



# PLANT SCIENCE BULLETIN

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A PUBLICATION OF THE BOTANICAL SOCIETY OF AMERICA



## The Little Red Hen & Culture Change

*by David Asai*  
Botany 2021 Speaker

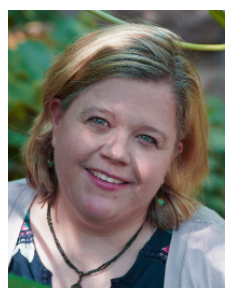
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# FROM THE EDITOR

Greetings,

In this issue of *PSB*, we present the BSA's new strategic plan and, as always, highlight many society efforts that fall into each of the four strategic priorities.

These topics are echoed in the report from the International Affairs Committee, an opinion piece on standardized admission exams, and in our feature article by David Asai, which I am particularly excited to share.

We celebrate the research and scholarly excellence of our Botany 2021 award winners, as well as the ongoing success of the BSA's science education programs. We are also delighted to feature many of our science communicators who enthusiastically educate the public about plants and plant science and present the reports from our Public Policy Award winners who attended this year's congressional visit day.

One of the highlights of being *PSB* editor is hearing from BSA members about their endeavors to promote and support botany and botanists. Stay tuned to the *PSB* for more in 2022!

Sincerely,



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# SOCIETY NEWS

## BSA Announces New Strategic Plan

*As most of you know, the Society spent much of the last year developing a new Strategic Plan. The strategic plan is a culmination of a very intentional multi-step process in which we prioritized inclusion, transparency, and BSA community involvement.*

*We are proud to present the revised BSA Mission statement and Strategic Plan to you (available at [https://botany.org/file.php?file=SiteAssets/home/BSA\\_Strategic\\_Plan\\_2021.pdf](https://botany.org/file.php?file=SiteAssets/home/BSA_Strategic_Plan_2021.pdf)), as it was approved by the BSA Council and at the All Members Business meeting in July 2021. Our staff and leadership will be working on the implementation of several of these goals and strategies in the coming year.*

*I want to thank our past President, Cindi Jones, for her leadership in this area as well as the 30 members of our Strategic Planning Committee and all our Section and Committee Chairs who provided feedback over this last year.*

*-Michael Donoghue, BSA President*

### STRATEGIC PRIORITIES

To ensure that we set forth a path that will build a stronger botanical community and serve our mission, the Botanical Society of America embarked on the process of creating a new 5-year strategic plan in 2020. BSA membership was surveyed and a diverse and broad coalition of members debated and discussed current and future needs. The resulting priorities, goals, and strategies were finalized and approved at the 2021 BSA Members' Business Meeting on July 22, 2021. The strategic plan is a culmination of a very intentional multi-step process in which we prioritized inclusion, transparency, and BSA community involvement. The BSA officers, committees, and staff will take the plan, outlined below, and move forward in the

next five years to implement changes that will make the BSA community stronger, more connected, and ready for global changes and the future of plant science.



#### OUR MISSION:

**To inspire and promote an inclusive global community committed to advancing fundamental knowledge and innovation in the botanical sciences for the benefit of people and the environment.**



## HUMAN DIVERSITY, EQUITY AND INCLUSION (DEI)

**Goal 1: The BSA will be an antiracist and anti-discriminatory society.**

### *Strategies*

1.1 Offer DEI leadership training opportunities to members, including students, that encourage and foster development as inclusive leaders and innovative educators.

1.2 Analyze all policies, practices, and expenditures of the society to determine if and how they may be leading to DEI disparities, and then eliminate or revise policies and cease practices and activities that do not support DEI goals.

1.3 Foreground considerations of diversity, equity and inclusion in all society policies and practices.

1.4 Develop activities and opportunities that extend beyond the BOTANY conference and that do not present financial barriers for member participation.

**Goal 2: The BSA will be a scientific society whose membership reflects the diversity of society as a whole.**

### *Strategies*

2.1 Increase visibility of who is a botanist, showcasing the diversity of the profession and the scientists themselves.

2.2 Prioritize collaborations with HSIs/HBCUs/MSIs/Tribal and Community colleges and with other professional societies and organizations to expand access to and inclusion of their students in botanical career pathways.

2.3 Increase recruitment and retention of BIPOC members.

2.4 Increase the diversity of leadership on the Board and all BSA committees.

**Goal 3: The BSA will be a leader in developing initiatives to recruit and support diversity and in advocating for institutions (academic, government, etc.) to recognize and reward the diversity enhancing activities of their members.**

### *Strategies*

3.1 Support and facilitate increased exposure to the botanical sciences in institutions that serve underrepresented groups.

3.2 Develop support documentation that will help encourage members to advocate for promotion and tenure metrics that reward contributions to DEI at their institutions.

3.3. Advocate for the importance of diverse perspectives and inclusive excellence in all aspects of science and science education.

**Goal 4: The BSA will actively evaluate its progress in recruiting and retaining members from underrepresented groups, and in understanding inequities in access and opportunity among its members.**

### *Strategies*

4.1 Collect and make available demographic data to be used in assessment and planning following IRB protocols to ensure privacy.

4.2 Develop and deploy tools for assessing the differential impact of access to existing and future opportunities (e.g., PLANTS), awards, grants, etc.

4.3 Collect data to understand why individuals join and leave the Society.

4.4 Share data and assessment with the membership on an annual basis to regularly revise policies and practices that improve support for diversity, equity, and inclusion.

## RESEARCH AND SCHOLARLY EXCELLENCE

**Goal 5: The impacts of BSA publications (*American Journal of Botany*, *Applications in Plant Sciences*, *Plant Science Bulletin*) will increase, as evidenced by various metrics.**

### *Strategies*

5.1 Broaden the scope of research represented in BSA journals and at conferences while supporting the current core of the society in organismal, structural, developmental, and evolutionary biology.

5.2 Attract more researchers from a wide range of plant-related areas (e.g., conservation, forestry, horticulture, plant-microbe interactions) to our publications and conferences.

5.3 Create and promote greater international, cross- and interdisciplinary opportunities for collaboration within BSA journals.

5.4 Move toward an entirely open access publication model while maintaining low publication fees for members.

**Goal 6: The recognition of botany as an essential biological and environmental discipline will increase within the scientific community.**

### *Strategies*

6.1 Promote the science of botany as foundational to global restoration and actively promote interdisciplinary efforts related to repair earth systems.

6.2. Increase the promotion of botany and its importance as a professional scientific discipline to confront public and professional misperceptions.

6.3 Provide expertise to funding agencies on current/future issues related to botany.

6.4. Promote inclusive ‘plant-person’ identities to address negative associations with botanical sciences and science in general (elite, exclusive, etc.)

6.5 Increase recognition of the value of indigenous botanical knowledge

**Goal 7: The increased prominence of the BSA as a global leader in research, teaching, and advocacy related to the botanical sciences will be reflected in at least a 5% membership increase over three years.**

### *Strategies*

7.1 Establish the BSA as a prominent leader on current issues related to our field and the mission of the society.

7.2 Recruit and retain more professionals at all career stages who study, teach and/or promote botanical sciences to BSA from all forms of academic and non-academic institutions.

7.3 Recruit/retain/support members from outside of the society, or who have been affiliated in the past, through presentation, service, or publication opportunities

7.4 Increase international participation in society activities and governance.

7.5 Evaluate the possibility of revising membership fees to include additional categories/price points to better accommodate international members.

**Goal 8: The BSA will provide its members with increased support for scholarly excellence and research.**

### *Strategies*

8.1 Increase the number of research awards and strategically increase or revise honors and awards to reflect BSA core values.

8.2 Promote discussions with decision-makers in funding agencies (e.g., The National Science Foundation) with the aim of increasing

understanding of the importance of botany and providing additional funding opportunities.

8.3 Create new mechanisms for the recognition of scholarly excellence that promote our members beyond the society.

**Goal 9: The annual BOTANY conference will be the premier venue to showcase and disseminate the latest research in botany.**

### *Strategies*

9.1 Increase access to the conference, especially for members of underrepresented groups.

9.2 Increase promotion of and access to special lectures/symposia beyond the conference.

9.3 Incorporate a virtual component in all future conferences.

## ORGANIZATIONAL IMPACT AND VISIBILITY

**Goal 10: The appreciation of plants and the field of botany will increase in society.**

### *Strategies*

10.1 Connect BSA resources with non-BSA audiences through stronger collaboration with other regional, national and international plant societies.

10.2 Increase emphasis on science communication and the development of science communication skills.

10.3 Highlight BSA members' expertise and the centrality of plants in solving pressing environmental and societal problems (climate change, biodiversity loss, benefits of nature to mental and physical health, etc.)

