand for his growing department in what was the largest ever registered for the third term in entomology (Anna B. Comstock, unpublished Chapter 9, pp. 25–26). In 1896, her senior year at Cornell, Miller was appointed



Figure 3. *Mary Farrand Rogers Miller* (*Cornell Alumni News*, 1909) and *Julia Ellen Rogers* (*Class of 1892, University of Iowa*).

to the position of laboratory assistant in the department of entomology and continued in the capacity of an instructor for the summer term.

In the following fall of 1896, winds of change began to blow for the College of Agriculture at Cornell. As stated previously, it was in this year that the Ways and Means Committee of the New York State Legislature appropriated funds to Cornell University to expand the nature study education initiative at the College of Agriculture. This appropriation was an expansion from the 1894 establishment of extension courses in horticulture with Cornell teachers in Chautauqua County of New York (Anna B. Comstock, 1953; Anna B. Comstock, unpublished, Chapter 10, p. 3). The Bureau of Nature Study began an issuance of leaflets immediately in December 1896. The early leaflets were known as the Teacher Leaflets with both Anna B. Comstock and Miller contributing articles accordingly. The Teacher Institute leaflets that Miller oversaw reached 30,000 teachers (Palmer, 1944).

In 1897, Miller was appointed Lecturer in Nature Study as Cornell began its extension

work in the College of Agriculture, and for a brief time commanded a higher salary than Anna B. Comstock herself (Kohlstedt, 2005).³ It was a position that Miller held for six years during which time she also taught at Cornell Summer School with the rank of Instructor. Miller also appeared on the programs of the National Education Association of the New York State Science Association, and of the American Association for the Advancement of Science (Cornell Alumnae, 1909). Miller's relationship with Anna B. Comstock intertwined as they both taught nature study at the State Normal School at Chautauqua, and she, along with her sister, Julia, lived with Anna B. Comstock during these summers away from Ithaca. The Rogers sisters were not just any students with a marginal relationship to the Comstocks; they formed an important part of the Comstock household (Comstock, unpublished Chapter 10, pp. 10, 17, 23).

Miller's name appeared at the onset of the project as the Nature Study educator as part of the organization of the Station and University Extension Staff. She contributed annually to the Teacher Leaflets until their publication ceased in 1901 (New York State Dept. of Agriculture, 1904). With the cessation of one project, Miller was free to complete another. Her book, *The Brook Book: A First Acquaintance with the Brook and its Inhabitants Through the Changing Year*, was first published in 1901. Dedicated to "John Henry Comstock"⁴, the book is expressive with its execution of a prose of deep reflection and introspection. Miller wrote in a semi-autobiographical format, as her unnamed protagonist hiked through wooded wetlands with "the Professor." Her writing anthropomorphized the brook with the courses of a human life. The wife of Cornell horticulturist, William (Wilhelm) Tyler Miller,⁵ Miller's *The Brook Book* has

an appeal to the botanist, entomologist, and naturalist alike as the chapters alternately weave each discipline in concert with each other. The symbiotic relationship of plant, insect, and animal in this slim volume is a treasure.

The termination of the Teacher Leaflets program in 1901 was more of a hiatus than an end-point for the educators involved with its writing. Each educator evolved their direction, guided by the demands of the teachers for whom they wrote their nature-education modules. The nature study work at Cornell continued with Liberty Hyde Bailey appointing Miller as the general director of the Home Nature Study course in 1902 as well as assistant editor of the magazine *Country Life in America* (a position she maintained through October 1909) (Cornell Alumnae, 1909). Miller contributed several articles to the Home Nature study course, but her tenure was short-lived as her husband's career pulled the couple in a new direction, away from Ithaca, New York in 1903.⁶ For several years before her death, at age 103, in 1971, Miller was noted as the oldest living Cornell alumna (Edward D. Cobb, personal communication).

JULIA ELLEN ROGERS

Little is known of Julia Ellen Rogers, the older of the two sisters, whom the Comstocks took to their hearts. At the end of the 19th century, Julia was known as a prominent nature study educator in the state of Iowa. Her collaboration with members of the Iowa Agricultural College was part of the nature study education movement being introduced in the west as well as an early attempt to compile seven nature study lessons in booklet form for classroom teachers. Her contribution

of “*A Nature Study Lesson on the Grasshopper*” to the Iowa-based booklet hints to the collaboration that lay a decade in her future.⁷ Scant documentation exists to indicate exact dates of Rogers’ migration east. The pull eastward may have been great with the prospects of a college education influenced by Julia’s younger sister, Mary (Farrand) Rogers Miller, and her senior thesis work with John H. Comstock. The notoriety of both the Comstocks’ work in nature study education, particularly of Anna B. Comstock, would have been known to Rogers as well and may have been an incentive to come to Cornell.

Rogers enrolled in Cornell in 1900 and worked closely with John H. Comstock on her master’s thesis of *Materials for Winter Work in Nature-study* (1902) (Rogers, 1902; Cornell University, 1908). In what is one of the few existing documents to reflect Rogers’ voice, the introductory remarks of her thesis speak directly toward the influence and importance of the Nature Study Program lauded by Anna B. Comstock at that time. She emulated Anna B. Comstock both with positive and encouraging paragraphs about the importance of the thoughts of a child’s own observations, and of the knowledge such observation incurs.

Rogers with her sister Mary Miller were considered members of the Comstock household. Both young women traveled with Anna B. Comstock to southern New York State for the summer nature study lectures at Chautauqua Institute. Julia would stay with Anna B. Comstock when John H. Comstock would travel for his work (Anna B. Comstock unpublished, Chapter 10, p. 23). A self-described publisher, Rogers was a prodigious writer; her article, “*Boys & girls, as naturalists, gardeners, home-makers, citizens,*” contributed to *Boys & Girls: A Nature Study Magazine*, was

to be the first of several articles and books that Rogers was to write in her career (Comstock, 1907). Rogers’ entomological beginnings took a decidedly botanical turn with seven of her ten publications following her botanical interest. These include:

- *Among Green Trees: A Guide to Pleasant and Profitable Acquaintance with Familiar Trees* (1902; A. W. Mumford: Chicago);
- *Tree Book: A Popular Guide to a Knowledge of the Trees of North America and to Their Uses and Cultivation by Julia Ellen Rogers* (1905; Doubleday, Page & Company: New York);
- *Book of Useful Plants by Julia Ellen Rogers. Illustrated by Thirty-One Pages of Half-Tones from Photographs* (1913; Doubleday, Page & Company: New York);
- *Useful Plants Every Child Should Know* (1913; Doubleday, Page & Company: New York);
- *Tree Guide: Trees East of the Rockies by Julia Ellen Rogers* (1916; Doubleday, Page & Company: New York);
- *Canadian Trees Worth Knowing* (1917; The Musson Book Co.: Toronto);
- *Trees Worth Knowing* (1917; Doubleday, Page & Company: New York);
- *Trees* (1926; Doubleday, Page & Company: New York).

Little more is known of Julia Rogers save for her writing. It is known that Rogers eventually settled in later life, first in New Jersey, near her sister Mary, and then in California where her interest turned to seashells and their identification (Cornell University, 1908). After her death in 1958, Rogers’ remains were interred in her home state of Iowa.

ADA ELJIVA GEORGIA

Ada Eljiva Georgia came to Ithaca, NY, to join John Spencer as his assistant in the early days of nature study education in 1896 (Fig. 4). Spencer discovered Georgia as a teacher in the city schools of Elmira, New York, engaged in nature study work with her classes (New York State College of Agriculture, 1921). Little is known about Georgia's background up until this time; however, her affiliation with Cornell University was through nature study initiatives she worked on in collaboration with Anna B. Comstock and others.



Figure 4. *Alice Gertrude McCloskey and Ada Eljiva Georgia*
(Images from *Cornell Nature Study Leaflets*, Fall 1956, Vol. 50, No.1.)

Georgia joined Anna B. Comstock in producing the Home Nature Study Course leaflets in 1906 when she was transferred to Anna B. Comstock's office. With her, Georgia brought a sound knowledge of plants that added tremendously to the writing of the leaflets and assisted in the answering of letters that Anna B. Comstock had been diligently working on alone, in the three years before the arrival of both Spencer and Georgia. Georgia's memory was vast, her interests many, and her

love of literature provided many of the literary references to Anna B. Comstock's superb *Handbook of Nature Study* (Trump, 1954).

Through her associations with Spencer, Anna B. Comstock, and in turn with Bailey, Georgia published a large tome with the MacMillan Company in October 1914 that was edited by Bailey. The book, *A Manual of Weeds* (1914), was part of a collection of books called *The Rural Manuals* edited by Bailey. Georgia's book contains 385 illustrations from wildflower author F. Schuyler Mathews and is dedicated to the memory of her mentor, Spencer, who died in 1912.⁸ Georgia describes herself as "an assistant in the farm course" on the front-piece of her book, yet Spencer and Anna B. Comstock's influences are evident in that Georgia endeavored to make her book "less technical and easier for the general reader to understand."

The preface of *A Manual of Weeds* safeguards the only words that are truly Ada Georgia's own thoughts or philosophies. The writing is lyrical and resonant of both Bailey's and Anna B. Comstock's own writing styles:

"... Dame Nature is an 'eye-servant'; only by the sternest determination and the most unrelaxing vigilance can her fellow-worker subdue the earth to his will and fulfill the destiny foreshadowed in that primal blessing, so sadly disguised and misnamed, when the first man was told, 'Cursed is the ground for thy sake; in sorrow shalt thou eat of it all the days of thy life; thorns also and thistles shall it bring forth to thee; and thou shalt eat of the herb of the field.' A stern decree." (Georgia, 1914)

Working with Anna B. Comstock up until her sudden death in 1921, Georgia was described by her colleague and friend as a woman of remarkable character and indomitable spirit

(Anna B. Comstock, unpublished, pp. 17-37).⁹ Additionally, Georgia is saluted by Anna B. Comstock's successor, E. Laurence Palmer, over 20 years after Georgia's death in the *Cornell Rural School Leaflet* of September 1944:

"A debt of gratitude is due to some of those who served during the early days of Cornell nature study but who did not have the opportunity to assume conspicuous places of leadership. Foremost of these is Ada Georgia, a tireless, careful, outdoor person with a fundamental love for children that was not always obvious to casual acquaintances. As an inadequate monument to her careful, useful work she left her Manual of Weeds that was for years a classic in its field." (Palmer, 1944)

In the Preface of her *Manual of Weeds*, Georgia lastly acknowledged the desire for her work to be published for the public-at-large as "one of the few wishes that 'come true' ..." (Georgia, 1914). This final statement of Georgia's book gives a nod toward the importance in which precedence, influence, and mentoring have toward the next generation of nature educators, including botanists, and particularly women, with the motivation to push forward toward legacies in their own names.

