



PLANT SCIENCE BULLETIN

SUMMER 2020 VOLUME 66 NUMBER 2



A PUBLICATION OF THE BOTANICAL SOCIETY OF AMERICA



SPECIAL REPORT: COVID-19 and Its Effect on BSA Members



IN THIS ISSUE...



A season of Awards.... p. 76

An era of virtual seminars: from creating one to a list of ones to join.... p. 111

A look back, and forward, at Black Botanists Week with Tanisha Williams.... p. 90

From the Editor

Greetings,

I think it is fair to say that this is a tumultuous year and that we are facing challenges on many professional and personal fronts. In this issue of *PSB*, we begin to explore the impact of the COVID-19 pandemic on the botanical community. No doubt we will be seeing the effects of the pandemic for years, but here we've included reflections of members to capture how it has felt in the moment. We include two articles that provide tips for moving to a more virtual world, as well. I am also delighted to highlight the Black Botanists Week Initiative, which was organized this summer to celebrate Black people who love, and work with, plants.

We also recap the unprecedented, but overwhelmingly well-received, Virtual Botany meeting. The feedback I have heard underscores the importance of joining together and maintaining professional community during difficult times. It was a joy to see outstanding work and deserving people celebrated, even if we were unable to meet in person.

I want to send a very special thank-you to everyone who contributed to this issue. Much of it came together while universities, labs, and public spaces were closed and people were juggling remote work with novel family obligations and extreme uncertainty.

Sincerely,



PLANT SCIENCE BULLETIN Editorial Committee Volume 66



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TABLE OF CONTENTS

SOCIETY NEWS

Meet the New BSA Board Members	75
Botanical Society of America's Award Winners.....	76
Reflections on Botany 2020 - Virtual!.....	88
A Look Back—and Ahead—at Black Botanists Week	90
COVID-19 and You Checking in with 12 BSA Members during a Global Pandemic.....	93

SPECIAL FEATURES

An Era of Virtual Seminars: From Creating One to a List of Ones to Join.....	111
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SCIENCE EDUCATION

Summary of Spring 2020: How Teachers Managed Planting Science During a Pandemic.....	123
Resources for Teaching Botany Online	127

STUDENT SECTION

Student Experiences During COVID-19 Lockdown.....	129
Getting to Know your New Student Representative: Imeña Valdes	135
Time Management Tips: Before and During a Pandemic	136

MEMBERSHIP NEWS

Thank You, Taran!	139
New 3-Year Post-doc Memberships	139
Gift Memberships	140
Membership Matters eNewsletter	140

ANNOUNCEMENTS

Machine Learning in Plant Biology: A new special collection in <i>APPS</i>	142
In Memoriam- W. Arthur ("Art") Whistler.....	143
An extended review of <i>Mulberry</i> by Peter Coles	145

BOOK REVIEWS.....	152
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Looking forward to meeting with these premier scientific societies!





SOCIETY NEWS

Meet the New BSA Board Members!



Melanie Link-Perez
Program Director



Chelsea Specht
Director at Large
for Diversity, Equity
and Inclusion



Michael Donoghue
President-Elect



Jennifer Cruse-Sanders
Director at Large for
Development



Imeña Valdes
Student
Representative

BOTANICAL SOCIETY OF AMERICA'S AWARD WINNERS

Distinguished Fellow of the Botanical Society of America

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



CANDACE GALEN
University of Missouri

In her nearly 40-year career, Dr. Candace Galen has been a champion for plant science, conservation, and education. In particular, Dr. Galen's career has had a major impact on the field of plant reproductive ecology and evolution. She was an innovator at a time when plant population biology was a budding field and stands out as a trail blazer in many dimensions. A hallmark of Dr. Galen's research is elegant experiments to test fundamental evolutionary principles in the wild. Her research is typified by a blend of keen observation in the field, novel conceptual models, and new tools to understand not just pattern, but also process. Her work on alpine skypilots, *Polemonium viscosum*, revolutionized our understanding

of floral trait evolution by integrating across ecological and evolutionary theory. Recent work documented evolutionary changes in pollinator trait evolution in response to climate change and illustrated the use of noninvasive monitoring of declining pollinators.

In addition to the numerous graduate students and postdocs she trained, nearly half of the 40 undergraduate students that worked in her lab became co-authors on research papers. In the broader context, her commitment to education is also evident in that she was one of the leaders of University of Missouri's GK-12 "Show me Nature from Elements to Ecosystems" STEM grant.

Dr. Galen's passion for public engagement has also led to formative change in conservation of natural resources. Her dedication to plant conservation and ability to convey complex and sometimes "hot button" topics (e.g., climate change) to the public led to partnerships with the Mountain Area Land Trust to preserve her long-time research site, Pennsylvania Mountain, in Colorado. Her ability to form these partnerships, to inspire broad groups, will lead to a lasting impact on the public and on biodiversity.

Dr. Galen has had a remarkable and impactful career as a botanist, educator, and conservation advocate, and has served as an important role model of strong, independent thought for generations of students.



JAMES LEEBENS-MACK University of Georgia

James Leebens-Mack has been described as a “genuine star in the firmament of plant molecular systematics and evolution.” One of the more notable aspects of his record is that he not only publishes top-notch empirical work from his own lab, and on a great diversity of topics, but he has a knack for community-building and forging collaborations. Colleagues from around the country seek him out to participate in some of the most exciting genomic research projects going on in the world today.

Dr. Leebens-Mack has made many significant contributions to our understanding of plant diversity. In just the last several years,

he has published papers on the molecular underpinnings of various aspects of seed and flower biology, sex determination, storage roots, CAM photosynthesis, and small RNA biology. And even with these focused studies, Dr. Leebens-Mack has been pushing the envelope by “going big,” with the publication of numerous whole genome sequences, and then even grander with the publication last year of the 1,124 plant transcriptome project, which he led. The landmark accomplishment represents the culmination of Dr. Leebens-Mack having forged collaborations across dozens of institutions. This achievement provides key genomic resources for the entire botanical community, as well as insight into the phylogeny of all green plants.

The broader impact of his skills as a mentor should not be overlooked. Dr. Leebens-Mack is readily available to give his time to help other researchers and is particularly good at helping students and postdocs. He regularly answers questions about techniques or troubleshooting from across our community, especially assisting early-career researchers with practical advice about their unpublished data sets. Dr. Leebens-Mack has shown real leadership for our community through his fearless approach to developing and applying new techniques, and new ways of thinking.

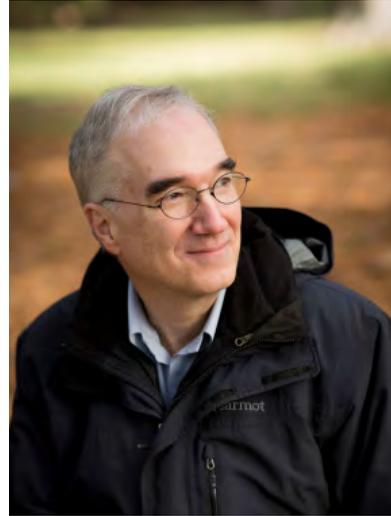
BSA Emerging Leader Award



CHRISTOPHER MUIR
University of Hawaii

Dr. Christopher Muir serves as an Assistant Professor in the Department of Botany at the University of Hawaii. Dr. Muir is an exceptionally talented quantitative evolutionary biologist, a passionate and committed botanist, and a true emerging leader across the fields of plant trait ecophysiology and evolution, including as a developer of community resources and organizations to support the synthesis of these fields. Muir's overarching research interests are focused on understanding the mechanisms underlying physiological trait variation, as well as their role in driving the creation, maintenance, and distribution of organismal diversity. Although Muir's record clearly shows his ambition and talent for research, he also has a highly developed sense of mentorship (including mentoring undergraduate researchers) and a rapidly emerging record as a leader and innovator in building community resources and networks. Muir has been described as creative and deep thinker, and a talented plant biologist with a strong computational bent.

Donald R. Kaplan Memorial Lecture



NED FRIEDMAN
Harvard University

William (Ned) Friedman is the Arnold Professor of Organismic and Evolutionary Biology at Harvard University and the eighth Director of Harvard's Arnold Arboretum. Friedman's studies have fundamentally altered century-old views of the earliest phases of the evolution of flowering plants, Darwin's so-called "abominable mystery." He is also deeply interested in the history of early (pre-Darwinian) evolutionary thought and is particularly focused on the largely forgotten contributions of horticulturists and botanists. As Director of the Arnold Arboretum, Friedman has worked to expand the Arboretum's societal impact through diverse initiatives in public programming, enhanced communication between scientists and the public, the embedding of scientific scholarship within the living collections, and a reinvigoration of the long-standing relationship between the Arboretum and the biodiversity of Asia.

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.

Rebecca Povilus, Whitehead Institute, for the Presentation: *Single nucleus analysis of Arabidopsis endosperm reveals new, transcriptionally distinct cell types*. Co-authors: Colette Picard, Ben Williams, and Mary Gehring

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.

Amanda Grusz, University of Minnesota-Duluth, for the Presentation: *An environmentally-based model for the origin of obligate apomixis in ferns: insights from the pellaeid clade (Pteridaceae; Cheilanthesoideae)*. Co-authors: Michael D. Windham, Kathryn Picard, Kathleen Pryer, Eric Schuettpelz, and Christopher Haufler

BSA PUBLIC POLICY AWARD

The Public Policy Award was established in 2012 to support the development of tomorrow's leaders and a better understanding of this critical area.

Taylor AuBuchon, Donald Danforth Plant Science Center

Mary Sagatelova, The Ohio State University

BOTANY ADVOCACY LEADERSHIP GRANT

This award organized by the Environmental and Public Policy Committees of BSA and ASPT aims to support local efforts that contribute to shaping public policy on issues relevant to plant sciences.

Nina House, Rancho Santa Ana Botanic Garden, for the Proposal: *Assessing Grazing Impacts on Remote Montane Meadows in the Southern Sierra Nevada, Tulare County, California*

DONALD R. KAPLAN AWARD IN COMPARATIVE MORPHOLOGY

Donald R. Kaplan was a leading researcher in the area of plant form, where he sought to deduce fundamental principles from comparative developmental morphology. Through his own work and the work of the many graduate students he mentored, he had a profound effect on the fields of plant development and structure. Kaplan always encouraged his students to work independently, often on projects unrelated to his own research. He believed that students should publish their work independently, and rarely coauthored his students' papers.

To promote research in plant comparative morphology, the Kaplan family has established an endowed fund, administered through the Botanical Society of America, to support the Ph.D. research of graduate students in this area. The annual award of up to \$10,000 may be used to support equipment and supplies, travel for research and to attend meetings, and for summer support. This award was created to promote research in plant comparative morphology, the Kaplan family has established an endowed fund, administered through the Botanical Society of America, to support the Ph.D. research of graduate students in this area.

Annika Smith, University of Florida, for the Proposal: *The unique nectar spurs of the nasturtiums (Tropaeolum): Vascular architecture, tissue conflict, and synorganization*

THE BSA GRADUATE STUDENT RESEARCH AWARD INCLUDING THE J. S. KARLING AWARD

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

THE J. S. KARLING GRADUATE STUDENT RESEARCH AWARD

Veronica Iriart, University of Pittsburgh, for the Proposal: *The Fate of Plant Mutualisms Under Anthropogenic Stress*

Hanna Makowski, University of Virginia, for the Proposal: *The role of plant mating systems in colonization*

THE BSA GRADUATE STUDENT RESEARCH AWARDS

Ioana Anghel, University of California, Los Angeles, for the Proposal: *Species boundaries and mechanisms of divergence in sympatric species of Linanthus*

Betsabé Castro Escobar, University of California, Berkeley, for the Proposal: *Phylogeography and Domestication of calabash trees (Crescentia cujete) in the Caribbean*

Nevin Cullen, University of Pittsburgh, for the Proposal: *Can adaptation to toxic elements facilitate microbially-mediated speciation in plants?*

Victoria DeLeo, Pennsylvania State University, for the Proposal: *Testing tradeoffs in different components of fitness due to frugivory in the common Caribbean tree Metopium toxiferum*

Estefania Pilar Fernandez Barrancos, University of Missouri-St. Louis, for the Proposal: *Effects of forest restoration on the recovery of coarse woody debris and associated arthropods*

Clarice Guan, Cornell University, for the Proposal: *Pieces of the puzzle: Morphological, genetic, and histological investigations of spiromonostichy, a unique phyllotactic pattern with associated helical growth in spiral ginger (Costus, Costaceae)*

Katherine Holmes, Cornell University, for the Proposal: *Plasticity and local adaptation of secondary metabolites to herbivory in Eutrochium maculatum*

Nina House, Claremont Graduate University (Rancho Santa Ana Botanic Garden), for the Proposal: *A Vascular Flora of the Manter and Salmon Creek Watersheds, Tulare County, CA*

Yi Huang, University of California, Riverside, for the Proposal: *Species delimitation in Arctostaphylos*

Amanda Katzer, University of Kansas, for the Proposal: *Modified-Trichome Nectary Development in Penstemon*

Thomas Lake, University of Minnesota, for the Proposal: *Does adaptation facilitate or impede future plant invasions?*

Bing Li, Northwestern University, for the Proposal: *Genetic and Morphological Changes of Oenothera organensis during Ex Situ Conservation*

Martin Llano, Universidad del Valle, Cali, Colombia, for the Proposal: *Taxonomy, phylogeny and biogeography of Anthurium section Dactylophyllium (Araceae)*

Elena Loke, Northwestern University, for the Proposal: *Incorporating Phased Alleles to Reconstruct a Recent and Rapid Radiation*

Natalie Love, University of California, Santa Barbara, for the Proposal: *Using field and herbarium collections to detect the ecological and evolutionary causes of geographic variation in pollen size and production in the California mountain jewelflower (Streptanthus tortuosus, Brassicaceae)*

Victoria Luizzi, University of Arizona, for the Proposal: *Investigating the potential microbial drivers of interactions between leafcutter bees (Megachile spp.) and cottonwoods (Populus fremontii)*

Valerie Martin, Utah State University, for the Proposal: *Microbial Facilitation of Exploitation in a Plant-Pollinator Mutualism*

Susan McEvoy, University of Connecticut, for the Proposal: *From genome to methylome: detection of epigenetic marks for two forest tree species*

Bailey McNichol, University of Nebraska-Lincoln, for the Proposal: *Characterizing plant diversity and distribution at an ecological crossroads in an era of global change*

Heather Phillips, Cornell University, for the Proposal: *Quantifying the Ontogeny of Development of Fused Structures in the Zingiberales*

Brandie Quarles, Duke University, for the Proposal: *Phenological Tracking via Dormancy: Facilitating Survival and Adaptation to Climate Change*

Maryam Sedaghatpour, University of California, Berkeley, for the Proposal: *Silene (Caryophyllaceae) of mediterranean Lebanon*

Elena Stiles, University of Washington, for the Proposal: *Linking cordilleran uplift and landscape aridification in the northeastern Andes*

Amy Waananen, University of Minnesota, for the Proposal: *Time is the Longest Distance: Temporal Outcrossing in a Fragmented Environment*

THE BSA UNDERGRADUATE STUDENT RESEARCH AWARD

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

Michael Daines, Brigham Young University-Idaho, for the Proposal: *Distribution of Astragalus amnis-amissi, a Plant Endemic to East-Central Idaho*

Jonathan Hayes, Bucknell University, for the Proposal: *Genetic diversity & connectivity of Chasmanthium latifolium (Poaceae) in Pennsylvania & the effect on conservation status*

Aaliyah Holliday, Cornell University, for the Proposal: *Evolution of the Monocot Inflorescence*

I. Jason Rose, Cornell University, for the Proposal: *Inflorescence Structure And Development In Liliales: What Is The Ancestral State Of The Liliales Order?*

Diamanda Zizis, Bucknell University, for the Proposal: *Solanum dioicum and Solanum ultraspinosum: A morphometric analysis of hybrid offspring from parents with different breeding systems*

THE BSA YOUNG BOTANIST AWARDS

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

Ava Adler, Oberlin College; Advisor: Dr. Michael J. Moore

Ariel Antoine, Bucknell University; Advisor: Dr. Christopher T. Martine

Sarah Ashlock, University of California, Santa Cruz; Advisor: Dr. Kathleen M. Kay

Jeannine Barr, Indiana University Southeast; Advisor: Dr. David Winship Taylor

Michele Beadle, College of Saint Benedict; Advisor: Dr. Stephen G. Saupe

Grace Brock, Miami University; Advisor: Dr. Robert L. Baker

Jennifer Davis, Bucknell University; Advisor: Dr. Christopher T. Martine

Rosemary Glos, Cornell University; Advisor: Dr. Shayla Salzman

Aaron Lee, The College of New Jersey; Advisor: Dr. Wendy Clement

Luisa McGarvey, Oberlin College; Advisor: Dr. Michael J. Moore

Grace McGee, Connecticut College; Advisor: Dr. Chad Jones

Samantha Mehl, Miami University; Advisor: Richard C. Moore

Elise Miller, College of Saint Benedict; Advisor: Dr. Stephen G. Saupe

Eastyn Newsome, Miami University; Advisor: Dr. Robert L. Baker

Lydia Soifer, Davidson College; Advisor: Dr. Christopher Thawley

Alexis Sullivan, Weber State University; Advisor: Dr. Bridget E. Hilbig

THE BSA PLANTS GRANT RECIPIENTS

The PLANTS (Preparing Leaders and Nurturing Tomorrow's Scientists: Increasing the diversity of plant scientists) program recognizes outstanding undergraduates from diverse backgrounds and provides travel grant.

Christina Andreski, Plymouth State University; Advisor: Diana Jolles

Juan Angulo, University of Georgia; Advisor: James Leebens-Mack

Sarah Ashlock, University of California; Santa Cruz, Advisor: Kathleen Kay

Trinity Depatie, Florida Atlantic University; Advisor: James K. Wetterer

Kandiss Dowdell, Montana State University Billings; Advisor: Jason Comer

Miyauna Incarnato, The College of Wooster; Advisor: Jennifer Ison

Maia Jones, California Academy of Sciences; Advisor: Nathalie Nagalingum

Sofia Ocampo, Florida International University; Advisor: Suzanne Koptur

Michelle Pham, University of California, Los Angeles; Advisor: James Cohen

I. Jason Rose, Cornell University; Advisor: Chelsea D. Specht

Vida Svahnstrom, University of St. Andrews; Advisor: Susan Healy

MAYNARD MOSELEY AWARD (DEVELOPMENTAL & STRUCTURAL AND PALEOBOTANICAL SECTIONS)

The Maynard F. Moseley Award was established in 1995 to honor a career of dedicated teaching, scholarship, and service to the furtherance of the botanical sciences. Dr. Moseley, known to his students as "Dr. Mo", died Jan. 16, 2003 in Santa Barbara, CA, where he had been a professor since 1949. He was widely recognized for his enthusiasm for and dedication to teaching and his students, as well as for his research using floral and wood anatomy to understand the systematics and evolution of angiosperm taxa, especially waterlilies. (PSB, Spring, 2003). The award is given to the best student paper, presented in either the Paleobotanical or Developmental and Structural sessions, that advances our understanding of plant structure in an evolutionary context.

Aleca Borsuk, Yale School of the Environment, for the Presentation: *Structural organization of the spongy mesophyll in laminar leaves with reticulate venation*. Co-authors: Adam Roddy, Guillaume Theroux-Rancourt, and Craig Broderson

ISABEL COOKSON AWARD (PALEOBOTANICAL SECTION)

Established in 1976, the Isabel Cookson Award recognizes the best student paper presented in the Paleobotanical Section.

Keana Tang, University of Kansas, for the Presentation: *Cunonicaceae from the Late Cretaceous of North America and its paleobiogeographic implications*. Co-authors: Brian Atkinson and Selena Smith.

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.

Cecilia Zumajo, New York Botanical Garden and CUNY, for the Presentation: *Evolution of the seed coat*. Co-authors: Dennis Stevenson and Barbara Ambrose

PHYSIOLOGICAL SECTION LI-COR PRIZE

(This year the Physiological Section awarded just one award for the combined Best Oral Paper & the Li-COR prize.)

Anna Jiselle Ongjoco, California State Polytechnic University, Ponomo, for the Presentation: *Strategies Utilized by Pinus coulteri and Pinus attenuata for Surviving at Low Elevations in the San Bernardino Mountains*. Co-authors: Edward G. Bobich, Frank E. Ewers, and Erin J. Questad

PHYSIOLOGICAL SECTION STUDENT POSTER AWARD

Simone Lim-Hing, University of Georgia, for the Presentation: *Untangling the micronutrient status and defense responses in loblolly pine (Pinus taeda)*. Co-authors: Kamal J.K. Gandhi, Brittany F. Barnes, Lawrence Morris, Elizabeth McCarty, and Caterina Villari

ECOLOGICAL SECTION STUDENT PRESENTATION AWARD

Veronica Iriart (Graduate), University of Pittsburgh, for the Presentation: *Herbicide drift reveals species-level variation in stressor resistance and weakens co-flowering interactions in 25 wild plant species*. Co-authors: Regina Baucom and Tia-Lynn Ashman

Jenni Velichka (Undergraduate), Queen's University, for the Presentation: *Intraspecific variation in seed dispersal strategies between annual and perennial ecotypes of Mimulus guttatus*. Co-author: Jannice Friedman

ECOLOGICAL SECTION POSTER AWARD

Aleah Querns (Graduate), North Carolina State University, for the Poster: *The evolution of thermal tolerance and clines in native vs. invasive populations of Mimulus guttatus*. Co-authors: Rachel Cooliver, Mario Vallejo-Marín, and Seema Sheth

A. J. SHARP AWARD ABLS/BRYOLOGICAL AND LICHENOLOGICAL SECTION

Bryan Piatkowski, Duke University, for the Presentation: *Carbon Storage and Niche Preference Track Phylogeny in Sphagnum (peat moss)*. Co-authors: Joseph Yavitt, Merritt Turetsky, and Jonathan Shaw.

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Fluorescent & Reflected Illumination*

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Drill Core, Tree Core & Pinned/Wet/Slide Mounted Specimens*



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My work focuses on small plants, i.e., bryophytes, and the ability provided by Macroscopic Solutions to capture microscopic details and display them on large scale banners is simply amazing. Excellent medium to draw attention to the architecture of these miniature plants. Whole set-up is user friendly and highly recommended to anyone seeking to capture details of small organisms that our eyes alone can not distinguish!

*-Dr. Bernard Goffinet
University of Connecticut*



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Physcomitrium pyriforme



REFLECTIONS ON BOTANY 2020 - VIRTUAL!



As COVID-19 disrupted the entire world, we were also forced to re-imagine the annual conference. No travel. No meeting in person. Potentially No Fun!

We worked to create a version that would allow our collective members to present their research, network a bit, and learn and share with each other. It was an enormous undertaking! But in your words, it was successful!

”
But in comparing experiences at #Botany2020 & #ESA2020 it was clear that #Botany2020 figured out how to replicate the conference experience in actually being a part of each session w live moderators + live...
“
Brian J. Enquist (@bjenquist) 18 days ago

Dr. Tanisha M. Williams #BlackBotanistsWeek @T_Marie_Wms
Thank you so much @Botanical_ for an amazing #Botany2020 experience!! We really appreciate all the hard work that made the conference easy to navigate and interact with our peers/plant friends! A huge THANK YOU!!! #BotanySaves2020

”
Online conferences like #Botany2020 are the only way my students could actively participate from Ecuador. I am so glad they could enjoy the experience too.
“
nora oleas (@NoraOleas) 26 days ago

Rachel Spigler @RachelSpigler · Aug 7
Replying to @T_Marie_Wms and @Botanical_ I was so impressed with #Botany2020! They really managed to keep a sense of community with the real time chats despite being virtual. And the talks were amazing!

ASPT award banquet #Botany2020 style. Winners of 2020 ASPT awards: recipient of the prestigious Asa Gray Award Jeff Doyle (pictured with Jane Doyle, A3) and former #CornellPlantSci undergrad Patty Chan ...
Dr. Chelsea D. Specht (@pla...) 21 days ago

Stacey Smith @iochromaland
Seeing continued praise for the #Botany2020 virtual conference, I think we are all basking in the glow of what was such an unexpectedly amazing meeting. I say unexpectedly because I bet many of us thought going online would lose some or most of the magic.

The shift to an online conference has brought some benefits to #Botany2020: j.mp/2Xc9pse "Greater accessibility can only be good for our science."
Botany One (@botanyone) 21 days ago

Brian J. Enquist @bjenquist
... what was most impressive was the amount of positive feedback - much more than I have heard even at in person conferences. Hats off to #Botany2020 for showing how to organize a rewarding online experience that actually surpassed many aspects of an in presion meeting.

”
Seeing continued praise for the #Botany2020 virtual conference, I think we are all basking in the glow of what was such an unexpectedly amazing meeting. I say unexpectedly because I bet many of us thought
G...
“
Stacey Smith (@iochromala...) 17 days ago

California Phenology TCN @CalPhenologyTCN · Aug 3
Although we were disappointed to not meet up with our collaborators in person, the digital #Botany2020 conference was a total success. Catch our presentations now available on YouTube, links in our blog: capturingcaliforniasflowers.org/blog-recap/cap...
2 8

Funny part is I'm still imagining you all at airports and on planes heading home from #Botany2020.
Chris Martine, PhDuh (@Mar...) 24 days ago

Hannah Locke @HLockeSTEM · 17h
In the past two weeks people have helped me navigate HR, tech systems, LMS, etc, despite all of their own current burdens. this is a big thank you to all the experienced faculty out there helping newbies along. Also attending #Botany2020 was "crucial" in my prep (great workshops)

“
Has anyone else caught themselves starting to physically clap after #Botany2020 talks. I find myself doing this and then having to chat to put 🍌🍌🍌🍌 because no one can see/hear it lol
”
Shawn Thomas at #Botany2...
25 days ago

Dr. Erin Zimmerman @DoctorZedd · Jul 31
Thanks for a phenomenal week, #Botany2020! I learned so much and met so many wonderful people. And for the first time since March, being stuck at home didn't feel isolating at all. Looking forward to next year!

Mike Barker @BarkerLab · Jul 31
I had an amazing time at #Botany2020! Two of my students gave their first presentations at the meeting and the online format was useful, approachable, and friendly. We have a wonderful community and so happy to call it home! Looking forward to seeing everyone in person next year!