10.4 Engage with the public to promote curiosity and appreciation for plants, nature, and science.

**Goal 11: The BSA will be a major contributor in efforts to educate the public about science and to shape regional, national and international policy regarding science and conservation; the BSA will be seen as a premier source of unbiased botanical information.**

### *Strategies*

11.1 Reward BSA members for leadership efforts beyond the BSA in areas such as innovation, strategic communication, etc.

11.2 Initiate or collaborate on public policy efforts broadly focused on science, botany, and pressing environmental stresses (climate change, biodiversity loss, etc.).

11.3 Amplify the visibility of BSA members participating in regional, national and international efforts that promote the role of science in society, influence public policy, shape educational initiatives, etc.

11.4 Lead/participate in cross-society data collection efforts to better understand opportunities and challenges, and work toward common goals focused on human diversity and scientific advancement.

**Goal 12: The BSA will be recognized as the leader in education for the botanical sciences.**

### *Strategies*

12.1 Encourage, assist, and advocate for life science educators at all levels to include botanical science in their curricula, standards, and lesson plans.

12.2 Ensure that education and outreach programs are grounded in evidence-based best practices of botanical science education and contribute to our goals in broadening participation.

12.3 Lead workshops throughout the year targeted toward students and early career academics and naturalists to foster future generations of exceptional educators in botanical science.

## PROFESSIONAL DEVELOPMENT

**Goal 13: All members of the BSA will share a strong sense of belonging to the society.**

### *Strategies*

13.1 Establish and support networks of affinity groups that enhance career development by providing accessible channels of communication among diverse members.

13.2 Develop and maintain strong frameworks that span career stages and peer mentoring focused on professional development.

13.3 Collect data to better understand what the BSA can do to support student members as they transition to professional positions, thus reducing attrition from botanical careers at these junctures.

13.4 Continue to increase the number and size of awards for graduate students/postdocs in outreach.

**Goal 14: Membership in the BSA by people outside of academia will increase by at least 10% over five years.**

### *Strategies*

14.1 Highlight the many diverse and cross-disciplinary pathways to successful careers in the botanical sciences outside of academia through publications, conferences and activities, and develop initiatives to support and retain BSA student members to transition to non-academic professional careers.

14.2 Review and revise our governance structure to generate benefits for non-academic career members, accounting for career path and career stage as two important axes of diversity.

14.3 Review the use of a Careers job board on our website and consider ways to better disseminate and heighten awareness of non-academic careers.

14.4 Create tools for career exploration, mentoring, and building connections across interdisciplinary boundaries.

**Goal 15: The Board, committee chairs, and staff will be well prepared to lead the organization with foresight and fiduciary responsibility.**

### *Strategies*

15.1 Provide leadership training opportunities for all Board members, Committee Chairs, and Section Chairs.

15.2 Create a professional development plan for all staff to ensure continued professional growth and incorporate best practices in all aspects of management.

15.3 Build institutional knowledge and facilitate the smooth transfer of operations and relevant resources to future society leadership.



# REPORT FROM THE BSA'S INTERNATIONAL AFFAIRS COMMITTEE

BSA's International Affairs Committee met this summer prior to Botany 2021. We are happy to share with you some details about the committee and what issues we have been discussing recently. Members of the committee include Hugo Cota-Sanchez (Chair); Cecilia Zumajo (Student Representative); Johanne Brunet; Suman Neupane; Shengchen Shan; Heather Cacanindin, Executive Director, ex officio; Melanie Link-Perez, Program Director, ex officio; and Michael Donoghue, President, ex officio.

The International Affairs Committee aims to link BSA with other national botanical societies outside the United States and to connect BSA members to international botanical events, including the International Botanical Congress (IBC), which is held every six years. The committee seeks to support young botanists attending the IBC, as well as other important international meetings. The committee informs the Society regarding international activities impacting the study of plants through articles in the Plant Science Bulletin, symposiums and colloquium at the annual Botany meetings, and other activities. Each year, new members join the committee as the same number of members rotates off. This committee is chaired by a member serving their third year on the committee.

At our recent meeting, we spent a good deal of time discussing international botanical meetings that are in the works. We would like to make our membership aware of the following:

- Latin American Botanical Congress – Cuba (month TBD) 2022

- Mexican Botanical Congress – October 2022
- Annual Meeting of the Canadian Botanical Association – Canada (month TBD) 2022
- National Botanical Congress – Brazil (month TBD) 2022
- International Congress of Sexual Plant Reproduction - Prague, Czech Republic, June 2022 (<https://www.iaspr.org/index.php?browse=news&nid=52>)
- International Conference on Botany and Plant Science – Helsinki, Finland, July 2022 (<https://waset.org/botany-and-plant-science-conference-in-july-2022-in-helsinki>)
- Association of Tropical Biology and Conservation – Cartagena, Colombia, July 2022
- International Botanical Congress Madrid, Spain, July 2024

If you know of any upcoming international activity or events that should be shared with our BSA community, please email those to [bsa-manager@botany.org](mailto:bsa-manager@botany.org) so we can add them to our list and assist in their promotion.

In December 2021, BSA will send out a call for committee service applications. We will be seeking two new members for the International Affairs Committee and one student representative as well. Please consider applying for committee service and joining in 2022!

# NATIONAL BOTANICAL AND NATURAL HISTORY SOCIETIES AND ORGANIZATIONS

For more information about the committee, see <https://cms.botany.org/home/governance/international-affairs-committee.html>. (Compiled by IAC, July 2021)

## Argentina

- Sociedad Argentina de Botánica: <https://botanicaargentina.org.ar>

## Australia

- Australian Native Plant Society: <http://anpsa.org.au>

## Australasia

- Australasian Systematic Botany Society Inc.: <http://www.asbs.org.au>

## Belgium

- The Royal Botanical Society of Belgium <http://www.botany.be/en/node/1>

## Brazil

- Sociedade Botânica de São Paulo: <https://botanicasp.org/en>
- Sociedade Botânica do Brasil: <https://www.botanica.org.br>

## Canada

- Canadian Botanical Association / L'Association Botanique du Canada: <https://www.cba-abc.ca>
- Canadian Wildlife Federation: <https://cwf-fcf.org/en/explore/gardening-for-wildlife/plants/buy/native-plant-suppliers/native-plant-suppliers/on/204.html>
- Nature Conservancy of Canada: <https://www.natureconservancy.ca/en/>

## Chile

- Sociedad Botánica de Chile: <http://socbotanica.cl>

## China

- Botanical Society of China: <http://www.botany.org.cn/English/content.aspx?PartNodeId=109>
- China Wild Plant Conservation Association (CWPCA): <https://www.wpca.org.cn/>

## Colombia

- Asociación Colombiana de Botánica: <https://www.biciq.com/events/asociacion-colombiana-de-botanica-afiliacion/>
- FaceBook: <https://www.facebook.com/Aso-ColBotanica/>

## Cuba

- Sociedad Cubana de Botánica: <http://www.socubot.cu>

## Czechia

- Czech Botanical Society: <https://botanospol.cz/en/node/42>

## Denmark

- Botanical Society of Denmark: <https://botaniskforening.dk>

## Europe

- Federation of European Societies of Plant Biology: <https://fespb.org>

## France

- Société Botanique de France: <https://societe-botaniquedefrance.fr>

## Germany

- German Society for Plant Sciences: <https://www.deutsche-botanische-gesellschaft.de/en/home>

# NATIONAL BOTANICAL AND NATURAL HISTORY SOCIETIES AND ORGANIZATIONS (cont'd.)

## Great Britain and Ireland

- Botanical Society of Britain and Ireland: <http://www.asbs.org.au>

## Internet Directory for Botany

- Botanical societies, international botanical organizations: <https://www.bgbm.org/IDB/botsoc.html>

## India

- Indian Botanical Society: <https://indianbot-soc.org/index.php>

## Israel

- The Israeli Society of Plant Sciences: <https://www.israelplant.org.il/en>

## Italy

- Società Botanica Italiana: <https://www.societabotanicaitaliana.it>
- International Union for the Conservation of Nature

## International Union for the Conservation of Nature

- <https://www.iucn.org>

## Japan

- Botanical Society of Japan (BSJ): <https://bsj.or.jp/index-e.php>

## Mexico

- Asociación Mexicana de Orquideología, A.C.: <http://amo.com.mx/indexesp.html>
- Sociedad Botánica de México: <https://www.socbot.mx>
- Sociedad Mexicana de Cactología, A.C.: <http://www.mexican.cactus-society.org/english.html>