CONCLUSIONS

This brief historical review of the rich tapestry of Nature Studies, conducted by dedicated women and men associated with Cornell University, attests to the profound influence that these pioneers had during the early part of the 20th-century America. Sadly, most of their writings have gone neglected. Yet, even a casual reading of the bulletins and books produced by these once influential scientists and educators shows that the love and concerns

about the welfare of the natural environment predates current concerns about the erosion of our ecosystems and the sustainability of our world's biodiversity. It would be remiss of me not to encourage re-reading the literature produced by these forward-looking scholars, for much would be re-learned and perhaps not forgotten.

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FOOTNOTES

¹ "Boys and Girls." "v. 1-6, v. 7, no. 1-6; Jan. 1903-July 1907. Caption title: Boys & girls, as naturalists, gardeners, home-makers, citizens. Official organ of the Chautauqua junior naturalist clubs, June 1904-Nov. 1905. Editors: Jan.-Mar. 1903, Mrs. Anna B. Comstock. --Oct. 1903-July 1907, Martha Van Rensselaer."

² *What Happened to Freckles*: March 1904 (Volume 2, Number 3); *A Riddle! Who Can Guess It?*: April 1904 (Volume 2, Number 4); *Required Reading for Chautauqua Junior Naturalists*: November 1904 (Volume 3, Number 3); *Required Reading for Chautauqua Junior Naturalists*: December 1904 (Volume 3, Number 4); *Bird Houses*: May 1905 (Volume 4, Number 5); *For Chautauqua Junior Naturalists*: May 1905 (Volume 4, Number 5); June 1905 (Volume 4, Number 6); December 1905 (Volume 5, Number 4); *Winter Birds*:

January 1906 (Volume 6, Number 1); *Carrots in the Schoolroom*: January 1907 (Volume 7, Number 1); *Cats*: January, 1907 (Volume 7, Number 1); *The Brook and the Brookside*: May 1907 (Volume 7, Number 5) (Cook, 2005).

³ The following year, Anna B. Comstock was appointed Assistant Professor of Nature Study in the Cornell University Extension Division on November 10, 1898. This designation was rescinded in 1899 by the Board of Trustees. Comstock was then appointed Lecturer in Nature Study by Cornell President Gould Schurman (Comstock, unpublished, 10-8).

⁴ “To JOHN HENRY COMSTOCK Guide, Philosopher and Friend ALL THAT IS WORTHY IN THIS BOOK IS AFFECTIONATELY DEDICATED (Miller, 1901).”

⁵ Wilhelm (William) Miller received his three degrees from Cornell University (1896 BS; 1897 AM, 1900 PhD) (Cornell Alumni News, 1922), and worked on chrysanthemum research with Liberty Hyde Bailey.

⁶ State of New York Department of Agriculture, *Cornell Nature-Study Leaflets*. “Mosquitoes” (1902), “About Crows” (1902), “Pruning” (1902), “The Life History of a Beet” (1903) (New York State Dept. of Agriculture, 1904).

⁷ Iowa State Horticultural Society, John Craig, and Julia E. Rogers. 1890. *Suggestive Outlines Bearing upon the Introduction of Nature Study into the Schools of the State / Authorised by the State Horticultural Society and Prepared by Members of the Faculty of the Iowa Agricultural College, Assisted by Julia E. Rogers*. Iowa State Horticultural Society: Des Moines, IA.

⁸ “To the revered memory of John Walton Spencer: My employer, teacher, and friend to whose first suggestion and encouragement the

beginning of this book is due.” (Georgia, 1914).

⁹ “On January 8th [1921] Miss Ada Georgia died. She was a remarkable character. She suffered hardships all her life and her indomitable spirit carried on despite them. She was a passionate lover of books, a keen observer of nature, and an indefatigable worker. She had been my greatly prized assistant in conducting the Home Nature Study Course for eight years. Her devotion to the work and loyalty to me had made her an important factor in my life and a valued friend.” (Comstock unpublished, 17-37).

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“Botanists: See Zoologists and Wildlife Biologists”: Seeking Resources on Careers for Plant People

Where do you send students or people interested in exploring a career in botany?

As Education Director, I often get e-mails asking me for advice on getting into a career in botany, or in switching careers to something aligned with an interest in plants. Many years ago, BSA created a very nice online resource highlighting our members, which is usually where I will send people to learn more: <https://www.botany.org/bsa/careers/>.

While this is still a valuable resource, I'm interested in updating and expanding what we offer in this area. We've also been asked for printable resources that can be shared with

the public at a career-day type outreach event.

In preparing to expand the career resources on botany.org, I've been taking a look at how plant careers are addressed in general career-exploration resources aimed at students, such as the U.S. Bureau of Labor statistics Career Exploration tool (<https://www.bls.gov/k12/content/students/careers/career-exploration.htm>) and the Missouri Department of Elementary and Secondary Education's Career Clusters paradigm (https://dese.mo.gov/sites/default/files/MCE_Career_clusters_centerfold.pdf).

These sorts of career exploration tools make me very curious about how and why certain specific occupations rise to the top while other fields are completely invisible. Many times it seems quite arbitrary which careers end up in which “cluster.” For example, in the U.S. Bureau of Labor Statistics Career Exploration Guide, “Agricultural & Food Scientist” and “Landscape Architect” are listed under the heading “Interest in Nature,” whereas “Environmental Scientist” and “Microbiologist” are under the heading “Interest in Science.”



By Dr. Catrina Adams,
Education Director

BSA Science Education News and Notes serves as an update about the BSA's education efforts and the broader education scene. We invite you to submit news items or ideas for future features. Contact Catrina Adams, Education Director, at cadams@botany.org.

As a sad but telling example of how difficult it can be to find information on plant careers, I looked up “botany” in the U.S. Bureau of Labor Statistics Occupational Outlook Handbook and found this redirect:

•Botanists, see: Zoologists and wildlife biologists.

What Zoologists and Wildlife Biologists Do

Zoologists and wildlife biologists study animals and other wildlife and how they interact with their ecosystems.

Work Environment

Zoologists and wildlife biologists work in offices, laboratories, or outdoors. Depending on their job, they may spend considerable time in the field gathering data and studying animals in their natural habitats.

I found myself humming the theme song to Chris Martine’s “Plants are Cool, Too!” YouTube channel (<https://www.youtube.com/watch?v=7F1lYVtuySw>) and wishing more plant people had found careers with the Bureau of Labor Statistics.

One group that has been trying to increase the profile of plant-related careers is the American Society of Horticultural Sciences, and the non-profit “Seed your Future” (<https://www.seedyourfuture.org>). As part of their research, they conducted surveys on various U.S. demographic populations and found that 0% of the middle school students could tell you what a “horticulturalist” does. The middle school students (ages 11-13) strongly

recommended rebranding horticulture as “Plantology.” Phone surveys of adults showed that 72% of adults over the age of 35 were familiar with the term “horticulture,” but only 48% of adults 18–34 knew the term. It would be interesting to see how many middle school students and adults in that age bracket are familiar with the term “botany.”

In order to develop an interest in plant careers, you need to have some exposure to plants or people who have plant careers. A worrying trend I’ve noticed among our U.S.-based PlantingScience middle and high school teachers is that it’s becoming increasingly difficult for teachers to include plants in their curriculum, even if the teachers already consider themselves to be “plant people” and enjoy sharing how interesting plants are with their students. The 2018 National Survey of Science and Mathematics Education (NSSME+) confirms that the lack of teacher autonomy over curriculum is a national trend. According to the NSSME+, 24% of middle school teachers and 11% of high school teachers perceive that they have no control over selecting content, topics, or skills in their classes. Only 27% of middle school teachers and 34% of high school teachers felt they had strong control over this area. A PlantingScience teacher commented to me that all the teachers at her school had been told by administrators that they must stick to the curriculum and schedule precisely and that there was no room for “love lessons”—spending more time on a subject of particular interest to the teacher.

Given the limitations that secondary school teachers face in using plants in their classroom, and the odd way plant careers are fractured in career planning guides, it’s especially important for us all to reach out and share our passion for plants and our career experiences any way we can.

If you know of particularly good (or bad) existing plant career resources, or exemplary career resources from a different field, please pass them along to me at cadams@botany.org. I would like to get a broad idea of what is already available to have the best chance of building new resources that can make the most difference.

I know that some of you have developed novel ways to share botany career-related information. For example, you may have seen Maryville University junior Emily Vago filming a 360 VR image during the Botany meeting in Tucson. Her “Veronicastrum 360 Project” (https://ilp.maryville.edu/media/VR_Tours/kkrakos/veronicastrum002/index.htm, or scan the QR code below) walks viewers through the entire process of a research project in plant ecology, from fieldwork to poster presentation. I would love to share links to similar projects as we revamp the education and career areas of the botany.org website.



Finally, if you have the opportunity to participate in a career fair or career day at a local school or community event, please consider it as a service to the future of the field.

PLANTINGSCIENCE LAUNCHES NEW “PLANTS GET SICK, TOO!” THEME IN COLLABORATION WITH AMERICAN PHYTOPATHOLOGICAL SOCIETY

This fall, PlantingScience has a new investigation theme, thanks to a collaboration with the American Phytopathological Society’s Office of Public Relations and Outreach. Check out the new theme and resource guides at <https://plantingscience.org/plantsgetsicktoo>.

The new theme is based on a module published in the *American Biology Teacher* by Lou Hirsh, Seth Miller and Dennis Halterman (“An Inquiry-Based Investigation of Bacterial Soft Rot of Potato”). The journal has made this article open access, so you can read it at <https://abt.ucpress.edu/content/80/8/594>.

Plant disease is definitely an important but underrepresented topic in secondary and high school curricula, so we are glad that we can offer a theme that introduces students to the basics of plant pathology. The potato soft rot pathogen—the organism under study in this new investigation theme—can easily be grown in any secondary-school lab (or kitchen) and gets around difficulties with shipping plant pathogen materials to teachers.

An additional advantage to using potato soft rot: it should be extremely memorable due to the incredible odor! As scent and memory are so closely linked, we anticipate

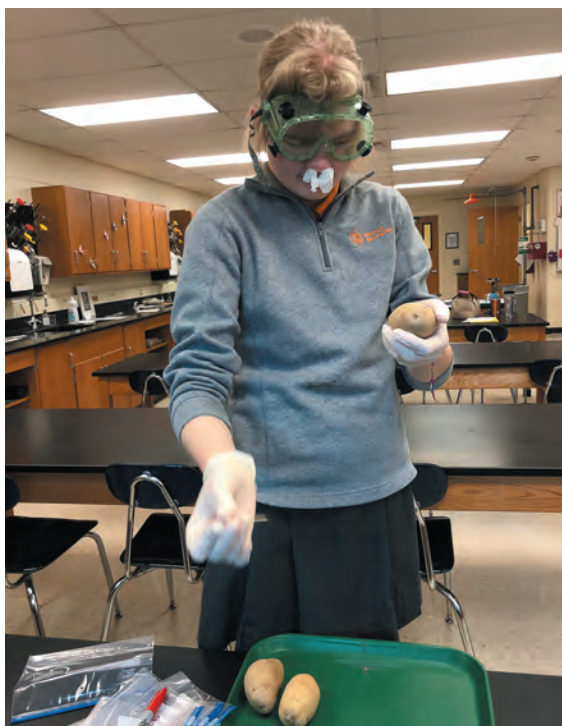


Figure 1. Students beta-testing the new “Plants Get Sick, Too!” PlantingScience module prepare themselves for working with the stinky soft rot-inoculated potatoes by using both eye and nose protection. Check out the new module here: <https://plantingscience.org/plantsgetsicktoo>.

that any inadvertent potato abandonment in participating students’ lifelong culinary adventures is almost guaranteed to bring back memories of their PlantingScience experiences (Figure 1). Beta-testing high school students Grace and Summer—from the team “Potat-bros” (<https://www.plantingscience.org/projects/mmhsharrisspring2019project2>)—described the unique odor during conversations with their scientist mentor Donna Hazelwood: “It smelled like a gross, uncleaned fish tank or burnt old people.”