Marian Chau, PhD @alohamarian · Jul 31
#Botany2020 was epic. Brilliant science, (com)passionate people, real conversations about critical topics, impressive innovation, and that perennial feeling of post-conference inspiration/optimism so desperately needed right now. #BotanySaves2020 Thank you @Botanical_!

Lucas C. Wheeler @LCWheeler9000 · Jul 31
I really enjoyed the #Botany2020 virtual conference. Lots of great presentations spurring good conversations. Easy to navigate. And I loved being able to go back and watch missed talks. All around I would say it was very successful!! Thank you to the organizers!

Miguel A Perez @AMikiperez · Jul 31
Virtual attendee! Thanks #Botany2020



Laura Klein @LK_botanist · Jul 31
Like every year, #Botany2020 has refreshed my curiosity, inspired ideas, and connected me to old and new friends in the botanical community. I love being a botanist 🌿. Thank you, @Botanical_ ❤️

Elena Meyer @elena4botany · Jul 31
I was hesitant about an all-digital conference, but I'm leaving #Botany2020 inspired, and with tons of resources to keep learning and botanizing in the next few weeks! A big congrats to @Botanical_ for an innovative event! 🌿🌿

Yuval Sapir @yuval_sapir · Aug 1
Thank YOU @Botanical_ and all the staff worked to make it one of the best conf I had! I wouldn't attend #Botany2020 in person, and making it virtual proved to be advantageous for many reasons. Wish next year #botany2021 will be the same

Sofia @sofichup · Jul 31
Super grateful I got the chance to attend my first BSA conference (and first conference ever) as a PLANTS grant fellow! Sad it's over but glad I got to see some amazing talks, meet new botanists, and connect with new mentors. #Botany2020

American Society of Plant Taxonomists @AmSocPlantTa...
Thank you @Botanical_ staff and leadership, ESPECIALLY @JohanneBotany for making #Botany2020 fantastic!



A LOOK BACK—AND AHEAD— AT BLACK BOTANISTS WEEK

In July 2020, BSA member Dr. Tanisha Williams—with a team of 11 like-minded botanists—coordinated the very first Black Botanists Week. PSB Editor Mackenzie Taylor reached out to Dr. Williams following the event to get her thoughts on the impact of the event and what the future brings.



Tanisha Williams

What was/is Black Botanists Week?

Black Botanists Week was first organized in 2020 to promote, encourage, create a safe space for, and find more Black people (and BIPOC) who love plants! The week is a celebration of Black people who love plants. This plant love manifests in many ways ranging from tropical field ecologist to plant geneticist, from horticulturalist to botanical illustrator. We embrace the multiple ways that Black people engage with and appreciate the global diversity of plant life.

What motivated you to spearhead this event?

During the height of the pandemic and the Black Lives Matter Movement, the #BlackBirdersWeek was formed in response to a White woman falsely calling the cops on a Black birder. I participated in this week and found such a sense of joy and pride in seeing the many beautiful Black people who were excited about science and nature. I wanted to create a similar space for Black people who loved plants.

What do you hope people will take away from Black Botanists Week and the huge response to it?

Our ultimate goal is that people from all backgrounds, especially BIPOC backgrounds, take away a sense of belonging within the botanical and plant science fields. We had nothing but positive and supportive responses from individuals, celebrities, botanical societies, and more

What's your vision for this hashtag and event going forward?

This will be an annual celebration and recognition of BIPOC who love plants. We also want to make sure we are giving back through service and outreach. Many of the committee members are sharing their research, time, skills, and love for plants across a variety of

platforms. We also are working to start a fund to support young and aspiring botanists with hand lens and botanical field guides. Also, the committee members are collaborating with the Holden Arboretum; each committee member will be giving a lecture that highlights the contribution of Black botanists during the 2020-2021 Scientist Lecture Series via Zoom.

Do you have a favorite post or story that came out of the event?

Wow, tough question! There were (and are) so many great stories.

The first newspaper article on the week: https://www.dailyitem.com/news/local_news/bucknell-researcher-starts-social-media-movement-to-highlight-black-botanists/article_45f85956-f9cd-5ec2-9a18-fc6f7d163e8f.html

Recent *USA Today* article: <https://www.usatoday.com/story/life/2020/08/04/blackinneuro-blackinchem-can-hashtags-help-black-scientists-build-community-spotlight-excellence/5541431002/>

My Plant Love Story: <https://www.plantlovestories.com/post/the-grace-of-growing>.

We also had a recent AP article that is really making an impact around the country: <https://apnews.com/0e42554f0d60afee4b9e119bb55165>

MEET THE BLACK BOTANISTS WEEK COMMITTEE

Maya Allen

Jade Bleau

Brandi Cannon

Natasza Fontaine

Morgan Halane

Rupert Koopman

Nokwanda P. Makunga

Beronda L. Montgomery

Itumeleng Moroenyane

Georgia Silvera Seamans

Tatyana Soto

Tanisha M. Williams

THE BACKGROUND OF BLACK BOTANISTS WEEK

Black Botanists Week is a celebration of Black people who love plants. This plant love manifests in many ways ranging from tropical field ecologist to plant geneticist, from horticulturalist to botanical illustrator. We embrace the multiple ways that Black people engage with and appreciate the global diversity of plant life. (Please refer to the website: <https://blackbotanistsweek.weebly.com>.)

The inaugural week of this social media movement was held on July 6 to July 11, and the organizers encourage all to participate to showcase and amplify the voice of past, present and future botanists.

The organizers define a botanist as anyone that has a love for plants and works with plants.

Any study fields or careers or social-cultural engagements with the topics listed below fit the profile of someone doing botany:

- Cytology – Cell structure
- Epigenetics – Control of gene expression
- Paleobotany – Study of fossil plants and plant evolution
- Palynology – Pollen and spores
- Plant biochemistry – Chemical processes of primary and secondary metabolism
- Phenology – Timing of germination, flowering and fruiting
- Phytochemistry – Plant secondary chemistry and chemical processes
- Phytogeography – Plant Biogeography, the study of plant distributions
- Phytosociology – Plant communities and interactions
- Plant anatomy – Structure of plant cells and tissues

- Plant ecology – Role and function of plants in the environment
- Plant evolutionary developmental biology – Plant development from an evolutionary perspective
- Plant genetics – Genetic inheritance in plants
- Plant morphology – Structure of plants
- Plant physiology – Life functions of plants
- Plant reproduction – Processes of plant reproduction
- Plant systematics – Classification and naming of plants
- Plant taxonomy – Classification and naming of plants
- Plant interactions – With other life forms or the environment

Applied Botanical Fields

- Agronomy – Application of plant science to crop production
- Arboriculture – Culture and propagation of trees
- Astrobotany - The study of plants in space
- Biotechnology – Use of plants to synthesize products
- Dendrology – Study of woody plants, shrubs, trees and lianas
- Economic botany – Study of plants of economic use or value
- Ethnobotany – Plants and people. Use and selection of plants by humans
- Forestry – Forest management and related studies
- Horticulture – Cultivation of garden plants
- Marine botany – Study of aquatic plants and algae that live in seawater
- Micropropagation – Rapid propagation of plants using cell and tissue culture
- Pharming (genetics) – Genetic engineering of plants to produce pharmaceuticals
- Plant breeding – Breeding of plants with desirable genetic characters
- Plant pathology (Phytopathology) – Plant diseases
- Plant propagation – Propagation of plants from seed, bulbs, tubers, cuttings and grafting
- Pomology – Fruit and nuts



SPECIAL FEATURES

COVID-19 and You

CHECKING IN WITH 12 BSA MEMBERS DURING A GLOBAL PANDEMIC

The past year has brought unprecedented challenges to those of us working in STEM and higher education. In late 2019, a novel coronavirus arose in Wuhan, China and spread throughout the globe, prompting wide-scale shutdowns and quarantines across most continents. These shutdowns hit the majority of the United States in early to mid-March 2020. Schools and universities closed, the majority of classrooms transitioned to remote learning, and research labs were shuttered. Many of us have lost friends, family, and/or colleagues to this disease.

As I write this in August 2020, the death toll in the United States continues to climb, even as many universities are reopening for fall classes. Those of us returning to campuses are faced with the challenge of implementing new, daunting requirements for enforcing social distancing, sanitizing classrooms, and wearing personal protective equipment such as goggles and masks, as well as accommodating students who are unable or unwilling to attend in-person classes. Others among us are facing another semester of teaching online.

One of the greatest challenges of the COVID-19 pandemic has been the isolation it has created. Many of us transitioned to working remotely where we missed regular, face-to-face interactions with students, mentors, and colleagues. In my opinion, it has been easy to feel as though each of us is alone in facing the challenges presented by the pandemic.

We asked people from across the Society to write briefly about their experiences with COVID-19 in order to document these experiences and to share them with others in the botanical community. It is my sincerest hope that the readers of *PSB* will find reading these reflections to be beneficial.



By Mackenzie Taylor
Editor-in-Chief, PSB



**Shannon
Fehlberg**

*Desert Botanical
Garden, Phoenix, AZ*

How has the pandemic and its response changed your job and/or daily routine?

I think many botanical researchers, regardless of their affiliations, were affected by the pandemic and efforts to control the spread of the virus in much the same ways. For myself and most of my colleagues at the Desert Botanical Garden, we lost several significant things:

- Access to our office and laboratory spaces.
- Access to the Garden's Living Collection for scientific purposes (essential staff continue their comprehensive care for the Living Collection itself).
- Ability to conduct fieldwork.
- Ability to work with volunteers (the Garden has more than 700 volunteers who not only care for plants but also work in our research labs, herbarium, and citizen science program).
- Revenue generated by daily visitors and special events during the height of the Garden's typical visitorship (spring season).

These losses primarily required shifts in the focus of our efforts. My new efforts were focused on adjusting project expectations,

timelines, and budgets; making alternative project plans under multiple, theoretical scenarios; transitioning from active data collection (in the lab or field) to data analysis and proposal and manuscript writing, and working with graduate students to finish up thesis work and defend virtually.

What was your greatest challenge in adapting to this new format?

For me the greatest challenge in adapting to these changes is the long work days. To accommodate working with my kids on their school work (before summer break) and other interruptions, I frequently have to work from sunup to sundown (on and off). The pressure to accomplish my daily work tasks and put in my hours, all while taking on additional and demanding responsibilities, feels unrelenting and exhausting. These changes come with other challenges too, like facing uncertainty in almost every aspect of life and adapting projects that really can't meet their goals without fieldwork, lab work, or volunteers.

What were some surprises you experienced as the spring/summer went on? What skills did you pick up along the way?

Some of the most important skills I rely on during this time are to be very organized in listing and prioritizing my daily and weekly goals and using software to track my time and efforts (I find this to be an excellent tool in helping me to stay focused). One important thing I am learning is to accept my limitations and other people's limitations (time, physical, mental)—we all are working to accomplish what we can in the midst of difficult circumstances.

Going into the fall, what challenges and opportunities do you see?

In the spring, when our states and institutions first began taking measures to limit the spread of the virus, we all hoped for a summer and

fall season with decreased rates of spread of the virus and a phasing-in of some of the things we'd lost. But in my part of the country, we are not seeing a decreased rate of spread but rather an alarming increase in the rate of spread, leading to more uncertainty and conflict among interests. The pandemic looks as though it will continue to delay our projects, shift our focus, increase our responsibilities, and shrink our budgets. Despite this, I am moving forward in a determined way to continue to make progress on all fronts and take advantage of some of the unexpected opportunities we have during these times. I am grateful for the additional time I've been able to spend with my children and the dramatic change we've seen in the pace of life's activities. I appreciate that virtual meetings, workshops, and conferences are providing chances for learning and interactions that might not have been possible otherwise. I'm looking forward to co-teaching a new course this fall incorporating a smaller class size and virtual components. As have heard said among family, friends, and co-workers, this is an opportunity to learn a new way of doing things, and that new way is not all bad.



John Z. Kiss
*University of
 North Carolina-
 Greensboro,
 Greensboro, NC*

How has the pandemic and the response changed your job and/or daily routine?

My job has not changed at all—I am the academic leader of the College of Arts & Sciences with about 500 faculty and staff members. All of the end of my academic year functions such as writing annual reviews of heads/chairs/staff and budget planning are the same as always. What really has changed is my daily routine—I work from home! We have been using Zoom to communicate and to schedule meetings large and small. I have taken over one room and my wife Helen is working remotely in another room. I have a lovely spacious house and live next to a lake with nature trails—so I am lucky.

One additional challenge is that my research lab has been closed, so my students have had to work remotely, and I have had to meet with them via Zoom. They have done well in that they have worked on analyses of the large amount of data that they had generated. Fortunately, now with some limitations, we can open our lab again.

What was your greatest challenge in adapting to this new format?

I feel like we are all working harder than ever dealing with the many changes that have resulted due to the corona virus situation. Thus, in my role as dean, I am “on” all of the time—but I am even more “on” now. Thus, I

have to turn off and stop looking at email and doing other types of work! In some ways, I am surprised that remote working is working well for me. I consider myself fortunate as I know other members of our society cannot adapt so easily to working remotely.

How did your interactions with your faculty and/or students change with the shift to online?

Moving to online meetings with faculty and the students in my research lab as well as having committee meetings online have worked reasonably well. Seeing and talking to them on Zoom is better than a phone call or conference call as there are some visual cues. However, there is still an element that is missing vs. having face-to-face meetings. You can lose more subtle signal and prompts. Personal interaction is still better—humans are social creatures. At the end of the day, I miss seeing my staff, faculty, and students!

What were some surprises you experienced as the spring/summer went on? What skills did you pick up along the way?

I feel like I am working harder and longer than ever. Part of this problem is that we all are dealing with massive changes and planning for the fall semester: moving things online, hybrid classes etc. Another issue is that with online meetings you can have *more* since there is no walking time needed between meetings! I seem to have developed skills with all of the major online meeting platforms. I also think that online meetings have made me focus more and stay on topic.

Going into the fall, how are you feeling about starting a new year? What challenges and opportunities do you see?

The University of North Carolina system has decided to open all public universities in the state. Surveys show that our students want to come back to campus, but things will look

different. The university leaders and faculty have had to institute many changes to make it a safe environment, and these measures include maintaining social distancing and keeping a clean environment. Some of our courses will go online and others will be in a hybrid format. I feel positive about seeing students and faculty on campus again but do have a degree of trepidation. I also feel we are doing everything we can to open the university safely but are likely to see unforeseen challenges. I do not see the university (and the world) getting back to normal until we have an effective vaccine with large scale distribution.

How are you feeling emotionally at this point?

While I am an optimistic person by nature, I have concerns about our society at large. Notwithstanding challenges, while we in higher education have been privileged in many ways, I am concerned about the massive disruption to our society at large: economic turmoil due to layoffs, problems due to a limited social safety net, continued health risks to vulnerable populations, among others. At the end of the day, I feel positive that our students, faculty, and staff will emerge from these challenges as well as our previous generations, who have had deal with tough situations in their time.



Shuang-Quan Huang

*Central China
Normal University,
Wuhan, China*

June from our research group, the busiest season in my scientific career. Face-to-face or oral communications were reduced to nearly zero, which may allow me to think deeply without distraction, but had made me dull in mind, because feedbacks cannot be gained as rapidly as usual. Generally, I do not like this style, because debates or even quarrels would ignite great ideas in our brains. In summary, the work efficiency of mine during the global crisis is quite low.

How has the pandemic and its response changed your job and/or daily routine?

The pandemic and its response have not changed my job too much, but did to the form of my job as a university professor in Wuhan. Students and faculty members were not allowed to study at the campus and the laboratory until late April. Fortunately, graduate students who pass the DNA examination and are without an infection of CoVID-19 virus have been able to apply to go back to the campus since Mid-June.

Research: Students and I are interested in plant reproductive biology, particularly plant-pollinator interactions, and ecology and evolution of flowers. Our research includes work in the field station and in the lab. For example, one of the PhD students in my lab is interested in the chemical ecology of pollen and nectar in spring-flowering plants of *Rhododendron* species. The field study of this year was missed and materials are unavailable for her further study in the lab. We are looking forward to conducting a field study in the field station of our university in Shangri-La, southwest China in this summer-flowering season from July to August.

During this spring pandemic, I was trying to read, write, and revise papers every day. Nine graduate students (five for a Master's degree and four for a PhD) graduated this

Teaching: I believe that online teaching has been possible for at least 15 years and the efficiency of online study seems quite low. One may expect that students can do other things during class given that the teacher could not directly watch them. During the pandemic online teaching, the students were actually much more active than usual. When they had any question, they simply typed out the question to be noted, letting me answer the questions immediately. In this year, all oral defenses for the graduated theses (dissertations) are communicated virtually online. This allows colleagues from worldwide and anyone who can access online, including students' parents, to join. From this point, I really appreciate this interaction mode online.

What was your greatest challenge in adapting to this new format?

As the outbreak was first realized in Wuhan, the isolation through a lockdown of the city had effectively protected people from virus infection. Staying isolated for a short time seems fine, but feeling lonely 2 to 3 months later. In this manner, I really agree the idea that humans are social animals; one is somehow living in other people's eyes, it is what you do that makes you what you are. Actually, I am not good at overcoming this challenge, but I see many people be brave, well behaved, and friendly. I got emails from western colleagues who kindly informed whether I needed help

in the early stages of the pandemic. One of my collaborators, an American evolutionary biologist, has been infected by the CoVID-19 and isolated in UK in February. I hope he will fully recover soon.

What were some surprises you experienced as the spring went on? What skills did you pick up along the way?

The biggest surprise is that until the vanish of COVID-19 in Wuhan, none of my relatives or acquaintances was infected by COVID-19. I picked up the skill of cooking and housekeeping, as I have to cook lunch for my daughter, a high-school student, now staying at home and learning from online classes. I note young and old generations playing table tennis in rooms or outside. The exercise has become more popular recently in China, as team sports are not recommended.

Going into the summer/fall, what challenges and opportunities do you see?

Challenges and opportunities co-exist in the current situation.

Challenges: We are not sure whether students can return the university campus and laboratory to study.

Opportunities: Our university inspires teachers to teach online and students to study online. However, experimental studies such as biology or chemistry are difficult to practice. We are trying to develop more practical projects under Virtual Reality (VR) technique for undergraduate students.

How are you feeling emotionally at this point?

As nearly half a million people passed because of deadly virus in the world, I feel that keeping healthy is essential to all of us at this point. We humans only can survive on the earth

if we are in harmony with nature, with no more damages to wildlife and ecosystems. If everyone treats the earth as his/her own eyes or as home and own garden, the diverse life forms will be symbiotic and sustainable in the green planet.



Seana Walsh
*National Tropical
Botanical Garden,
Kalāheo, HI*

How has the pandemic and its response changed your job and/or daily routine?

Thankfully, conservation work was deemed essential early on in the state of Hawai'i so I have been able to continue field work. There was only a 2- to 3-week pause on field work while the state's, our county's and our organizations' safety protocols were being figured out. Other than that, office-related work has changed from my office at our NTBG headquarters to my home office, which is just a couple miles away. I still go into the office at least once a week to process collections. I use Google Meet and Zoom on a daily basis now.

What was your greatest challenge in adapting to this new format?

I was never very comfortable communicating over video conferencing platforms such as Google Meet and Zoom before this. I got used to it really quick though and now it feels very easy and natural.

What were some surprises you experienced as the spring/summer went on? What skills did you pick up along the way?

I was surprised that conferences and meetings scheduled for late summer and fall were being cancelled left and right. Didn't initially expect that the pandemic would last that long. I've picked up some skills in pre-recording presentations for conferences! For example, making sure lighting, sound, and background are appropriate, having video at eye level, making it a little more engaging, etc.

Going into the fall, what challenges and opportunities do you see?

Challenges I see will be as easily maintaining and building relationships with colleagues and friends. Also, making new connections and building new collaborations. Nothing can replace the connections you make with people in-person, including the ideas that come up spontaneously when you're physically together and talking in an informal way. Opportunities I see are connecting more frequently with colleagues and friends because of this, over video conferencing platforms, phone, text, etc. I think we'll need to connect more in that way since we won't be able to see each other for a while in-person. There is also an obvious opportunity to work on publishing those hanging papers with freed-up time due to cancelled conferences and cancelled field work for some.

How are you feeling emotionally at this point?

Being out here on Kaua'i, I feel very safe at the moment and am very grateful for that. We haven't had any new or active COVID-19 cases in over two months. I'm a little nervous how things will change once we open up again for tourism with the way things are in other parts of the country. I am a little disappointed that I haven't been able to, and won't for the foreseeable future, connect with colleagues,

family, and friends in-person. I agree that cancelling travel plans is the safest and smartest decision at this point, though.



**Jason T.
Cantley**
*San Francisco
State University,
San Francisco, CA*

How has the pandemic and the response changed your job and/or daily routine?

Yes, the pandemic has absolutely changed my daily routine, but my job is secure (TT Assistant Professor). There may be upcoming changes to my job, including a furlough or pay cut. Additionally, I have an option to delay my tenure review clock slightly. I have not yet decided if it is in my benefit to do so. My daily work routine is mostly sitting at my dining room table with my roommate (and occasionally my partner, who is a health care worker) trying to be considerate about our various meetings. I also stare at my pantry all the time and try not to think of all the snacks I could be eating!

The shift to online teaching was very fast. What was your greatest challenge in adapting to this format?

I was in the middle of teaching a Plant Systematics class which has a large component of hands-on labs with live plant material and 11 field trips. Most of this was cancelled when we moved in early March to completely remote instruction. Converting the class almost instantaneously was a struggle particularly as

much of my teaching material is not digitized (ex. herbarium specimens, live plant materials, plants/habitats at a field site). I struggled most with providing experiences that would stand in for the outdoor field experience and exposure to different native plants. Technology was also an issue, but mostly, I found our video meeting platform to be challenging and not equitable for my student's home situation. It was difficult to meet synchronously with my students. I also believe that many students had a rough time and their mental health was challenged in being able to finish the semester.

How did your interactions with your students change with the shift to online?

In my classes, they became less initially. Our video meetings were not terribly engaging and I felt as if I was struggling to reach them. Eventually, save for a few students, I had found a rhythm that seemed to work after a few weeks of trial and error. For my grad students, I prepped them with as much material as possible to go home with and we started weekly lab meetings to simply check-in with each other. Sometimes interactions with them were spotty or challenging as they were losing their jobs or housing, or were struggling to maintain positive mental health as family members, friends, and people around the globe became sick.

What were some surprises you experienced as the spring/summer went on? What skills did you pick up along the way?

I'm grateful that San Francisco State University has several opportunities to prepare for Fall semester that will be taught almost exclusively remotely. A group of nearly 70 staff, faculty, lecturers, and graduate teaching assistants of our Biology department have committed to revamping high impact / high enrollment courses to completely reinvent our lab activities for these classes so that they are 100% capable of online instruction.

Additionally, we have committed to having a new lab manual for all of these classes by the end of the summer with a critical eye towards student learning outcomes, and diversity, equity, and inclusion. Also, SF State has a professional development center, called the Center for Equity and Excellence in Teaching and Learning (CEETL), that is running summer workshop for literally hundreds of faculty members who will be learning all kinds of skills for better online engagement for their remotely instructed fall semester. These experiences are providing me with a large set of skills that I believe will make me a better educator, especially as we move to remote learning for the fall.

Going into the fall, how are you feeling about starting a new year? What challenges and opportunities do you see?

I'm anxious, to be honest. While I feel like I will be working hard this summer to be able to deliver an engaging course that meets remotely, it is still overwhelming. I am trying not to worry that this class will be like a new course prep during this important time point in my path to tenure. I know that the time I am spending on course development is in direct tradeoff with my research and lab productivity. I feel like the Fall will be okay given the current state of the world and my preparation, but I recognize the extra work that I will do to ensure a successful learning experience for the students that I engage with in class and within my lab.

How are you feeling emotionally at this point?

At this point, I feel okay. But I would be lying if I didn't say this experience is an emotional roller coaster. I've been doing weekly reflections with my partner, and sometimes I'm feeling fine, but other weeks I'm feeling quite low. Low moments are strongly felt and noticeable because my productivity tanks.

I fail to schedule meetings and lose track of important emails or deadlines that I need to stay on top of. Those weeks are a struggle. And if I'm being truly honest, those weeks are correlated with the national mood that I cannot escape in the middle of San Francisco where I live. My partner is an emergency medicine doctor and has had (and might continue to have) to intubate several SARS-CoV-2 positive patients with rapidly declining health. Some of those patients have died, some are still on ventilators, others have recovered. I worry because he is seeing a lot of death and his work environment is full of people who are stressed out, overworked, and anxious or sick. His direct contact with the virus puts our household at an elevated risk of contraction. On top of that, just outside my apartment windows, I've witnessed several peaceful civil rights protests with thousands of participants chanting for justice sparked by the death of Geogre Floyd. Across the street, a hotel has been converted by the city into temporary living accommodations for homeless individuals who need to recover in quarantine safely away from others. There are often sirens from police and ambulances every day. It has not been possible for me to escape the dual crises that our nation is now facing. As I write this, daily cases are increasing across our nation at an alarming rate. California, and thankfully to a lesser degree San Francisco, is poised to become one of the next hotspots. I just hope that we can all stay as healthy as possible, mitigate as much death as we can, and weather out the pandemic safely.



Morgan Gestel
*Botanical
 Research Institute of
 Texas (BRIT),
 Ft. Worth, TX*

How has the pandemic and its response changed your job and/or daily routine?

The inconvenience of work has been an adjustment, especially living in a one-bedroom apartment. It was easy to be distracted working from home at the beginning, but I adjusted by turning the dining room space into as much of a clutter-free office as possible. My spouse had just moved across the country in December and we had been apart in the field for all of that month and much of January. The apartment was filled with our newly reunited lives and all of the clutter and boxes that came with it, so finding and making space was a challenge. We rented a storage unit to move overflow. Just before the shutdown and travel ban, my spouse also traveled to Germany for a workshop and ended up getting trapped for a couple extra weeks. That was not ideal, but we adapted and made the most of it—in fact, this time apart was quite productive for both of us.

Unlike most of my colleagues, I have been back at work (in my office) since mid-May. Returning to work has been interesting. It feels more like a “work environment” again, but highly controlled and a little stressful to move throughout and use shared facilities. Lunch is difficult to coordinate, I need to bring enough coffee and water to last throughout the day, and I am prioritizing office-work (e.g., analyses/writing) over herbarium and lab work because I want to minimize shared contact.