## Philippines

- Association of Systematic Biologists of the Philippines: <http://asbp.org.ph>

## Poland

- Polish Botanical Society: <https://pbsociety.org.pl/default/en/>

## Spain

- Sociedad Botánica Española: <http://www.rjb.csic.es/jardinbotanico/jardin/contenido.php?Pag=293&tipo=noticia&cod=7219>

## Switzerland

- Swiss Botanical Society: <https://botanica-helvetica.ch/en>

## United States of America

- American Society of Plant Taxonomists: <https://www.aspt.net>
- Botanical Society of America: <https://botany.org>
- California Native Plant Society: <https://www.cnps.org>
- The Nature Conservancy: <https://www.nature.org/en-us/>
- Torrey Botanical Society: <http://www.torrey-botanical.org>
- Southern Appalachian Botanical Society: <https://sabs.us>

## Other International Societies

- International Association for Plant Taxonomy: <https://www.iaptglobal.org>
- The International Compositae Alliance: <https://www.compositae.org>
- AASP – The Palynological Society: <https://palynology.org>
- The International Organisation of Palaeobotany: <https://palaeobotany.org>

## REPORT FROM VIRTUAL CONGRESSIONAL VISITS DAY

*Each year, the BSA Public Policy Committee awards two early-career botanists the opportunity to attend the American Institute of Biological Sciences' Congressional visits Day. This event is hosted by the Biological and Ecological Sciences Coalition, and recipients obtain first-hand experience at the interface of science and public policy. The first day includes a half-day training session on science funding and how to effectively communicate with policymakers provided by AIBS. Participants then meet with their Congressional policymakers, during which they will advocate for federal support of scientific research. This article details the experiences of this year's recipients.*

### A Personal Account by Mary Sagatelova, MPA



Public affairs—and by extension public policy—can broadly be defined as purposeful action taken by the government in order to address a general issue. Seemingly simple but fraught with complexity, the field of public affairs is often overlooked as one of the most important professional fields in our society. Every niche within society is affected in some capacity by government affairs and the implementation of public policy. Perhaps most salient is the effect of public policy decisions on science and scientific research. Policy decisions have the capability of prioritizing research areas, blocking or authorizing projects, and most importantly, funding our work through federal allocation.

As a graduate student studying Evolution, Ecology, and Organismal Biology, I am extremely cognizant of the potential policy implications of scientific research, especially within botanical research. Seldom do I come across research that does not reference policy application in the real world. The more I saw these policy connections, the more I became interested in working at this intersection of science and policy. As such, I felt incredibly honored by the opportunity to be recognized by the Botanical Society of America as a Public Policy Award recipient, and to be afforded the opportunity to attend the 2021 Virtual Congressional Visits Day.

The first two days, I participated in a virtual communications boot camp through the American Institute of the Biological Sciences (AIBS). Despite the virtual setting, I was able to meet and connect with fellow graduate students, postdocs, professors, and botanical professionals, all while learning about the specifics of the policy process. This training covered a wide range of topics! We were provided with the tools necessary to craft exceptional elevator pitches, interact with the media, and effectively communicate our message to decision makers. Through a variety of multimedia resources, practice pitches, and interviews, the training provided through AIBS was instrumental in preparing me for the virtual congressional visits!

Working within a regional pairing, I successfully met with the offices of five different congressmen across Indiana and Ohio. In these meetings, we advocated for enhanced funding for the National Science Foundation (NSF), specifically encouraging representatives and senators to approve the proposed \$10.2 billion budget for NSF. Further, we asked for support for the then-newly introduced Research Investment to Spark the Economy (RISE) Act. This act would authorize approximately \$25 billion across different federal agencies to be allocated to independent research institutions, national laboratories, and universities, with the specific intent of addressing pandemic related disruptions to research and learning. Each of us shared anecdotes of how NSF funding has been instrumental in our home states, universities, and labs, elaborating on how the pandemic has affected our research and the benefits of increased funding.

Over two days, we met Senator Michael Braun (R-ID), Representative Trey Hollingsworth (R-ID), and the offices of Senator Sherrod Brown (D-OH), Senator Rob Portman (R-OH), and Senator Todd Young (R-ID). Each meeting was a unique experience in which we were able to apply the training we received just a few days prior and successfully communicate our messages in advocating for increased scientific funding. I was particularly encouraged by the office of Senator Brown, who intended to introduce policy specifically targeting systemic issues within STEM. Specifically, Brown's office asked about our experiences in STEM and shared intentions of increasing funding to remove barriers in STEM for minority groups, as well as creating new government jobs for more scientists!

I am incredibly fortunate that I was able to participate in the AIBS training and the virtual congressional visits. Public policy often seems like an impervious and intimidating

field because of the perceived complexity of politics. However, through this experience, I was able to build the basic skills and experience necessary to effectively confer on public policy and communicate science professionally. I look forward to building upon these skills and continued scientific advocacy.

*(Mary is from the College of Arts and Sciences Department of Evolution, Ecology, and Organismal Biology; The John Glenn College of Public Affairs Public Policy and Management)*

## Taylor AuBuchon-Elder's Experience



I was fortunate enough to receive BSA's Public Policy Award in 2020 just prior to the beginning of the pandemic in the United States. My fellow award recipient, Mary, and I were planning accommodations and preparing for the whirlwind that is Congressional Visits Day (CVD) to argue for NSF funding. Sadly, we never made it there in person; but I think this year's virtual format for both the American Institute of Biological Sciences (AIBS) Communications Bootcamp and CVD was an incredible success. I feel truly grateful that I was able to be a part of it.



The AIBS Communications Bootcamp's success, I believe, was because of Dr. Jyotsna Pandey and the supportive and welcoming attendees. Jyotsna led us through two days of lectures, group exercises, and career panels—all of which I found to be enlightening and challenging. One thing I think scientists can always improve upon is our communication of scientific ideas, especially in our areas of expertise. A group exercise where you have to describe your work's purpose in 1 minute will definitely help get you there!

To prepare for our meetings with representatives, we reviewed best practices for talking to policy makers: Why should they care? What motivates them? Are they up for re-election? While we went over communication strategies collectively, our job as individuals was to read up on our own representatives—their voting record, committees on which they serve, political viewpoints, etc. I live in Missouri so I have been aware of my representatives' conservative voting record when it comes to federal spending, but I was optimistic we could make a strong argument for basic research funding given the last year's strong reliance on robust science. I was assigned to Representative Ann Wagner (R-MO), Senator Roy Blunt (R-MO), Senator Josh Hawley (R-MO)—along with my partner, Claire's, representatives in Tennessee, Senator Marsha Blackburn (R-TN) and Senator Bill Hagerty (R-TN). We knew asking for increased federal funding for the NSF was going to be a tall order.

Our asks on behalf of the AIBS were \$10.2 billion for NSF for FY 2022, President Biden's budget request, an increase from FY 2021's \$8.5 billion, and for our representatives to support or co-sponsor the Research Investment to Spark the Economy (RISE) Act to address pandemic-related disruptions

and closures in basic research funded by the federal government. I'm not sure if there's ever been a more important time to stress the need for increased investment and engagement in NSF-funded science. We knew it was pertinent to tell our stories and bring the message home that we all benefit from basic research.

The lab I work in operates almost solely under NSF funding; and we specialize in cereal crops—more specifically, we study the genetic diversity of wild grasses and their relatives, with the end goal that this knowledge will provide other scientists and crop breeders with the necessary building blocks for engineering more efficient crops in harsher climates. This is relevant research being in Missouri, considering our annual corn production value in 2020 was around \$2.4 billion. The current project we're working on under NSF funding also directly employs around 30 people at several research institutions—truly exciting, multi-faceted, and collaborative work. When talking with my representatives, I wanted to highlight that.

One hurdle the project faced early on was a large cut to its budget—half of it—when the NSF-PGRP was specifically targeted in 2018. I'm not sure why someone somewhere decided the Plant Genome Research Program needed half the money; maybe it was the idea that there is “too much” basic research funding out there—something we heard when talking to a legislative staffer during CVD. I admittedly was taken aback slightly by that idea. And while I did not necessarily have a retort specifically prepared for it, I was able to draw from my own experience in budget cuts. Because our project's budget was cut so significantly, we actually lost the translational part of the work—going from a project focused on basic research for

directly applied results in crops, to a project heavily focused on just the basic stuff. So while some Congressional offices vote to cut basic research funding to shift focus to more applied work; ironically, they inadvertently disrupt the downstream applications of said basic research. I highlighted this point during our meeting with a legislative staffer, and I hope it resonated.