We are anticipating a lot of interest in this new module for spring, and we can use more mentors who are comfortable mentoring for this new module. Scientists of all career stages

are welcome, and you can choose which sessions you are available to mentor. Sign up to mentor here: <https://plantingscience.org/mentorjoin/mentorjoinmain>.

We are also recruiting middle and high school teachers to participate in PlantingScience with their classes for the spring session. The program is free to teachers; we provide basic materials and online mentoring support. Please direct prospective teachers here to learn more: <https://plantingscience.org/psteachers/joinplantingscience>.

THANKS TO PLANTINGSCIENCE’S EARLY-CAREER SCIENTIST SUPPORT TEAM

A program like PlantingScience requires a lot of personalized attention and monitoring to ensure that the hundreds of active student teams get mentor attention and that teachers know where to turn when they run into issues. Keeping all the conversations between mentors and students going strong requires a strong support team.

We are very lucky to have had Cari Ritzenthaler from Bowling Green, Ohio as our PlantingScience intern since the Fall 2017 session. This session, Cari is joined by new intern Jessi Griffard from St. Louis, MO. Jessie is an experienced teacher with a background in ethnobotany and environmental education, and we are excited to have her help this fall. Our interns help to set up the website for teachers and students, coordinate the work of the Master Plant Science Team, and help make sure all teams are getting timely mentor support.

We'd also like to recognize the cohort of graduate students and postdocs who make up our Master Plant Science Team (MPST). These scientists serve as mentors to teams of students and as liaisons for PlantingScience teachers. They help teachers make mentor matches for their teams and ensure good communication between a teacher and his or her mentors, as well as step in to help keep all the student/scientist conversations going strong. BSA is supporting 14 scientists on the MPST for 2019-2020:

- Alina Avanesyan
- Auyudh Das
- Aline Rodrigues de Queiroz
- Chloe Pak Drummond
- Kelsey Fisher
- Sonal Gupta
- Laura Klein
- Josh Kraft
- Jill Marzolino
- Funmilola Mabel Ojo
- Carlos Pasiche-Lisboa
- Chelsea Pretz
- Elizabeth Stunz
- Luiza Teixeira-Costa

These graduate students and post-docs help teachers to teach more plant biology in the classroom, which is so essential to capturing student interest and increasing appreciation for plants. Please thank them for their service to the field!

Learn more about the benefits and requirements of being on the Master Plant Science Team and consider joining next year's MPST cohort of graduate students and postdocs: <https://plantingscience.org/joinmpst>. Applications will open at the end of this academic year.





STUDENT SECTION

The Botanical Society of America has been a society for botanical research and education for 126 years, and the student portion of its membership is growing stronger over the years. For our Botany 2019 meeting in Tucson, Arizona, we had **497 students (40.7% of the total!)** registered at the conference. BSA is committed to supporting its student members in every feasible way. Starting this year, BSA increased the amount awarded to support graduate student research from \$500 to \$1500 per person without decreasing the number of award recipients. In addition, to keep the cost of student memberships affordable, BSA urges professional members of the society to provide gift memberships to their students. This year we started to offer 3-year student memberships for only \$50, which stays effective even if one were no longer a student during those three years. This year, BSA also initiated a brand-new paid position for students to be BSA social media liaisons. BSA is incorporating students' perspectives to stay connected and is trying to shape botany's future with its student members!

Students of all levels are also encouraged to get engaged in the Society, and students' voices are welcomed in every BSA committee.

Serving as a student representative or on a BSA committee is an invaluable experience, and it is a great way to know how professional societies work and how to organize conference events. If you are interested in becoming the next student representative, serving on a committee (a list of committees can be found at <https://cms.botany.org/home/governance/committees-committee-officers.html>), or nominating someone for any of the positions—or even if you have any questions regarding the positions or BSA in general—feel free to contact your current student representatives: Minya (yamin@g.harvard.edu, @0_minyaaa) and Shelly (michellegaynor@ufl.edu, @ShellyGaynor). Of course, make sure to follow and connect with us on Facebook, Twitter (@Botanical_), and Instagram (botanicalsocietyofamerica)!

GETTING TO KNOW YOUR NEW STUDENT REPRESENTATIVE: SHELLY GAYNOR

When did you join BSA and what motivated you to do so?

I stumbled upon botany.org during my sophomore year of undergraduate at the University of Central Florida (UCF). I was tasked with looking for funding sources for my research project and found the undergraduate research grant. I started to explore the BSA website, but I didn't join BSA until my awesome summer NSF REU (Research Experience for



By Min Ya and Shelly Gaynor
BSA Student Representatives

Undergraduates) advisors, Drs. Robert Laport and Julienne Ng brought me to the annual meeting in 2016. At this meeting, I met so many people and became excited to be a part of this field. I felt like I belonged.

What motivated you to run for the position of Student Representative to the Board of Directors?

During my first BSA meeting, I found out about BSA student chapters. At the time, I felt very isolated in my interest at my undergraduate institution. We did not have any faculty that were doing active botanical research or members of BSA. Luckily, UCF filled this gap and hired a botanist and BSA member, Dr. Chase Mason, in Spring 2017. With Dr. Mason's support and the help of another student, we established a BSA chapter at UCF. By establishing this chapter, I realized I wasn't alone and was able to help create a community for the numerous students who shared my interests. Establishing this chapter of BSA at my alma mater was extremely rewarding, as it enabled me to see others become excited about botany (six of the UCF chapter's members were even at Botany 2019!). From this experience, I became passionate about making fellow students feel welcome and excited to be a part of BSA. Having the opportunity to help support students in BSA motivated me to become a student representative.

What have you gained from being a student member of BSA?

I have gained so much from being a member of BSA. As an undergraduate, BSA gave me confidence; I was very fortunate and was awarded a number of research and presentation awards by BSA. Through the annual meetings, I met most of my current

collaborators, including my graduate advisors, Drs. Pam and Doug Soltis.

What's your research about and how did you discover your research interest?

Broadly, my research focuses on polyploidy evolution and ecology. I discovered my research interest while working in a turf grass lab as a high school student, where I encountered polyploidy for the first time using a slide I prepared. I discovered that the grass had undergone multiple rounds of genome duplication, resulting in triple the number of chromosomes, and I wanted to know why.



What sorts of hobbies do you have?

I'm truly a cat lady and like to spend my evenings watching Netflix with my cats. I spend a lot of time with my two cats, Mabel and Gus, and post many photos of them on Twitter (@ShellyGaynor). Like most botanists, I love hiking and traveling. I also enjoy spending time with my family and make time to go see them as often as I can. Other things that fill my time include cooking, baking, and painting.

QUICK NOTES ON THE BOTANY 2019 CONFERENCE

We would like to extend a huge “thank you!” to everyone who attended Botany 2019 in Tucson, Arizona. It was an excellent meeting filled with great field trips, workshops, talks, posters, arts and mixers. We hope you enjoyed the beautiful Tucson summer, connected with old friends, made new friends, and were inspired by all the amazing science during the meeting.

We are very grateful to Erin Dokter and Nick Cenegy from the University of Arizona Think Tank, as well as Gordon Uno and Melanie Link-Perez, for co-hosting the Statement Writing Workshop with the student representatives. We want to thank all the panelists in our Careers in Botany Luncheon, and our keynote speaker Betsy Arnold from the University

of Arizona gave an especially touching and inspiring talk about the paths she took to get where she is today. We also had a blast in our undergraduate mixer and student social and networking event, which was kindly sponsored by Wiley; students were able to meet and chat with editors of the *American Journal of Botany* and *Applications in Plant Sciences*. This year we also had a brand-new CV reviewing session during the conference. We are very grateful for all the professional members that volunteered to be the CV reviewers, and spent their time helping students to tailor their CVs and resumes to their desired career paths.

We also loved seeing all the tweets and pictures shared on social media during the conference—let’s keep the good vibes for botany going! We look forward to seeing all of you again, or getting to know you for the first time, at #Botany2020 in beautiful Anchorage, Alaska, on July 18-22, 2020!

Plants at the Extreme!

Botany

Anchorage
Alaska
July 18-22

2020





ANNOUNCEMENTS

New BSA Social Media Liaisons Selected for 2019-2020

BSA is pleased to announce that two Social Media Liaisons have been selected for 2019-2020: Taran Lichtenberger and Jared Meek. Earlier this year, the BSA Student Representatives asked the BSA Board to approve the creation of these roles to better engage with and provide a community for BSA members (both current and potential) via our social media platforms of Facebook, Twitter, and Instagram. Here they are to introduce themselves!



Taran Lichtenberger
*Northwestern University and
Chicago Botanic Garden*

Hi! I'm Taran Lichtenberger, a Plant Biology and Conservation Master's student at Northwestern University and Chicago Botanic Garden. I currently conduct research on plants from the Colorado Plateau region using micropropagation techniques and studying intraspecific diversity. I am also very passionate about sharing science with others and helping everyone recognize how awesome plants are! I have contributed to other organizations' social media pages and am looking forward to interacting with BSA members and growing the community of interested botanists, plant science researchers, and plant enthusiasts.



Jared Meek
Columbia University

Hello! My name is Jared Meek, and I'm a Master's student at Columbia University in the Ecology, Evolution and Environmental Biology Department. I love learning about plants, mountains, and plants in mountains! I'm currently studying a beautifully diverse genus called *Pedicularis* (lousewort) in the Hengduan Mountains of SW China and Tibet. I'm excited to join BSA's social media team to help students have a deeper connection with the wonderful world of botany.

HARVARD UNIVERSITY: BULLARD FELLOWSHIPS IN FOREST RESEARCH

Annually Harvard University awards a limited number of Bullard Fellowships to individuals in biological, social, physical, and political sciences and the arts to promote advanced study or the integration of subjects pertaining to forested ecosystems. The program seeks to allow mid-career individuals to develop their own scientific and professional growth by utilizing the resources and interacting with

personnel in any department within Harvard University. In recent years Bullard Fellows have been associated with the Harvard Forest, Department of Organismic and Evolutionary Biology, and the J. F. Kennedy School of Government and have worked in areas of ecology, forest management, policy, and conservation. Stipends up to \$60,000 are available for periods ranging from six months to one year and are not intended for travel, graduate students, or recent post-doctoral candidates. Harvard Forest is an equal opportunity employer. We are committed to establishing and plan to maintain a diverse and inclusive community that collectively supports and implements the Harvard Forest mission.