My spouse and I welcome this opportunity to be out of our cramped one-bedroom space, but we are anxious for and mindful of our colleagues and their families at home.

What was your greatest challenge in adapting to this new format?

The distractions and fluidity of work/life balance were a difficult adjustment. I'm not sure I ever fully adjusted, but I did eventually become quite productive and my writing was prolific for a month at home. It took two weeks to adjust and then afterward, returning to the office again was another adjustment. Lost work opportunities include a lot of canceled travel, lack of specimen loans to/from herbaria, and inability to hire students this summer. Fortunately I have a lot of backlog work that I can continue with, so I have much to keep me busy. I am especially concerned for the next generation of botanists who are missing important opportunities to learn and develop. I miss the more engaging aspects of my work—including conferences, daily interactions (lunch and social gatherings) with co-workers, and work with students and volunteers. Our offices are part of an open/shared layout and because so many of our normal activities have shifted to regularly schedule virtual meetings, there is often excessive noise throughout this shared space that adds an extra distraction for work and productivity. Knowing that we are back to work, we also try to completely restrict any outside exposure, so we have shifted all normal activities to delivery and pickup. Although we try and have succeeded in so many ways, there are many parts of our work that cannot be replaced in a virtual format.

What were some surprises you experienced as the spring/summer went on? What skills did you pick up along the way?

My time management skills definitely improved and the ability to create new routines. Expectations in March were not

met for reasons associated with difficulty of coordinating with colleagues, closure of herbaria (and corresponding lack of shipping offices/ability to send or receive loans), inability to travel, etc. I am fortunate that my place of work is continuing to operate with minimal impacts—thanks to hardworking and committed staff; I'm not surprised, but I continue to be impressed.

Going into the fall, what challenges and opportunities do you see?

There will continue to be challenges for time management and coordination of activities both for myself and with colleagues. Additional conferences and field trips will switch to online only. Being able to work in the laboratory, herbarium, or other traditionally shared spaces will require further coordination. I won't be able to sort through a pile of specimens to make determinations, with a colleague next to me with whom I can bounce ideas around. Direct student mentorship will be challenging and eventually the "back log" will begin to run out. I'm trying to focus on taking this time, as before, to focus on work that is feasible, including writing and fieldwork. My spouse and I took a trip to southwest Texas to do fieldwork and are planning another in September. The laboratory at BRIT has reopened on a limited basis and I have begun working with a volunteer to get some DNA sequencing completed. We continue to adapt and manage in this new normal.

How are you feeling emotionally at this point?

This is a difficult question. Sometimes I feel a little misanthropic due to the disregard by a lot of leadership in the United States to this pandemic. However, my personal situation is quite unique right now for personal reasons, so perhaps I'm able to see more of a silver lining than others. I'm not sure if I feel okay because I'm willing myself to do so, or if it's

because I'm able to accept things are the way they are and trying to go with the flow of this crazy time. In a way I think I am happy things have slowed down and am forced to focus on what is important. My spouse and I are privileged to have jobs and not have to worry about taking care of others or coordinating online school during these extremely difficult times. I am hyperaware of my friends and colleagues, though, and their needs. I'm counting my blessings and allowing this time to reflect on other parts of my life and focus on what is important. This pandemic is a global tragedy—it has been heartbreaking to watch it unfold—but somehow my eternal optimism sees a positive outcome in my life and those of my friends and colleagues. We'll get through this with renewed ties, a sharper focus on what is important, and I hope we will learn something that endures about where our values rest.



Allison Miller
*Danforth Plant
Science Center,
St. Louis, MO*

How has the pandemic and the response changed your job and/or daily routine?

The pandemic landed me, my husband, and our two kids (ages 11 and 8) working and doing school at home for ~3 months. We converted part of our house to an office and set up a divided schedule where one parent was working and one parent was the teacher,

and we would switch half way through the day. Many days, the parent serving as the elementary school teacher was also doing Zoom calls, or even teaching his/her university class, at the same time.

What was your greatest challenge in adapting to this new format?

The pandemic has been challenging to so many people for so many different reasons. My husband and I are grateful that our jobs were intact and that we have been able to remain healthy (so far). Having said that, the greatest challenge for me was trying to do my job—the expectations of which didn't change much with the pandemic—in roughly half as much time. The struggle is real: it is extremely difficult, if not impossible, to work a full-time job and serve as the teacher/parent of two kids. Further, the accumulating backlog of stuff—both at work and at home—that I couldn't get to was (and continues to be) overwhelming. The pace of work hasn't slowed, but my capacity to do it has been severely impacted.

How did your interactions with your colleagues and/or students change with the shift to online communication?

My lab group started a morning coffee from 8:30 to 9:00 a.m. Mondays through Thursdays, and then we held our regular lab meeting on Friday. This has been a joy, to touch base with people each day, talk about what is going on, and think about what we were trying to do that day. My Economic Botany class moved to Zoom—and my attendance improved!! It was fun to teach people from home; I really enjoyed the interaction with students.

What were some surprises you experienced as the spring/summer went on? What skills did you pick up along the way?

One of the greatest joys of the pandemic has

been rediscovering nature and gardening with our kids. We live within walking distance of a major park in St. Louis where we have been recording bird sightings and plants in bloom since March. The kids are turning into great naturalists! Also, our garden has never looked better—although our dog Cookie is currently decimating the squashes....

How are you feeling emotionally at this point?

Exhausted, but grateful for our health, the extra time with family, and the joy of consciously taking in the biodiversity that surrounds us every day.



Dustin Wolkis
*National Tropical
Botanical Garden,
Kalāheo, HI*

How has the pandemic and its response changed your job and/or daily routine?

In some major ways, my daily routine and that of my lab's has been significantly altered. I have ongoing experiments plus imbibed seeds in my lab and was and so was deemed essential by my organization. However, restrictions were in place so that I could only access the lab two to three days per week. This was enough to assay and water the imbibed seeds and monitor the physical facilities of the ex situ conservation seed collection. I rely on a half-time staff person, and full-time intern, plus a small group of dedicated volunteers to

help carry out the daily operations in the lab. The staff person went on leave (unrelated to COVID-19) just as the world was melting down, and all volunteer activities were suspended. I was able to advocate for my intern to be physically present, so it was just the two of us trying to do more work in less time. This has led to reduced operations overall including less-frequent germination assays, and halting initiating new experiments altogether.

What was your greatest challenge in adapting to this new format?

The greatest challenge by far was figuring out how to work from home two to three days per week, while my partner also worked from home while attempting to provide distance-learning to our kindergarten-aged son, Canyon. We worked out a schedule where she would wear the Kindergarten teacher hat Monday through Thursday, with me playing that role on Fridays. Now that that school is out it is less challenging, but one of us is still working every day of the week.

What were some surprises you experienced as the spring/summer went on?

I expected that with limited access to my lab, I could focus on projects with existing data and hanging papers. I thought I was going to be super productive, submitting papers and grant proposals left and right, leaving me feeling accomplished and proud. The reality has been just the opposite. Working from home has its perks (e.g., eating lunch with family every day; attending Zoom meetings with your child), but it just was not nearly as productive as I had hoped. Since the safe-at-home order was enacted, I've yet to submit one project in which I am leading.

What skills did you pick up along the way?

Well I'm still trying to figure out a Zoom background, LOL. My organization is

focusing on communication to the general public, so I have been trying to sharpen my public outreach writing skills.

Going into the fall, what challenges and opportunities do you see?

We are planning for volunteers to return to the lab in early July, including rearranging the lab space to accommodate social-distancing practices. The return of volunteers is huge for my program since I rely so heavily upon them. New germination experiments will restart, assays will be conducted more frequently, and I will be freed up to get back to those papers I never finished.

I believe my students understood the need to change our daily routines to help our community reduce disease transmission.

During the summers, I instruct elementary science camps at our local museum. We transitioned our camps to a 100% virtual platform, which has had many positive results. Many campers that otherwise would not be able to attend our science camps due to distance (i.e., living in another state) or a physical handicap (e.g., having an autoimmune disorder) are now able to have a camp experience through a virtual setting. I do miss the in-person interactions with campers, but I have been excited to share science with elementary aged students across the United States. Without the transition to virtual science camps, I would not have had the opportunity to teach such a diverse group of young scientists.



Keri Maricle
*North Central
Kansas Technical
College
Hays, KS*

How has the pandemic and the response changed your job and/or daily routine?

As an educator, the pandemic has impacted my daily routine tremendously. I teach a mixture of virtual and in person science courses during the academic year. My virtual courses were not altered by the pandemic, but my in-person courses were drastically changed. Transitioning to remote delivery for the remainder of the spring 2020 semester impacted the way in which lectures and labs were conducted. Students expressed the disappointment in not being able to interact with each other as well as myself. However,

What was your greatest challenge in adapting to this new format?

Being an educator, the greatest challenge has been finding new ways to teach science outside of a classroom setting. However, I feel that challenges help us grow as individuals. This is especially relevant in education. Sometimes during challenging times, educators find themselves redesigning their curricula that may need a refresher. This benefits us as educators as well as our students. Therefore, I have enjoyed this challenge. I am also thankful my career places me in a position to spread scientific knowledge while also ensuring disease transmission in my community is minimized.

How did your interactions with your colleagues and/or students change with the shift to online communication?

Many of my colleagues have come together to

share new ideas and methods for educating students during a pandemic. Students have become more communicative with me as many of them feel more comfortable asking questions in a virtual setting. This situation does not apply to all colleagues and students I interact with, but I have noticed a shift toward strengthening of relationships as we feel we are all in the “same boat” when it comes to these major changes.

What were some surprises you experienced as the spring/summer went on? What skills did you pick up along the way?

I would say the biggest surprise came in March 2020 when our campus decided to transition to remote delivery of courses. All decisions that have come following this one major decision have not really been surprises as many of us have accepted that our way of living and working has and will continue to change each day. Many of my students and advisees are taking my courses to enter a nursing program. Therefore, many of my students are CNAs working at organizations and institutions that are at the forefront of COVID-19. I have gained an entirely new appreciation for nurses as I have seen what my students have encountered during this pandemic as they continue their work.

Going into the fall, how are you feeling about starting a new year? What challenges and opportunities do you see?

Living in western Kansas, you come to understand that science is not always going to be accepted in your community. I have noticed just how true this is when interacting friends, family, co-workers, and students. Many of the individuals around me have different interpretations of the current issues, which have shocked and disgusted me. That being said, I feel that this new academic year is an opportunity to not only share the importance

of science (specifically, basic concepts of epidemiology and immunology), but also a time to take a stand toward the racial injustice that is happening in our country. The changes to my daily life have shown me the importance of acting and speaking up in the moment rather than waiting for something to happen. The pandemic has encouraged me to redefine my approach toward current scientific and political issues as I know now how quickly a lifestyle can change.

How are you feeling emotionally at this point?

I am greatly concerned about our country’s decisions, but empowered to know that, as an educator, I can educate those around me with the facts. We all have decisions to make in life. Political leaders may choose to reject science and visions of equality, but I choose to use my knowledge to support my students to be better human beings through education.



**Michael J.
Moore**
*Oberlin College,
Oberlin, OH*

How has the pandemic and the response changed your job and/or daily routine?

Well, I’ve been working at home since mid-March, making liberal use of Zoom. I see much less of my colleagues and students, but much more of my family (which is a silver lining).

What was your greatest challenge in adapting to this new format?

Not being able to interact with students on campus has been difficult. I can't read the classroom nearly as easily, and I worry about the welfare of some students more than I ever have.

What were some surprises you experienced as the spring/summer went on? What skills did you pick up along the way?

I think the shift to online-only learning in the spring has had me thinking about ways to incorporate elements of online learning to supplement my classroom teaching when, one day, the world returns to a more normal routine. In particular, how can I make more efficient and more impactful use of lecture time? I have been thinking a lot about how to lecture less and have more in-class discussions.

I've also been very pleasantly surprised at how effective shifting my Plant Systematics lab to remote learning was. I was really worried about the loss of field trips in April and May. To try to minimize the loss of field work, I had my students go on individualized, short field trips at home and post the plants they found to iNaturalist. They adapted to this extremely well and learned a tremendous amount on their own. We still met on Zoom during lab time, and I still taught plant families and a few key species, but I was very pleased with the individual learning at home. Several of my students from this past spring are still actively using iNaturalist over the summer, and collectively they have posted over 500 new plant observations from various parts of the country.

Going into the fall, how are you feeling about starting a new year? What challenges and opportunities do you see?

To be honest, I feel a bit uneasy about the plans to reopen so many universities to in-person classes this fall. For several reasons, I have decided to teach my courses remotely this fall, and so I will have all the challenges that come with online learning. I am most worried about my introductory biology section, which is composed almost entirely of first- and second-year students. I have been brainstorming ways to effectively introduce a lot of students to biology in an online format.

However, I think my first-year seminar course should work fairly well in an online-only format, and I think there might be some cool ways to incorporate online resources into the course. Plus, the breakout rooms feature on Zoom should work well for small-group discussions, which I like to emphasize.

How are you feeling emotionally at this point?

Overall, I feel OK. I think the state of the world right now is taking a bit of a toll, and the uncertainty of the coming months is not easy. But we're all in this together, and I'm very happy to belong to welcoming and open professional societies!



**Ranessa L.
Cooper**
*Western Illinois
University,
Macomb, IL*

How has the pandemic and the response changed your job and/or daily routine?

It was certainly an adjustment, at first, to work almost entirely from home, but I had to visit the office briefly each week to take care of a few tasks. However, I became quite comfortable with the change and had a routine in place, but I have recently returned to the office full-time.

The shift to online teaching was very fast. What was your greatest challenge in adapting to this format?

My greatest challenge was that I had not participated in any remote work or meetings, but I was fortunate to have excellent assistance from CITR staff on campus. They offered webinars multiple times each week to help faculty and staff learn how to use Zoom, Google Meets, and our Western On-line platform, and they were readily available to answer questions and assist with troubleshooting.

How did your interactions with your faculty and/or students change with the shift to online?

We held our department meetings using Google Meets. Most of my meetings were held in this way too, with the exceptions of

large-attendance meetings where Zoom was employed. My Tropical Ecology class was able to travel to and from the Galapagos safely before the shutdown. Prior to the study abroad experience, we met weekly for lectures and class discussions, and we resumed this using Google Meets once classes were back in session.

What were some surprises you experienced as the spring/summer went on? What skills did you pick up along the way?

With eight students, Google Meets worked well each week, and I lectured with my PowerPoint slides with this format too. I learned how to give exams online with our Western On-line platform, and we quickly developed a weekly routine of lecture, followed by class discussion. Students even gave their individual presentations using Google Meets, while discussion essays and group reports were submitted electronically to me via e-mail. I was surprised to see how much I enjoyed the on-line exam preparation and administration, especially when the program can grade a number of questions automatically. I learned how to implement Respondus Lockdown Browser and Respondus Monitor for use by students during the scheduled exam times.

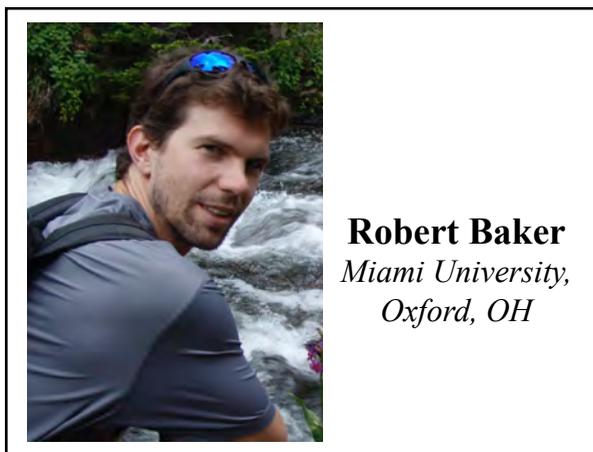
Going into the fall, how are you feeling about starting a new year? What challenges and opportunities do you see?

As a Department Chair, working through modifications of the fall schedule to be able to offer face-to-face classes and laboratories with limited room capacities and social distancing has been challenging. I want everyone in my department and on campus to feel safe and be safe, but many of us know that our plans can change on a moment's notice with COVID-19 surging in many parts of the country again.

How are you feeling emotionally at this point?

I am still mentally tired from such a taxing spring semester, along with educators and parents, as we all had an abrupt shift in our daily and weekly routines. I recall seeing a phrase about us “all being in the same storm but a different boat,” and this still resonates with me. Fall will look different to all of us in academia, and we will have to hope for the best yet be prepared for a switch to online and alternative deliveries.

responded to the financial pressures by, in part, not renewing contracts for many non-tenure track teaching faculty. Consequently, my teaching load will more than double next semester. We also have an altered Fall 2020 academic calendar that is not compatible with the growing season for my plants. I expect my research productivity and grant proposal submissions will be substantially decreased. Thankfully, my institution offers the option to delay the tenure clock as well as an extension on the time to spend startup funds.



Robert Baker
*Miami University,
Oxford, OH*

How has the pandemic and the response changed your job and/or daily routine?

On the whole I've been incredibly lucky and benefit from amazing privilege. I'm lucky to still have my job at all! I'm lucky to have a family situation that is relatively conducive to working from home. I and my family have remained relatively healthy. So has everyone in my lab, thank goodness—I hope that doesn't change!

In addition to moving my teaching and research to 100% online, I had to cancel a field season, had a pilot study cancelled halfway through, and today I should be visiting a colleague to help collect data but am not allowed to travel. My institution has

If these teaching changes are permanent, a tenure clock extension may not be enough. For instance, if we keep the new academic calendar, I will need to re-envision my research program. I think my tenure and promotion committee understands this, but I am not so sure about the upper administrators. I hope they will recognize that if my job description permanently changes, then the expectations for tenure and promotion should also change.

Amid all this uncertainty, I did my best not to change my daily routine: I still held class at the same time (with asynchronous options available). I make sure to meet with my entire lab group during our usual timeslot and scheduled additional individual meetings with my grad students. We moved all of our work online to data entry and analysis, or alternatively collecting data from previously recorded digital images. My students were able to (virtually) present their posters and all of the undergrads graduating from my lab either have well deserved jobs or graduate positions in the fall. And, I am able to take short breaks, contribute more to childcare, and do fun things like eat lunch with my family instead of at my desk.

What was your greatest challenge in adapting to this new format?

The biggest challenge was and continues to be uncertainty. Our institutions are not used to dealing with the rapid pace of the changes we've seen over the past 3 to 4 months. There was (and still is) a lot of conflicting information. This past spring, there was no forewarning or time to plan, and our budgets were frozen so we were unable to do things like construct and mail kits to students so they could do labs at home. While I did (and continue) to do my best to pivot towards on-line interactions, it's hard to do something as simple as design a course syllabus without knowing whether it will be in person, online, or hybrid. Designing research projects involving living organisms that are robust to these unknowns is even more challenging.

How did your interactions with your colleagues and/or students change with the shift to online communication?

They decreased both in quantity and quality. It's really pushed us to adopt a number of online collaboration tools that we probably should have been using all along. Within my research group there are a few things I've done: first, I've made it a point to have regularly scheduled meetings individually and in groups with all my lab members. Second, we tested project management software (turns out we don't like to be managed and I prefer mentoring to managing) and communication software (turns out we do like to communicate!). Third, I'm taking a page out of the Bioinformatics culture of open-source sharing and extensive documentation and applying it to our wet lab, growth chamber, greenhouse, and field studies. Faculty in my department have an informal virtual lunch hour, which has been great. And finally, even as a sometimes-introvert, I've increased the amount of time I spend on Twitter (mostly

lurking) so that I can feel more connected to my scientific friends and colleagues.

What were some surprises you experienced as the spring/summer went on? What skills did you pick up along the way?

One of the best, most exciting things about being a scientist is solving problems—improvising, making do, and overcoming unique obstacles that no other person has ever encountered before. As a profession, I think we are uniquely suited to dealing with new challenges. Tapping in to that problem-solving reserve has been critical.

Going into the fall, how are you feeling about starting a new year? What challenges and opportunities do you see?

Apprehensive. What if my partner and I get sick at the same time? Who takes care of the kids? What if we get shut down again, mid-experiment? What if there are further visa restrictions and my grad students can't leave to visit family or return afterwards? How can I serve students in countries that block our online tools while maintaining FERPA compliance? What if students refuse to (correctly) wear masks? How can I teach a 32-student lab in a room that has a new maximum occupancy of 5? Is it possible to socially distance as over a thousand people move through narrow corridors and tight stairwells within our building? Can I be productive enough to pass tenure review? One potential opportunity is that if we restructure our courses to be deliverable in an online (or even hybrid) format, that could really increase the size and diversity of the audience we can reach.

How are you feeling emotionally at this point?

Drained.

An Era of Virtual Seminars: From Creating One to a List of Ones to Join

Online seminars provide opportunities to share research, meet people, and learn. In this era of digital media, the use of video meetings has increased communication and collaboration. There are many benefits of hosting digital seminars (even when COVID-19 will no longer be a threat). One major benefit is no one has to travel! This is not only environmentally friendly, but also means it is possible to hear about research and collaborate with international researchers, without spending large amounts of money. Virtual seminars are a great way of sharing ideas across fields with researchers that may not attend the same conferences. Not to mention, these seminars develop a community that is welcoming and encouraging for new researchers.

Ana Rita Simões and Lauren Eserman have developed the Convolvulaceae Network Seminar Series during the past year, which currently gathers over 100 participants from nearly 20 countries, from Asia to Brazil. Rocío Deanna and Chelsea Pretz saw this as a model

and started a similar seminar series focusing on research on physaloids (Solanaceae) that, even being a more specialized and restricted group, currently included the participation of almost 50 researchers from America and Europe. In light of the COVID-19 pandemic, many other researchers are exploring the idea of starting virtual seminar series, or joining existing ones, to stay active. Here, we describe our story as just one of many ways to continue to engage in the research community despite geographical and financial barriers, with the goal of encouraging other researchers to pursue these collaborative events.

STARTING A VIRTUAL SEMINAR

When starting a new seminar, there are many things to consider. What is the central topic? How often do you meet? What platform to use? What's the best time for everyone? Should we record? How do we promote our seminars? With the collective experience

By Chelsea Pretz^{1,5}, Rocío Deanna², Lauren Eserman³, and Ana Rita Simões⁴

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from the Convolvulaceae Network and Physaloid Seminars (now Solanaceae Seminar Online), we hope to help other groups who are transitioning to virtual seminars.

THE BEGINNING: ASSESSMENT OF INTEREST

In early 2018, Ana was living in Brazil and noticed a growing community of young Convolvulaceae taxonomists in the country, although with limited contact with each other because of the large distance between them. To help them engage more in discussions, and help each other with references or scientific queries, a Whatsapp group was created with about 15 participants. It was called Convolvulaceae Network. In May 2019, they gathered for a Workshop of Young Convolvulaceae Researchers—online, through Skype—which lasted for an entire day, with a 15-minute presentation from each of the Brazilian participants. It was a success and left everyone craving more. It was also attended by early career Convolvulaceae researchers from other countries (Thailand and DR Congo), who expressed the desire to participate as well. In 2019, Lauren and Ana both attended the Botany 2019 conference in Tucson, Arizona, where they met in person for the first time, along with Joanna Rifkin and Irene Liao, and shared their enthusiasm for Morning Glories (Figure 1). Many ideas were brainstormed during that week, one of which was to find a way to bring together all these researchers working in the family, especially linking the younger students and early career researchers who needed more support, and who were more open to the use of new technologies. One of these ideas was to set up a workshop or small conference where everyone could present their work to



Figure 1. Ana Rita Simões (left) and Lauren Eserman (right) at Botany Conference 2019 in Tucson, AZ.

each other. This would have the advantage of giving students an opportunity to practice their communication skills, especially in English, and offer them a platform to promote their work, which is especially important for those working on research fields that are usually published in low-impact journals and do not always get adequate visibility, such as taxonomy. It would also be a good chance to engage in discussions about overlapping topics (e.g., researchers working on the same taxa, but on different research questions), and about competing ideas. The original plan of a small in-person conference was abandoned because of lack of funding, a large number of participants, and difficulties accommodating everyone's availability. The best option was to make the conference online and spread it out over a few weeks or months, with each week featuring a different speaker. So what would be a worldwide Convolvulaceae conference of one or a few days actually became a seminar series.

The increasing rate of research for the Solanaceae family has led to the development of global networks of collaboration. To pursue this, multiple meetings were organized along the last 50 years, from the International Solanaceae Conferences starting back in 1976 (Birmingham, UK) to the more recent SOLgenomics meetings and Latin-American Symposium of Solanaceae. Even with all the efforts to integrate different research topics during these meetings, there are still gaps in the communication between biodiversity, genomics, and plant breeder communities. Chelsea and Rocío noticed an increased interest in *Physalis* back in 2017. Several different research groups started working with the genus but would not continue to conduct research, despite the economical potential and questions that could be answered within the group. Chelsea and Rocío believed this was caused by absence of communication among researchers and confusing taxonomy. This led them to their taxonomy and nomenclature work, as well as to thinking about ways in which to improve communication across different research communities on the physaloids. In 2019, Rick Miller invited Rocío to the Convolvulaceae Network, and she was impressed about the outstanding organization of these seminars. This opened the idea of a similar seminar series for physaloids, considering that the increase of goldenberries and groundcherries market raised the necessity of working across different questions and communities that needed to be promoted and interconnected. The onset of the Physaloid Seminar Series began by polling other researchers of the Solanaceae family, to gauge if there was interest in this type of online seminar. Once Chelsea and Rocío knew there was more than enough interest, they started with the organization of these seminars, from finding a time that worked for most people to inviting speakers and preparing a schedule.

PICKING A TIME THAT WORKS FOR MOST

In September 2019, Lauren would inaugurate the Convolvulaceae seminar series with a talk on her work on evolution of storage roots, and 10 months later (about 40 weeks), still not all researchers in the group have presented their work. The time selected to host the seminars was 2 p.m. London time, because it was the only time that allowed all the participants to be “awake”—very early morning in North and Central America (6 a.m.), and late evening in Asia (9 p.m.). This solution was found for the very first seminar and has not changed since, because it works perfectly for everyone. The issue with the wide range of time zones is also one of the reasons why it would be difficult to organize a one-week conference or full-day conference; certainly, some people would have to participate at inconvenient times (e.g., present their work at 2 a.m.).