The rest of our meetings went on without a hitch and were generally pleasant and productive, except for one no-show. Virtual meetings may not be everyone's favorite, but I think it was fairly conducive for our purposes, with a strict start time and limited interruptions, as I'm sure would not have been the case if we were running around Capitol Hill! We made our cases to the staffers, and they talked to us about where their bosses stood and what their current priorities were. Just before we began our meetings, we were made aware of the

Endless Frontier Act, a large sweeping funding bill that would pump an historical amount of money into federally funded science, even creating a new Directorate at the NSF. The bill was making its rounds around Congress and it seemed to be taking up a lot of everyone's time, so it came up frequently after we made our case for NSF funding.

I'm sincerely grateful for the opportunity to have attended CVD on behalf of BSA. It was an exciting, educational, and tiring few days training for and meeting with Congressional staffers. I learned firsthand how initiatives and situations can change in a minute and how succinct and effective we have to be at arguing for basic research funding (and how important it is to stay involved!).

*(Taylor is from the Donald Danforth Plant Science Center, St. Louis, MO)*



**SPNHC**  
Edinburgh

4 - 10 June 2022

International Partner - BHL  
National Partner - NatSCA

**Society for the Preservation of Natural History Collections**

Join our global community dedicated to the preservation, conservation  
and management of natural history collections

[spnhc.org](http://spnhc.org)

SPNHC 2022: hosted by Royal Botanic Garden Edinburgh and National Museums Scotland, UK  
SPNHC 2023: hosted by California Academy of Sciences, San Francisco, USA, May 28-June 2, 2023



@www.spnhc.org



SPNHC



"It's pronounced 'SPINACH!'"



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## A SCICOMM CELEBRATION

*At Botany 2021, the BSA hosted the second annual SciComm Celebration. Plant Science Bulletin is pleased to highlight several of the SciCommers active in the Botanical community. Editor Mackenzie Taylor reached out this fall to ask about their experiences and advice. Below are highlights from their responses and information about how to follow them.*

**Tell us a little about yourself as a SciCommer. When did you become active? What platforms do you use?**

**Naomi Volain (NV):** I've always been a science communicator in some form in my career—nutrition, medical advertising, science teaching and education—but it wasn't until 2020 that I started creating plant and science Comic strips. I put them on the Comics page of my website, Plants Go Global. Instagram, Facebook, Twitter and LinkedIn are my social platforms.

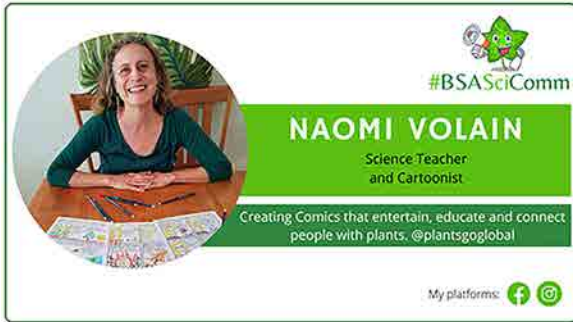
**Giovanna Romero (GR):** I started as a SciCommer a year ago. I use Twitter, Instagram and Facebook platforms. These platforms are linked to BIOWEB Ecuador. BIOWEB is a webpage managed by Catholic University of Ecuador. I post every Monday morning about native plants of Ecuador. The goal is that people get interested in Ecuadorian plant diversity. Generally, I upload pictures that I take every time I go to the field in private preserved areas or National Parks. When I go to the field, to me, it is challenging because plants in the Tropics have varying blooming times. I take pictures of plants that I think would be attractive to people (based on flower color, flower forms, sori form, endemism, habit). Then, I identify and post them. Sometimes, identification takes time and it can even require a visit to local herbaria, like QCA.



**Teressa Alexander (TA):** I love communicating plant science through intriguing articles I've read about different plants, but I mainly focus on cacao trees. My topics surround cropping systems, climate change, social and economic issues surrounding the cacao crop. I use Instagram and Twitter (fairly new to Twitter) to communicate this work.

**Jacob Suissa & Ben Goulet-Scott (SG):** Let's Botanize (@letsbotanize) is an Instagram-based science communication series using plant life to teach about ecology, evolution, and biodiversity through engaging photography and thoughtfully produced videos. As gardening and outdoor recreation increase in popularity, we are creating a digestible entry point for a broad audience to indulge their curiosity about plant life and biology more generally. We started in January 2021 and are active on Instagram and YouTube.

**What are your strategies for being an effective SciCommer and/or what have you learned while engaging in SciComm?**



**NV:** I'm really careful to get the science right, to make sure the art is expressive, and to be sure that the text teaches and entertains. The small space limits of a Comic panel force me to pare down the information into quick bites. I'm also mindful of the speed people consume media, so I work to make my art and words a quick view.

**GR:** I began with no experience as a SciCommer. Actually, I did not know about it until I read in a tweet, posted by Botanical Society of America, that what I was doing is called "SciCommer." It has been a learning process and it is still. I started with no strategies, but I have learned a lot. My strategies now to engage people with my posts are combining good pictures with interesting facts about the plant species being presented.

**TA:** I use photography and chart designs to explain information on topics relevant to cocoa research, plant biomechanics, and climate change. By sharing, I've learned about other interesting work in these areas from other plant scientists/enthusiasts.

**SG:** As we created content for Let's Botanize, over time we realized that plant life is a much more effective substrate for teaching about ecology and evolution than we initially appreciated. For example, plants are plentiful and stationary, meaning it is easy to closely observe and interact with them in natural settings. Also, as the foundational organisms in most ecosystems, they provide ample opportunity for discussing ecological processes. Most people are also already familiar with the incredible variation expressed in plants (e.g., the diversity found in an arboretum, a nursery, or on your dinner plants) that allows one to see how mutations arise and lead to evolution in real time. In addition, we are both PhD Candidates at Harvard University in the department of Organismic and Evolutionary Biology, with a focus on plant evolution, so we are able to leverage our academic expertise.

**What is the most difficult thing about engaging in SciComm?**

**NV:** The nagging feeling to be constantly present in social media.

**GR:** Posts must be very precise. So, to make the story interesting and short is difficult.

**TA:** I think the most difficult thing about engaging in SciComm is staying consistent with content sharing. As a current graduate student, I think there has to be a structured plan of action in order to execute content sharing consistently.

**SG:** Determining the fine line between too much and too little detail. We want to keep our audience engaged and teach them new things without losing them in technicalities.





**SG:** Number of followers, and positive comments/engagement with our work. Also our connections with larger institutions such as The Arnold Arboretum, Harvard Museum of Science and Culture, and LabXchange.



**What do you consider your strongest measure of success in SciComm (e.g., number of followers, personal engagement, getting paid for your work)?**

**NV:** The strongest measure is the feedback. Hearing from people personally, beyond the number of likes or followers deepens the meaning of what I'm seeking to accomplish, which is to create Comics that entertain, educate, and connect people with plants. Today I heard Olympic gymnast great Simone Biles say, "I'm more than my medals." This resonated for me. But yes, monetary feedback would surely validate my feeling of success!

**GR:** I would say, the strongest measure of success in SciComm is the number of likes in every post and sometimes when someone asks a question or comments about the post.

**TA:** I consider the strongest measure of success in SciComm to be engagement. When people are engaging with your call of action, giving feedback, asking questions, or just sharing your content, it shows how impactful your content is. As a result of high engagement, gradual increases in followers and eventually getting paid for your work will occur.

**What has changed about being a SciCommer while you have been active?**

**NV:** The need for truth and communicating in science is even more critical since the start of the COVID pandemic. What's especially needed now is for the public to learn, to truly understand how the process of science works to gain knowledge.

**GR:** Well, the fact that I was chosen to participate as a SciCommer in Botany 2021 changed the way I see this activity. To me it was unthinkable that posting about Ecuadorian plants could be shown in a Conference. Being a SciCommer made me understand that it is possible to communicate through platforms and reach a wide range of people.

**TA:** Platforms such as TikTok and new Instagram features like reels have encouraged new creative ways for SciCommers to engage with their audience. The way I communicate science can be diversified while reaching broader audiences with increased creativity.





**GR:** SciComm is a rewarding activity, and it is a way to engage people to know about plants.

**TA:** SciComm is a great way to challenge misinformation and breakdown the complexities of scientific language making it useful and accessible to everyone.

**SG:** It's fun and rewarding, but doing it well takes a lot of forethought, planning, and time.

**SG:** We have been active for less than a year, so not much. We still feel like we are learning how to improve ourselves each day.