Additional information is available on the Harvard Forest website (<http://harvardforest.fas.harvard.edu>).

Annual deadline for applications is
December 15, 2019.



In Memoriam

PERSONAL REFLECTIONS ON A GUIDING LIGHT: WINSLOW R. BRIGGS (1928-2019)

On February 11, 2019, the botanical society and the broader scientific community suffered the loss of one of our most esteemed members, Dr. Winslow R. Briggs, an exceptionally productive scientist, extraordinary mentor, and beloved colleague. As but two representatives among many former students and scientists to have been mentored by Winslow, we hope to convey our sense of his ongoing impact on the scientific world, and on individuals that are fortunate enough to be included in the long list of associates, mentees, and friends influenced by this generous and gifted man.

Several recent tributes have enumerated many of Winslow's achievements. His scientific productivity and the importance of his contributions to plant biology are indisputable; for more than seven decades, Winslow contributed a tremendous amount to our understanding of light-mediated regulation of plant growth and development, and of the biochemical and physiological mechanisms underpinning those responses. Throughout his career, from his doctoral work at Harvard University, an eight-year stint as a faculty member at Stanford University, his return to Harvard as a Professor of Biology, and his subsequent recruitment as Director of (and ultimately Emeritus positions in) the Carnegie Institution of Washington's Department of Plant Biology and Professor at Stanford University, Winslow's scientific accomplishments and impact across many fields cannot be overstated. For his groundbreaking work on auxin redistribution, phytochrome function, and blue-light receptors, Winslow was inducted into the



Winslow Briggs (center) with Ann Briggs and Tim Short at a Carnegie conference in 2014.

prestigious National Academy of Sciences, the American Academy of Arts and Sciences, the Deutsche Akademie der Naturforscher Leopoldina, and the California Academy of Sciences. As further testament to his outstanding influence in scientific endeavors, he earned numerous awards, including:

- The Distinguished Fellow of the Botanical Society of America Award “for pre-eminence in research ranging from vernalization in ferns and hormone transport to the chemistry and biophysics of light-mediated growth of plants”
- The Alexander von Humboldt Award to U.S. Senior Scientists to pursue scientific research in Freiburg, Germany
- The Stephen Hales Prize for “serving plant physiology as a teacher and mentor, as an investigator of how light interacts with internal metabolic and hormonal controls, and as a senior spokesperson for science” and the Adolph E. Gude, Jr. Award “...in recognition of outstanding service to the science of plant biology”, both from the American Society of Plant Biologists, for which he served as President in 1975-76
- The U.S. Department of Agriculture – American Chemical Society Sterling B. Hendricks Memorial Award
- The Japan Society International Prize for Biology

There can be no doubt that Winslow was widely recognized throughout his career as a brilliant scientist.

While it was through his substantial scientific achievements that we were initially drawn to

work with him, we soon came to understand how much more there was to Winslow beyond his superb research reputation, and we wish to convey the deeply personal connections that make Winslow’s a life to celebrate. Winslow was an inspiring mentor, and the environment he fostered made going into the lab everyday a joy. Unless he was traveling, one could expect him to appear at least once a day in the lab to look at the latest autoradiographs or consider the next experiment; and several times each day he would suggest brewing a cup of tea as an excuse to talk about the manuscripts we were outlining, discuss recent papers that might be relevant to our work or that were important scientific milestones, or simply float ideas for possible future experiments. On multiple occasions he donned a lab coat and parka to help harvest pea epicotyls or maize coleoptiles in the cold room under “reagent grade” darkness, in preparation for large-scale membrane extractions and protein phosphorylation experiments—and used the opportunity to exchange awful jokes and puns. At the same time, he gave us enormous latitude to try novel experiments or take new approaches, allowing us to succeed on our own terms or to fail and learn from our mistakes. To wit, when it was suggested that *Arabidopsis* might be a good addition to our model species for biochemical studies, Winslow’s initial response was, let’s say, less than enthusiastic, yet he yielded gracefully. After this little weed proved to be precisely the plant we needed to finally identify what turned out to be the phototropin photoreceptor, Winslow became one of the greatest advocates of using *Arabidopsis* as a genetic and biochemical system.

What these examples have in common is that Winslow treated us not as underlings to be directed, but as colleagues with valuable

insights that could alter his preconceptions. He did not have to push us because he inspired us to push ourselves. And like co-workers, rather than leaving us in the lab while he presented our work, Winslow often gave us the opportunities to not only attend meetings with him, but to give the talks and field the questions on our work. He gladly introduced us to other members of the community without regard to their prominence or to the “sexiness” of their work, and when walking through poster sessions, he made a point of stopping at posters that had had few visits and asked, to the delight of the lonely student, “Take me through it.” In the same vein, when sitting in the audience listening to others’ presentations, he would invariably whisper enthusiastic and positive appraisals of each talk. He made his own joy for scientific exploration contagious, and in so doing was widely respected and revered across the community. In fact, after presenting new and unpublished data, attendees would often point out to us that larger labs would never try to “scoop” us because his peers held Winslow in such high regard. Indeed it will be interesting to watch the field and attitudes within it in Winslow’s absence; we hope his legacy of collegial interaction and respect will continue to live on.

Winslow’s guidance did not end when we left his lab. He served as a principled mentor, leading by example. Both of us have commented frequently on how we strive to lead our laboratory groups in the manner exemplified by Winslow: providing criticism respectfully but clearly, maintaining high scientific and ethical standards, supporting resourcefulness in our students, and treating the lab members as scientific associates in ways that encourage them to take ownership of their projects. Whether initiating a local gathering of plant photobiologists that he slyly



Winslow Briggs with Mannie Liscum, preparing for his keynote address at his 90th birthday celebration symposium in April 2018 at CIW-Plant Biology.

dubbed the Bay Area Regional Photomorphogenesis (BARPH) meeting, or at the annual Carnegie Institution hog roast; on a lab hike at Henry Coe State Park, where he and his wife Ann were honored for their extensive conservation efforts, research, and volunteer work that was instrumental to saving the park from closure, or at one of the many Chinese banquets he (often aided by one or more of his daughters) prepared for as many of the extended lab family and visiting scientists as he could gather; sharing his love of art and for nature, or demonstrating his exceptional talent as a pianist, he made us feel we were part of his life, and we saw him as part of ours. And, of course, many of his former students, including both of us, still adhere to the “Briggs Rule,” stipulating that under no circumstances should a meeting last more than an hour!

His mentoring also included a fearless and unwavering advocacy for his students and colleagues. He called out the academic administration that had unjustly denied advancement to one of his former students

based on gender, and he worked hard to ensure fair treatment of not only his mentees, but of faculty and staff with whom he worked. He fought to protect and expand the “Carnegie model” that allowed exploration of innovative ideas and interdisciplinary research, collaborations with labs across the globe, and funding to support graduate students and postdocs built into the institution’s budget. Yet, despite all the difficult decisions and complications of heading one of the most distinguished institutions for plant biology, he always made time for lunch in the Carnegie woods or a cup of tea to talk science or to help with a personal issue—and he never missed an opportunity to make us laugh.

Although we grieve with his wife Ann, and their daughters Caroline, Lucia, and Marion, we also celebrate the scientific and personal legacy that will hold Winslow in our memories and propagate in his scientific family for generations. Winslow was a devoted scientist, an incomparable mentor, and a dear friend. We believe we speak for so many whose lives were touched by Winslow: we were blessed to have crossed paths with such a unique, accomplished, humble and gracious humans beings to have walked this Earth. We will miss him enormously.

Donations in memoriam can be made to support the ASPB-Carnegie Winslow Briggs Mentorship Award at <https://carnegiescience.edu/WinslowBriggs>.

- *Timothy W. Short and Emmanuel Liscum*



ARTHUR OLIVER TUCKER, III (1945-2019)

Arthur Oliver Tucker, III, retired Research Professor of the Delaware State University (DSU), died on 5 August 2019, in Dover, Delaware, after a short illness.

He was born on 22 June 1945, in Allentown, Pennsylvania, son of Arthur Oliver Tucker, Jr., and Clara Tucker. He attended Fountain Hill High School in Bethlehem, graduating in June 1963, then graduated from Kutztown State College (now Kutztown University) in Kutztown, in June 1967, after majoring in Biology with a Botany emphasis (B.A.).

Art entered graduate school at the Rutgers University, New Brunswick, NJ, and studied plant systematics under Dr. David E. Fairbrothers, with whom he maintained friendship until Dave’s death in 2012. His master’s degree (M.S., 1970) research

involved the variation of leaf proteins in three species of *Mentha* (Lamiaceae). He continued with studies for his doctoral degree (Ph.D., 1975) studying the morphological, cytological, and chemical basis of the *Mentha* × *gentilis* L. hybrid complex.

After a short period (1974-1976) of teaching a biochemistry laboratory at the Rutgers University Medical School, he began his long career (1976-2012, 36 years, on retirement, becoming Professor Emeritus) at the Department of Agriculture and Natural Resources at the Delaware State University, Dover, DE.

The 36 years at Del State involved teaching, research, and outreach to the scientific community and the general public. His professional interests included ethnobotany, especially plants used for flavor, fragrance, medicine and culinary use; systematics of the mints, *Mentha*, and especially the Lamiaceae, flora of the DelMarVa peninsula; plant essential oil chemistry and analysis; and botanical and gardening history, including his latest book (with Jules Janick) on the biota of the Voynich manuscript.

During the late 1970s he and Prof. Norman H. Dill formed the beginnings of the Claude E. Phillips Herbarium (DOV). A new two-floor facility for the herbarium was erected near the agricultural and natural resources research building, which became the center for collecting and development of the field botany program in the state of Delaware. Several historic collections of specimens were added to the collection, now amounting to over 150,000 sheets plus specimens of wood, potpourri, fibers of plant origin, and beads made of plant materials. Among the more prominent associates in the herbarium were Dr. Susan E. Yost, who was the Herbarium

Educator; Dr. Robert F. C. Naczi, his first successor as curator of the herbarium; and then Dr. Cynthia Hong-Wa, current curator of the herbarium.

His teaching load over the years at DSU, at the undergraduate or master's degree student level, included general biology, general horticulture, horticulture and plant materials, general botany, plant physiology, population biology, evolution of vascular plants, taxonomy of ornamental plants, plant anatomy and morphology, and systematic botany.

Among his outreach activities at DSU were the exhibitions of materials of plant origin at the herbarium, involving volunteers in the herbarium activities such as mounting plants and filing of specimens. Special days of programs for children were a favorite of his activities.

Art was a long-time and prominent speaker at local herb society meetings, the Herb Society of America, and the International Herb Society.

The Tucker Research Laboratory, run for many years with the assistance of Michael J. Maciarello, studied the flora and rare and endangered plants of Delaware and Maryland and undertook the analysis of essential/volatile oils of culinary and aromatic plants. Michael was a coauthor on publications with Art from 1979 through 2011.