The timetable, including different time zones with the correct time for a list of several cities, was one of the great ideas that Chelsea and Rocío followed from the Convolvulaceae Network and applied to the Physaloid seminars. This table is very important to keep everyone on board and avoid confusion, and it is constantly updated as the group grows; attention is also given to time changes (e.g., daylight saving time). The Physaloid seminars were inaugurated by Rocío in February 2020 with a talk about her work on Physalideae phylogenetics and evolution. After almost 10 seminars on a biweekly basis, there is an upcoming expansion to Solanaceae works that requires more frequent seminars, starting in July 2020 on a weekly regularity. The time selected for these seminars was 4 p.m. London time, in order to not overlap with the Convolvulaceae seminars, as well as to

make it possible for the researchers in the U.S. West Coast (e.g., 8 a.m. in Seattle) to join. Up to now, this has worked for almost everyone and, when someone cannot attend, they can still watch the talks, because they are recorded and made available on the Physaloid Seminar YouTube channel.

CREATING THE STRUCTURE: ESTABLISH COMMUNICATION AND PREPARE THE PLATFORMS

Initially, the presentations of both seminars (Convolvulaceae and Physaloids) were delivered on Skype, and participants could use the chat function to communicate in between talks and during the week, exchanging ideas and references. Particularly for Convolvulaceae, an email address was arranged to send out the program and manage participant communications. To avoid an excess of emails, the monthly program is sent out to a mailing list at the beginning of the month and shared on a dedicated Twitter account (@convolv_network), also created for this purpose. An existing Convolvulaceae Facebook group (created by Ana in 2011) is also used to communicate the program of the seminar series, as well as the Whatsapp group that gathers the Brazilian community. The program includes a list of the talks with additional information about the speakers, as well as a table with the correct seminar time, for each time zone. A website has also been set up, and participants can now join by signing up directly via a Google Form Sign-up sheet.

The Physaloid seminars were similarly developed to Convolvulaceae, but using

Google-Groups, Twitter, and a website, although there are many other ways to promote and inform participants (Figure 2). A Google-Group was set up for communication to the participants, but instead of sending a program, an email reminder of every talk is sent a few days before the seminar. On the website, presenters were asked to write up a small abstract that could be reviewed before the seminar and highlighted during the email. While these abstracts remain on the website in the “past seminar” tab, it is also posted on YouTube with their talk. The researcher can not only add this seminar as an “invited talk” to their CV, but also use the link for presenting their talk to a wider audience. Our hope is that promotion of researchers’ work will help strengthen their career along with extending collaborations beyond country borders and continents.

Recording the seminars provides more flexibility, allowing more people to watch and be connected with the community. You can record the talks easily in both Skype and Zoom. However, there are several different aspects of each tool to be considered. Skype is free, but there is a limit of 50 people during the call, though no time limit; Zoom, however, can freely accommodate up to 100 participants, but there is a time limit of 40 minutes per call (Figure 3; refer to Table 1 for a comparison of online platforms). When starting the Physaloid seminar, there were roughly 35 people with around 15 to 20 attending every week, so Chelsea and Rocío decided to use Skype. Now that the Physaloid seminar is expanding to include the whole Solanaceae family, they have transitioned to Zoom. Many U.S.-based universities have contracts with Zoom, which removes the time limit on the Zoom calls and which could be useful to know before setting up a platform for these meetings.

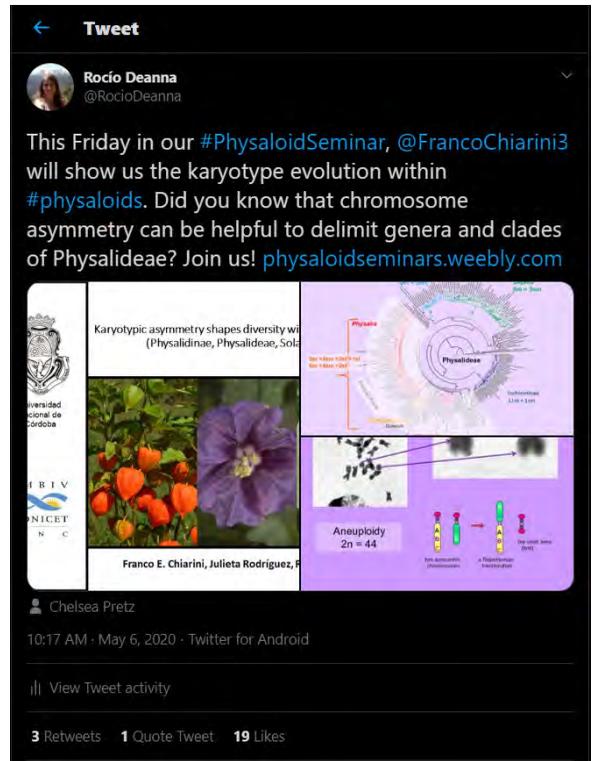


Figure 2. Pictures promoting an upcoming seminar and later the YouTube link to the channel.

PRESENTING RESEARCH AND OTHER COMMUNITY BUILDING ACTIVITIES

The Convolvulaceae group grew, and a new organization system was put into place, which would not have been possible without close communication between Lauren and Ana, as well as effective task division. At the beginning, Ana would organize the email correspondence, the program preparation, and hosting of the seminars, while Lauren would help promote the events on social media and contact potential speakers. They have discussed together, from the outset, all the decisions and new ideas, and especially the technological constraints and how to overcome them. Currently, Lauren and Ana alternate in hosting the seminars, and Lauren has set up a new way of participants signing

up, through a Google form, which collates new participant information onto a Google Sheet (currently over 100 participants from 22 countries). Ana is still more focused on the program preparation and contacting speakers. Both manage the email account, and, depending on the availability, one or the other responds to emails and sends out the program.

In the meantime, since it was not possible to reconcile everyone's availability and have a speaker for every week of the month, some gaps in the program have urged our creativity, and the program started to be enriched with other types of talks: journal club, fun quizzes, and participation of external speakers. These have been equally successful and ended up being a new element of the program and not incidental. Journal clubs are sporadic and not regularly organized. Every now and then, if

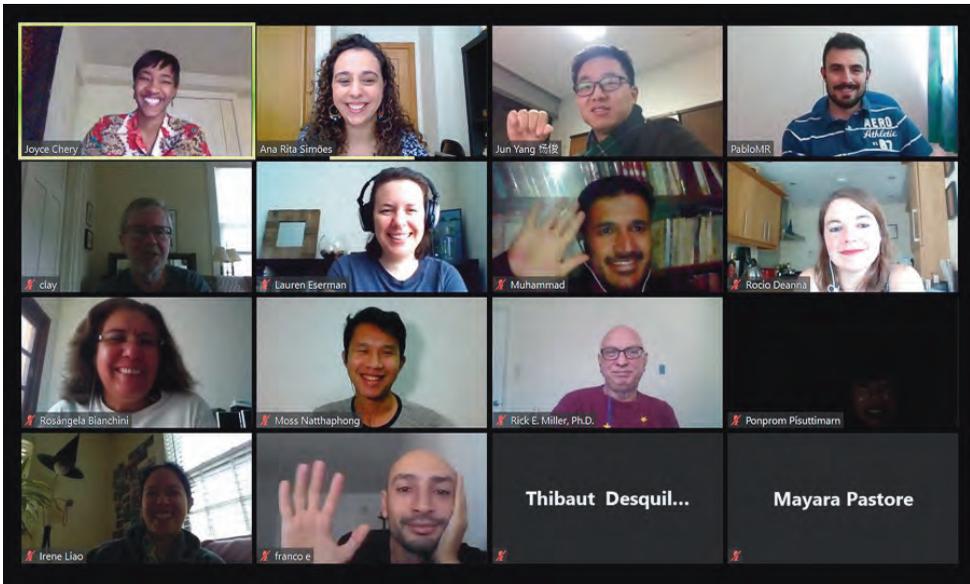


Figure 3. The Convolvulaceae Network meeting on Zoom.

a recent interesting paper is brought to the attention of the group through the chat, usually the person who mentions the publication is asked to prepare a short discussion about it, and we set up a date for this in the following month. The quizzes are a more informal platform, which have been very effective in socialization between the participants—in other words, they are a lot of fun. Kahoot is a user-friendly platform through which you can create questions with four optional answers. You can create different sets of questions on different topics. The quiz is then run on the host's screen, through Kahoot's website (no installation of programs is required), with all the participants joining in through their mobile phones or computers. The Kahoot platform allows you to choose a chronometer with how long is allowed to answer each question, and it manages all the participants' scores and ranking, updating it in between the questions. The participants look at the computer screen for the questions, and they will have four symbols showing on their phones, corresponding to the answers, on which they can easily click throughout the game. At the

end of the questions, Kahoot announces the winner. So far, Ana has organized two quizzes, one on general Convolvulaceae knowledge (from classification to palynology), and another querying about the speakers and the presentations themselves. Several participants sent Ana emails with ideas for questions, and possible answers, which were incorporated into the quiz. Lauren also prepared one on species identification of *Ipomoea*, and it is possible that new ideas will come up in the future; for example, other participants offering identification quizzes about the species or genera, or geographical region, that they work on.

Invited speakers, working on cutting-edge research fields or closely related taxa as our dear colleagues from the sister family Solanaceae, have also become part of the matrix of the Convolvulaceae seminar series and helped the group grow and expand on the scientific range of the discussions. This also inspires Convolvulaceae researchers to look at aspects of their work from different perspectives and try new methodologies.

Table 1. Examples of the popular free platforms that seminar series use (upgraded versions could change the limits in people and time). This is not an extensive list, but rather a starting point.

Service	People Limit	Time (Space) Limit	Some pros	Some cons	Website
Skype	50 people	4 hours per individual video call	Easy to join once the group is set up; stable; able to record	Must screenshare whole screen	https://www.skype.com
Zoom	100 people (webinars can host up to 10,000)	40 minutes per individual video call; unlimited with paid account	Can screenshare from only one tab/position of screen; can set up a waiting room and break rooms; high-quality video and audio; able to record	Zoom-bombing more common recently; requires link for meeting but can be set up as recurrent	https://zoom.us/zoomrooms
YouTube	None	None	It can have a wider audience	Discussion can only be done through chat	https://www.youtube.com/
Google-Groups	>2000 direct add members	None	Email-based; stable	Emails are more formal and might discourage chatting; no video calls	https://groups.google.com/
Microsoft Teams	250 members	None (1Tb + 0.5Gb per E-licensed user)	Better for discussions, chat; Microsoft applications integrated; works with Skype too; data encrypted, more secure	Only allows 4 people with video in the same screen	https://www.microsoft.com/en-us/microsoft-365/microsoft-teams/group-chat-software
Google Meet	100 people	None	Light, fast interface; only need to share a link to start a meeting; able to record	Not so easy to share screen	https://meet.google.com/

FOSTERING A COMMUNITY: INVITING SPEAKERS AND INCLUDING DISCUSSION PERIODS

Maintaining a diversity of speakers is a major aspect to keep in mind. With researchers working on systematics, biochemistry, ecology, evolution, and breeding, it is important to recognize and highlight the importance of these diverse fields of research—not only to include diversity in research topics, but to make sure there is an inclusion of people. This includes inviting researchers in different career stages, from different institutions, and from different corners of the world, while always considering gender equality. To foster an inclusive community of international researchers, the Convolvulaceae Network Seminar Series occasionally have speakers present in their native language with slides in English. This allows researchers whose proficiency in English is improving but would be more comfortable speaking in their native language to present their work to an international audience. Two talks have been presented in Portuguese so far, and Ana has assisted the speaker with translation. The Physaloid seminar is very fortunate to have strong female leaders in the family for early career researchers to aspire to, such as Sandra Knapp, Stacey Smith, Tiina Sarkinen, Mahinda Martinez, Gloria Barboza, and Lynn Bohs, just to name a few. With the expansion to include the whole family, Andres Orejuela, a researcher from Colombia (and PhD student at Edinburgh), will increase the participation of Latin American researchers to the seminars, since there is a large diversity of research done in Solanaceae in South America due to it being the center of diversity of the family.

Both the Convolvulaceae seminar and the Physaloid seminar include time for discussion after the presentation. While this is a time for questions about the presentation, it also allows time to discuss concepts and broader questions about the field the researchers are studying. Allowing this time for questions and discussion makes the community learn and grow together, along with providing the presenter feedback to improve their research. It also provides a place for researchers to learn how to talk to other researchers from other fields that will later strengthen collaboration and give a sense to young researchers about the community dynamics.

SECURITY ISSUES AND TRANSITIONS TO DIFFERENT STREAMING SERVICES

After using a platform for a while, you might realize due to the size, security issues, or for other reasons that you would like to transition to other services. For instance, Skype has recently posed a significant constraint, which is the limitation of 50 participants in a call. Although it is rarely the case that more than 50 participants participate in the actual call, the fact that there are more than 50 participants in the chat group itself excludes the possibility of making the call. This meant excluding participants at the start of every weekly meeting, and then re-adding them after the call, which was a clumsy and exhausting process for the Convolvulaceae Network. Lauren and Ana started exploring new possibilities, and, having benefited from exchanging ideas with Rocío and Chelsea, decided to move toward solutions to the technological problems to these seminar series. Currently, the Convolvulaceae seminar

series are based on a Microsoft (MS) Teams chat, where the actual talks take place and are recorded in Zoom, with the discussions taking place afterward in MS Teams video calls.

MS Teams comes with its own headaches. Many people receive the invite and cannot login. It keeps giving them an error message (“Link is no longer valid”) or it simply freezes their computer every time they try to log in. It is very random, because most people seem to join without problems, and others consistently run into the same message; this suggests there is some technical issue that is not obvious, and it has generated a lot of frustration. This experience of trying to join a group without success can lead to giving up joining.

Security can be a problem with some platforms. Zoom has what is called “zoombombing”—when a person not a part of the group will enter the chat just to be disruptive. There are a few things you can do to ensure this doesn’t happen: (1) do not post the link on the internet, (2) require a password for login, and

(3) have a waiting room and only let people with their full name since bombers usually use single names.

PULLING IT ALL TOGETHER

Once everything is put into place and presenters have been invited, it’s time for your seminar! While starting a seminar is hard work, it does not stop once things are going. There will be weekly tasks such as uploading videos, promotion, and website changes. As with everything, you have to find a balance with helpfulness and time management. This will look different for each group. While putting together a successful seminar is hard work, it is ultimately rewarding to work and hear about research within a group of plants you love to think about!

If you are looking to attend virtual seminars, be sure to check out Table 2 on the following page.

Table 2. A list of Digital Seminars. (This is a dynamic table. To see the most up-to-date list of on-line seminars, go to: https://docs.google.com/spreadsheets/d/1U9AOVwxga-n7T_fO-JROL7GdE-B30VP30EUga4tTb9pjA/edit#gid=0).

Topic	Contact	Meeting Times	Platform	Website
Convolv Network	Ana Rita Simões & Lauren Eserman	Weekly, Fridays 7 a.m. GMT-6	Zoom, Microsoft teams	https://sites.google.com/view/convolvulaceae-network
Solanaceae Seminar	Chelsea Pretz, Andres Orejuela, & Rocio Deanna	Weekly, Fridays, 9 a.m. GMT-6	Zoom, Google-Groups, YouTube channel	https://physaloidseminars.weebly.com/upcoming-seminars.html https://www.youtube.com/channel/UCBKAYT-QFTMDZfHFho9VAqQ/
EvoEco	Andreas Sutter et al.	Mondays, 9 a.m. GMT-7	YouTube channel	https://twitter.com/EvoEcoSeminars https://www.youtube.com/channel/
	Gabriela Auge et al.	Mondays, 2 p.m. GMT-3	Zoom, Google-Groups, YouTube channel	https://argplantwomen.weebly.com/
Polyploid Webinar	Mike Barker	Mondays, 11 a.m. GMT-7	Zoom	https://www.barkerlab.net/polyweb
	Frederick “Erick” Matsen	Monthly	YouTube channel	http://phyloseminar.org/ https://www.youtube.com/user/phyloseminar/feed
Linnean Society Seminars	learning@linnean.org	Periodically	Zoom	https://www.linnean.org/meetings-and-events/podcasts-of-events

Table 2 (continued)

Topic	Contact	Meeting Times	Platform	Website
Plantchat		Bi-monthly	tchat (twitter)	https://twitter.com/itsplantchat?lang=en
Virtual Genomics Social Hour	Athena Lam alam@calacademy.org	Fridays 11 a.m. -12:30 p.m. GMT-7 Everyweek	YouTube channel + Google Hangout	https://www.calacademy.org/virtual-genomic-social-hour
University of Michigan		Thursday Seminars	YouTube	https://www.youtube.com/playlist?list=PLY8QfwKxxfG5m5mkB3f3nNO5bF0cYKXqV
UCLA		Periodically	YouTube	https://www.youtube.com/channel/
Melastome Seminars		Once a Month	Zoom	https://melastomeseminars.weebly.com/

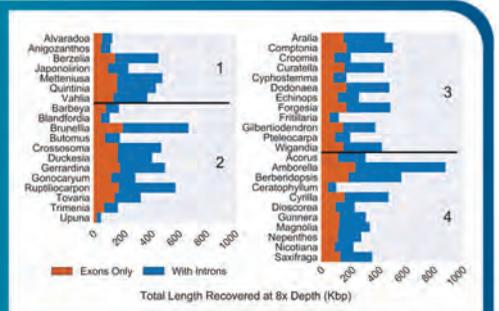
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Summary of Spring 2020: How Teachers Managed PlantingScience During a Pandemic

During March of the Spring 2020 PlantingScience Session, as a global pandemic led to the shutdown of schools across the United States and around the world, teachers who had started or had planned to start their lessons with PlantingScience quickly had to decide how to navigate remote schooling for an indeterminate amount of time. Teachers emailed us asking what they should do and how to continue, whether they should continue, or whether they should scrap their plans for open-inquiry plant projects in the classroom. In the confusion of the first couple of weeks of March, it was unclear whether any of the schools across the U.S. would open again in the spring, leading to teachers requesting that we temporarily close their online groups with the hope that they would be back in a few weeks.

We sent the following options to teachers as they considered their remote learning lesson plans:

- **Keep projects going as usual.** If schools are open, your students can keep plugging away at projects in the classroom and communicating with their mentors as usual.
- **Keep projects going from home.** Depending on the module, where you are in your projects, and internet accessibility for students, your students could potentially take home the projects, or at least communicate questions and ideas to mentors during the time they are home from school. If you choose to have students communicating from home, please keep an eye on the communications to make sure they stay appropriate. Please remind your students that they should not contact mentors outside of the PlantingScience platform.
- **“Pause”** the group and come back later this Spring. We can archive your group until you are ready to come back to the platform. Archiving the group will stop those automatic «At-Risk» emails that come when projects have a lack of activity, plus no one (not students or mentors) would be able to log into projects to make any changes or new posts.



By Dr. Catrina Adams,
Education Director



Dr. Jodi Creasap Gee,
*Education Technology
Coordinator*

- **End the projects and say good-bye.** Depending on where the class is with the projects, it might make the most sense from your perspective to finish up and post thank you's and goodbyes. Students could potentially post conclusions before the end of the session, when we archive all groups.

It seemed that some teachers were grateful to be able to focus on other lessons and come back to PlantingScience another time, while others embraced the opportunity for students to engage in deeper conversations with their scientist mentors about interruptions to their research and how to navigate such disruptions.

Many scientists were able to work on data analysis, and many were forced to modify their plans—either by reducing collection numbers or by reducing the number of people in the collection team. The key to many of these conversations, we noticed, was that students learned that scientists have to be adaptable—global pandemic or not—in order to get their work done. They also learned that science is a process and that it is not always a simple cookie-cutter formula to answer the important questions.

Sarah Tabor (teacher, in a forum post to her mentors):

I have asked all students to continue to communicate with mentors until the termination of this project. At this point, I think the value in this project is the opportunity for students to discuss this unprecedented situation with their mentors. Any science that isn't directly related to SARS-CoV-2 seems to have come to a halt. Mentors, I thank you for your time and efforts in communicating with my students. I hope you are all healthy and sheltering in a safe place.

Kate Sidlar (scientist mentor, in a post to her student team members):

Well, this is certainly unexpected. But the unexpected is just something you have to learn to expect in science. Learning to adapt is a very important skill! I remember having a grade 6 science project on plants all go moldy, so I changed my project to be about mold growth!

When I was working on my Master's project, I spent 6 months in the lab preparing specimens for a specific type of testing. Then when I was ready to submit the samples to be tested, the company didn't offer the test anymore. So I had to come up with other ways to analyze my data.

We can never really know what's going to happen, but we can try to adapt to what's happened.

With that said, I'm going to keep checking in until the end of the project. You are welcome to ask me any questions you want about studying science, researching, what kind of school it takes to be a scientist, or anything else you can think of. You can also ask me anything you want about any kind of science, and I'll try to find some answers for you or point you in the right direction to find some yourself! Although I studied biology (fungi specifically) for my Master's degree, my job now involves a lot of chemistry and physics as well, so get creative with your questions! Even random little things you've always wondered about could have some really interesting science behind it, so let the questions fly!

Kelly Kerr (scientist mentor, in a post to her student team members):

How is everyone holding up with the Covid-19 disruptions? I thought I'd share some of the impacts it's been having on my life and research to commiserate.

Since my research involves a lot of field work (e.g. camping, hiking, living in the woods for weeks at a time collecting samples) in the spring and summer, I'm very worried that I won't be able to get a lot of the work done I had planned. While a lot of public land (i.e. forests) in Utah and Colorado are still open, my University also shut down and no one is allowed to work in the labs. So even if I go to the forest, I may not be able to measure my samples in the lab once I collect them.

I also had 2 conferences planned this summer to talk about my research. One has been cancelled—the other one is in August but the organizers are already talking about it being in an online format.

Working from home is a real challenge for me—I don't have the best discipline to stay focused and on task. But it has led to a lot of fun hobby exploration. I've been playing the banjo a lot, baking lots of bread (working on some sourdough now), painting, and reading a lot of books. Oh, and of course catching up on some Netflix. I have a weekly zoom hangout with some good friends, and we've started a movie club while under "quarantine" too.

Anyway, while this pandemic is unprecedented, disruptions to science are unfortunately common—especially when you work with live specimens like plants. Two summers ago, the forest in

CO I work in was largely on fire and I could not access many of the sites. So there are big gaps in that dataset too! I think we do our best to learn from the mistakes, and try to gather what data we can.

Hope you all are well! Feel free to share/discuss your thoughts if you'd like. Happy to chat about anything.

Many students whose teachers decided to continue with PlantingScience also posted about their experiences during the COVID19 pandemic. While a few expressed joy at being away from school, most shared their thoughts about how much they missed school (gasp!) and their friends. As anyone who has or works with children know, the disruptions throughout their lives are creating no small amount of consternation, confusion, and disorientation, regardless of age. These feelings were expressed and explored to some extent on the PlantingScience platform during the last 6 weeks of the session.

7Dani (student, posting to their team's page):

Since our last check-in, I haven't seen my plants or even my classmates for that matter. We are on our second week of online schooling and needless to say, I very much wish to go back (Never thought I would say that). We have left our plants to die and it seems like there is nothing we can do about it at the time being. Has this happened to you with any of your research? What have you been doing with your time off? Are you able to do research remotely? Has the corona affected you in any way differently like has a friend or family member got it? Hope you are safe and well.

4Emma (student, posting to their team's page):

Hi! As few people have already said our school was closed during our spring break until the 10th of April but it will most likely be for the rest of the year. I wish we would have had the chance to finish the experiment and I want to thank you for all of the help that you gave us. Are you still able to do your labs and experiments? How is your quarantine going? I am starting to get bored of doing the same things over and over again ☺ Luckily our school and teachers have the ability to teach us over technology so we are still able to get some sort of education. My brother keeps asking me to play baseball all the time and I've read a lot of books. Anyway I hope that you are finding a way to stay sane during this time! Again, thank you for being willing to help us with this project.

Maahir (student, posting to their team's page):

I can't believe everything that has happened because of the pandemic. That made it really hard to communicate and spun my world around and I am sure it has happened to others too. My conclusions on my seed work are that leaving the second and third batches of seeds stay in the sun helped jumpstart their growth. Not one seed molded and everyone single hypocotyl formed in at most five days. I used to think that sunlight was just a small factor of germination but now I realize that it

made a bigger difference than I thought it would. I still wonder about so many things and will continue to learn more about plants. I would like to wrap this by thanking you Emily for helping me through and sparking my plant interests. It was fun to talk about other topics too! You seem like an amazing person and I hope that you have a happy life and wish for all of us to keep on trucking through this tough time.

This was so fun!

A worldwide pandemic has disrupted every aspect of our lives, including schooling, which has been challenging for children who are used to those social interactions, meal plans, and structure, among other benefits. Pediatricians initially recommend that K-12 students go back to school this fall, as the benefits outweigh the detriments (pending students' underlying personal and family health concerns. However, they later added the caveat that in-person school should happen only if it can be done in a way to keep everyone – students, teachers, staff, administrators, etc. – safe and healthy.

Knowing that this fall will likely look nothing like last fall, PlantingScience staff continue to prepare for a fall session to support teachers in their efforts to teach their middle and high school students the process of science through hands-on plant science research projects. We are currently reassessing our modules to determine how—if at all—we can enable teachers to run them through remote learning strategies.



Resources for Teaching Botany Online

When the COVID-19 global pandemic forced universities to shift very quickly to online teaching, many were left seeking help and needing resources. The BSA was quick to create and provide online resources that are continually being updated. Go to https://cms.botany.org/home/resources/online_resources.html to explore these resources!



The screenshot shows the Botanical Society of America (BSA) website. The header features the BSA logo and the text "Botanical Society of America" with the tagline "leading scientists and educators since 1893". Below the header is a navigation menu with items: Home, Membership, Publications, BOTANY Conference, Awards, News, Careers/Jobs, Governance, Outreach, and Resources. The main content area is titled "Teaching Botany Online" and contains a paragraph of introductory text. Below this is a "Menu" section with a list of links: General Information about Teaching Online, Specific Information Related to Biology Education, Specific Information Related to Botany Education, Citizen Science, Partner Resources, Resources on Accessibility, and YouTube and Other Video Resources. On the right side of the page, there is a decorative image of a blue, spiky virus-like particle with a glowing core, set against a dark background with red and white speckles.