**What would you like people to know about SciComm?**

**NV:** Communicating science brings science, scientists, and the scientific process to the world. SciComm is a deliberate, unique initiative focused on this!




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## BSA WELCOMES NEW ACCOUNTING MANAGER, TRICIA JACKSON

The BSA is pleased to announce the addition of Tricia Jackson, CPA as the Society's new accounting manager. She reports to Executive Director, Heather Cacatinidin.

Tricia comes to the BSA from public accounting, where she specialized in audit and assurance services for non-profit and healthcare clients in the St. Louis Metropolitan area. She also has more than 4 years of non-profit experience working in various accounting roles.

Her other interests include cooking, hiking through local and state parks, getting lost in jigsaw puzzles, and hanging out with her two pet rabbits, Buns and Jolene.

Tricia can be reached at [tjackson@botany.org](mailto:tjackson@botany.org).



# BOTANICAL SOCIETY OF AMERICA'S AWARD WINNERS (PART 2)

## CHARLES EDWIN BESSEY TEACHING AWARD

*(BSA in association with the Teaching Section and Education Committee)*



### DR. BERONDA MONTGOMERY MICHIGAN STATE UNIVERSITY

Dr. Montgomery is an outstanding scientist and one of the foremost ambassadors of Botany today. Not only has she made significant and lasting contributions to our understanding of determinants of cyanobacterial cell shape, signaling, and light dependent Physiology but she has also burst onto the scene as a public intellectual and authority on plant science and mentoring. With a huge Twitter following, she engages and challenges us through sharing her science and research on pedagogy through social media, podcasts, online seminars, and special lectures both for her scientific colleagues and for the general public. Beronda is also one of the co-founders of #BlackBotanistsWeek.

Her extraordinary and innovative approaches to mentoring and teaching are documented in a number of peer-reviewed articles on pedagogy, mentoring and diversity in STEM. In her work, she links the domains of plant science and mentoring while sharing that mentees, like plants, flourish or struggle based on their environment—not as a result of any inherent deficiency.

Dr. Montgomery has been described as a visionary, an outstanding educator, and an engaging source of inspiration by colleagues and students alike. Her transformative leadership encourages and enables others to become more deeply engaged in teacher-scholar outreach and training. As one of her nominators described, “Prof. Montgomery is a giant walking among us. Her scholarship around equity-engaged mentorship has awakened multiple generations of plant scientists of a pathway to do better. She has brought acclaim and welcome attention to plant science, and has forged a unique melding of her science, her advocacy and her teaching.... I can think of no one who better fits the criteria of the Bessey Award or who is more deserving of public recognition for her work on behalf of all of us.”

## BSA CORRESPONDING MEMBERS AWARD

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

**Dr. Peter Linder**  
Switzerland

**Prof. Jianquan Liu**  
China

**Dr. Marie-Stéphanie Samain**  
Mexico

## THE GRADY L. AND BARBARA D. WEBSTER STRUCTURAL BOTANY PUBLICATION AWARD

*This award was established in 2006 by Dr. Barbara D. Webster, Grady's wife, and Dr. Susan V. Webster, his daughter, to honor the life and work of Dr. Grady L. Webster. After Barbara's passing in 2018, the award was renamed to recognize her contributions to this field of study. The American Society of Plant Taxonomists and the Botanical Society of America are pleased to join together in honoring both Grady and Barbara Webster. In odd years, the BSA gives out this award and in even years, the award is provided by the ASPT.*

**Kamil E. Frankiewicz, Alexei Oskolski, Łukasz Banasiak, Francisco Fernandes, Jean-Pierre Reduron, Jorge-Alfredo Reyes-Betancort, Liliana Szczeparska, Mohammed Alsarraf, Jakub Baczyński, Krzysztof Spalik**

Parallel evolution of arborescent carrots (*Daucus*) in Macaronesia *American Journal of Botany* 107(3): 394-412 (March 2020)

## AWARDS FOR ESTABLISHED SCIENTISTS GIVEN BY THE SECTIONS

### 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.*

**Irene Liao**, Duke University, For the presentation: *Identifying candidate genes contributing to nectar trait divergence in the selfing syndrome* (Co-authors: Gongyuan Cao, Joanna Rifkin, and Mark Rausher)

## 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.*

**Ana Gabriela Martinez**, National Autonomous University of Mexico, UNAM. Faculty of Higher Studies Zaragoza, For the Presentation: *Disentangling the systematics of the Elaphoglossum petiolatum complex (Dryopteridaceae)* (Co-Author: Alejandra Vasco)

Honorable Mention

**Jacob Watts**, University of Cambridge, For the Presentation: *Microarthropods Increase Sporophyte Formation and Enhance Fitness of Ferns.* (Co-Authors: Aidan Harrington, James Watkins)

**David Wickell**, Cornell University, For the Presentation: *Gene fractionation and differential expression of homoeologues following whole genome duplication in the tree fern, Alsophila spinulosa.* (Co-Authors: Fay-Wei Li, Li-Yaung Kuo, Xiong Huang, and Quanzi Li)

## ISABEL COOKSON AWARD

(PALEOBOTANICAL SECTION)

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

**Michael D'Antonio**, Stanford University, For the Presentation: *"Sigillaria from the Wuda Tuff: the implications of new species and internal anatomy for lepidodendrid life history reconstruction."* (Co-Authors: Kevin C. Boyce, Wei-Ming Zhou, and Jun Wang)

## 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.*

**Molly B. Edwards**, Harvard University, For the Presentation: *A developmental a transcriptional framework for pollinator-driven evolutionary transitions in petal spur morphology in Aquilegia (columbine).* (Co-Authors: Evangeline S. Ballerini and Elena M. Kramer)

## PHYSIOLOGICAL SECTION LI-COR PRIZES

### Best Student Oral Presentation

**Haley Branch**, University of British Columbia, For the Presentation: Historical differences in climate between populations alter responses to severe stress. (Co-Authors: Dylan R. Moxley and Amy L. Angert)

### Best Student Poster

**Myriam “Mimi” Serrano**, San Francisco State University, For the Presentation: Tracking Leaf Trait Differentiation of Newly Diverging Subspecies of *Chenopodium oahuense* on the Hawaiian Islands. (Co-Authors: Jason Cantley and Kevin A. Simonin)

## PHYSIOLOGICAL SECTION STUDENT PRESENTATION AND POSTER AWARDS

### Best Student Oral Presentation

**Jianfei Shao**, University of Guelph, For the Presentation: Root trait plasticity in response to contrasting phosphorus environments and its consequences for plant performance. (Co-Author: Hafiz Maherali)

### Best Student Poster

**Gillian Gomer**, University of Central Florida, For the Presentation: Consequences of Stress-Induced Trait Plasticity in Cultivated *Helianthus*. (Co-Authors: Chase Mason and Eric Goolsby)

## 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.*

**Harold Suarez Baron**, University of Antioquia, For the Presentation: Developmental and genetic mechanisms underlying trichome formation in the *Aristolochia* (Aristolochiaceae: Piperales) perianth. (Co-Authors: Favio González, Soraya Pelaz, Juan Fernando Alzate, Barbara Ambrose, and Natalia Pabon Mora)



## ECOLOGICAL SECTION STUDENT TRAVEL AWARDS

**Mimi Serrano**, San Francisco State University, Advisor: Dr. Kevin Simonin, For the Presentation: *Tracking Leaf Trait Differentiation of Newly Diverging Subspecies of *Chenopodium oahuense* on the Hawaiian Islands*

**Laura Super**, University of British Columbia, Advisor: Dr. Robert Guy, For the Presentation: *The impact of simulated climate change and nitrogen deposition on conifer phytobiomes and associated vegetation* (Co-author: Dr. Robert Guy)

**Yingtong Wu**, University of Missouri - St. Louis, Advisor: Dr. Robert E. Ricklefs, For the Presentation: *What Limits Species Ranges? Investigating the Effects of Biotic and Abiotic Factors on Oaks (*Quercus* spp.) through Experiments and Field Survey* (Co-author: Dr. Robert E. Ricklefs)

## ECONOMIC BOTANY SECTION STUDENT TRAVEL AWARDS

### Best Student Ethnobotany Poster

**Kaylan Reddy**, Stellenbosch University, For the Poster: *Sceletium Secrets - Exploring the phytochemical and metabolomic diversity in the *Sceletium* genus.* (Co-Authors: Gary Ivan Stafford and Nokwanda Makunga)

### Best Student Crops and Wild Relatives Poster

**Juan Diego Rojas-Gutierrez**, Purdue University, For the Poster: *Genome-wide association analysis of freezing tolerance in soft red winter wheat.* (Co-Authors: Gwonjin Lee and Christopher Oakley)