Numbering among his many hundreds of scientific and popular publications are these books:

Tucker, A. O. and T. DeBaggio. 2000. *The big book of herbs: A comprehensive illustrated reference to herbs of flavor and fragrance*. Interweave Press, Loveland, CO.

McGuffin, M., J. T. Kartesz, A. Y. Leung, and A. O. Tucker. 2000. *Herbs of commerce*. American Herbal Products Association, Washington, DC

Tucker, A. O. and T. DeBaggio. 2009. *The encyclopedia of herbs: A comprehensive reference to herbs of flavor and fragrance*, ed 2. Timber Press, Portland, OR, 2009.

Belsinger, S. and A. O. Tucker. 2016. *The culinary herbal: Growing and preserving 97 flavorful herbs*. Timber Press, Portland, OR.

Janick, J. and A. O. Tucker. 2018. *Unraveling the Voynich Codex*. Springer, Cham, Switzerland.

Belsinger, S. and A. O. Tucker. 2019. *Grow your own herbs: The 40 best culinary varieties for home gardens*. Timber Press, Portland, OR.

The broad scope of his interests is represented by the awards he revealed during his very active career: Faculty Excellence Award in Research (DSU, 1988); Medal of Honor (Herb Society of America, 1990); Outstanding Scientist Award (Association of Research Directors (1994); Distinguished Research Award (National Association for Equal Opportunity in Higher Education); Scientific Award (American Herb Society, 1996); Industry Achievement Award (Texas Herb Growers & Marketers Association, 1996); Professional Award (International Herb Society, 1997); Excellence in Research/Creativity Award (DSU, 1998); Award for Excellence in Horticulture (Herb Society of America, 1998); 2002 Book Award (International Herb Association, 2002); Certificate of Achievement for Positively Outrageous Service, Delaware (Cooperative Extension, 2008); Award for Excellence in Herbal Literature (Herb Society of American, 2004); and Friends of Extension Award (Delaware Cooperative Extension, 2016).

Art met his wife Sharon Smith (Ph.D., animal ecology) while they were graduate students at Rutgers, and they were married for over 48 years. They have three children: Melissa (husband, Eric Klinker), Angelica (husband, Jonathan Glatt), and Arthur Oliver IV (wife, Ana Paula), and four grandchildren.

His non-professional interests included folk painting and stencil painting; home gardening; going through phases of collecting old cultivars of roses and irises, a traditional herb garden, and a wooded area with small ponds and wooden arbors; sour-dough bread baking; cement garden planters; and sculptures. He also collected antique hand-painted metal trays, green-man facial sculptures, narwhal figures, and egg-cups (the last two, his most recent pastimes).

[Note: The College of Agriculture, Science and Technology of Del State recently issued a special commemorative edition, Summer 2019, "Humble giant: Dr. Arthur Oliver Tucker, III, 1945-2019: A fond farewell to our paragon of plant science." [<https://indd.adobe.com/view/74306885-2f8a-45a4-8d27-71ab6724f720>, consulted 6 Sep 2019].]

-Thomas A. Zanoni (retired), *New York Botanical Garden*



W. MARK WHITTEN (1954–2019)

Mark Whitten passed away suddenly on 11 April 2019. Mark was an amazingly talented botanist. He was an experienced field botanist who knew the flora of Florida as well as that of eastern North America extremely well; he was also equally comfortable in the molecular lab. In fact, Mark was working regularly both in the field and in the molecular lab in the days before his sudden death. He will be missed by all who knew him for his helpfulness, botanical expertise, and cheerful nature.

Mark was an extremely warm and friendly person who readily gave much of his time to help other scientists. He took undergraduates as well as graduate students and visiting scientists in to the field. He also trained students and visitors in molecular methods. His love for botany was contagious; part of his legacy will be the many people who became interested in botany because of his enthusiasm and love for plants. Part of his legacy is also the model he provided for young people by helping others while being a hard-working scientist.

Mark was born on 20 October 1954, in Memphis, Tennessee. He graduated from

Bishop Byrne High School in Memphis in 1972 and then from Thomas More College in Covington, Kentucky, in 1976, with a bachelor's degree in biology. As a college student, he sampled phytoplankton in the Ohio River as a consultant to several environmental companies. He received his M.S. in botany from the University of Tennessee at Knoxville in 1979 with a thesis on the pollination biology of *Monarda* (Lamiaceae) species and hybrids in the southern Appalachian Mountains. He then chose to work with Norris Williams, then at Florida State University, on euglossine bee-pollinated orchids in 1979. When Norris moved to the Florida Museum of Natural History at the University of Florida in Gainesville in 1981, Mark transferred there and spent a summer as a student intern at Marie Selby Botanical Gardens in the Orchid Identification Center. His dissertation, completed in 1985, was titled, "Variation in floral fragrances and pollinators in the *Gongora quinquenervis* complex (Orchidaceae) in central Panama." In addition to Norris's mentorship, Mark received valuable guidance on orchids from Robert L. Dressler (Panama) and Calaway Dodson (Ecuador and Marie Selby Botanical Gardens); that triumvirate, along with David Roubik of the Smithsonian Tropical Research Institute in Panama, were then leading virtually all work on euglossine bees and the flowers they pollinate. Mark collaborated with them and later, with additional collaborators, expanded on their work to include osmophores, floral fragrance components, flight-cage experiments, and bee anatomy.

In the 1990s, Mark began work in orchid molecular phylogenetics, using nuclear ribosomal ITS and plastid sequence data. He managed the molecular lab in the Herbarium (FLAS) and collaborated with

researchers throughout the orchid community on systematics papers involving Laeliinae, Stanhopeinae, Oncidiinae, Arethuseae, Angraecinae, Zygopetalinae, Vandaeae, Pleurothallidinae, Sobralieae, Spiranthinae, and particularly Maxillariinae, for which he wrote most of the generic treatments for Volume 5 of *Genera Orchidacearum*. Mark's expertise in sequencing and his willingness to help everyone extended to work on other plant taxa such as Polygalaceae, Malvaceae, Ericaceae, Melastomataceae, Melanthiaceae, Zingiberaceae, the aquatic fern *Marsilea*, mammals (a study of retrieving DNA from small bones of dried specimens), and crassulacean acid metabolism. In fall 2013, Mark started a project to build a comprehensive species list and DNA-barcode plants in the Ordway-Swisher Biological Station, along with Kurt Neubig and Lucas Majure.

Mark joined the Laboratory of Molecular Systematics and Evolutionary Genetics at the Museum in 2015 to work with Pam and Doug Soltis and was deeply involved in their National Science Foundation grant to determine how

historical constraints, local adaptation, and species interactions shape biodiversity across the ancient floristic disjunction between southeast China and the eastern United States. He led the field work and sampling and was also active in the lab. Mark had an enormous impact in the Soltis Lab beyond that one project. He took undergraduates, graduate students, and visitors into the field; collected samples requested by colleagues in labs around the world; worked in the greenhouse; gave sage advice to students; and developed new methods for the isolation of high-molecular-weight DNA. He seemed to be everywhere. Mark had also recently begun a floristics project at the Etoniah Creek State Forest and was there at least once every week. He was never happier than when he was out collecting plants and building our knowledge of biodiversity. He will be missed by friends and colleagues around the world.

-Douglas E. Soltis, Pamela S. Soltis, and Lucas C. Majure, Florida Museum of Natural History, University of Florida, Gainesville, FL

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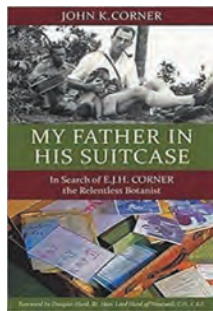
My Father in his Suitcase: In Search of E.J.H. Corner the Relentless Botanist

By John K. Corner

2013. ISBN: 978-981-4189-47-7.

Soft cover, £24.99, 431 pp.

Landmark Books Pte Ltd, Singapore 199588



Before and during World War II (WWII) a number of excellent, productive, and sometimes eccentric botanists roamed South East Asia. One of them was Edred John Henry Corner (1906-1996), who started his career in 1929 as Assistant Director of what is now the Singapore Botanic Gardens (SBG). [Full disclosure: I visited the Garden frequently to work and write the third edition of

Micropropagation of Orchids with my former post-doctoral fellow, Dr. Tim Wing Yam.]

Richard Eric Holttum (1895-1990), who wrote an excellent book about the orchids of Malaya during the Japanese occupation, despite considering himself to be a fern expert, was director of SBG at the time, having assumed the position in 1925 after being assistant director starting in 1922. He also founded the Malay Orchid Society, now the Orchid Society of South East Asia; produced the first orchid hybrid in Singapore, *Spathoglottis* Primrose; and later became the first professor of botany at the University of Singapore. [Another full disclosure: starting in 1972 I spent many months during summers and sabbatical leaves working at the Botany Department of this university with its chairman, the late Professor A. N. Rao, and Professors P. N.

‘Danny’ Avadhani and Choy sin Hew, both retired now.] It was not long before tension developed between Corner and Holttum for reasons that are not clear to this day, but may well have been due to differences in their personalities.

Corner quickly became very active in Singapore and Malaya. He studied fungi, trees, and the local flora. One result of these studies was the classic *Wayside Trees of Malaya*. Not wanting to climb tall trees to collect study material, he trained pig-tailed monkeys, *Maracus nemestrina* (locally known as *berok*) to collect epiphytes, small branches, flowers, and fruits for him. During my first visit to SBG in 1969, monkeys still roamed free in the Garden.

During the brutal WWII Japanese occupation of Singapore (which the Japanese called *Syonan-to*, meaning “Light of the South”), Corner took it upon himself to save and protect scientific and cultural institutions. He developed excellent working relations with the Japanese officials who were in charge of these matters. This gave him considerable freedom of movement, which he used to carry messages that could have resulted in his execution had he been caught. He also destroyed nautical charts, which could have been useful to the occupiers.

Corner’s close association with Japanese occupation officials led to accusations of treasonous collaboration after the war. He exacerbated these accusations by strengthening the friendships he forged during the war and writing books and articles that praised the Japanese men of science officials (Corner, 1946, 1981). In reality, there was no treasonous collaboration. There was collaboration of dedicated scientists working together. The Japanese scientists who were

sent to Singapore to assume high-level administrative positions (in civilian clothes or military uniforms) were high-integrity, principled men of science whose goals were the same as those of their British colleagues. In fact, some of them ran into problems with the Japanese military because of their good relations with Corner and Holttum.

Professor Hidezo Tanakadate, who was in charge of the Raffles Library and Museum, and SBG, announced on his arrival in Singapore, “I conserve cultural institutions.” He was very kind to Corner and Holtum (Holttum, 1958, 1964, 1977). The Marquis Yoshuchika Tokugawa, president of the gardens and the museum, who was equally devoted to protection of such institutions, fell under suspicion of being a supporter of the British because of his kindness. He was relieved of his duties and returned to Japan. Brigadier General Professor Kwan Koriba, a plant physiologist with an interest in orchids (Koriba, 1913, 1914, 1926), who was appointed director of SBG, held the view that “there is no nationality in the field of science” (Arditti, 1989). He allowed Holttum and Corner to continue their work and treated them kindly; he himself engaged in research on the periodicity of tree growth (Koriba, 1958). Koriba also treated the SGB laborers very well. They called him *orang yang baik sekali*, which roughly translates to “perfect gentleman” (Arditti, 1989). When food became scarce, Koriba and/or Dr. Yata Haneda, who became director of the museum in 1942, invited Corner and Holttum for lunch following the weekly facilities tours on Sundays, to make sure that they had at least one good meal every week (Arditti, 1989).