Teaching Botany Online

Many people are working from home for the first time, including teachers and faculty across the country. We have collected some resources that might provide useful information for teaching botany online, in addition to some general biology resources. While many of these resources are K-12, many also apply to undergraduate education as well.

Menu

- General Information about Teaching Online
- Specific Information Related to Biology Education
- Specific Information Related to Botany Education
- Citizen Science
- Partner Resources
- Resources on Accessibility
- YouTube and Other Video Resources

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Icahn School of Medicine at Mount Sinai

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Allison DeHaas
*Undergraduate
Student,
Widener University*

As a senior in undergrad, I was finishing up writing my thesis when all of the chaos that is COVID-19 ensued. I had done most of the work, but the few things I had left to do required my Research Advisor and I had to share her computer because she had access to the data analysis program I needed to use, and I did not. Due to social distancing, we were unable to do this. I was able to make do with what we had—using previous figures from posters, but it definitely interrupted the process and plan we had outlined. On top of that, the flowers that we study were in full bloom and I was unable to visit them because the arboretum was closed! Once I finally finished my senior thesis, I had the unique opportunity to do my thesis defense via Zoom. In all of this, I've found the best way to cope is to just be honest with those around you about how you are doing. It isn't always easy to be vulnerable and share, but I've found that everyone tends to relate. Right now, we are all doing the best we can with what we have!



Chelsea Pretz
*Graduate Student
University of Colorado, Boulder
@chelsea_pretz*

Staying inside so much has probably given me vitamin D-deficiency, but I learned to be cat-like and sit by windows. I have also learned what bias-tape is and how to make it, so I could make a homemade cloth mask.

Kate Volk
Graduate Student

I've found that, more than ever, my motivation is all over the place. Some days I'm a go-getter; some days I need a lot of breaks; some days I can't focus at all. Some tricks I've developed for those un-focused days are making daily to-do lists and checking things off as I go. Even if the list doesn't consist of classwork and research, but rather "take 10 min break." I've found that checking the box off gives me a little push to do the next thing on the list. Also, when taking breaks, heading outside really refreshes me.

Tracey Simmons
*Post-Doc Student
@traceyssimmons*

With the campus closed due to COVID-19, I can no longer access our lab. Some things can

be done remotely, but there is no substitute for the energy that comes from working in the same room. The loss of that safe and supportive space is difficult. My advice is to treat yourself with kindness during this time. Take the gentle care you would give a growing plant and turn that care back onto yourself. Drink water, soak in the sunlight, and take some deep breaths. Your work will be there when we return, so put your mental health first now. We will get through this together.



Nannie L. Persson
*Graduate Student,
University Museum of Bergen*

The decision to close our university due to COVID-19 came very fast and I didn't even have time to get my laptop or the literature I needed. I live alone, abroad, and suddenly felt completely shut out from the world. I was able to get my things the next day, though, and it turns out I made the right decision to bring home my big screen, since we've now had a home office for two months and will probably have over the summer. My workplace is very important to me, and if I don't like it, my concentration is bad. I was granted access to the molecular lab after 1.5 months and had long conversations with three colleagues that day. When I got back home, I was exhausted, and it was the same exhaustion I had felt

every day after work prior to the shutdown. Thus, during these two months, I've gone from thinking I was an introvert, to longing for people more than I've ever done before, to realize that I am indeed an introvert and I appreciate my home office. Especially since my deadline to deliver my thesis is in less than six months and I need not to be disturbed.



Minya
*Graduate Student
@0_minyaaa*

I was a teaching fellow for a class (Biology of Plants) this semester and transitioning to online teaching had been the most challenging thing. This class has a weekly 3-hour lab component and it's always students' favorite part because that's where they get to look at and dissect all sorts of plants. Changing in-person labs into online labs has not been satisfying no matter how many online materials we prepare or what methods we try. However, the most difficult part was not adjusting course materials but adjusting myself. I knew my students understood things and were enjoying the lab when I taught the lab in person, but I felt insecure when speaking through the camera because I don't have the connection to the students anymore. The semester has ended and I appreciate all my students being so great, but I wish I could figure out a way to make the situation better both for them and for myself.

Justin Williams

Graduate Student

Lots of writing! Thank god for the online herbaria consortia and databases! Currently TA-ing an online field course...hmmm.



Bashir Bolaji TIAMIYU

*Graduate Student,
Wuhan Botanical Garden
Chinese Academy of Science
@timmybash001*

Getting to Wuhan Botanical Garden as a new graduate student (Ph.D.) in January and there was lockdown a few days later, it was an awful experience that brought some inconvenience, in the beginning, however, with the help of the management team, and my supervisor, I was able to adapt to the new surrounding and the reality on-ground. I decided to channel my energy towards reviewing relevant literature for my proposed research. As a resident in Wuhan, initially it was a traumatic experience, but as time passed by, the psychological pressure eased. I tried to stay healthy through regular exercises, watch movies and communicate with loved ones back in Nigeria.

Sukuan Liu

Graduate Student

Yes. I was possibly exposed and became infected back in China in mid-December....

Deva Raj Khanal

Graduate Student

@karkatdrk

From the beginning of spring semester 2020, I had just started my research project: Genus *Salsola*'s complexity for my MS studies at South Dakota State University. However, with the effect of COVID-19, I had stopped my lab work. But, in this pandemic situation, I am learning computational things from home, which will be very useful for my research project soon. For this, I am also taking an online course. I hope to return to my normal lab work and play with DNA data very soon.



Jacob Ewald

*Graduate Student
California State
University, Chico*

I am a first-year graduate student at Chico State University in Chico, California. I have been quite fortunate in being able to adapt to the COVID-19 pandemic. As a commuter living about 75 miles away from campus, I

already had to be flexible to pursue my education. When the statewide orders shut down the campus, I was still collecting seeds from ripening fruits from 40 greenhouse-grown monkeyflower specimens. Realizing I would quickly lose access to these specimens, I transported them from Chico State to my home in Redding, CA, where I continued to collect their seeds. If the shutdown order had come earlier (say, when I still needed to collect seeds from my original 270 plants), my research would have been greatly impacted, as I would not have been able to transport them all. Fieldwork, too, has been able to continue in a properly regulated fashion. I acquired university permission to collect monkeyflower DNA samples from the field, but once the proper safety precautions had been discussed, I was able to conduct my fieldwork with only a short delay. Overall, it has taken some flexibility and unorthodox methods, but my research is forging ahead.



Simone Lim-Hing
Graduate Student
University of Georgia
@simonelimhing

I think the biggest impact the pandemic has had on me is the psychological one. While I have the privilege to work safely from home and maintain my stipend, many of my friends and family are not. I am constantly worried

about the safety of others, like my mother, for example, who is an essential worker at a detention center that has a COVID-19 outbreak. On the other hand, this lockdown has taught me to appreciate the things around me more, like my partner, pets, and books!



Kathryn Mercier
Graduate Student
City College of New York
and the New York Botanical Garden
@kpmercier

I've been relatively lucky in regard to COVID-19. My family and I are all still working and healthy. I have been able to shelter-in-place with my parents, surrounded by Florida biodiversity and empty hiking trails. Yet, this coronavirus has taken many firsts of my dissertation career. It took my first season of fieldwork. It took my first Botany meeting. In the fall, it will likely take my first in-person teaching experience. It can be difficult not to feel dejected. But I try to remember that I have also gained some firsts. I have seen friends from across the country defend their dissertation through virtual meetings. I have taken up the guitar. I will be teaching online and attending a virtual Botany meeting. Despite the feeling of missing out, I will still be able to have these firsts, virtually or eventually.

Joanna Lumbsden-Pinto

Graduate Student

Bringing so much uncertainty in my last fieldwork season in the summer so I needed to come up with contingency plans.



Grace Brock

Recent graduate of a BA

I've just graduated in mid-May with a BA in Botany and Creative Writing. The transition to online coursework during my last few months as an undergrad was quite unexpected. I've stayed in close contact with all of my friends through texting and video conferencing, but checking in on the plants that I've helped research for the past 3 years has proven more difficult once non-essential workers were asked to stay at home. One thing that has made the transition easier is the weekly Snapchat video updates that my labmate sends to me from inside the greenhouse! As for coping with missing out on in-person lectures, nothing can really perfectly substitute for it. Instead, I've been delving through all of my old botany notebooks to pull out the topics that interest me most. Rather than spending this last semester physically attending lectures, I've been creating my own mini-lectures at home. I hope to someday work in the field of science communication and if nothing else, this extended time at my house has given me the chance to work on potential topics to

someday write about. Lastly, I have found it valuable to take advantage of all of my free time by reading. It's a wonderful de-stressor to put yourself into another world for a while. Right now, I'm reading *Jurassic Park*, and then I'm moving onto the *Lord of the Rings* trilogy!

Bethany Nichols

Graduate Student

@Frondbenefits

Being isolated at home means I don't get to interact with other students and talking to others is often what inspires my work. One of my PhD chapters now has to be a literature review because I can't get into the lab. However, my garden and house plants have never looked better and I'm connecting more with the wildflowers growing around my house. I've even started a plant blog to help me keep learning and writing.



Shelly Gaynor

Graduate Student

University of Florida

@Shelly Gaynor

COVID-19 has really impacted my research progress. My fieldwork was delayed. Though my university may allow fieldwork in a few weeks, I worry that it wouldn't be safe to go. I am slowly finding my footing and figuring out how to move forward despite these delays.

GETTING TO KNOW YOUR NEW STUDENT REPRESENTATIVE: IMEÑA VALDES

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

While at Florida International University, my undergrad advisor, Dr. Suzanne Koptur, encouraged me to apply for the PLANTS program in 2015. I had such a great experience at the Botany meeting, especially as a PLANTS student. Since then I have promoted BSA and the PLANTS program to many friends so they could have similar experiences while networking for their future.

What motivated you to run for the position of Student Representative to the Board of Directors, and what do you plan to do as the student representative of BSA?

Because of the consistently great experiences I have had while attending Botany meetings, I wanted to do my part and contribute to the Society. I want other underrepresented students to have access to the tools I was provided and a chance to meet incredible scientists that can serve as mentors as they navigate through STEM. The current Black Lives Matter movement makes it abundantly clear that we need to make science more inclusive and safer for Black, Brown, and Indigenous students. I envision using my position as a sort of liaison between students, particularly those who are underrepresented, and the rest of the board.



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

My research focuses on understanding and evaluating pollinator preferences and support in order to provide information on best practices in landscaping and restoration regarding the development of natives. I discovered my love for plant–animal interactions in undergrad while talking to a friend about narrowing down my interests so I could be placed in a lab for a semester to complete a USDA scholarship requirement. At first it was a casual interest but soon enough I was hooked, and I continued in Dr. Koptur's lab until I graduated in 2018.

What sorts of hobbies do you have?

I enjoy baking; taking care of my growing houseplant collection; traveling; chiseling away the imperialist, capitalist, white supremacist patriarchy; and petting other people's dogs.

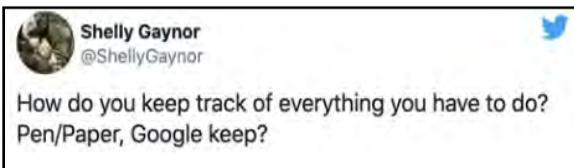
Time Management Tips: Before and During a Pandemic

Prior to the COVID-19 shutdown in the United States, we collected perspectives via Twitter for our planned workshop on time management. Since the shutdown, time management has been a struggle and we aren't ready to teach it! Instead, here we share some tips we gathered on managing time. Particularly, we called for answers to three main questions:

1. How do you keep track of everything you have to do?
2. What do you do when you can't complete your to-do list?
3. How do you manage procrastination?

We also posted the links to the original tweets below so that you can see the original responses. Please feel free to contact us if you want to share your time management strategies!

1. How do you keep track of everything you have to do? (<https://bit.ly/3krEjXs>)



Summary of responses:

To-Do List

- Pen/Paper or Notebooks
- Sticky Notes (e.g., Kanban boards)
- Whiteboard
- Planners
 - Normal Planner
 - Passion Planners
 - Erasable pen *
 - Post-Its in a Planner
- Bullet Journals

Personal Task Manager

- AmazinMarivin (\$6 per month)
- ToDoist (Free or \$3 per month)
 - Can set reminders at times, link to phone too.
- Omnifocus (\$9.99 per month)
 - Mac or iOS only
- GoodNotes (\$7.99 for app)

Digital To-Do

- Google Keep
- OneNote
- Trello
- WorkFlowy (\$4.99 per month)
- GoodNotes (\$7.99 for app)

Calendars

- GoogleCalendar
 - Todolist Pro doesn't integrate well!
 - Google task
- Outlook Calendar
- Synced Calendars between devices

During the pandemic, did your strategy change?

Karolina Heyduk
@kheyduk

I didn't change methods - relying on pen and paper lists and allotting time for this activities in discrete time blocks on my Google calendar. For me, to-do lists and scheduling have become extra important to getting anything done!

2. What do you do when you can't complete your to-do list? (<https://bit.ly/2ZFwDsz>)

Shelly Gaynor
@ShellyGaynor

What do you do when you can't complete your to-do list? #TimeManagementBotany2020 - we hope to use these responses in a workshop

10:52 AM - Feb 15, 2020

The responses had three main themes:

- Break your to-do list into manageable items (rank and organize this list).
- Identify feasible goals.
- It is okay if you do not get everything done.

Mike Barker
@BarkerLab

Not much! There are so many things to-do in a day, that I just learned to focus on the important and urgent tasks. Keep things moving for students/postdocs in the lab, and make sure I block out time for my own writing/research each day. Otherwise, move it to tomorrow!

Taran Lichtenberger
@plant_taran

Remember to breathe and then rewrite a feasible list

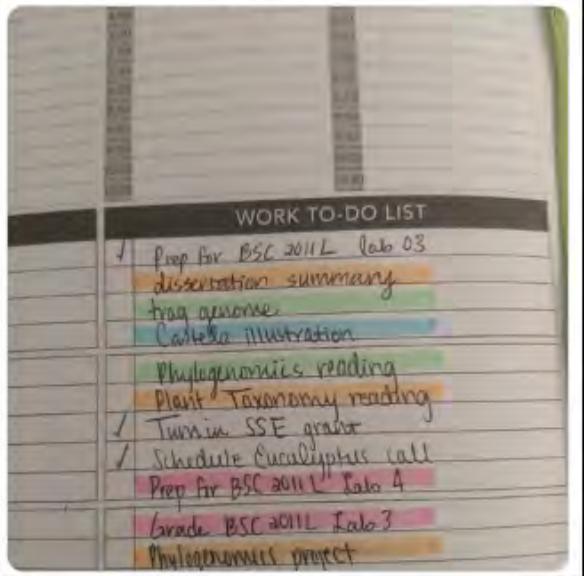
Shelly Gaynor @ShellyGaynor · Feb 15, 2020
Replying to @plant_taran
How do you define feasible goals?

Taran Lichtenberger
@plant_taran

Normally I will have like ~10 things I want to get done when timewise unless something takes less time that expected i could only fit ~7. So ill carve that list of 10 into the 7 based on importance (normally when its due). So feasible goals in this instance I mean w/in the time

Kasey Khanh Pham
@KaseyKPham

Long to-do lists make me anxious, so I try to break them up by color-coding by priority -- that way I can think about one color at a time.



During the pandemic, did your strategy change?

Shelly Gaynor
@ShellyGaynor

I have really embraced this GIF that @BarkerLab posted in response to the original thread.

3. How do you manage procrastination?

(<https://bit.ly/3kuTcbt>)

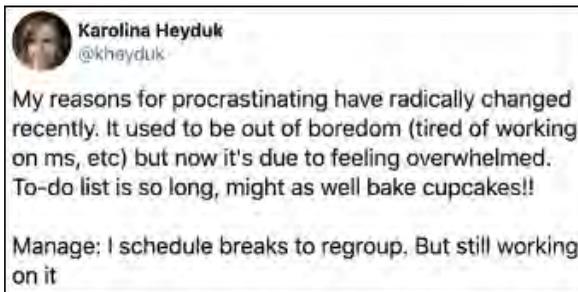


Shelly Gaynor
@ShellyGaynor

Looking for more time management advice: What's your biggest cause/source of procrastination? and how do you manage it? #TimeManagementBotany2020

Response summary: Procrastination is part of life.

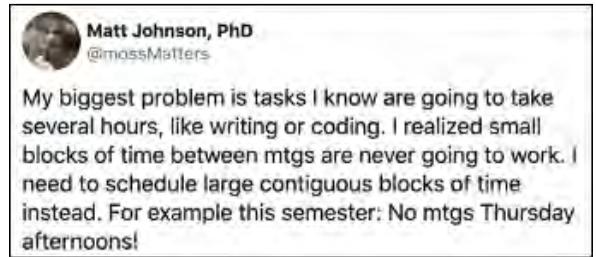
- Schedule chunks of time for long tasks.
- Remember to schedule breaks!



Karolina Heyduk
@kheyduk

My reasons for procrastinating have radically changed recently. It used to be out of boredom (tired of working on ms, etc) but now it's due to feeling overwhelmed. To-do list is so long, might as well bake cupcakes!!

Manage: I schedule breaks to regroup. But still working on it



Matt Johnson, PhD
@mossMatters

My biggest problem is tasks I know are going to take several hours, like writing or coding. I realized small blocks of time between mtgs are never going to work. I need to schedule large contiguous blocks of time instead. For example this semester: No mtgs Thursday afternoons!

During the pandemic, did your strategy change?



Jacob Landis
@JLandisBotany

Keeping a written to-do list and actually keeping to that became more important during the pandemic. If I didn't follow what I had set out for myself at the end of the week I didn't get anything meaningful accomplished.



MEMBERSHIP NEWS



THANK YOU, TARAN!

A big **THANK YOU** to Taran Lichtenberger, one of two BSA Student Social Media Liaisons hired last year to promote BSA's mission, via a student voice, on our social media platforms. Taran's focus was on Facebook and Instagram, where she grew our audiences over 7% on Facebook and an amazing 82% on Instagram. Taran has been instrumental in helping to shape the BSA Liaison position for future students, including co-creating a detailed

liaison handbook. We wish Taran well as she starts her next chapter as the Community Engagement Manager for Budburst, a community science program of the Chicago Botanical Garden.

The BSA Student Social Media Liaison positions, which were originally developed as two, one-year positions, are now two, two-year staggered positions in order to maintain continuity in tone and purpose. We are thankful to Jared Meek for agreeing to stay in this position for a second year. We are in the process of hiring the second liaison at this time.

If you have anything you would like to see promoted on the BSA social media channels, e-mail socialmedia@botany.org.

NEW 3-YEAR POST-DOC MEMBERSHIPS

The BSA renewal season is just around the corner starting in October (BSA memberships run on an annual cycle, Jan-Dec). New this year, post-doc members will have the option of a 3-year post-doc membership! For a discounted rate of \$105 (a savings of \$15), post-docs can keep this membership level for the full three years even if their post-doc status changes.

Three-year Student and 3-year Professional membership levels are available now, so don't miss out on the opportunity to pay once and stay connected for three years when you renew your membership this fall!



By Amelia Neely

*BSA Membership
& Communications
Manager*

*E-mail: [ANeely@
botany.org](mailto:ANeely@botany.org)*

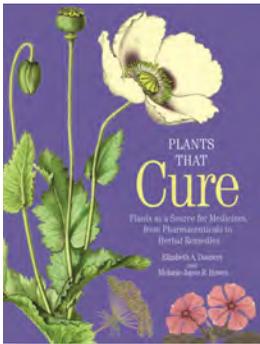
GIFT MEMBERSHIPS

For only \$10, gift memberships are an affordable way to share the benefits of being part of the BSA community with students or developing nations colleagues. Visit www.botany.org, click Membership on the top menu, and then click Gift Memberships to get started.

MEMBERSHIP MATTERS ENEWSLETTER

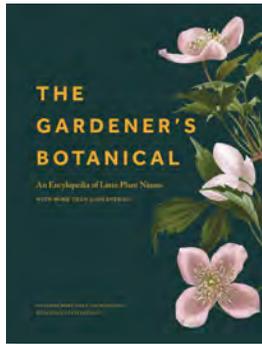
As a member benefit, BSA members receive the monthly eNewsletter, *Membership Matters*. The newsletter includes society news and awards you do not want to miss. If you do not currently receive a copy of *Membership Matters*, and wish to start receiving them, please contact Amelia Neely at aneely@botany.org.

NEW FROM PRINCETON



Plants That Cure
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Elizabeth A. Dauncey
& Melanie-Jayne R. Howes
Cloth \$29.95



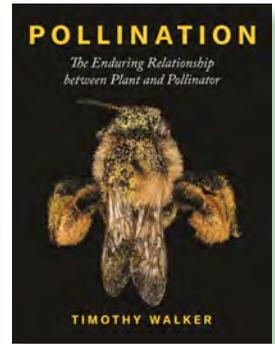
The Gardener's Botanical
An Encyclopedia of Latin Plant Names - with More than 5,000 Entries

Ross Bayton
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The Enduring Relationship between Plant and Pollinator

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FROM THE *PSB* ARCHIVES

60 years ago

William Campbell Steere gave the Address of the retiring President of the Botanical Society of America at the meeting held in Oklahoma State University, Stillwater. His remarks are included in *Plant Science Bulletin* and discuss the unique conditions for plants in arctic regions. He provides an important perspective as we consider the rapidly changing conditions in the arctic today. He introduces the talk:

“I selected the topic, ‘Botanical Problems in Arctic America,’ as being timely because of the recent admission of Alaska to the Union as the 49th State, because of the large amount of publicity given to the activities of the International Geophysical Year in arctic and antarctic regions, and because of the increasing importance of our northern outposts in the military defense of this continent. Moreover, after eight field seasons in arctic and subarctic Canada, Alaska and Lapland, I have developed some ideas and some questions that may well be of interest to a group of my botanical colleagues.

--Steere, William Campbell. “Botanical Problems in Arctic America” *PSB* 6(4): 1-5.

50 years ago

“A freak hurricane on January 4, 1970 resulted in extensive damage to one of the worlds’ leading botanical establishments. The loss to botany of such a famous and important collection transcends national boundaries and it is felt that many of the institutions and individuals who have benefited from the Gardens and its associated facilities such as the Treub Laboratory and the Herbarium Bogoriense may wish to do something tangible to help.”

--“Botanic Gardens at Bogor Damaged by a Hurricane” *PSB* 16(3): 8-9.

40 years ago

Joe E. Winstead discusses some situations that can negatively affect the experience of presenters, moderators, and the audience at scientific conferences. This demonstrates the fact, that while technology has changed, giving a quality presentation is a perpetual struggle.

“It never ceases to amaze me that individuals with scientific training can hand a set of slides to the projectionist (usually an undergraduate) expecting that person to know immediately how the slides are to be placed in the projector to appear on the screen. What happened to rehearsal time and the courtesy of marking slides by number and with indications of which corner is to face the projectionist? One or more slides often appear upside down or backwards and the speaker implies or states that the projectionist was at fault.

...

Finally, it seems to be rare to find a moderator who will take 30 seconds to commend the academic hostage who operated the projector by at least introducing them by name and, if a student, mentioning the major area of study. Having been a faceless non-identity in the old days, I feel a special kinship to those that have to hear every paper along with the moderator.”

--Winstead, Joe E. “Disconsolate Observations at Paper Sessions or The Unselling of Information.” *PSB* 26(3): 17-18

MACHINE LEARNING IN PLANT BIOLOGY: A NEW SPECIAL COLLECTION IN *APPS*

The BSA is pleased to announce the publication of an exciting special collection of articles in our Open Access journal, *Applications in Plant Sciences*, that highlights machine learning in plant sciences.

Machine learning—the science of enabling computers to learn without being explicitly programmed—is becoming so prevalent that we often use it without even knowing it. The autocorrect on your cell phone, the ads you see as you browse online, and self-driving cars are all common examples of machine learning, as are personalized medicine and precision agriculture.

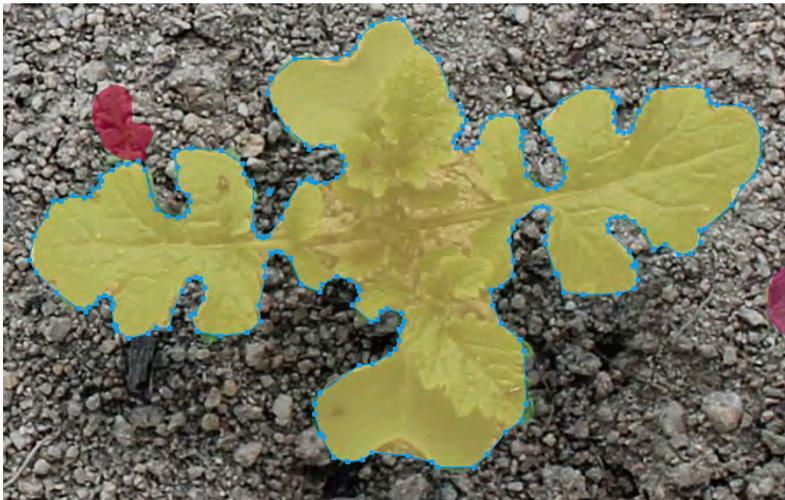
The field of machine learning is advancing rapidly as computer scientists develop more efficient algorithms and more powerful computing platforms. Plant scientists are now increasingly applying machine learning to biological problems including species identification, plant phenology, and comparative genomics.

The special collection in *APPS*, organized by editors Pam Soltis, Gil Nelson, Emily Meineke, and Alina Zare, was published across the

June and July 2020 issues. The papers fall into two broad categories: the first focusing on applications to images of herbarium specimens, on topics from phenology to herbivory; and the second including papers that address a broader range of topics, data, and biological scale.

All articles are freely available at [https://bsapubs.onlinelibrary.wiley.com/doi/toc/10.1002/\(ISSN\)2168-0450.machine-learning-in-plant-biology](https://bsapubs.onlinelibrary.wiley.com/doi/toc/10.1002/(ISSN)2168-0450.machine-learning-in-plant-biology). We especially encourage you to check out the issue introduction (<https://bsapubs.onlinelibrary.wiley.com/doi/full/10.1002/aps3.11371>), which provides a thoughtful overview of the 16 featured articles, as well as a snapshot of the current promise and challenges of this emerging field.

New approaches involving machine learning have the potential to change how we study plants and even the questions we can ask. We hope that the papers presented in this collection encourage further progress on the emerging applications of machine learning to plant biology.