## PHYTOCHEMICAL SECTION PRESENTATION AWARDS

**Liz Mahood**, Cornell University, For the Presentation: *Leveraging Integrative Omics Analyses for Stress-Responsive Metabolic Pathway Elucidation in *Brachypodium*.* (Co-Authors: Lars Kruse, Alexandra Bennett, Armando Bravo, Maryam Ishka, Chinmaey Kelkar, Yulin Jiang, Maria Harrison, Olean Vatamaniuk, and Gaurav Moghe)

### Honorable Mention

**Thiti Suttiyut**, Purdue University, For the Presentation: *Investigating the biochemical evolution of the shikonin pathway in red gromwell (*Lithospermum erythrorhizon*).* (Co-Authors: Robert Auber, Manoj Ghaste, Jennifer Wisecaver, and Joshua Widhalm)

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# SPECIAL FEATURES

## The Little Red Hen and Culture Change

[Editor's Note: David Asai spoke at Botany 2021 for the *Belonging in Botany Lecture, Perspectives on DEI.*]

The children's story *The Little Red Hen* (Dodge, 1874) is a metaphor for inertia. In her efforts to be a change agent, the Little Red Hen collided with the barriers protecting the barnyard's center of power. In this essay, I present some thoughts on race, culture change, and responsibility, and conclude with my version of the tale of the Little Red Hen.

### “RACE MATTERS” (WEST, 1993)

Race matters to all of us, regardless of our skin color or whether we are a victim of overt discrimination. Race and racism are deeply rooted in our national identity. Racism is not a problem only for persons of color; it is an American problem.



**By David J. Asai**  
*Senior Director, Science  
Education  
Howard Hughes Medical  
Institute*

From our nation's beginning, the racialization of people has been used by the white center of power to define who belongs and who does not—who may immigrate, become a citizen, vote, own property, and whom a person may marry (Lepore, 2018). The term “white center of power” is not about the skin color of those who are in power or those who are on the outside looking in. Instead, the “white center of power” refers to a *social structure* created by and for persons—almost all male—who descended from white northern European immigrants. Their perspectives became the norms of our society, our economy, our educational system, and our science.

### SCIENCE IS COMPLICIT

The racialization of people and how it has become weaponized is inextricably rooted in science. The leading scientists of their time wrongly claimed that there are genetically distinct human races that evolved independently (see, e.g., Gould, 1981). This idea, in turn, allowed for the racialized ranking of humans in terms of intelligence, industriousness, ingenuity, sexuality, and criminal behavior. The imprimatur of science was the authoritative cover for colonization, enslavement, and sterilization. The cells of Henrietta Lacks, the men of Tuskegee, the



DNA of the Havasupai, the telescopes atop Mauna Kea.... these are all reminders that science is complicit in perpetuating and reinforcing racism. Science helped create the present culture of racialization and exclusion, and so science has the responsibility of replacing the old culture with a new one that is centered on equity and inclusion.

## TALK IS CHEAP

A characteristic of a white-centered system is that it is unprepared and unwilling to deeply examine race and racism. In the last few years, and especially after the video-recorded murder of George Floyd in May of 2020, America has, once again, dipped its toe into the ocean of systemic racism. We have marched in the streets, planted yard signs, and toppled statues. Academic buildings have been renamed, and carefully worded statements claiming allyship with Black Lives Matter have been published. But these are the easy things, the superficial things. Much harder is to change our culture—to walk our talk.

Even as we boldly declare that now is the time for a racial reckoning, too many liberals and defenders of free speech are afraid to even whisper the words “critical race theory,” which recognizes that racism is systemic and embedded in our policies and rules, our practices and behaviors (see, e.g., George, 2021). The normalization of the white center of power results in policies and rules that naturally exclude Black and Brown people. As Ezra Klein paraphrased Ibram Kendi (Klein, 2021), “Racists don’t make racist policies. Racist policies make racists.”

When we use “scientific rigor” as the rationale for our lack of diversity... when, in our teaching and textbooks, we tell only the stories of the white “founding fathers” of science... when, in our recruiting of students and hiring of faculty, we rely on a person’s pedigree as a proxy for worthiness... when we focus on individual prizes instead of encouraging interdisciplinary collaboration... when we do these and other things, we perpetuate the white center of power.

## PEERS

In science, we often refer to a person of color as a “URM.” But that’s not right (e.g., Bensimon, 2016; Williams, 2021). The “M” word has two definitions, neither of them appropriate. One, “minority” is numerical. But persons of color are not the numerical minority; in fact, 85% of the world’s population are persons of non-European ethnicities. The second definition of “minority” is a pejorative—defining persons as lesser, diminished, and subordinate.

The “UR” part of “URM” stands for underrepresented, but underrepresentation is the *symptom* and not the cause. The *cause* is that the culture of science has systematically excluded persons of color. Instead of “URM,” I use “PEER,” which stands for Persons Excluded from science because of their Ethnicity or Race (Asai, 2020). PEERs in science include Blacks/African Americans, Latinx/Hispanic, and persons belonging to populations indigenous to the United States and its territories.

The system fails to keep PEERs in STEM even though PEERs are well represented at the start of the academic pathway. Today,

PEERs are 32% of the U.S. population, 37% of undergraduates, 21% of STEM bachelor's degrees, 12% of STEM PhDs, and 6% of tenured faculty in STEM (NCSES, 2021).

The disproportionate shedding of PEERs from STEM is not due to their lack of interest. In fact, PEERs are *over-represented* among students entering college intending to study STEM. Nor is the disproportionate loss of PEERs due simply to their lack of preparation. In studies that control for important factors—including high school math, family interest in higher education, and family income—PEERs leave STEM at much greater rates than non-PEERs (Riegle-Crumb, 2019).

Among students entering college, the interest in studying STEM is the same for PEERs and non-PEERs. But the *persistence* in STEM by each group is vastly different. PEERs intending to major in STEM earn the bachelor's degree at only half the rate of non-PEERs, and earn the PhD at only one-fourth the rate of non-PEERs. More alarming is the fact that these disparities in persistence have not changed in at least three decades (Asai, 2020).

## “FIX THE PEER” IS NOT SUFFICIENT

In those three decades, gazillions of dollars have been spent on a myriad of programs aimed at increasing racial and ethnic diversity in science. These interventions include, for example, summer bridge programs, programs to help students transition from community college to the baccalaureate, remedial courses and special advising, summer research experiences, “minority” supplements to

federal research grants, and funds for “cluster hiring.” Although these programs can benefit the participants, they are not sufficient to create systemic and sustained change.

These interventions are examples of a “fix the PEER” (or “blame the victim”) mindset. The “fix the PEER” mindset has these hallmarks:

- PEERs are treated as a commodity. The system rewards us for collecting PEERs—having more PEERs helps us win training grants and looks good when we are undergoing departmental or university review and accreditation. Too often, PEERs are invisible except when it's time to illustrate brochures and websites.
- Interventions are aimed at helping the PEER fit in... to assimilate into a scientific culture that is not of their making. As a result, PEERs and people from other underrepresented groups are unable to be their authentic selves when studying and working in our institutions.
- And PEERs are often expected to bear the burden of change. There are some who claim that when Black and Brown students dress nicely, show up to class on time, sit in the front row, and ask questions, then institutional racism disappears. And then there's the “diversity tax,” in which a student or faculty member from an underrepresented group is asked to serve on every committee—admissions, recruiting, advising, “DEI”—because we depend on them to do our work of advancing diversity.



## CHANGING OUR CULTURE

Instead of fixing the PEERs, we must change the culture of science and science education. Culture is not ephemeral—it is structural and it is manifested by behaviors (West, 1993). In higher education and science, structures and behaviors include how we select persons who may enter science, the curriculum, the policies and procedures that signal whether a person belongs in science, and the system that rewards certain behaviors.

Changing the culture means recognizing PEERs as peers, rather than as a commodity. Changing the culture means ensuring that our structures—our policies, procedures, curriculum, system of rewards—genuinely reflect the values and perspectives of all the participants, rather than expecting PEERs to assimilate. And changing the culture means that *we* who are currently in charge of the system have the responsibility to change the system, rather than placing the burden on PEERs.

As we strive to change the culture, here are three questions that can guide our work:

1. **Who gets in and why?** If we are still relying on standardized tests like the SAT and GRE, let us ask ourselves why. These tests do not accurately predict success in college or graduate school (e.g., Hall et al., 2017), but they correlate well with family income and zip code (<https://reports.collegeboard.org/pdf/total-group-2016.pdf>). Success in the program is a function of what happens *during* the program rather than what the student scored on a standardized test before they entered the program.