The treasonous collaboration allegations were resolved in Corner’s favor once all the facts became known, but it took years, during which he was employed by UNESCO. In 1965

he returned to England and was appointed Professor of Tropical Botany in Cambridge. Later he was also elected to the Royal Society.

Corner was not an easy man to get along with. He was dogmatic and argumentative. The price he paid for his personality was high on several levels. His son, the author of this book, left home in 1960 at the age of 19 and never saw his father again. Corner did not forget his son. He had a suitcase labeled “For Kay, wherever he might be” and kept putting in it items he wished his son to see. This suitcase came into the son’s possession in 2002, and he nearly threw it away. Fortunately, he did not, and took it with him on moving to Australia where it languished on a shelf in the garage until 2006 when he opened it on a dull and wet winter day in Melbourne.

The material in the suitcase plus additional information the author gathered are the basis of this book, which the author concluded with “*va pensiero*,” two words that mean “go, thought” (the same two words start the beautiful and touching Hebrew slaves chorus in Verdi’s opera *Nabucco*), “Adieu,” and “I have found a father.” Being an admirer of both men, I think that a more apt conclusion would have been the very personal epitaph Corner wrote for Kwan Koriba,

“*In the footsteps of Kwan Koriba
his one time enemy
his adopted son
his admirer*”

There is much more in this book about a prominent botanist and his life, times, work, and wandering around the world. I concentrated on the events in Singapore during WWII because they show “devotion to duty...and...sympathetic understanding of human nature [and] understanding that transcended racial boundaries, even in times

of war and of privation” (Holttum, 1958).

This is an unusual book that may be of lesser interest for some in the current generation, which barely remembers WWII and its horrors. For me it is interesting, informative, and touching, not the least because I spent a good part of my life visiting and working in Singapore and SBG where the story started and much of it happened, and because the book deals with great men of science whose actions were driven by firm principles and high integrity during the worst of times. It is a good book to read and maybe even assign to students as an example of how good men should behave during difficult times.

-Joseph Arditti, Professor of Biology Emeritus,
University of California, Irvine

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ECOLOGY

Carnivorous Plants

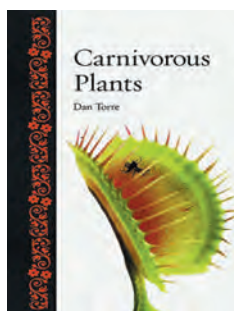
By Dan Torre

2019. ISBN-10: 1789140528;

ISBN-13: 978-1789140521

Hardcover, £16.00. 240 pp.

Reaktion Books, London, UK.



When I taught general biology, my audience was primarily pre-medical students. For the most part, this group was bright and motivated, but they were not very interested in learning about botany or plant biology. However, when the time came to discuss carnivorous plants, their interest seemed to perk up a bit. Wow, plants can actually do something interesting—sometimes they even eat animals! I took advantage of this momentary interest to try to make some broader points about plant sciences.

It turns out that our society in general has a great interest in carnivorous plants—and the tales are fantastical. The author considers this public fascination in Chapter Four titled “Attack of the Killer Plants.” Of course, we had the film “Little Shop of Horrors,” with Audrey the killer plant and his caretaker Seymour,

that developed a cult following. This film was adapted into a very enjoyable (at least from my perspective) off-Broadway musical. Many of my students seem to think that there were plants in the Amazonian jungles that ate humans for lunch!

In reality, plants developed carnivory as an adaptation to live in nutrient-poor environments (Ellison and Gotelli, 2001) as the author points out in Chapter One on the natural history of these plants. Carnivorous plants are very distinct with only about 700 species known among all vascular plants. They expend energy to develop very specialized leaves to capture their prey. The author divides these plants into: fast-moving carnivores such as the famous Venus flytrap, sticky carnivores such as the sundews, and pitcher plant carnivores that have fluid-holding vessels. All of them secrete digestive fluids with enzymes to digest their prey, which usually includes insects, but could be larger animals such as rodents and amphibians. In fact, the Darwins specifically considered insectivorous plants in one of their botanical treatises (Darwin and Darwin, 1888).

Carnivorous plants are increasingly featured in art and design as summarized in Chapter Five, which is illustrated with many images of paintings of this plant group. To me, the most fascinating art form was the recent series of glass and metal sculptures. For example, artist Jason Gamrath depicts large botanical structures including glass-blown pitcher plants that are about three feet tall. In addition, Paul Hill has created large public sculptures of Venus flytraps made of carbon steel and fused glass, which are displayed near their native range in North Carolina. The use of images of carnivorous plants on stamps and coins throughout the United States is also considered.

The sixth and final chapter discusses collecting and conserving carnivorous plants. In the late 1800s, specialized nurseries in England and the United States stocked this plant group, often with a large selection. In the past, the ethics of these nurseries was questionable as some of them decimated wild populations of Venus flytraps and pitcher plants. Carnivorous plant societies have been established throughout the world to promote the conservation and cultivation of these fascinating plants.

This book, written for the general reader, is part of a series that integrates information about a plant group into broader social, cultural, and historical contexts. The books in this series typically have a single word title that reflects a plant group (e.g., cactus, sunflowers). The volume is beautifully illustrated and compact, and it comes with a reasonable price. It's a fun and enjoyable read.

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-John Z. Kiss, *Department of Biology, UNC-Greensboro, Greensboro NC 27402*

ECONOMIC BOTANY

Tasting the Past: The Science of Flavor & the Search for the Origins of Wine

By Kevin Begos

2018. ISBN 978-1-6162-0577-5

Hardcover, US\$26.95.

277 + x pp.

Algonquin Books of Chapel Hill, Chapel Hill, NC



More search than science, this interesting and readable book is the odyssey of a journalist intrigued with the diversity of wines and where they originated. The search displays the author's prowess as a travel writer and leads us to exotic places like the Republic of Georgia, villages in the Swiss Alps, heritage vineyards in the Palestinian Territories, and more. Here he explores the renaissance in the use of local grape varieties for the production of unique wines. The science is based on his review of the literature and visiting wine researchers.

The enemy in the book is the large, industrial wine industry that—as the author constantly reminds us—depends upon Pinot Noir, Merlot, Chardonnay, and Sauvignon Blanc grapes, cultivars that produce high yields and have been adapted for mass production. Begos explores little known grape varieties, tastes their wine, and describes the flavor. As the author notes, he set off “. . . like a viticultural Quixote, traveling ancient wine routes, championing obscure grapes and railing against the glut of famous French varieties.”

This approach is in line with the movement for the utilization of indigenous plants and their products produced in small batches by local vintners.

I found the short chapter on terroir of particular interest; it reminded me of a German wine chemist who tasted a wine and told me the grapes were grown on volcanic soil. He was right. But Begos discusses a new approach to understanding terroir, one that considers the role of microorganisms in the transmittal of flavor into the wine. The widespread use of fungicides and other pesticides alters the biology of the soil. Although Begos does not use the term, his research shows that the term *ecology* could be a stand-in for *terroir*.

Tasting the Past skillfully combines the biology of wine with local cultures and colorful characters. For example, ethnobotanists would agree that cultivation of wine grapes originated in Western Asia, then spread to such centers as Cyprus, Greece, Italy, France, and Spain. He identifies as heroes those who often worked against great odds to protect and propagate autochthonous vines. The author uses grape varietal DNA research to document the spread of wine. He also notes that the progenitors of the wine grape, *Vitis vinifera*, were unisexual like other species in the genus.

There is a discussion of American species of grapes and how they are being used to develop varieties suitable for differing climates. As someone who lives in an area where the native muscadine grapes, *Vitis rotundifolia*, are relished, I was sorry nothing was said about the role of methyl anthranilate and its role in wine making. I was originally drawn to the book because of my work on the ethnobotany of the Bible and Qur'an, so I was disappointed that the traditional method of growing grapes without trellises, as I have seen in Syria, Palestinian Territories, and Iraq, was not mentioned. Is there evidence (aside from the Bible) that this was more common in ancient

times? Myrrh was added to wine (p. 106) in ancient times, but myrrh is not a pine resin, as Begos states.

This book nicely combines recent botanical research with the saga of wine production through the centuries. Buy a copy and enjoy it with a glass of one of the highly recommended Georgian wines.

-Lytton John Musselman, Department of Biological Sciences, Old Dominion University, Norfolk, Virginia 23529-0266

PHYSIOLOGY

Physiologie der Pflanzen. Sensible Gewächse in Aktion.

By Ulrich Kutschera
2019. ISBN-13: 978-3-643-14226-9
Hardcover, 59.90€, 712 pp.
LIT-Verlag, Berlin



It is fair to say that “plant blindness” is widespread, even among biologists. Sessile green organisms are regarded as a kind of background for the frolicking of mobile heterotrophs. They may be ancient and important, but clearly plants not “higher organisms.” Indeed, during the first half of the 19th century, many scientists believed that plants were inhabited by “vital forces.” It was the great German biologist Julius Sachs (1832–1897) who flatly rejected this metaphysical idea and replaced it with a mechanistic *Weltanschauung* based on chemistry and physics—a worldview showing that plants were every bit as alive as animals and fungi.

Now, in a new splendid textbook, the equally

prominent German biologist Ulrich Kutschera (a corresponding member of the Botanical Society of America) traces the roots of Julius Sachs' experimental plant science and brings each discipline up to date. A few examples regarding the content of this expansive book will have to suffice for this review.

Chapter 1 provides the history of plant physiology with reference to the "vital force-concept" as proposed by German philosophers (Schelling, Hegel, Schopenhauer) and pre-Sachsian botanists (Meyen, Treviranus, Schacht, de Candolle). Kutschera also describes the "Sachs-Pfeffer-revolution" in the botanical sciences and defines plant physiology, with reference to his 2015 paper published in *Nature Plants*, as "systems biology of photoautotrophic organisms (embryophytes, algae, cyanobacteria)." The position of plants in the Five-Kingdom-System of Life is described, and the role of bacteria for the development of embryophytes is addressed with reference to gnotobiology. Each of the subsequent 19 chapters begins with a brief description of the research that Sachs pursued and published in the respective area of plant science. These introductory remarks are supplemented by the pertinent woodcuttings Sachs created, each reproduced from his original papers and textbooks. Thus, Chapter 2 describes the principles of experimentation and deduction of hypotheses vs. theories, with reference to the Sachsian principle of Factor-analysis. Basic and applied research using crop plants is summarized, and the pros and cons of *Arabidopsis* as a model organism are debated. In Chapter 3, plant cell biology is treated in some detail, with reference to tissue tension (as described/discovered by Sachs), cell wall architecture, aquaporins, as well as the organism concept of plant development and the significance of stem cells, including a comparison between embryonic stem cells

in humans vs. plants. In Chapter 4, cell-water relationships are summarized, with illustrations of the water potential concept and resurrection plants. In this context, climate change, which leads to warming of the atmosphere and dryer soils, is discussed. In Chapter 6, Kutschera discusses the translocation of organic substances (sucrose, etc.) and the newly discovered "heart of the plant". To transfer and concentrate sucrose into the phloem, molecular pumps (SWEET-translocators) are active in the leaves of crop plants. These ATP-driven "sugar pumps" are depicted in a unique model.