ANNOUNCEMENTS

In Memoriam

W. ARTHUR (“ART”) WHISTLER

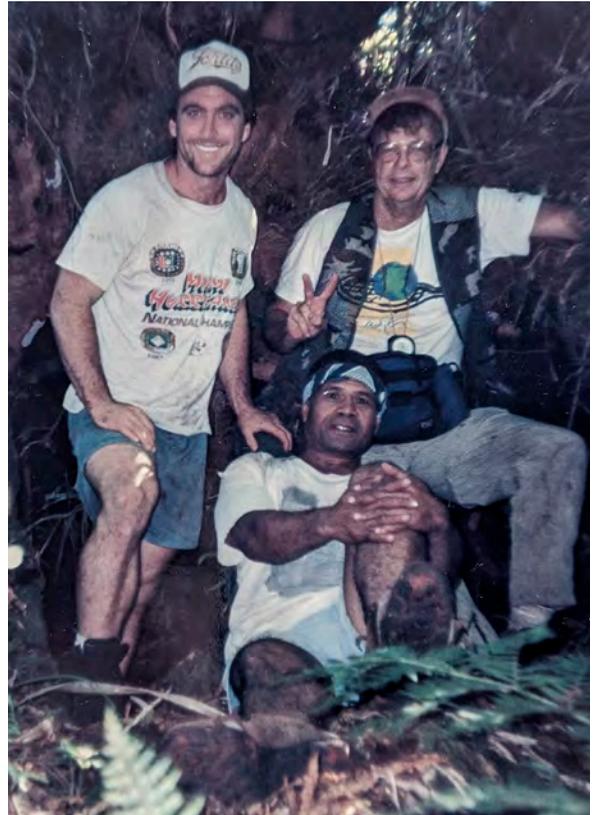
W. Arthur (“Art”) Whistler, an eminent botanical expert of the South Pacific islands, died on April 2, 2020 due to COVID-19. His death was the third in Hawaii from the disease.

Art was originally from Trona, California, a small desert town near Death Valley with vegetation that stands in stark contrast to the tropical flora that he studied for four decades. Although Art had visited Samoa in the late 1960s as a Peace Corps volunteer, his botanical story begins with him earning a PhD from the University of Hawaii in 1979, supervised in part by the legendary vegetation ecologist Dieter Mueller-Dombois. Art’s major publication from his dissertation titled “The vegetation of Eastern Samoa” was published in 1980 and continues to influence all vegetation work in the American Samoa portion of the archipelago. Subsequent to his PhD, Art established and maintained affiliations with the University of Hawaii Botany Department, the Bishop Museum, and the National Tropical Botanical Garden.

Instead of pursuing an academic career, Art established a consulting firm, Isle Botanica. He leveraged the private sector to pursue his botanical interests, not only as a consultant, but also by publishing his botanical accounts in guide books, which were sold across the Pacific. These books have been widely

disseminated and include titles such as *Polynesian Herbal Medicine*, *Wayside Plants of the Islands*, *Rainforest Trees of Samoa*, *Plants of the Canoe People*, *Samoa Herbal Medicine*, *Flowers of the Pacific Island Seashore*, and *The Samoan Rainforest* among others.

Despite his focus on consulting and writing botanical guidebooks, Art authored a large number of peer-reviewed journal articles, including accounts of vegetation of Pacific islands, ethnobotanical treatments, and taxonomic revisions such as for the



Art Whistler (right) with Siaifoi Fa’auumu (seated) and Edward Webb (left) in a small patch of montane forest at the top of Olosega island, Manu’a, American Samoa. Circa 1997.

genera *Psychotria* and *Syzygium* in Samoa. He also made numerous commissioned inventories, perhaps most importantly the botanical inventory of forests that were proposed—and later became—the National Park of American Samoa. Art's long-term professional goal, and which he was in the process of finalizing upon his death, was to publish the Flora of Samoa. This flora, which is being published by the National Tropical Botanical Garden in Hawaii, will be the crowning achievement of his more than 40 years of experience and collection in the Samoan archipelago.

I met Art in 1996 when I was *en route* to American Samoa to serve as a botanist for the Government of American Samoa. I still recall that first meeting and the advice he gave me, which was that although American Samoa was changing rapidly on the surface, the culture remained deep and should be unfailingly respected. This was sage advice and it reflected Art's acknowledgment that foreign botanists—*palagis* in the Samoan language—are guests in the island nations and we should never forget that. Indeed this was one of the reasons Art was so highly regarded in Samoa. He treated people with respect and enthusiastically mentored and trained Samoan colleagues who he hoped would take the mantle of Samoan botanical explorations forward. His books, arguably his products that have gained the most traction, were written with the average person in mind, and designed to entice the readers to engage with plants. They were, moreover written to chronicle the local knowledge of plants, their names and uses, across the Pacific as lifestyles change and that information becomes threatened with extinction. Thus, Art committed his life's work to improved taxonomy of Pacific island plants but with a parallel and equally important goal

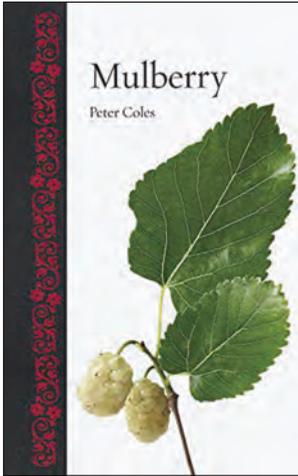
of making that information available to all people, not just the academic world, so that people may be inspired to maintain or rekindle their cultural connections to the remarkable plants of the Pacific islands.

Over the course of our 20+ year friendship, I would occasionally send Art photos of Samoan plant specimens, almost always sterile and sometimes of seedlings, to ask his help with identification. Without exception, Art gladly gave his opinion along with his reasoning and any caveats. Not only did he enjoy the puzzles that plants offered every day, but as I describe above he supported anyone who had an interest in Pacific island plants. He was generous with his time and expertise. The last time I spoke with Art was in December 2019, when I called him from a small remnant patch of Tava (*Pometia pinnata*) lowland forest on the island of Tutuila, American Samoa. We discussed field identification of two *Dysoxylum* tree species (Meliaceae) and the characteristics of the stinging hairs on the rare tree *Dendrocnide harveyi* (Urticaceae). As always, Art was happy to chat about Samoan plants and I remember wishing he could have been in the forest as we inventoried the trees in that small but important forest patch. Indeed, he will be sorely missed, but his legacy guarantees him a prominent place in the annals of Pacific island botany.

Edward L. Webb, PhD
Department of Biological Sciences
National University of Singapore

An extended review of *Mulberry* by Peter Coles

By Dorothea Bedigian



2019. ISBN
9781789141429.
Hardcover, £16.00;
\$27.00. 264 pp.
Reaktion Books,
Ltd., London,
UK, distributed
by University of
Chicago Press,
Chicago, IL.

It was startling to encounter the full-page illustration (p. 192) with the caption, ‘Mulberry pattern textile by Moda Fabric,’ because the stems have thorns, the berries have sepals, and the leaves with serrate margins are uniformly tripartite, opposing Coles’ photograph of a mulberry and leaf on p. 196! Instead, the striking textile depicted is *Rubus* L., with sepals at the base of the aggregate drupe(lets), i.e., many carpels from one flower. Rather, *Morus* L. has many separate flowers/fruits fused together (a syncarp, compound), and the perianth is part of the fleshiness, so there are no distinct/recognizable sepals. While some *Morus* leaves are lobed, they are not compound.

I looked forward eagerly to reading *Mulberry* because mulberries were an essential part of my childhood. On summer Sundays we would travel to a nearby wooded area to harvest a week’s supply of fresh black and white mulberries; in winter, dried mulberries would substitute. Mulberries relate to my Armenian heritage; I recall grandparents’ childhood memories of treasured traditions in Western Armenia, harvesting the fruit by stretching a large sheet held by four corners, while someone climbed the tree to shake its limbs, releasing the ripe fruit.

It is unfortunate that despite Coles’ international focus, this detailed work neglects substantial geographical aspects and omits considerable regional expertise

{Ed. Note: Dorothea Bedigian, who has contributed book reviews to Plant Science Bulletin for years, recently provided a review of the 2019 book “Mulberry” by Peter Coles that surpassed the typical review in terms of depth and research. Because of this unique take, we’ve chosen to publish this as a full article. Thanks to Dorothea for her work.}

The material culture of mulberry, including its service to sericulture, paper making, for its wood, fruit, healing properties, and its inspiration to artists and writers is documented in *Mulberry* (see the Book Review section for full info). Author Peter Coles describes the trees botanically and societally, with 100 effective illustrations (95 in color) that are, in my view, among its most valuable features. There are reference notes to each chapter, a select bibliography, and 6-page Index. Coles is a freelance science writer, fine art photographer and translator, and a Visiting Fellow at the Centre for Urban and Community Research, Goldsmiths, University of London.

about mulberry. My disappointment is Coles' shocking omission of Armenian culture that venerates, and is identified so completely with, mulberry, involving food, drink, and silk manufacture. Coles identifies mulberry pekmez (պեկմեզ) the concentrated fruit must, widely used as syrup by Armenians (often mixed with tahini), as a Turkish item. However, long before the Mongol invasions of Anatolia, the Armenian Highlands were a site of major agricultural innovations (Bedigian, 2011). Coles credits mulberry foodstuffs to the colonial conquerors, a case of cultural appropriation, thereby erasing history, ignoring contributions of Armenians, among the original peoples of the region after the fall of the Kingdom of Urartu, near the end of the 7th century BCE, many centuries before the Ottoman conquest. This report seeks to rectify the disservice done with these significant gaps.

Although Coles does not delve into these details, black mulberry (*Morus nigra* L.) appears to have originated in the mountainous areas of Mesopotamia and Persia, coinciding with the center of its diversity: the south Caucasus countries, Armenia, and northern Persia (Grieve, 1931; Yaltirik, 1982; Jansen et al., 1991; Westwood, 1995; Tutin, 1996; Browicz, 2000). Iran is viewed as its center of origin (Koyuncu, 2004; Koyuncu et al., 2004, p. 125). According to Markarian (1978), mulberry (evidently *M. alba* L., because the preceding sentence was about its Chinese origin) was introduced to Armenia in the 16th century, in 1710. Safar Vaselinean transplanted the first mulberry from Russia (Tereki vicinity, Terek Soviet Republic).

The root of the Armenian term tut (թութ) originates from the Aramaic tūtā (Chicago Assyrian Dictionary, 2006), a loanword also used in present-day Arabic, Azerbaijani, Croatian, Hindi, Georgian, Kazakh, Kyrgyz,

Pashto, Persian, Romanian, Tajik, Turkish, and Uzbek, reflecting its transfer along the Silk Road.

There is a long textual tradition of mulberries in Armenia. Mkhit'ar Gōsh, an Armenian scholar, writer, public figure, and priest, was among the stars of the Armenian Renaissance prior to the Turco-Mongol Invasions of the late 12th to early 13th centuries. His Fables (Bayizian, 1987), include a metaphorical rivalry between mulberry and olive: each boasted of its strength(s), the olive of its evergreen condition, and plentitude of fruit—especially since its fruit is made of oil, oil is made of light, and light dispels darkness. The mulberry boasted of the sweetness of its fruit and the fact that its leaves make silk. Worms are born and cloth comes from it—cloth enjoyed by kings and princes. The olive challenged the mulberry, arguing that its fruit passed too quickly, became diseased, was discretionary versus necessary, and that [people] removed [silk clothing] at night, but still left their lamp lit.

An Armenian creation myth describes the origin of mulberry, its place in the natural and social world. It illustrates the importance of mulberry in Armenian culture, offering a fantastical tale of how it came to be (Najarian, 2013).

Once upon a time, a silkworm wove a special dress for a girl. It was incredibly thin, light, with stunning lace. It was no ordinary dress. It possessed some magic powers: the woman who wore it became even more attractive. Additionally, any woman who wore the dress could go without food for days. After a woman wore it, she lent it to her friend. Her friend used it, then shared it with another friend. They all rejoiced, seeing their beauty proliferated.

One day, the king chose one of these women to become his wife. She then stipulated that henceforth she alone would wear the beautiful dress; she would never share it. Her friends were taken aback, saddened by her selfishness. Some grew angry, so they went to the palace, began to shout, threw stones at the windows, and eventually stormed the palace; finding the new queen cowering in a corner, they ripped the dress from her hands and tore it to shreds.

Suddenly, before the enraged women's eyes, the hem of the dress turned into a tree trunk with many branches. The shreds of the torn dress flew up to the branches of the tree and turned into swollen buds, that expanded broad leaves, forming a dense canopy. That was how the mulberry tree was born.

Mulberry was ubiquitous throughout historical Armenia, in cuisine and lifestyle. Armenians consumed mulberry fruits fresh and made jams and syrup or molasses, prepared by straining mulberry juice, then boiling and thickening it. Traditionally that was used in place of sugar, an uncommon commodity, found only among the wealthy. Mulberry seasons yogurt and flavors wine. Mulberries are distilled for a coveted commercial product: the powerful (57–65%) alcoholic beverage ttioghi that was widely produced as moonshine at home, across Armenia. Mulberry's sweet aromatic juice doshab is believed to possess healing powers against pneumonia, angina, and the common cold. When dried, doshab forms the fruit leather pekmez. Mulberries are famously esteemed by residents of Goris, Syunik Province, who mount a National Mulberry Festival annually, in July.

Early travelers' accounts are an invaluable resource to reconstruct Armenian cultural life before the massacres (1894–1915). Ainsworth (1842) includes 10 entries about mulberry plantations and groves amidst vineyards,

gardens of mulberry, fig, and pomegranate trees: "Someone climbed the mulberry tree and shook the branches, letting down enough fruit to feed 20 persons" (p. 190). Taylor (1868, p. 330) observed "fine gardens of mulberry, apricot and walnut."

Writing about Arabgir, Knight (1854, p. 408) noted: "built amidst a forest of fruit-trees, among which the White Mulberry is most common. The fruit of the mulberry is eaten fresh, or used for making brandy, or it is made into a sweetmeat called pekmez, which is common all through Armenia"; about Anatolia (Knight, 1854, p. 335): "Olive and mulberry trees are extensively cultivated for the production of oil and silk"; about Amasia (Knight 1854, p. 271): "there are numerous mulberry plantations, as silk forms an important article of export"; about Hazero in the Tigris plain near Bitlis (Knight, 1854, p. 515): "mulberry and Lombardy poplar flourish in the district." At the valley of Eghin, mountains rise rapidly to around 400 ft, the lower slopes rising in terraces above the narrow valley laid out in gardens and planted with trees (Knight, 1854, p. 512): "the trees are mostly white mulberry, the fruit of which is eaten fresh, or dried and distilled for brandy, or else boiled into a conserve"; mountains surrounding the basin of Lake Van on the south (Knight, 1854, p. 517) are "clothed with woods of oak, and along the rivers are walnut trees, raspberries, mulberries, and vines."

The city of Van was widely admired as a "garden city," owing to its impressive 80-km long stone-lined irrigation canal constructed during King Menua's reign, around 810-786 BCE (Bedigian, 2011), that ferried freshwater from the Artos Mountains to water the vineyards and orchards tucked behind mud walls. American missionary and physician

Moses Parmalee reported (1888): “As we approached Van, at the western extremity of the lake, the villages of the Armenians became more numerous... the dwelling-houses in the gardens are embowered in most charming orchards of mulberry and other fruit trees.”

Protestant missionary Susan Wheeler (1877, pp. 39-40) provides extensive firsthand culinary detail:

“White mulberry is very abundant there and is much used. It is the first fruit that ripens, and the people relish the sweet fruit after the long fast in the spring, when they have little variety in their food. When they are ripe the women bring out large sheets and spread them under the trees, which are then shaken, and the ripe fruit is easily gathered. The berries are put into a large copper boiler, a fire is kindled near the place, and the boiler is supported by large stones on each side of the fire. The fruit is cooked for several hours, and strained through a cotton bag, till all the juice is pressed out. This is put into shallow copper vessels, whitened with tin, and placed on the flat roofs of the houses, where it remains for days to evaporate in the sun. Then it is put into a narrow-necked earthen vessel, the mouth of which is covered with wet leather, and the molasses is ready. Bread and molasses is the morning meal of many a poor Armenian family. They also prepare a sort of sweet meat of this molasses. They stir starch or fine flour into the fresh syrup, boil it till it becomes a paste, and then spread it on their cloth, and dry it for winter. Sometimes they put nuts upon it while it is fresh, or when it is partly dry, rolling up the nuts, strung on strings, in these thin layers. Its appearance, very much like a sausage when rolled so, gives its name “sweet sausage” (ՎՍՆԼԶ ՍՈՒՂՈՒԽ). Rojig (sharots) [‘strung in a row,’ as in beads] is prepared by stringing walnuts, then dipping the string into a preparation of molasses

and flour paste, and then allowed to dry [forming fruit leather around the walnuts]. This kind of sweet paste is often brought in with the sherbet and offered to guests. I often brought home my pockets full of this bastic.”

Taylor (1868, p. 311) stated: “[Kharpert] gardens abound in fine fruit trees; the mulberry, however, is the most profitable, its fruit being made into a kind of thick paste, called ‘Pestek,’ largely exported, and into raki, a villainous spirit, largely consumed in the town and villages. A little silk is also raised; but this branch of industry is as yet in its infancy.” Lynch (1901, p. 391) also wrote admiringly about Kharpert where “the mulberry grows in such profusion that the silk crop is often of considerable value.”

We must also consider the weavers craft, using the silk produced by silkworms bred with mulberry leaves. Hadjian (2018) uncovered historical evidence showing that Bitlis Armenians (ancestral home of my paternal grandparents) always had several mulberry trees in the garden, a remainder of the fact that Bitlis was on the Silk Route. Beyond silk production, Bitlis exported silk carpets and fabrics to France and Italy.

Years later, an editorial in *The New Armenia* (1920) testifies: “Speaking of the decrease in the production of silk...this industry is in full decline. The principal producing factors have been wrecked, the population which specialized in the rearing of silkworms displaced, and the mulberry plantations uprooted wholesale. Everything has been done to deal a death-blow to a once flourishing industry. [...] There is a slight inaccuracy in the above statement. To say that all this has been ‘destroyed by the war’ is not strictly accurate... neither of the above-mentioned silk producing regions was anywhere near the

fighting area. The real truth is that the Turkish Government availed itself of the state of war to carry out its favorite policy of exterminating the Greek and Armenian population, in whose hands the silk industry chiefly is.”

Shirinian (1997) apprises David Kherdian’s celebration of being alive, as in *The Fast* (an amusing introduction to the person’s regard for the delicacy of *rojik*) and ‘*Mulberry Trees*’ (finding one’s roots while staining one’s fingers with ripe mulberries):

*When
as a small boy
I saw them ripen against
the early summer sun
I stopped alone for an hour and ate until
my fingers
took an ancient purple stain
until something remembered
a small, knotty tree
in a barren, rocky landscape
before an older, quieter sun*

*and I went home a little
sadder, a little gladdened
and standing on the porch
my mother and father
saw their Armenian son.*

Thus, Kherdian connects with his heritage, and from the Diaspora in America, he is suddenly transformed through tapping into the larger collective memory of the Armenian people. The mulberry tree in America reminds him of one in the old country he could never have known except discursively, perhaps through his parents’ stories. As a result, he is both saddened because of its loss, and he is happy because of the experience that seems to have confirmed his identity. At the end of the poem, through a transposition, he places himself in his parents’ point of view and calls himself “their Armenian son.” This third-person transposition is the result of Kherdian’s reinterpreting his past, trying to

make it complete and meaningful. Kherdian, at this point, has arrived at a crucial moment in his life, when he is able to look back and see himself clearly in relation to his parents and their Armenian heritage.

Atom Yarjanian, pen name Siamanto (1875-1915), among the most influential Armenian writers, poets, and national heroes of the 20th century, was one of the intellectuals arrested by Ottoman Turkish authorities on April 24, 1915 and subsequently slain. Excerpted here is a portion of his lament, ‘The Mulberry Tree,’ which depicts the atrocities committed by the Ottoman Turkish government, characterizing the momentous political and cultural upheaval in the history of the Armenian people. ‘The Mulberry Tree’ gives voice to a woman who has gone mad, upon seeing her grandson killed.

*They’ve even cut down my mulberry tree.
Give me death. They’ve cut my mulberry
tree.*

*I planted it the day my grandson was born.
They’ve cut my mulberry tree.
Woe to his memory. It grew tall before my
eyes just like him –
It was seven years old, and I was sitting in
its shade with my grandson in my arms
singing.
They’ve even cut my mulberry tree.
Look, they sawed it at the roots.
Where is the cart with the corpses? I still
hear it squeak.
I want to be thrown into it next to my
grandson.
There’s still a place on the cart.*

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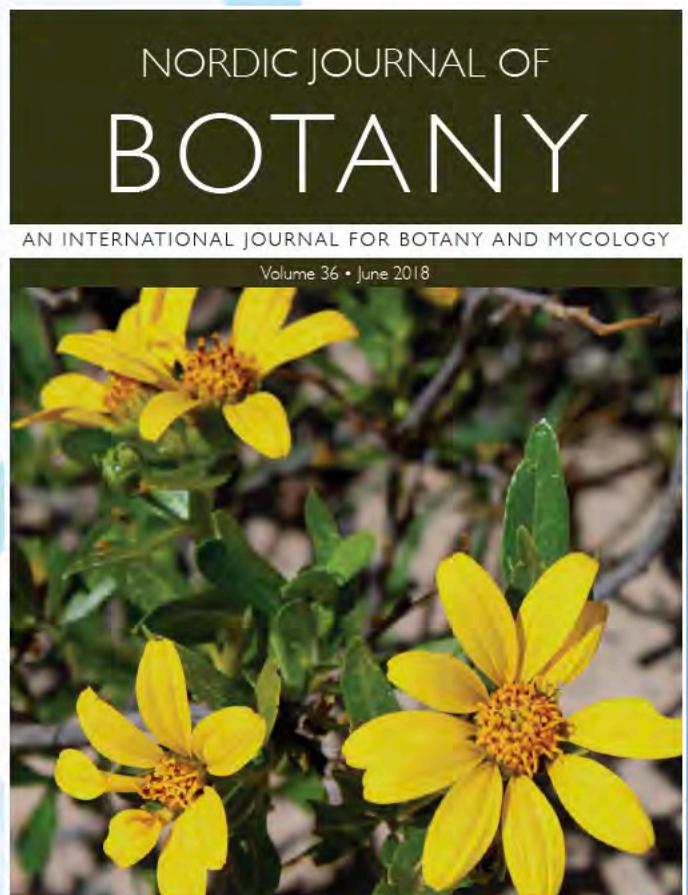
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BOOK REVIEWS

Bark Anatomy of Trees and Shrubs in the Temperate Northern Hemisphere	152
Chasing Centuries.....	154
Food Production in Native North America An Archaeological Perspective <i>and</i> Feeding Cahokia Early Agriculture in the North American Heartland	156
Guide to the Vascular Flora of Picture Creek Diabase Barrens.....	157
The History of Lancelilla Botanical Garden.	158
John Gill Lemmon - Andersonville Survivor and California Botanist	160
Lichen Study Guide for Oklahoma and Surrounding States	162
Making Eden How Plants Transformed a Barren Planet	163
Mulberry	164
The Natural History of The Bahamas: A Field Guide.....	165
The Nature of Plant Communities	165
The Tree Story	167
Wild Yet Tasty: A Guide to Edible Plants of Eastern Kentucky.....	169
Wildflowers and Ferns of Red River Gorge and the Greater Red River Basin	170

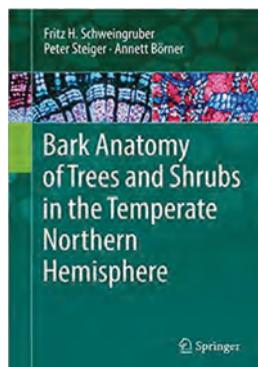
Bark Anatomy of Trees and Shrubs in the Temperate Northern Hemisphere

Fritz H. Schweingruber,
Peter Steiger, and Annett
Börner

2019.

ISBN 978-3-030-14055-7
Hardcover €145,59; eBook,
€117,69; 394 pp. + vi

Springer International
Publishing



now set for more systematic bark anatomical descriptions of trees, shrubs, and herbs.

The authors of this book are well qualified to undertake this effort. Fritz H. Schweingruber contributed with his deep understanding on plant anatomical variability. Peter Steiger is a landscape architect with a strong interest in plant ecology and photography. Annett Börner has been working in the field of scientific publishing and book design for more than 15 years.

They compiled a well-produced atlas. Underlining the importance of bark in plant life, the introduction supports the need for the book. Two following chapters describe general bark macroscopic and microscopic appearance introducing specific terminology. Then, every two-page spread describes bark macroscopic and microscopic variability within each species. The trees and shrubs species included in the book, most from the deciduous temperate forest in Europe,

The first anatomical image of a plant structure ever published represents the porous bark of oak (Hooke, 1665). Since then, our anatomical understanding of bark—and in particular phloem—was enriched in structural details and vital plant processes undergoing in the bark were unraveled. The important book from Esau (1969) summarizes phloem-related knowledge of the mid-20th century. More recently, an illustrated and annotated glossary of terms enriched our capability to describe barks (Angyalossy et al., 2016). The bases are

encompasses species from the Mediterranean region, Eastern Asia, and Northern America. With more than 180 species described in the book, the reader is transported from the Mediterranean lowlands to boreal forests, and up to the subalpine and subarctic regions of the Northern Hemisphere.

Each species description includes scientific name and common names in English, German, French, Italian, and Spanish. Plant habitat, life-form, as well as leaves, flowers, and fruits appearance are described. The bark anatomical descriptions report details on the phloem cells occurrence and distribution. The anatomical description of rhytidome and cortex is also detailed. While the text is simple and short but still very informative, the colorful pictures are impressive. A general species description includes a picture to show the plant in its ecological context, and its flower and leaves details. Two macroscopic bark pictures represent young (twig/branches) and old (stem) bark appearance. Two to four low- and high-magnification anatomical pictures provide an anatomical overview of the phloem. Microscopic view in polarized light underlines crystals occurrence and distribution. All anatomical images are double-stained with a blend of safranin and astrablue. In doing so, lignified (red) and less-lignified (blue) cell walls can be easily spotted. All anatomical thin sections were prepared using a sliding microtome, as described in a dedicated chapter.