In recruiting and promotions, let us not rely too heavily on academic pedigree and “the old boys network.” *Before* we begin searching for more persons of color, we—the search committee and the hiring department—must first be able to clearly articulate why diversity is important to our department, rather than depend on the candidates to explain to us the value of diversity (see Sensoy and DiAngelo, 2017).

2. **How do we decide who is worthy of staying?** Let us first provide *all* faculty opportunities and incentives to learn inclusive pedagogical and mentoring skills. Then let us create reliable and fair methods to assess the effectiveness and inclusivity of our teaching and mentoring. And finally, let us include those assessments in our rewards system, including promotion and tenure.
3. **What do we celebrate?** In our teaching, let us tell the stories of current, living scientists from all backgrounds, instead of only teaching the discoveries of the “white founding fathers.” And in our newsletters, websites, and awards, let us recognize accomplishments of all types, not only for individual achievements but also for effective collaborations and effective cross-disciplinary work.

## TIME

You don’t need my sermon to know what to do. As a community, we have plenty of good ideas, and we have many persons willing to be change agents who are committed to implement those ideas. Yet, we remain stuck.

Let's consider what typically happens. We go to a meeting or read an essay. We get fired up. We see all of the ways that we can get better. We create lists of things to do, and we debate their relative priorities. We might even write a "white paper" or publish a list of recommendations. And then we return to the realities of our jobs, and we are almost instantly consumed and subsumed by the daily hard work of everything else we do. We might want change, but we just don't have the time to do it. The real barrier to genuine culture change is the *lack of time*.

We need time to reflect on how the structures of science and science education uphold the white center of power, and how we erect barriers to preserve the center. We need time to learn the skills of inclusion and practice the skills of listening, so that we can talk candidly about race, racism, and cultural privilege. And we need time to hold ourselves *accountable* by taking action, and then assess the effectiveness of our actions.

To make time for reflection, learning, and accountability means we also have to *not* do some things. And this brings me to my "what if" dreaming.

What if our department or school were to suspend all other activities for a few weeks in the autumn so that faculty, staff, and students could engage in facilitated reflection and learning, then collectively decide on one or two things we want to accomplish in the coming months. We should set realistic goals that will lead to bigger outcomes. For example, we might choose to begin the process by examining the introductory science curriculum, or dig into the criteria for faculty promotion and tenure. In the spring, we would again suspend all other activities and come together to reflect

on the past year, to assess our progress, and to hold ourselves accountable. And we would make this a recurring habit, regularly stepping away from everything else to focus on equity and inclusion.

Of course, there are millions of reasons why we can't try my idea. But if equity and inclusion are really institutional values, if we truly want to become allies to PEERs, if we really aspire to be anti-racist, then we must find a way to learn how to walk our talk, to truly change our culture. Culture change does not happen because of fancy rhetoric or strategic plans; it will happen only when we find the time to change our structures and behaviors. The goal of diversity through equity is far too important for us to give up just because it is hard, or because it is new, or because it makes us uncomfortable, or because we don't have time. Let us all commit to culture change through reflection, learning, and accountability. Now is the time to begin.

## THE LITTLE RED HEN REVISITED

One spring day, the Little Red Hen had an idea. She thought that it would be a great improvement to the barnyard if they could add some diversity to their menu. Instead of the daily pecking at dried corn and munching of hay, the citizens of the barnyard would benefit from having some freshly baked bread in their diet. "What an improvement that would be!" thought the Little Red Hen. "Bread will enable some barnyard citizens who cannot easily digest hay or dried corn to obtain important nourishment. It will make us all stronger."

So the Little Red Hen asked the citizens of the barnyard to help her. “Who will help me till the soil and plant the seed? Who will help me weed the field and water the soil? Who will help me harvest the wheat and mill the grain? And who will help me bake the bread?”

The Little Red Hen asked the barnyard dog if he could help. “I really admire your spunk and all, but the barnyard has survived just fine without baked bread. If it’s not broken, don’t fix it, I always say. And this doesn’t affect me anyway because the farmer feeds me dog food,” he replied.

Next was the barnyard cow, the most senior citizen of the barnyard, who responded, “I don’t want to be part of this conversation because it sounds like you’re being critical of our current diet, and that makes me uncomfortable and feel guilty. I don’t want to be blamed for the fact that we didn’t try this idea many years ago.”

The barnyard pig was next. “Now then,” he said. “Miss Hen, you go right ahead and try out your nice little idea. Of course, I’m busy with all of my enormous responsibilities here so I don’t have the time to help—but I know you’ll do a good job and I’ll be watchin’!”

And finally the Billy Goat, who was the boss of the barnyard. “To show you how much I support your work, I’ll arrange for you to be able to apply for a grant so that you can purchase some of the farming equipment you’re going to need.”

Because no one was able to help, the Little Red Hen went ahead by herself. She learned how to grow the wheat, mill the grain, and bake the bread. Of course, along the way, she

made some mistakes but learned from them and, in the end, just as the Little Red Hen had predicted, the bread was good and all of the barnyard enjoyed the new item in their diet.

And so it came to pass that every year the Little Red Hen went about her tasks—she tilled the soil and planted the seeds, she weeded the field and watered the soil, she harvested the wheat and milled the grain, she baked the bread and everyone enjoyed eating the bread.

Then one day it happened: the Little Red Hen decided to retire. And because the dog and the cow and the pig and the goat and all the other citizens of the barnyard had not learned the skills of farming and milling and baking, because none of them had had the courage to change, because none of them had had the time to try new ideas, because none of them had been willing to share in the responsibility, the barnyard never again had freshly baked bread.

THE END.



Source: Wikimedia.org

## REFERENCES

- Asai, D. J. 2020. Race matters. *Cell* 181: 754-757.
- Bensimon, E.M. 2016. The misbegotten URM as a data point. Center for Urban Education, University of Southern California. Website: [https://cue.usc.edu/files/2016/01/Bensimon\\_The-Misbegotten-URM-as-a-Data-Point.pdf](https://cue.usc.edu/files/2016/01/Bensimon_The-Misbegotten-URM-as-a-Data-Point.pdf)
- Dodge, M. M. 1874. The Little Red Hen. *St. Nicholas* vol. 1, part 2: 680-681. Scribner.
- George, J. 2021. A lesson on Critical Race Theory. *Human Rights Magazine* vol. 46, no. 2. American Bar Association. Website: [https://www.americanbar.org/groups/crsj/publications/human\\_rights\\_magazine\\_home/civil-rights-reimagining-policing/a-lesson-on-critical-race-theory/](https://www.americanbar.org/groups/crsj/publications/human_rights_magazine_home/civil-rights-reimagining-policing/a-lesson-on-critical-race-theory/)
- Gould, S. J. 1981. *The Mismeasure of Man*. W.W. Norton, New York.
- Hall, J. D., A. B. O’Connell, and J. G. Cook. 2017. Predictors of student productivity in biomedical graduate school applications. *PLoS One* 12: e0169121.
- Klein, E. 2021. Transcript. Ezra Klein interviews Ibram Kendi. New York Times, July 16, 2021. Website: <https://www.nytimes.com/2021/07/16/podcasts/transcript-ezra-klein-interviews-ibram-x-kendi.html>.
- Lepore, J. 2018. *These Truths: A History of the United States*. W.W. Norton, New York.
- National Center for Science and Engineering Statistics (NCSES). 2021. *Women, Minorities, and Persons with Disabilities in Science and Engineering*. National Science Foundation. Website: <https://nces.nsf.gov/pubs/nsf21321/data-tables>
- Riegle-Crumb, C., B. King, and Y. Irizarry. 2019. Does STEM stand out? Examining racial/ethnic gaps in persistence across post-secondary fields. *Educational Researcher* 48: 133-144.
- Sensoy, Ö. and R. DiAngelo. 2017. “We are all for diversity, but...”: How faculty hiring committees reproduce whiteness and practical suggestions for how they can change. *Harvard Educational Review* 87: 557-580.
- West, C. 1963. *Race Matters*. Beacon Press, Boston.
- Williams, T. L. 2020. ‘Underrepresented Minority’ Considered Harmful, Racist Language. *Communications of the ACM*. Website: <https://cacm.acm.org/blogs/blog-cacm/245710-underrepresented-minority-considered-harmful-racist-language/fulltext>



# Opinion: It's Time to Eliminate Standardized Tests for Graduate School Admissions

A colleague of mine just sent me the link to this article from *Science*, by Natalia Aristizábal (June 3, 2021): “I bombed the GRE—but I’m thriving as a Ph.D. student” (<https://www.sciencemag.org/careers/2021/06/i-bombed-gre-i-m-thriving-phd-student>).