In Chapter 9, cell respiration is treated at length, with a description of metabolic scaling theory, models of the ATP-synthase, and the role of reactive oxygen species (ROS). In this context, soil respiration is highlighted, and the author again discusses the topic of climate change (carbon cycle). But perhaps the most comprehensive chapter deals with photosynthesis; in Chapter 10, the author describes plants as "living sunlight-powerplants and CO₂-removers." On approximately 70 pages, illustrated by 38 figures, he describes all key discoveries in photosynthesis research over the past 200 years, with a focus on the work of Julius Sachs, Robert Hill (1899–1990), and Melvin Calvin (1911–1997). In Figure 10.38, the terrestrial carbon-cycle is depicted, based on work published in September 2018. The author points out that, with reference to climate change, approximately one third of anthropogenic CO₂ emissions is recycled by land plants (plus marine photoautotrophs) and refers to Sachs's principle of energy conservation in the biosphere via the "assimilation of carbonic acid." Finally, Chapter 20 brings the book to closure with general conclusions and a general outlook on plant physiology. In this chapter, Kutschera

explains why Sachs was a genius of biology. Then he reproduces a number of unpublished aphorisms taken from the notebooks of Sachs. Then, a comparison between research in medicine and plant physiology is provided, with reference to a forgotten paper of Sachs (1859), wherein he clearly pointed out that we can only feed a growing world population based on plant science. Duckweeds as source for food are described, and the question discussed whether or not it would be possible to feed the world based on organic farming. The text ends with a description of transgenic plants (GMOs) and golden rice.

The book is dedicated to the memory of one of Sachs' successors of the chair of botany at the University of Freiburg i. Br. (Germany), where the 1868 book was written: Hans Mohr (1930–2016). Accordingly, at the end of the book, the author juxtaposes philosophical insights published by Sachs on the “art of logical thinking” with those of Mohr. Taking these aspects into account, it is fair to say that this textbook also should be of interest to general readers interested in the philosophy of science. Kutschera's Magnum Opus is supplemented by 314 high-quality figures, inclusive of many color images. Unfortunately, comparatively few non-German biologists read German. Therefore, a translation of this book in English is highly recommended.

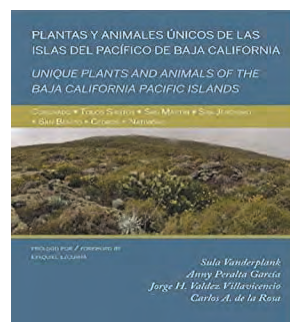
- *Karl J. Niklas*

SYSTEMATICS

Unique Plants and Animals of the Baja California Pacific Islands

Sula Vanderplank, Anny Peralta García, Jorge H. Valdez Villavicencio, and Carlos A. de la Rosa
2017. ISBN-13: 978-1-889-878-51-5

Flexibound, US\$20. Bilingual, 132 pp.
Botanical Research Institute of Texas Press



Of the hundred or so field guides I own, this is one of the most unique. I didn't have any real prior knowledge of these islands, but I learned a lot from the background provided in this book. It's unfortunate that introduced species have taken such a toll on these islands, but a lot of biodiversity remains.

The book includes a foreword, introduction, and about this guide and how to use this guide sections. The seven islands (Coronado, Todos Santos, San Martin, San Jeronimo, San Benito, Cedros, and Natividad) are then described individually followed by sections describing the endemic Plants, Reptiles, Birds, and Mammals and what islands they are known to occur on. This is then followed with citations, author bios, and an index. All text is provided in Spanish and English.

The plant section follows family and then alphabetical order by genus species. The descriptions could use more detail as most lack measurements in terms of size, height, leaf shape, etc. This may be due to distinct species in a narrow geography but could be useful characteristics to someone trying to make a definitive identification. Line drawings could also be a useful addition along with flowering

times. The photos are small but clear and would likely allow for positive identification.

The reptile section also provides short descriptions of each species without measurements for the most part, but the photos should allow for a positive identification. A few of the descriptions do include some unfortunate wording in that they list animals as non-poisonous. Given the context I believe they should have used non-venomous. The reference is used for two gopher snakes, which are constrictors and non-venomous.

Given their mobility I would have expected to see more birds in the bird section. Introduced species have taken a toll on the native animals, and populations are struggling to rebound. Most species are now protected but have a long road to recovery. The descriptions are again short but were likely restricted to allow for the English and Spanish text. The color photos show a lot of detail and should allow for positive identifications.

The mammal section is similar to the others, but also includes some of the introduced species that the islands are actively trying to control and eliminate for reference. All sections include a designation in the upper right corner if the species is listed by the Mexican government or United States of America with protected status.

This would be a useful guide for anyone planning to visit these islands for ecotourism or study.

-David W. MacDougall, CWB® Consulting Biologist

Sedges and Rushes of Minnesota: The Complete Guide to Species Identification

By Welby R. Smith (Photos by Richard Haug)

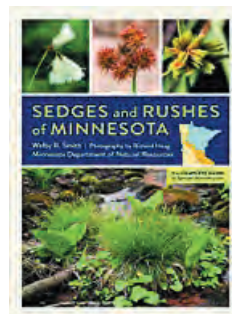
2018.

ISBN 978-1-5179-0275-9

Paperback, US\$39.95.

667 pp.

University of Minnesota Press, Minneapolis, MN



Over the last 10 years, a number of fine books have been produced that cover the Cyperaceae or *Carex* for Midwestern states (Wisconsin, Indiana) or other regions that have significant overlap with the Midwest (Maine). Now we have a book that covers the family for Minnesota, and even includes the Juncaceae, which is a welcome addition to the world of graminoid field guides. This book starts with the typical “how to use this guide” detailing how Smith has approached the difficult task of covering these challenging groups. The species descriptions were made *de novo*, with measurements taken exclusively from 25,000 specimens collected across Minnesota. So, this guide shows the range of variation within the covered taxa but based solely on Minnesota populations. This is an interesting approach, and one that I greatly appreciate, as it allows the reader to see how local populations within a species’ overall range may differ from one another. Another feature that I really like about the book is the inclusion of three maps of Minnesota in the introduction. These depict major substrate types, major vegetation zones at the time of public land survey (1847-1907), and the three major vegetation zones distilled into three provinces. This provides a lot of context for understanding species’ distributions, and I wish more guides would include maps like these.

A key to all Juncaceae and Cyperaceae genera that occur in Minnesota follows the introduction, and then all genera are treated separately, in alphabetical order. One aspect of this I don't like is that the two families are not treated separately, but rather *Juncus* and *Luzula* are included within the middle of the Cyperaceae genera. I would have preferred that each family was treated in a separate section of the book (this same annoyance is in Smith's trees and shrubs book). Each genus has a description and notes on its range worldwide, in America, and in Minnesota. Then each species is treated alphabetically, with a key to species if more than one occurs in the state. The bulk of this portion of the book is filled by *Carex*, of course, with a key to sections; each section then has its own treatment and key. Regardless of genus, all species are treated the same way: a two-page spread with description, range map and notes, habitat notes, comparison with similar species, and other facts on the left-hand page, and photos on the right-hand page. This is a very welcome layout as it doesn't require the user to flip pages to read about one individual species. The range maps show individual specimen dots across a map of Minnesota depicting both county borders and the three vegetation provinces. This relays interesting phytogeographical information showing that many species are found only in certain provinces. The photos are all excellent in quality, showing habitats, plant habit, and close-ups of leaf and flower features. The highlight of these is that almost every species has a close-up shot of all the floral parts separated from one another and together. For instance, for any given rush, this photo will show a single intact flower next to the removed capsule, next to removed seeds. This photo approach is greatly appreciated when comparing the bracts, achenes, and perigynia

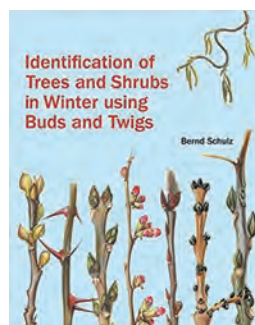
in *Carex*. Taxonomy is up-to-date in most cases (e.g., *Schoenoplectiella* is split from *Schoenoplectus*, *Lipocarpa* is subsumed into *Cyperus*). The book itself is not too bulky or heavy and is easily portable, despite its length.

This is a very well-done, beautiful book that will be quite useful to people looking to learn these interesting and often intimidating plants—I highly recommend it.

-John G. Zaborsky, Botany Department,
University of Wisconsin – Madison, Madison,
Wisconsin, USA; jzaborsky@wisc.edu

Identification of Trees and Shrubs in Winter using Buds and Twigs

By Bernd Schulz
2018. ISBN: 978-1-84246-650-6.
Cloth, US\$80. 368 pp.
Royal Botanic Gardens, Kew



This book offers a systematic and comprehensive guide to the identification of winter twigs and shrubs native and naturalized to Central Europe, as well as genera in cultivation. Originally published in German, this edition is an English translation. According to the preface, this second edition adds 40 new genera and 60 new species, removes approximately 10 species, and includes an updated phylogenetic framework.

The introduction to the text presents a brief historical overview of the study of bud morphology, beginning in 1675, as well as a review of early publications for the identification of woody plants in winter. It also includes a discussion on the biogeography and ecology of deciduous woody plants. The introduction is suitable for a general audience

with an interest in the topic. It is written from a central European perspective with the text, including such phrases as “further species came to us” or “our climate,” without explicitly defining the location the author is referencing until a later section of the book.

The book includes a section on how to use the text and a fairly in-depth introduction to woody plant structure and development, with an emphasis on buds. This section is illustrated by many drawings in which structures are color-coded. This approach is visually engaging and facilitates comparison between examples. However, I found myself having to flip back to find the relevant color key to remember what each color represented. Further, the colors used are semi-realistic, ranging from reds and browns to greens and dark yellows. A colleague with limited color perception suggested to me that more variation in intensity might make the colors easier to differentiate. This section provides a succinct introduction to the topic suitable for students of botany and serves as a reference for traits and terms used in the keys. Included at the end of the book are references for further reading, an index for scientific and common names, an index of botanical terms, and a quick reference key treating the 270 most common species in Central Europe.

The heart of the book is comprised of an initial identification key and descriptions of each family. The initial key leads to genus or, in a few cases, species. Line drawings represent each taxon in the key, as well as select traits. This key relies primarily on bud (vegetative and flower), twig, and plant habit characters, and I found it relatively easy to interpret. The line drawings add clarity. Most, if not all, of the characters can be observed with the naked eye or a hand lens. The family descriptions include identification keys for subfamilies,

genera, and/or tribes. These keys emphasize bud and twigs but sometimes use fruit and seed characteristics. In addition, for each species, there is a description of the woody structures, accompanied by illustrations of twigs with buds and sometimes fruits and/or seeds. The illustrations are stunningly beautiful and lifelike such that I was able to recognize many of the species I am familiar with solely from the drawings.