The intended audience includes a very wide range of readers. Scientists and professionals of various disciplines from archaeology to ecophysiology, soils science to plant ecology will benefit from the book. Aiming to demonstrate the macroscopic and anatomical variability of bark, the authors also suggest it can be used in helping to identify prehistorical

and historical plant remains. However, there is no identification aid in the book, and the bark identification process is left to the reader's ability to identify key anatomical features while flipping through the book. The layout consistently repeated in each species description helps the process. The reference and recommended reading lists are valuable examples of 'must-have' books for the bark anatomist—including the book by Crivellaro and Schweingruber (2015) that is cited in the text, but not included in the reference.

A unique point of the book is the ability to link ecosystems to the within plant bark variability. The variability of external bark appearance along the plant stem is informative about the aging process occurring in barks. As the anatomical structure of the bark highly contributes to its outer aspect, the approach to microscopic bark variability is rich in high-quality images, which is a rare feature in bark anatomy books. Having both the macro- and micro-appearance of bark within the same page allows the reader to assess the association between the internal and external bark structure. Thus, the book provides a unique bark macroscopic and microscopic viewpoint to the field of plant anatomy. In integrating bark macroscopical aspect with bark anatomy, the huge variability of bark structure can here be seen as the result of an anatomical driving process of new cells formation by the cambium, cells enlargement, development of subsequent phellogens, and the origin of patterned cracks or abscission layers as beautifully illustrated on p. 6.

Even if I would find it difficult to use the book to orient myself in the identification of an unknown bark, the images of bark demonstrate the multiple ways it is constructed in plant stems. In this respect the book is a huge step forward, setting the base for future

similar works. The reader will appreciate the plant descriptions and photographs, which help to link the microscopic views to the scale at which we may have known the plants in our hikes and, in some cases, in our gardens.

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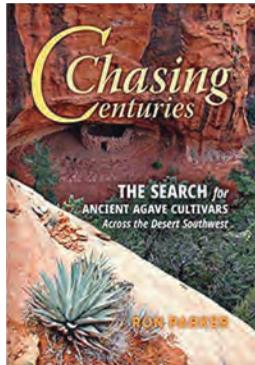
Chasing Centuries: The Search for Ancient Agave Cultivars Across the Desert Southwest

Ron Parker
2019.

ISBN: 978-1941384480

Paperback US\$19.99;
176 pp.

Sunbelt Publications



It may be safe to say that this reviewer has had her horticultural horizons broadened by Ron Parker's engaging work with agave in *Chasing Centuries: The Search for Ancient Agave Cultivars Across the Desert Southwest*. Parker's book is so concentrated with information and photography that a reader might believe

an agave would spring forth from its pages if water, inadvertently, spilled onto the binding. *Chasing Centuries'* ten chapters are nestled under three sections: *The Historical Perspective* (Chapters 1-3), *Agaves of the Region* (Chapters 4-6), and *Notes from the Field* (Chapters 7-10).

In *Part I: The Historical Perspective*, Parker's writing is akin to the story weavers of old. Parker verbally transports us on a historical tour of early American Paleo-Indian cultures inclusive of their dwellings, farming techniques, and agave cultivation. One may hearken to hear Parker crumble the stone underfoot as he walks the reader through the ancient villages, irrigation networks, and traditional agave uses of the pre-Columbian Native American Hohokam, Sinagua, and Salado cultures. The lush photography, featured in more than half of the book, enhances this reading experience. As a nature study historian, this section of historical perspective is particularly interesting to my contextual side of researching the past, applying this knowledge to the present, and educating toward the future.

Agaves of the Region, Part II is the largest and most comprehensive of the three sections with its decidedly more scientific bend toward taxonomy, hybridization, and vegetative characteristics of agave in Arizona. Parker offers his keen insight into pollinator dilemmas, plant blooming strategies in subversive conditions, and plant adaptations of the 12 naturally occurring agave species of the state. The agave plants are simultaneously beautiful and beastly in appearance. Parker's attention to detail with each of the 12 cultivar emphasizes his expertise while his conversational writing style engages, rather than intimidates, the reader. This section of *Chasing Centuries* is more akin to a field identification manual with field notes, specie

descriptors, and clear photographs of each of the 12 cultivars. It would not be remiss for any agave adventurer to squeeze this book into their backpack to aid their search in the Arizona backcountry. When reflecting back on the first section of Parker's book, after completing the second section, one cannot but marvel at the ingenuity of the Native American ancestors who learned to grow and glean from this plant.

The remaining four chapters of Parker's book are in Section III: Notes from the Field. This section is a reflective discourse of Parker's pursuit of the ancient cultigens singular in their characteristics. In deciphering the complicated agave biological history, and ancient cultural history associated with the botanical work, our author is fully aware that time, which has passed for the agave ancestors growing near remnants of ancient dwellings, continues to march forward. One gets from Parker the sense of a hope in continued engagement with his work; however, he is not unrealistic to suggest a finite end to the most vulnerable cultigens. This reviewer hopes that interest piqued about agave from this book will continue to lend Parker, and others, to search for another connection to the antediluvian cultures that met the challenges to provide for their communities living in such austere conditions.

Parker ends his book on a cautionary note for the reader. High extinction risks for agave groves in the mountainous desert environs of Arizona continuously challenge the remaining cultigens. Climate changes, insect infestation, and precarious governmental policies are also added to the stew in this pot of trouble. Parker examples his own explorations and research as testament to the decline. That said, Parker emphasizes the wonderful work by colleagues at the Desert Botanical Garden in Phoenix to

continue interest, education, and propagation strategies. Rounding off the book is a table of the Arizona agaves with the subgenus, status, size, elevation, and more, listed for researcher and explorer alike. Parker provides a clear reference trail with additional resources for the curious researcher in the glossary, endnotes, and bibliography.

As one who lived a short time in Sierra Vista, Arizona, almost three decades ago, *Chasing Centuries* brought back wonderful memories of the Huachuca Mountains and dry desert stretches between towns. It was with the pummeling of torrential rain, with the coming of the July monsoon season, that quenched the land and satiated life. I remember the yucca and agave, almost bursting forth, in the change of season. It was so beautiful, and so foreign, to an easterner's eyes. Parker completely engages the reader in his adventures and thereby connects the reader to their own senses and memories. Be it horticultural students, scientific researchers, or plant enthusiasts, *Chasing Centuries* would be at home, equally, on one's coffee table or in one's academic office library.

- *Karen Penders St. Clair, PhD*

Food Production in Native North America An Archaeological Perspective

Kristen J. Gremillion

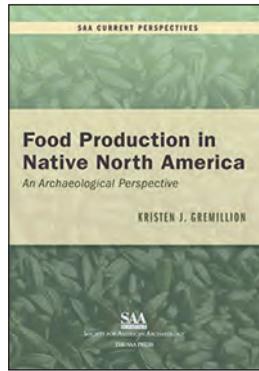
2018.

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Paperback US\$31.95; 194

pp. + x

Society for American Archaeology Current Perspectives. The Society for American Archaeology Press. Washington, DC



history of the EAC, they document the decline and demise of the crops and, for some, the extinction of cultivars. By 1000 AD maize had spread to much of Eastern North America. Both authors discuss the spread of maize and its role in supplanting cultivation of other, native species.

Species comprising the EAC are from diverse plant families and weedy in their behavior yielding seeds/fruits with high oil or carbohydrate content. Most of them thrive in the rich disturbed soil of river bottomlands.

AND

Feeding Cahokia Early Agriculture in the North American Heartland

Gayle J. Fritz

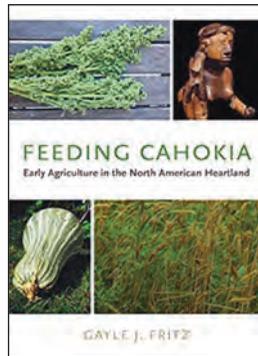
2019.

ISBN: 978-0-8173-2005-8

Cloth US\$59.95; 232 pp. +

xiv

The University of Alabama Press. Tuscaloosa, Alabama



The importance of adequate technology in the study of archeological sites is described in both books. This includes flotation methods for material obtained from food caches, paleofaeces, carbonized plant remains, and stable isotope analysis of bones.

My review centers on botanical aspects, but there is a wealth of information on Native American agriculture and culture during different historical periods, epochs, and cultures.

These two books are authored by recognized authorities in archeology and anthropology. Both treatments deal with forgotten crops. For the ethnobotanist this is especially interesting because indigenous plants known as the Eastern Agricultural Complex (EAC) were selected by Native Americans as crops. This is a rare example of autochthonous crop evolution in North America. Gremillion and Fritz's work is a major contribution to documenting the process of artificial selection, transforming native flora into agronomic value.

The image of Native Americans as strictly hunter-gathers is modulated by extensive research documenting the role of agriculture in Central and Eastern North America in roughly corresponding to the eastern deciduous forest. Just as they describe the

Both volumes are valuable resources for the ethnobotanist. Gremillion emphasizes anthropology while carefully documenting crop details. For example, she discusses foraging for wild plants in the chapter titled "Food Production Without Farming," using examples from the Pacific Northwest. In the chapter on food production after European contact, appropriately titled "A World of Difference," Gremillion discusses the role of missions and plantations in the introduction of crops new to the hemisphere and the impact of this irruption on indigenous agriculture.

This is an authoritative yet accessible book reflecting the distinguished career of the author. It is well indexed with extensive references.

“Feeding Cahokia” could be considered a detailed regional study of many of the topics included in Food Production in Native North America. Cahokia was a Native American megapolis near the Mississippi River east of Saint Louis with a well-established agricultural system and concomitant social structure.

I found the discussions of species used as crops interesting because of my studies of edible native plants. These include *Chenopodium berlandieri*, *Iva annua*, and *Hordeum pusillum* and other species of the EAC. Artificial selection for *I. annua* resulted in larger achenes. Unfortunately, these large-fruited varieties have been lost and are now appropriately called a forgotten crop. Even the weedy expression of *I. annua* is difficult to locate, as I learned after looking for it in two states.

After reading about *C. berlandieri* I located a sizeable population and collected the abundant seeds. Though nutritious, they are tedious to clean and had an unremarkable taste. My culinary experience with *I. annua* was similar.

There are numerous images in “Feeding Cahokia” of varying quality. As a microscopist I always chaff at SEM images of a single seed like those in this work. A cluster of a few seeds, especially small seeds, gives the viewer a better impression of the variability in size, shape, and ornamentation than a SEM picture of one seed.

These two volumes are valuable contributions to an often-overlooked aspect of crop development and will be of value to ethnobotanists as well as the target audience of anthropologists and archeologists.

On a broader scale, understanding the Eastern Agricultural Complex may, in the

words of Gremillion, “...bring diversity and sustainability back to modern agriculture, and perhaps will lead to a greater appreciation of ancient agricultural traditions like those of Native America.”

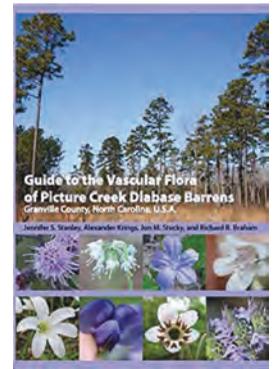
I highly recommend both books.

-Lytton John Musselman, *Old Dominion University, Norfolk, VA*

Guide to the Vascular Flora of Picture Creek Diabase Barrens

By Jennifer S. Stanley, Alexander Krings, Jon M. Stucky, and Richard R. Braham
2019.

ISBN: 978-1889878522
Soft cover US\$45; 367 pp.
Botanical Research Institute of Texas Press, Fort Worth, Texas



The *Guide to the Vascular Flora of Picture Creek Diabase Barrens* arose as an outgrowth of the authors' efforts to voucher the floristic diversity of Picture Creek Diabase Barrens, an area known to be rich in rare species but not comprehensively surveyed or well-collected. It opens with an extensive overview of the site; its geology, soils, history, etc.; and a classification of the plant communities found there. The relationships between soils, vegetative communities, and terrain are made clear through well-chosen illustrations, and the accompanying maps of communities and soils make it easy to understand the layout of the barrens.

This section is followed by color photographs illustrating the taxa described in the book, emphasizing diagnostic features (e.g., most *Carex* spp. are illustrated with a photograph of a perigynium against a millimeter scale). The plates are followed by dichotomous keys

to the flora of the barrens; while adapted from published from more comprehensive published floras, the authors have taken advantage of the limited scope of this work, and even the higher levels of the key mostly make use of easily observed morphological characters. The illustrations accompanying the key are the only discordant note; the use of public domain art to illustrate overall plant features and habit, rather than commissioning drawings *de novo*, is understandable, but the relative simplicity of the drawings (largely taken from Britton & Brown, 1913) contrasts somewhat jarringly with the detail in the photographic plates. The frequency and typical habitat on-site is given for each taxon, as well as bloom time, supporting vouchers when available, conservation status, and a slightly cryptic symbolic reference to previously published plant lists for the site.

The authors aver that the guide is designed for both specialists and a more general audience. I feel they have succeeded in doing so: the lucid keys and well-chosen photographs make this about as easy to navigate for a non-specialist as can reasonably be expected. However, the casual reader might be forgiven for asking whether a single, albeit interesting, floristic community warrants so detailed a book, at a density of about 0.9 pages per acre—surely a case of gross overspecialization? As an admitted devotee of edaphic grassland ecosystems, I would disagree! While the vouchering of the site flora and compilation of a checklist for Picture Creek is a worthy project of itself, the leading sections of the book make it a valuable tool for site management and maintenance.

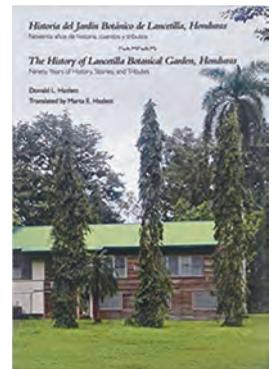
We now recognize that protecting fragments of biodiversity like Picture Creek is a duty that cannot be supported solely by government agencies or expert naturalists. Broad coalitions of volunteers are necessary to

protect, maintain, and restore these habitats. In my own experience of helping to maintain serpentine barrens, assessing habitat and identifying taxa of conservation concern is one of the most formidable tasks for non-specialist volunteers. A focused guide, like the present work, is much less intimidating to the lay volunteer than a regional flora, and the mapping and detailed description of communities makes it possible for a visitor to assess and interpret the landscape. The authors are to be commended for their efforts to render this unique landscape legible and approachable to both novice and expert.

-*Christopher Hoess, Chair, Friends of the State Line Serpentine Barrens*

Historia del Jardín Botánico de Lancetilla, Honduras (The History of Lancetilla Botanical Garden, Honduras)

Donald L. Hazlett
2017. ISBN-10: 1889878537
Softcover \$24.00; 140 pp.
Botanical Research Institute of Texas Press, Fort Worth, Texas



While reading *The History of Lancetilla Botanical Garden, Honduras*, I received the *Sonoran Quarterly*, a mailed publication sent by the Desert Botanical Garden to its members. In the mailing I learned that the Desert Botanical Garden in Phoenix, Arizona now has a new scientific facility to protect plants of the Sonoran Desert and is funded largely with philanthropic donations. I then returned to the Lancetilla Botanical Garden (LBG), where the story contrasts sharply with that of the Desert Botanical Garden and other established botanical centers. Lancetilla Botanical Garden is not well-known, nor is it

well-funded, but it is interesting, important, and deserving of our attention.

The History of Lancetilla Botanical Garden is a sturdy little book written by ethnobotanist Donald L. Hazlett and published by the Botanical Research Institute of Texas. The text is printed in Spanish and English and is interspersed with drawings and color photos. Due to its brevity and slight choppiness, it is difficult to establish a rhythm while reading the history of the LBG. Hazlett's book doesn't quite know what it wants to be. It isn't a guide book and it is not a thorough history book; rather it is a little bit of everything, including folk legends, descriptions of plants, recollections of work by the author, and tributes to important local guides. For the most part, Hazlett recounts visits to Lancetilla in 1973 as a Peace Corps volunteer and later as the director of Lancetilla from 1978 through 1980. Although he continued to be associated with Lancetilla after 1980, it is unclear why Hazlett's tenure was so short and what his connection to the LBG was after he returned to the United States.

If you search the internet for Lancetilla Botanical Garden, there really is not too much to find. The Garden does have a website (http://jblancetilla.org/welcome_ingles.htm), but the information about its history is limited to four paragraphs. The website does have, however, a detailed map of the protected area—something that the book lacks. Because of its sparse website presence, *The History of Lancetilla Botanical Garden* is the definitive source for the garden at the present time. Unfortunately, with the death of Hazlett on January 5, 2019, it is unlikely that there will be a revised edition anytime soon.

Lancetilla is not a town or city, but the name for a valley found along the north coast of Honduras. The Lancetilla Plant Experimentation Station, slightly more than 4100 acres in size, was established here

by the United Fruit Company (UFC) in 1926. Overall, the station served as testing grounds for plantation crops, namely disease-resistant strains of bananas. The first director hired by UFC was William Popenoe who is known for his work with avocados and later for his directorship of the Pan-American Agricultural School in Zamorano, Honduras in 1941. Hazlett situates Popenoe and the early history of the LBG in a timeline at the end of the book. Here, there are short descriptions of places and people, but this is not a go-to source for the history of banana research in Central America.

Hazlett does mention how the UFC exploited workers and bribed government officials, but he does not dwell on the dark side of the banana business in the Honduras. Unlike authors who have critically examined multinational fruit companies for their labor practices and land exploitation, Hazlett writes from the perspective of a botanist who has worked and lived at the plantation site and has benefitted from the early actions of the UFC. It is safe to say that the economic muscle of the UFC helped protect the valley, its forests, and its watershed from human encroachment. This is noteworthy today since the Lancetilla Valley is situated close to the coastal city of Tela, a tourist destination complete with golf courses, resorts, and real estate agents.

In 1974, the UFC relinquished its experimental field station and turned over the land and buildings to the Honduran Forestry School. During this time Hazlett helped shift the focus of the LBG from large-scale plantation research to that of growing tropical fruits for Honduran orchards and home gardens. The bulk of the book reflects upon this time and is a bit scattered in terms of notes and recollections. Hazlett's writing focuses on tributes and stories—from local guides who have helped him complete an accurate inventory of plant life, to toucans and

strychnine poisoning. Interspersed with this are descriptions of local plants, with common, family, genus, and species names given.

For botany historians, the book provides information on noted botanists who worked at Lancetilla or were associated with the LBG in some way. These include New York Botanical Garden collectors Percy Wilson and Elizabeth Mitchell in the early 1900s and Paul C. Standley, who published *The Flora of the Lancetilla Valley, Honduras* in 1931, and at the same time expressed his concerns about the increasing loss of biological diversity at the experimental station. Also working in Lancetilla were noted tropical plant disease experts Otto Reinking and Paul House. Reinking introduced a number of Southeast Asian plants into the Lancetilla Valley, including the African oil palm from Malaysia.

Botanist Paul H. Allen served as the third director of the experimental field station (1960–1963) and is remembered for his work with new banana breeds in Southeast Asia and orchid systematics in Central America. Bamboo researchers J. H. Perman and Floyd A. McClure helped introduce several species of bamboo plants to Lancetilla, and more recently, Honduran botanists Cirilo Nelson and Antonio Molina are recognized for their plant taxonomy work in Central America.

Like many small botanical gardens, the LBG has seen its share of struggles. Fortunately for us, Hazlett was able to document some of these struggles before his untimely death. Reading the book reminds us of how dogged an approach it is for those involved with the protection of land, plants, and animals in botanical gardens that are severely underfunded, understaffed, and faced with a tenuous future.

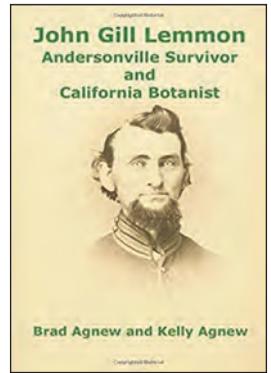
-Karen L. Wellner, Biology Department, Chandler-Gilbert Community College, Chandler, Arizona

John Gill Lemmon: Andersonville Survivor and California Botanist

Brad Agnew and Kelly
Agnew
2020.

ISBN 9781695040212
Paperback US\$24.95;
573 pp.

Independently Published



Brad Agnew and Kelly Agnew's *John Gill Lemmon: Andersonville Survivor and California Botanist* is an interesting book about the botanical pursuits of Californians John Gill Lemmon (1832-1908) and his wife Sara Allen Plummer Lemmon (1836-1923) in the mid-to late 19th century. The title of this book does not represent the scope of John Lemmon's capture in two American Civil War (1861-1865) Confederate prisoner of war camps; nor that Lemmon studied, and obtained, botanica in several other western states (New Mexico, Arizona, Texas, and Oregon) other than California. The Agnew and Agnew book is thorough, and chronological, in the detail of Lemmon's extraordinary life, and it will appeal to American Civil War history buffs, botanical historians, and archival researchers equally.

John Gill Lemmon possessed an innate detail to attention in his military career, botanical pursuits, and entomological study. Lemmon lived his life balancing both his remarkably good- and sobering bad luck as he struggled for gainful employment for the generous portion of his adult life. His botanical quests gave him a sense of purpose and drive after his debilitating war experiences left him physically and emotionally depleted. As his life story unfolds, Lemmon vacillates between self-pity and self-righteousness to earn a living, live a meaningful life, and create a

lasting legacy. Often these three objectives are at odds with each other, with Lemmon, or with those who knew him socially, familiarly, or professionally.

Lemmon's professional connections in the botanical world of the late 19th century are impressive. Foremost is Asa Gray (1810–1888), botanist and Harvard professor, who figured prominently in Lemmon's career from the first letter of admiration Lemmon exchanged with Gray in 1873 until the latter's death in 1888. Professor Gray served as mentor to Lemmon by trying to carefully instruct Lemmon in the growth of his western botanical collections. Gray provided sources of remuneration for Lemmon's work, and professional contacts to Lemmon for increased opportunities to provide botanical specimens at cost. Through Gray's correspondence with Lemmon we feel the exasperation and frustration of Lemmon's difficult personality, yet also recognize the herculean efforts Lemmon made in traveling, identifying, and cataloguing his herbarium.

Lemmon's marriage to Sara Allen Plummer in 1880 was a definite joy in an otherwise challenging life. Sara Allen Plummer Lemmon was a true beacon of solace in her husband's life. She was inquisitive, daring, a Women's Rights advocate, and successful in her efforts advocating for the Golden Poppy to become the State flower of California (on March 2, 1903). Throughout their marriage the Lemmons lived in an emotional, physical, and academic symbiosis with each other. The botanical accomplishments of John and Sara Lemmon are almost one in the same because they worked so closely with each other. Together their accomplishments are staggering. For example, they labored for months to label and present 900 species of plants procured from California for their state's participation in the New Orleans Exposition of 1884. This feat is

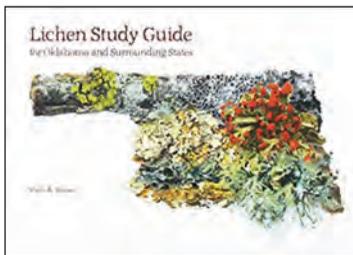
appreciated moreso when one realizes that the Lemmons risked life and limb through aggressive environmental assaults to attain any, and all, of their specimens. They carried their equipment and specimens on their backs, suffered through their individual medical conditions, and slept on pine boughs for months at a time to acquire their quarry. So intertwined were each with the other that, in the years immediately following John's death, Sara's mental health unraveled to startling degrees and her last years were a heartache to read.

The first portion of this biographical book is about John Lemmon's early life, and more poignantly, about his POW experiences in the Andersonville and Florence Confederate prisoner of war camps during the American Civil War. This section is an exciting read, and yet, very sobering. The authors' structured chronological order in their research have these military anecdotes roll into the second portion of the book with Lemmon's contributions to botany including his fanatical quest for accolades with the botanical academics of his time. Equally as detailed as his Civil War years, Lemmon's botanical life story might be further divided into his botanical pursuits as a bachelor, and of those years he and Sara Plummer worked in harmony. The Epilogue of the Agnews' book is a necessary completion to the Lemmons' story after John Lemmon's demise on November 24, 1908. Here the authors complete the circle of life for the couple with the telling of Sara Lemmon's complete mental breakdown and last sorrowful years. The comprehensive Endnotes, Bibliography, and Index are sound and thorough, and will more than adequately aid any researcher for further study.

The repeated comparison of the Lemmons as a married couple dedicated to their science reminds this reviewer of the detailed research

I did on contemporaries of the Lemmons. I conducted extensive research on the archival papers and original autobiographical manuscript of entomologist Professor John H. and Anna Botsford Comstock, nature educator, both of Cornell University. The Comstocks may be considered part of the East Coast faction of agrarian scholars with whom Asa Gray harbored. That such a biography of the Lemmons, and the turn-of-the-century West Coast faction of botanists now exists in one tome, is beneficial to researchers and historians alike. This reviewer would also like to acknowledge the industrious efforts Sue Agnew contributed to the Agnew familial effort with the research, compilation, and writing of this book. The undertaking of this project was no small task. I thoroughly enjoyed Agnew and Agnew's book, and respect their research efforts to bring the accomplishments of the Lemmons back to us.

--Karen Penders St. Clair, Ph.D.



Lichen Study Guide for Oklahoma and Surrounding States

Sheila A. Strawn

2017.

ISBN: 978-1-889878-55-3.

Flexibound US\$25; 80 pp.

Botanical Research Institute of Texas Press, Fort Worth, TX

Lichens are a microscopic universe of complex species interactions between fungi and algae. Their inherent beauty, diversity, and abundance have firmly established

lichens in the hearts of mycologists around the world. Lichens also open new era of research with a special focus on their metabolites.

“Lichen Study Guide for Oklahoma and Surrounding States” offers readers a comprehensive field guide consisting of 68 pages and is easily pocketable. The book abounds with beautiful photographs and keys for identification of lichens. The purpose of this guide is to encourage large-scale studies of lichens in this region and in surrounding states with similar habitat by explaining the basic characteristics needed to understand lichen biology and identification. This guide is comprehensive and helpful for study of lichens all over the globe. The introduction is well written and up-to-date. It also focuses on the importance of lichens, especially their role in solving immunological problems, land management, climatic change, and biodiversity. It guides finding and collecting lichens and the tools required for it with comprehensive knowledge of observing and documenting lichens, followed by their identification. It also explains how to preserve and store lichens in herbaria. The most fascinating part is chemical and UV tests for identification supplemented with bright color contrast slides. It also includes detailed information about lichen morphology and anatomy. Common features such as thallus types, color, reproductive structures, substrates for growth, and stepwise procedures are thoroughly illustrated. These are well explained by colorful photographs of lichen from Oklahoma and surrounding states.