Despite the European emphasis of the text, all 24 of the deciduous tree and shrub species I regularly assign to my General Botany students at Creighton University, which include a mix of trees native to Nebraska and trees cultivated on campus, were at least mentioned in the text; all but three (*Ostrya virginiana*, *Populus deltoides*, and *Ulmus americana*) were included in keys to species. Oddly, *U. americana* is represented by a fairly extensive description with an illustration but is left out of the key to *Ulmus*. I had less luck with a list of deciduous trees assigned in General Botany at the University of Tennessee - Knoxville, with 3 of the 11 additional trees (*Celtis laevigata*, *Magnolia grandiflora*, and *Ulmus alata*) not included in the text at all. I am not particularly experienced in identifying woody twigs, but I successfully used the keys for the three winter twig examples I had available, identifying *Acer saccharum* and *Aesculus hippocastanum* to species and *P. deltoides* to genus.

This book is a worthy edition to any botanical library. The identification keys and species descriptions are accessible and useful, and the illustrations are exquisite. Although this book is quite comprehensive, the European focus means that it may need to be supplemented by other sources if used in North America or other parts of the world.

--Mackenzie Taylor, Department of Biology,
Creighton University

Grasses of Florida

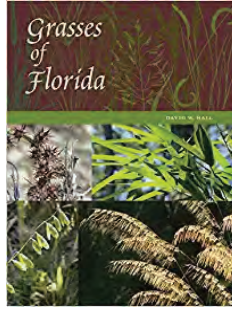
By David W. Hall

2019. ISBN: 9780813056050

Hardcover, US\$80.00. 353 pp.

University Press of Florida,

Gainesville, Florida, USA



Until this year, there were not too many recent sources to identify grasses in Florida. Besides three editions of the *Guide to the Vascular Plants of Florida* by Wunderlin and Hansen (no illustrations), there were only two illustrated manuals published recently: Yarett (1996) and Taylor (2009). The book under review represents a substantial improvement of this situation. Major features of the three manuals can be summarized in the following table.

Manual	Yarett, 1996	Taylor, 2009	Hall, 2019
Species	100	218	463
Keys	no	no	yes
Drawings	some	some	>500
Photographs	96	>350	none
Maps	100	none	none

In the reviewed manual, species are first identified into 17 tribes, then to genera, species, and (when appropriate) varieties. Based on my counting, among 463 species, 298 are native, 8 are doubtfully native, 155 are naturalized or casual, and 2 are just cultivated. In total, more than 50 species included in this manual (mostly introduced) were not in the last edition of the *Guide to the Vascular Plants of Florida* (Wunderlin and Hansen, 2011). The nomenclature is up to date (e.g., *Pennisetum* is treated just as a section in *Cenchrus* and *Calamovilfa* as a section in *Sporobolus*; some species formerly treated as *Leptochloa* are now in *Dinebra*, *Diplachne*, or

Disakisperma). The list of relevant literature is sufficiently complete. Surprisingly, however, a reference to the *Manual of Grasses for North America* (Barkworth et al., 2007) is missing. Illustrated vocabulary of morphological terms would make this manual more useful for non-professionals.

In this decade, some grass identification manuals are reaching a completely new level. Detailed photographs illustrating hard-to-see diagnostic features are becoming the standard (Judziewicz et al., 2014; Roché et al., 2019). Still, the Hall's manual, with just classic drawings, fills an important gap in our graminological literature. It will be an extremely useful source of information for all botanists working in Florida and for everybody interested in grasses of the Southeast.

– Marcel Rejmánek, Department of Evolution and Ecology, University of California, Davis, CA

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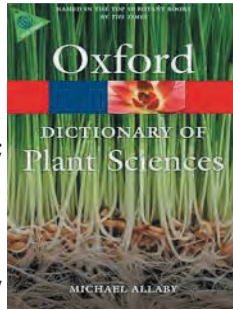
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Dictionary of Plant Sciences, ed 4

By Michael Allaby, editor.
2019. ISBN-13: 9780198833338;
e-ISBN: 9780191871665
Paperback, \$19.95; £14.99. 616
pp.
Oxford University Press, Oxford,
UK



Michael Allaby is a dictionary writer who has delivered many editions about nature and environmental science. He is the General Editor of the *Oxford Dictionaries of Botany, Zoology and Ecology*, and co-author of the *Dictionary of Geology and Earth Sciences*. Other publications include *The Gardener's Guide to Weather & Climate*, *The Dictionary of Science for Gardeners*, *the Encyclopedia of Weather and Climate; the Facts on File Weather and Climate Handbook*; and the *DK Guide to Weather*.

According to Allaby's foreword to this new fourth edition, he adjusted the entries about plant taxonomy to make them conform to the classification of the Angiosperm Phylogeny Group (APG). That necessitated adding new entries for plant families and moving some of the earlier families +/- unchanged to their new locations. Fully adopting the APG system has also required adding entries for orders that were missing in the third edition. He also reproduces APG phylogenies to illustrate how they are constructed.

It certainly is advantageous to have family names conform to APG with this new fourth edition. This edition increased the entries about chemical compounds of medicinal importance. Terms about ecology and soil types are included, along with some entries

for fungi and bacteria that impact plants. The Geologic Time Scale identifies important stages in plant evolution. Common names now appear in a 15-page appendix where each is cross-referenced to other entries where they are mentioned.

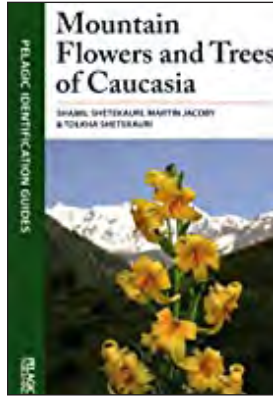
Although Allaby asserts that he removed from the main dictionary common names of plants, other organisms, and products such as timber, there are some inconsistencies. For example, goat tang, japweed, and sena remain in the *Dictionary*, whereas some everyday terms such as apricot, kudzu, mung bean, and yam are absent from the appendix of common names. Sorghum appears only among the short list of crop plants in an appendix that lists names with their region and approximate date of domestication; that incomplete list could be expanded. Two Latin binomials on that page are misspelled: both the genus and species names of foxtail millet, as well as the species name of rye. While the dictionary holds "more than 7,700 entries covering aspects of plant sciences including biochemistry, plant physiology, cytology, ecology, genetics, evolution, biogeography, earth history and earth sciences," many terms that I searched within my interests were absent (e.g., caudex, caudiform, lignan, prickle). *The Dictionary of Plant Sciences* might be a useful resource for plant studies, especially for international students, amateur botanists, and gardeners, and under conditions where internet access is limited; the paperback format makes the dictionary portable. (Incidentally, British spelling is used [e.g., *fibre*, *soya bean*].)

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

Mountain Flowers and Trees of Caucasia

By Shamil Shetekauri, Martin Jacoby, and Tolkha Shetekauri

2018. ISBN 978-1-78427-173-2 (Pbk); ISBN 978-1-78427-173-9 (ePub); ISBN 978-1-78427-175-6 (PDF).
£29.99; \$40.00. 380 pp.
Pelagic Publishing, Exeter, UK.



supported by the handy 15-page Species Index, makes the field guide easy to use by non-botanists, as does the 11-page Botanical Vocabulary. A list of synonyms to the names used in the guide are included. Seven pages are given to a chapter titled *Vegetation of Georgia* with vegetation zones and patterns of endemism—reasonable since two of the authors are Georgian, but it leaves one wondering about the rest of the region. Their Bibliography omits a key reference work: *Red List of the Endemic Plants of the Caucasus: Armenia, Azerbaijan, Georgia, Iran, Russia, and Turkey*, previously reviewed in these pages (Bedigian, 2014b).

Mountain Flowers and Trees of Caucasia claims to describe and illustrate nearly all the wildflowers, trees, and shrubs that can be found over 1000 m above sea level—1009 species—in the Caucasus. It was prepared, initially, as a field guide “to encourage you to visit the mountains of Caucasia to delight in their unique and spectacular assemblage of flowering plants, and so contribute to its conservation.” The authors narrowed the species selected as those that occur at altitudes over 1000 m and that are conspicuous, locally abundant, or endemic. Omitted are ferns, grasses, sedges, and rushes.

However, while the colorful photographs are certainly appreciated, the contents are not comprehensive. For example, *Tulipa armeniaca*, discussed at length in the review of *The Genus Tulipa* (Bedigian, 2014a), is overlooked. Likewise, although a photograph of *Iris iberica* is included, listing its occurrence in Georgia and Azerbaijan, surprisingly, the authors failed to mention *Iris iberica* subsp. *elegantissima* in the *Oncocyclus* section. That is a noteworthy subspecies of *Iris iberica*—a rhizomatous perennial, from Armenia, Iran, and Turkey—that was discussed in the review

The Caucasus Mountains include “the highest, most dramatic, least spoiled and least known mountain ranges of the northern hemisphere after the Himalayas and Rockies.” The area supports about 6400 species of vascular plants, of which a quarter are endemic to the region. This is the highest percentage of endemism in the temperate world, thus one of the most important hotspots of biodiversity on earth.

First published privately in 2009, this revised edition corrects errors, updates the taxonomy to follow the Angiosperm Phylogeny Group arrangement, and increases the number of species described. The order of genera within each family generally follows that of *Flora Europaea*.

The first and third authors are father and son, of Georgian ancestry. Shamil is Professor of Botany at Javakhsishvili State University, Tbilisi, while his son works in the Department of Plant Conservation in the National Botanical Garden of Georgia, Tbilisi. Martin Jacoby is English; after a career as educator, he led field-studies tours in Caucasia, Europe, Africa, and South America for 20 years.

Featuring 1049 color photos and 5 color maps, the book opens with an essential topographic map of the Caucasus, facing the Preface. Regarding the book’s organization, using numbers to identify each plant family,

of the *Red List of the Endemic Plants of the Caucasus: Armenia, Azerbaijan, Georgia, Iran, Russia, and Turkey* (Bedigian, 2014b).

This close scrutiny should not detract from the pleasure of enjoying an illustrated field guide to the lovely flowers and trees of the Caucasus, until the reader can visit those mountains personally.

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

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& inquiry into the form, func-
tion, development, diversity,
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of plants & their interactions
within the biosphere.



BSA staff members who arrived early to Tucson to begin preparing for Botany 2019 were offered a wonderful opportunity: an invitation by long-time BSA member and Tucson resident Martha Hawes to tour her 65 acres of land!

Hawes, a professor at University of Arizona who specializes in plant pathology, donated the land in 2016 to expand Tucson Mountain Park, which helps preserve the area's wide variety of plants and wildlife. BSA staff members were thrilled to hike the land and experience the beauty of Tucson up close.

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