The book is well written and up-to-date. I am particularly fond of the “Practice keys for the lichen identification,” which is a concise explanation for an amateur scientist/mycologist about how to identify lichens from all over the world based on thallus characters and chemical tests. Shelia A. Strawn has done

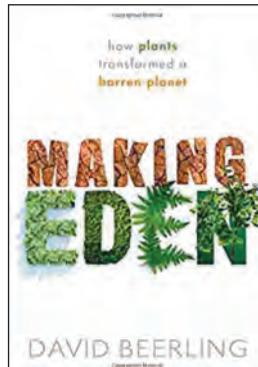
a tremendous job of capturing the beauty and diversity of the lichen of Oklahoma and surrounding states with a wide array of high-quality pictures that typically show each character from several angles. The book ends with a quick identification guide for common lichen genera of the region. It is also decorated with an appendix containing websites with sources for lichen study.

The target audience for this impressive work is clearly the one focusing on identification of lichens and appreciation of their diversity. Those with such interests will not wish to do without this guide. The book is highly recommended for undergraduate students, field explorers, and libraries of all mycology fans. The book's combination of aesthetically appealing and scientifically accurate color photographs and extensive descriptions makes it a standard reference work for lichen identification in not only in Oklahoma, but also around the globe.

-Dr. Arooj Naseer, Assistant Professor in Botany, University of the Punjab, Lahore, Pakistan

Making Eden: How Plants Transformed a Barren Planet

David Beerling
2019;
ISBN-10: 019879830X; ISBN-13: 978-0198798309
Hardcover US\$27.95;
272 pp.
Oxford University Press



The evolution of plants has transformed the Earth. Once photosynthetic organisms came onto the evolutionary scene, the atmosphere changed due to the presence of oxygen. The life of humans and all animals still is intimately tied to the success of plants. Yet, most of our society suffers from a lack of knowledge from

plants or a so-called “plant blindness.” This book attempts to remedy the problem and to introduce plant biology to a broader audience.

After a brief introductory chapter, the second chapter focuses on the evolution of land plants. The theory of endosymbiosis has enhanced our understanding of the evolution of plants. The controversies around the acceptance of this theory are considered. The major groups of plants, life histories, and their evolutionary relationships are also discussed. While I found this early chapter interesting, I am a botanist, but I started to ask if this book would truly appeal to a general audience as it is touted to be.

The author goes on to discuss the genomics revolution of the past decade and the insights it brought us regarding plant evolution. The genome of a plant can be viewed as a molecular “living fossil.” While this chapter starts broadly and in an interesting manner, it gets too technical with a good dose of name dropping of plant molecular geneticists throughout recent history.

The next discussion is on the rise of and the importance of the “evo-devo” branch of plant biology. This field compares the developmental processes of different organisms in order to infer the ancestral relationships among them and how developmental processes evolved. The example used is the KNOX–ARP relationships across land plants. The KNOX and ARP genes are reported to be involved in the evolution of leaf form in different species. Again, I found this part of the book interesting but question its broad appeal to non-botanists.

Stomatal pores, referred to as “gas valves,” are also considered in detail. These structures are especially important for the successful transition to land plants as they control water balance and the avoidance of desiccation. When considering the height of redwood

trees, the author notes that this “humble” small structure is important for allowing these amazing trees to survive and thrive. The function and the genetic basis of stomatal function is discussed in detail.

In the chapter “Ancestral Alliances,” the co-evolution of plants and fungi is considered. The history of the discovery of these symbiotic relationships in the fossil record is reviewed as well as the excitement generated by the scientists at the time of its introduction. However, there also was a great deal of skepticism as occurred when the endosymbiotic theory was first proposed. The historical parts of the book do make for interesting reading and may be appealing for a more general group.

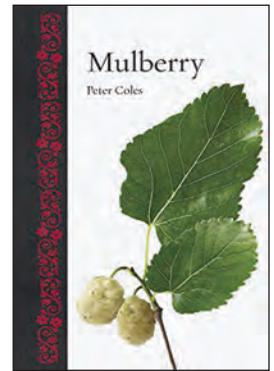
I found the last chapter on ecological devastation and climate change to be the most compelling and suspect it also will have the broadest appeal. Because humans are very successful animals, we are devastating the resources of the Earth, which is resulting in species decline and significant loss of biodiversity. The end of the book considers our future and how we can survive as a species in harmony with plants if we act on conservation imperatives.

Particularly at this moment, we do need non-scientists to understand important concepts in science, especially in relation to climate change. We also want non-botanists to better understand and appreciate the role of plants in our history and civilization. Thus, the author has the noble goal of making these topics accessible to the general public. I enjoyed reading this book and found some gems of insights. While I see a lot of interesting ideas, the book may have too much terminology and jargon to make it live up to its aspiration of appealing to a more general audience.

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

Mulberry

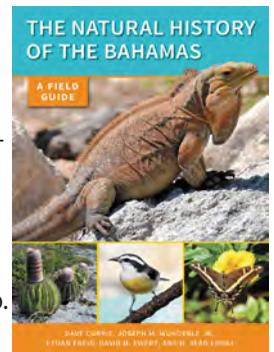
Peter Coles
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Reaktion Books, Ltd.,
London, UK, distributed
by University of Chicago
Press, Chicago, IL.



{For this review by Dorothea Bedigian, see p. 145.}

The Natural History of The Bahamas: A Field Guide

Dave Currie, Joseph M. Wunderle Jr., Ethan Freid, David N. Ewert, and D. Jean Lodge
2019.
ISBN-13: 978-1501713675
Paperback US\$34.99; 464 pp.
Cornell University Press,
Ithaca, NY



Natural history field guides are the literary equivalent of a Swiss army knife. These tomes do not set out to treat one element of the natural history extensively, but instead, provide broad treatments of the fauna, flora, and habitats affiliated with a region. *The Natural History of The Bahamas: A Field Guide* provides a sorely needed resource covering the terrestrial and coastal flora and fauna of the Bahamas. The intent of such guides is to provide an entrance into the world of birding, herpetology, etc. Guidebooks permit one to enjoy everyday encounters with the most common organisms in your backyard or ones protected in one of the national parks in the Bahamas. In all honesty, if it were not for guidebooks, many of us would not have the careers in botany. If Correll and Correll’s (1981) 1692-page flora was your starting point for exploring the

flora of the Bahamas as a high-school student in a Bahamian National Trust (BNT) Young Navigator Program, you probably would bypass that interest. Give a student a guide, provide them with a chance to learn a bit about plant morphology and taxonomy, and send them out to explore. That is how you start to grow a botanist.

The guide begins with a nicely presented coverage of the habitats, climates, and ecological communities and transitions into treatments of fungi, plants, invertebrates, fish, amphibians, reptiles, birds, and mammals. Each section begins with an overview of the natural history and figures elucidating the key characteristics needed to identify taxa. Species descriptions consist of common and Latin names, ranges, and descriptions. All species are illustrated in color. The invertebrates are lavishly photographed, and this guide provides a nice coverage useful to identify some of the more common pollinators. The treatment of fungi is honest in informing the reader of the need of mycological studies of Bahamian fungi. This illustrates yet one more valuable attribute of natural history field guides, uncovering the groups of organisms that are in dire need of investigation.

The plants are treated by Ethan Freid, resident Botanist at the Leon Levy Native Plant Preserve, Eleuthra, and long-time affiliate with the BNT. Ethan knows the Bahamian flora from Bimini to Inagua and has contributed greatly to building the next generation of Bahamian botanists. The coverage he has provided for the guide includes the most common species from throughout the archipelago. I teach an economic botany and ecology courses on San Salvador Island. I would not hesitate to use this guide as an entry point for students learning the more common elements of the Bahamian flora. Along with the web resources presented, and prepared by Ethan and the Leon Levy staff

(<http://www.levypreserve.org/>), you can offer a solid botanical field course in the Bahamas.

The Natural History of The Bahamas: A Field Guide should be in every classroom in the Bahamas, and it supports a number of important standards of the Bahamian curricula. Most importantly, it is a tool needed by all Bahamians affiliated with conservation initiatives in the Bahamas. This is particularly true for the BNT and its management of more than 32 national parks protecting over 2 million acres of marine and terrestrial environments. Likewise, the tourist who wants to skip the cruise and explore the real Bahamas can toss a copy of this guide in their backpack and venture out into the natural beauty of these extraordinary islands.

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-Melanie L DeVore, Professor of Biology,
Department of Biological and Environmental
Sciences, Georgia College, Milledgeville, GA

The Nature of Plant Communities

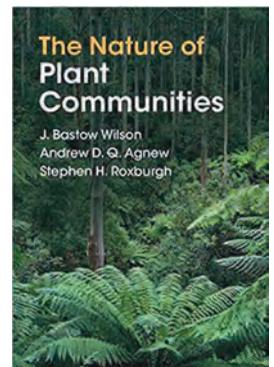
J. Bastow Wilson, Andrew D.Q. Agnew, and Stephen H. Roxburgh
2019.

ISBN: 9781108612265

Hardcover US\$64.99;

370 pp.

Cambridge University Press



The aim of this book is to go beyond the simple characterization of plant communities to the forces that structure plant communities. The authors sought to offer a new viewpoint to challenge others to think differently about

plant community ecology. I find they were successful! This book is coauthored by two prominent, retired professors of Botany (one who worked in New Zealand, the other in northern Europe and the Middle East) and the PhD protégé of one, whose is now an ecologist at CSIRO in Australia. It is of decided interest to those of us who have become plant ecologists with primarily New World influences.

As with many classic works, this one begins with autecology, considering the physiological adaptations and movements of plants, and the challenging question with these modular organisms: what is an individual? Modular growth, plasticity in response to the environment, selecting for changes in the genotype that manifest in altered phenotype.

They go on to consider interactions between species important in plant communities: facilitation, interference, but no mention of tolerance (that in most textbooks on the subject say is necessary for coexistence in communities). They spend some time on the importance of litter, a product of plants that is useful to many as well. There is a very interesting table of possible mechanisms of herbivore- and pathogen-mediated plant-plant interactions, with discussion elaborating the mechanisms with many examples.

But the apparent omission of ‘tolerance’ is addressed by the chapter titled “Mechanisms of Coexistence,” with the first discussion of alpha niches and their differentiations to permit coexistence. This section also covers fires and other disturbances, pest pressure, and circular interference networks. It is in this section that I learn what Spatial Mass Effect is: the constant immigration of a species into a patch where its population is maintained (i.e., the ‘sink effect’). Zoologists will not be surprised by the inclusion of ‘inertia,’ both

temporal and spatial, in plants (as many see plants as less lively than animals!). This is a new way, for me, of considering long-lasting (perhaps “climax”) communities.

Disturbance, succession, resistance, resilience, and stability are all considered in the next section on community-level processes. Many examples of communities with which I was previously unfamiliar* are discussed, as well as some ideas: cyclic succession (though maybe this is just like a dynamic equilibrium?), switches (that lead to alternative stable states), and retrogressive succession. This section includes a discussion of stability, and whether or not it occurs in the real world.

In the discussion of niches, the authors discuss the *alpha* and *beta* niches of plant species – *alpha* being the traits of the plant species itself, *beta* being the environmental features/habitat. After considering these for individual species, the authors consider how the coincidence of plants in communities is affected by the filtering of the species and their subsequent competition and coexistence. The organization of the book in this way is logical and plausible.

I always thought ‘guild’ was defined first by Root (1967) as ‘a group of species using similar resources in a similar way’, but since most plants use the same resources, that was not the original intent. I learned that Drude (1885) coined the term for a group of species moving from one region to another. Schimper (1903) used the term to mean a *synusia* (such as a stratum within a community in a forest. And one of the first experimental plant ecologists, Tansley, used it to describe ‘guilds of the same dependent life form, such...as lianes’. Much more like a group of species working toward the same end, as a group of human workers in the same trade.

How species interact in communities and the effects on genotypes of the species feeling various influences from others and their environment brings us back to character displacement. Some attention is even paid to other trophic levels at the end of the book, although early on the authors provide the disclaimer that although animals are important, this is a book about plants!

One interesting section of the book considers exotic species as community structure probes. In studying how and why exotic species outcompete natives in certain situations, the strengths and weaknesses of native species in their natural interactions with other species may be revealed. Why and why not introduced species become invasive or merely naturalized can be due to plant–plant interactions but also plants’ interactions with other biota, from fungi to various animals.

The volume builds to review the theories of community composition (Clements, Gleason, Whittaker, Hubbell, Grime, Tilman), comparing and contrasting them in their validity and applicability in different situations. In the final section, Synthesis, the authors review Heterogeneity, Community Structure, and Assembly Rules, and the Processes that govern plant community structure.

The book begins with a glossary that nearly put me off reading the entire work, since some of the definitions were not very useful. Maybe this section would have been better located at the end of the book. The one that particularly annoyed me was the definition of a leaf, which was just a quote from F.G. Gregory cited by L. Croizat in his *Principia Botanica*: “Although no satisfactory definition of a leaf is possible, I shall assume that we all know what we are talking about.” However, included were abbreviations and acronyms that some use constantly without adequate definition—

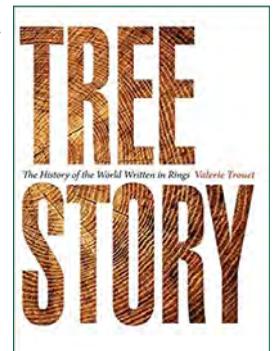
quite useful, I think. And some other other definitions brought up phrases with which I was unfamiliar*, such as “altruistic facilitation,” “cyclic succession,” “ombrotrophic,” “spatial mass effect,” and “subvention.” If these are unfamiliar to you also, you might want to check out this volume! For anyone working in the large field of plant ecology, and teaching courses in ecology and other topics, this book may provide some new food for thought. It might be used in a graduate seminar course or as background reading for students new to the field as they are developing their career foundations and graduate research plans.

* Maybe some of my unfamiliarity is due to my area of expertise in plant ecology (evolutionary and population ecology, plant/animal interactions), but I have lectured Plant Ecology at the undergrad and grad level since 1982.

-Suzanne Koptur, PhD, Florida International University, Miami, FL

Tree Story: The History of the World Written in Rings

Valerie Trouet
2020. ISBN: 9781421437774
Hardbound US\$27.00;
246+iii pp.
Johns Hopkins University Press



What do Genghis Khan, sunspots, Belgian beer, a Stradivari violin, plagues, Frankenstein, shipwrecks, and fall of the Roman Empire have in common? Tree rings. Tree rings are scribes of history.

This book explains how tree rings can document weather, sunspots, volcanos, human events, and many more phenomena both past and present. Well written with clarity and humor, it draws on the extensive research of

the author and her tree ring research around the world, providing information both authoritative and accessible.

Valerie Trouet is on the faculty of the Laboratory for Tree Ring Research at the University of Arizona. She deftly takes the reader to this most unlikely place for tree ring research—a desert—explaining why the lab was located there and then from the Sonoran Desert to expeditions around the world. Her descriptions of the sites and field experiences are a worthy natural history journal on their own.

Trouet describes the global search for interpretable rings from trees as well as old buildings, logs, stumps, and charcoal that can provide a timeline year by year—even season by season—reaching back thousands of years. In fact, she makes the case that tree rings are the most accurate record of climate. These data are corroborated with ice cores, coral dating, and several other measures of yearly growth.

There are 17 chapters, and the final chapter addresses global climate change. This is a relevant aspect of tree ring research because it sets present conditions in the context of thousands of years of data showing cycles of drought or varying temperatures and how that affects humans.

The other chapters each address an archeological, weather, or historical question for which dendrochronology can provide insight. For example, the chapter “After the Gold Rush” treats the role of regular small-scale fires in California. The frequency of these was changed from regularly burned patches by indigenous peoples, whose populations were decimated by European diseases. The result was few fires, then fuel built up, stoking hotter and more devastating fires. To determine the natural frequency of fires, a tree ring history from fire scars was assembled for the

past 3000 years. These scars are best studied in the stump of trees recognized by fire scars or “cat faces.” (Cat faces in the South mean the scars on old turpentine trees that do look like cat faces, unlike the scars in the western trees using—inexplicably to the author—the same term). Of more recent interest is the history of fires in California since the establishment of the U.S. Forest Service in 1905 and the resultant development of the “Smoky Bear Effect,” which caused what the author calls a “fire deficit” that also led to the build-up of fuel. In other words, the lack of frequent low-intensity fires increases fire extent and heat leading to the disastrous California wildfires of recent years. In addition, Trouet analyzed the effects of El Niño and El Niña as reflected in tree rings. I was disappointed that research in the longleaf ecosystem of the Southeastern United States, a fire-dependent system, was not included.

One of the features of the book is the author’s description of the development of her academic career—post-doc, publication rejection, sometimes the only woman working on a project, the powerful gain of collaborative work, and especially the way she models how a scientist asks questions based on hypotheses developed from published data and field observations, collects and analyzes data, publishes, and deals with the public.

For this reason, *Tree Story* is a great read for young scientists as well as providing a most readable and enjoyable presentation of tree ring research for a wide audience. The book is a must-read for dendrology, ethnobotany, and climate change students as well as anyone interested in the relationship of history with weather. If tree rings are the scribes of history, Valerie Trouet is their chief scrivener. Highly recommended.

-Lytton John Musselman, *Blackwater Ecologic Preserve, Old Dominion University, Norfolk, VA*

Wild Yet Tasty: A Guide to Edible Plants of Eastern Kentucky

Dan Dourson and Judy Dourson

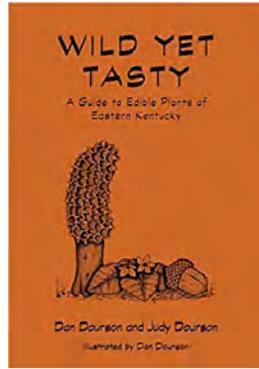
2019. ISBN: 978-1-94-

966903-9

Paperback US\$14.95; 44

pp.

Kentucky Press



This slim volume discusses 21 edible plants plus the common morel (*Morchella*, a genus of sac fungi), with one page devoted to each species. The common and scientific name (usually) is provided along with a paragraph on identification and habitat and another paragraph about the edible parts. The best time to harvest is indicated, and each species is illustrated with one or more drawings. Two pages in the front of the book offer a pictorial description of terms related to flower structure or leaf arrangement as used in the text.

I have mixed opinions about the book. On the positive side, the writing follows a conversational style that is often engaging and entertaining. For example, many hikers will be familiar with the experience of being snagged by the prickly vines of greenbriers (*Smilax*); the authors urge, “So next time you’re backpacking in Eastern Kentucky and a Greenbrier snags your leg, just reach over and take a bite out of it!!” [Note: the two exclamation points are, in fact, as written in the book.] I may heed this suggestion next time I find myself tangled up trailside.

On the negative side, I was disappointed in this book as a guide to edible plants. A “Note of caution” regarding the consumption of wild edible plants on the copyright page admonishes readers to “be more familiar with the species than you are with your own name!” Certainly, this is excellent advice. However, I think the information and illustrations

for much of the book are insufficient for confident identification of the species without prior knowledge of them. Typographical errors throughout are distracting, as are a few more “technical” errors. (An illustration of “basic root types” would more accurately be called “underground storage organs,” and the scientific name for sumacs is incorrectly listed as *Asimina* species—which are pawpaws—instead of the correct genus, which is *Rhus*.)

Every species included is widespread and common throughout eastern North America. I’m not sure why the book is billed as a guide specifically for Eastern Kentucky, except that the authors have many years of experience in the Red River Gorge watershed of east-central Kentucky. Perhaps the suggestion that the contents are specific to the region makes the book more attractive to visitors who come to eastern Kentucky for various outdoor recreational pursuits. Non-native and invasive edible species like garlic mustard (*Alliaria petiolata*) are notably absent.

All complaints aside, the book does support the authors’ goal of “rekindling...that sense of wonder we all had as kids” and, although it is a bit pricey for the limited content, people may be interested in adding it to their personal botanical libraries as a source of some folksy commentary about a few well-known edible plants.

-Melanie Link-Pérez, Eastern Kentucky University

Wildflowers and Ferns of Red River Gorge and the Greater Red River Basin

Dan Dourson and Judy Dourson

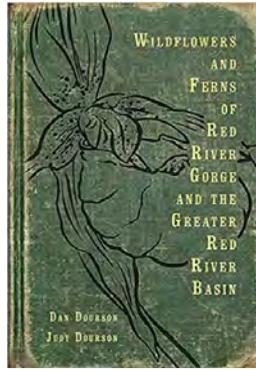
2019.

ISBN: 978-1-9496-6900-8

Paperback US\$39.95;

488 pp.

Kentucky Press



The Red River Gorge (RRG) and its watershed are a botanical hotspot and a popular tourist destination, drawing more than half a million visitors to east-central Kentucky annually. Since I was planning to take my Plant Systematics class to the RRG during a spring semester fieldtrip, I was eager to review this book by Dourson and Dourson focusing on the ferns and wildflowers of the area. Although the shift to remote instruction due to the COVID-19 pandemic prevented me from visiting RRG with my class this spring, I've enjoyed studying its flora by perusing this book.

When the package containing the review copy arrived, I was immediately enamored by the physical attributes of the book inside. Although a paperback, the rugged cover mimics those of many vintage hardbound botanical texts, with the appearance of a green cloth cover worn around the edges from frequent use—the hallmarks of a favorite book that has accompanied its owner on many a happy exploration of its subject. The book is the perfect size to slip into a field bag and to thumb through while on the trail; conveniently, the book lays open flat when on a table.

Several dozen pages at the beginning of the book provide interesting context in which to consider the vegetation of the region. A chapter on the prehistoric history (written by Johnny

Faulkner) details the early human habitation of the sandstone cliffs and rock shelters of the RRG and discusses artifacts, petroglyphs, and other evidence that documents human presence from nearly 13,000 years ago. A chapter on cultural history (written by Alan Cornette) describes resource extraction and its impact on the vegetation—for example, the burning of pitch pine and short-leaf pine to produce tar (pitch) in tar kilns, extraction of saltpeter, and timber harvesting all influenced forest composition. A chapter written by Halard Lescinsky provides an overview of the 400-million-year geological history of the Red River Watershed and helps readers interpret the limestone and sandstone features that characterize the region. All these background chapters are generously illustrated with full-color photographs and figures.

The bulk of the book is devoted to presentation of the ferns and lycophytes (56 pages) and the herbaceous wildflowers (263 pages) of the Red River Basin. These species accounts are preceded by a short section that describes the basic habitats present along with a diagram of the habitat profile of RRG (for example, riparian, lower slope, limestone cliff, sandstone ridgetop). Abbreviations for the habitat designations are included in the species accounts. Each species is accompanied by at least one full-color photograph, and both the common and scientific names are provided. Along with habitat and morphological descriptions, species accounts often include information about frequency, usefulness to humans or wildlife, or how to distinguish from similar species.

All 51 species of ferns in Red River Basin are beautifully illustrated by Elijah Hicks; these illustrations are often annotated and complement the color photographs. The ferns are grouped according to their relative size and typical habitat, such as “Large Wetland Ferns” or “Medium Woodland Ferns.” The “Rock Loving Ferns” are further parsed

according to limestone and/or sandstone, ultimately bringing the number of headings to more than 20, which seems unwieldy but possibly facilitates comparison between species that may share a habitat. I admit I found some headings to be quite charming: “Exceedingly Tiny Rock Loving Gametophyte Ferns (sandstone)” for the Appalachian gametophyte or Shoestring fern (*Vittaria appalachiana*), and “Peculiar-Looking Woodland Ferns” for Climbing fern (*Lygodium palmatum*) and Southern adder’s tongue fern (*Ophioglossum pycnostichum*). There are also a couple pages of wonderful illustrations comparing spleenworts (*Asplenium*) with proportionate scaling, including a full page illustrating the relationships among Appalachian spleenworts of RRG. Overall, the photographs, illustrations, and text do a great job of emphasizing important characters for identification for the ferns, horsetails, and clubmosses.

Coverage of the wildflowers is organized alphabetically by family with no separation between monocots and eudicots. Within a family, I could discern no particular arrangement of species. There is a “Color Key” where users can first choose the flower color of an unknown plant and then choose the appropriate season to find a list of page numbers with potential matches. Provided the unknown specimen is covered in the book, this possibly works well for many plants but not for those with 16+ pages to consider (for a spring-blooming white flower, a user may need to consult 71 pages!). The stunning full-color photographs (mostly by Dan Dourson) are outstanding in their usefulness for identification via image comparison. The writing in the species accounts is lively and engaging—for example, Virginia bluebells (*Mertensia virginica*) are described as “eye-catching gems” with “flamboyant bell-shaped flowers.”

There is scant representation of grasses, sedges, and rushes with only six pages devoted to them. Woody vines, shrubs, and trees receive slightly more coverage than the graminoids, and the photos emphasize the flower or inflorescence and often don’t include many vegetative features. These are not really criticisms, since these plants are beyond the primary scope of the book. It concludes with a species list (compiled by Julian Campbell) for 1573 vascular plants known from the Red River Basin along with indications of their native ranges, indices of common names and scientific names, and safety tips that include photos of venomous snakes and arthropods to watch for in the RRG.

Overall, I think this field guide will be useful for anyone botanizing in the region; for those like myself who use technical dichotomous keys, the images in this book will be a helpful supplement. Importantly, the Red River Basin contains five ecoregions and more than half of Kentucky’s native or naturally occurring vascular plants; thus, many of the species covered in its pages are found beyond the limits of the watershed. This book is an excellent addition to any collection of books on the flora of Kentucky or eastern North America. Anyone who loves photographs of wildflowers or ferns will enjoy looking through these pages.

-Melanie Link-Pérez, Eastern Kentucky University

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Plant Science Bulletin



Thank you to Dr. Emily Rollinson for creating this word cloud representing conference attendees' Twitter comments during the week of Botany 2020 - Virtual!

If you were a registered attendee to the conference, remember you have access to the recorded talks for the next year! You can go back in using your unique link* and view and review all the talks and posters! Enjoy!



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