I have been arguing for years that the GRE is discriminatory, and my colleague, who is the chair of our department, heard my pleas to eliminate the GRE requirement from our programs. He organized a committee to investigate the issue and, unfortunately, they decided to keep the GRE requirement with some assurance that it would not be the defining criteria for admission to our programs. I have my doubts.

I would like to share my story of how I circumvented the GRE requirement while getting into a Ph.D. program at a prestigious university in upstate NY in 1971. I am dyslexic and consequently I read very slowly. I have never done well on standardized tests because I cannot finish these tests in the

time allotted. I always score way below my intellectual level. I applied to a Ph.D. program without submitting my scores—stating that I had not yet taken the exam. I was accepted provisionally because I had transferred all excellent grades from a master’s program at another school. The conditions were that I would take the GRE and submit the scores at a later time. I had no intention of doing that and each time the advisor of the program asked for my GRE scores I told him I was planning to take them. This went on for the four years I was in my Ph.D. program. Finally, they stopped asking, especially because I had excellent grades in the courses I was required to take and I had passed my oral comprehensive exams for the Ph.D. I submitted my thesis, defended by oral presentation, and applied for and was accepted to a research fellowship at an esteemed University in the UK. Ironically, that University did not recognize American Ph.D.s—they only honored degrees from two other UK universities—and when I arrived they awarded me a Master’s degree based on my Ph.D., so that I could do research and teach in their programs.



**By Professor Lee B. Kass**  
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When I returned to the states and obtained a teaching job at a small liberal arts college in upstate New York, I always gave students as much time as required to complete their exams. If we had to vacate the classroom before they were done, I would take the students to my office or my lab to finish their



tests. I never wanted my students to be placed in the situation where they did poorly on a test because they did not have enough time to finish.

The statement by Natalia Aristizábal's professor rang so true for me: "...the GRE is a better measure of race, ethnicity, and income than academic ability." I am the first person in my family to go on for graduate work. My parents were first-generation Americans and only two other members of their immediate family had gone to college. Neither of my parents completed high school. I was blessed to attend an undergraduate college in New York City that had no tuition in the mid-1960s but did require excellent high school grades and the SAT for entry. And at that time, females needed higher high school grades than males to be accepted. Of course I

was admitted provisionally at first because my grades on the SAT were abominable. The cost of taking these tests placed a financial burden on me and my family. I also worked full time while an undergraduate.

Many students who entered Ph.D. programs were admitted based on excellent GRE scores, but often these same students dropped out within the first few years. Possibly because they knew how to take standardized tests but had no understanding of how research requires working hard for long hours, and sometimes having to restart a project because a hypothesis did not provide expected results. I encourage all colleges and universities to reconsider their requirements for these discriminator exams and let students prove themselves by their productivity in courses and research.

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- Flora of Oregon. Volume 2: Dicots A-F
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# FROM THE *PSB* ARCHIVES

## 60 years ago

“The interaction between botany and politics is of course exemplified by the well-known support by the Communist party of [Soviet biologist Trofim] Lysenko’s doctrines. This has severely limited the plant and animal breeding programs and thus set Soviet agriculture even more behind that of the West than it was before the revolution. Also scientifically, by stopping the development of genetics, it has excluded the Soviets from the immense modern development in this field, which has done so much to enrich other areas of biology and especially biochemistry. As a practical matter, with the huge plantings of corn they now have in the Ukraine and even north above Moscow, it has denied them the increased yields due to hybrid corn, estimated to average 30 per cent. It is rumored that the Agricultural Academy, until recently presided over by Lysenko, is to be abolished, on account of its not having served the Union effectively. This (if true) might well be only a device for reducing Lysenko’s power.”

--Remarks of retiring BSA President Kenneth V. Thimann: General and Botanical Observations on the USSR at and before the International Biochemical Congress in August, 1961. *PSB* 7(3): 1-6.

## 50 years ago

“He made a good impression, so I invited him to join my party for a week’s exploration of Mt. St. Helens, a 9,677-foot peak in the Cascade Mountains. The party also included my students R. T. Davison and C. S. English, Jr. My car also held food, tent, and camping equipment.

Today there is a paved road leaving the Pacific Highway 99 at Castle Rock, and following up the Toutle River valley to Spirit Lake. We drove in on August 1, 1925, and successfully made the 40-mile trip, but the road required a skilled driver. The gravel stretches in the valley were not bad, but midway the road for several miles climbed up one side, then down the other side of a mountain as a plank road. The planks were laid lengthwise, a single 12-inch, 12-foot plank for each wheel, nailed to cross pieces end and middle. The cross pieces rested on the forest floor and once had been firm. We found many of the nails loose or lost, and some tread planks warped up at the end. It was hard driving.

Spirit Lake is a clear, beautiful mountain lake at the north base of Mt. St. Helens. The mountain itself is a perfect volcanic cone, inactive at present, but built up by fairly recent eruptions. It is unique among the Washington volcanoes in having the surface formed by a layer of pumice 20-40 feet thick. As a result, all drainage sinks through the pumice and flows underground on older solid lavas. Hence, the tree line is very low, at about 2,500 feet, and the upper and middle slopes are mostly bare. The pumice is of rounded balls of all sizes, up to a foot in diameter. Climbing the peak is a very arduous task, as on a sand hill, one loses half of each stride. Then, one must be alert, keeping watch upwards, to be ready to dodge every pumice boulder that comes bounding down the slope.”

--Harold St. John on G. Neville Jones. *PSB* 17(3): 23-24

## 40 years ago

“Who Will Be Teaching Botany in the 1980’s?”

The majority of teachers will be the people in the associate and early full professorial ranks. As tenure track positions will not be available, the above-categorized people will have to become, as in the early days of science, true botanists. That is, persons versed in all the basic units of this discipline. In order to achieve this level of competency, many professors will have to undergo extensive retraining efforts during the decade to come.

If your institution is fortunate and the enrollment is stable or continuing to grow, the introductory courses will be taught by temporary professors who will be hired as lecturers or visiting professors with year-to-year contracts. The danger of this system is that it leads to disillusioned teachers of little help to building the department.

In specific and unusual situations, the use of adhoc teachers will be used. These people will generally have other full-time employment, but will be hired on a per-course basis to fill in the area of need.”

--Saigo, Roy. Who Will Be Teaching Botany in the 1980’s? - Survival Of Viable Botany Programs in the Face of Declining Enrollments. *PSB* 27(6): 42-43.



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# SCIENCE EDUCATION

## Welcome to Jennifer A. B. Hartley! BSA's new Education Programs Supervisor

The Botanical Society of America is pleased to announce the addition of Jennifer Boeyink Hartley to the BSA Education team! Jennifer serves in the role of Education Programs Supervisor and reports to Catrina Adams, Director of Education.

A graduate of Missouri State University, Jennifer holds a comprehensive B.S. in Biology and Secondary Education. Growing up in the suburbs of St. Louis, Missouri, Jennifer spent as much time as possible in the wooded gullies around her subdivision. Jennifer taught high school biology and earth science in Illinois for several years before taking a sabbatical when her children were born. While out of the classroom, Jennifer taught for an in-home tutoring agency and designed websites for local nonprofits. In 2009 she took a part-time position with the Missouri Botanical Garden (MBG)'s Butterfly House while reactivating her teaching certification, with plans to return to the classroom. However, plans changed when Jennifer was offered a full-time

instructor position with MBG's Education division, and by 2012 she was promoted to manager of the School Programs team. Jennifer's team managed the Garden's field trip programming, school-focused initiatives, and teacher professional development. "I am so proud of our work," Jennifer says. "Watching students and teachers really appreciate plants for the first time is incredible!"

The classroom lured her back in 2019. Jennifer left the Garden to help open Kairos Academies, an experimental new charter middle school in St. Louis where she served as the Head of Experiential Learning. She hadn't planned to step away again but couldn't pass up the opportunity to work with BSA and PlantingScience. "I had spent years telling teachers, 'Have you heard of PlantingScience? You need to check it out!' Science teachers hear so much advice from other educators, but they want and need to hear more from career scientists. Programs like PlantingScience give classrooms access to real-world research they would have a hard time accessing otherwise."

Jennifer will be spending the majority of her time managing the PlantingScience community and helping with the professional development and research activities of the NSF PlantingScience F2 Grant (NSF DRK-12 #2010556). Her experience managing school programs at the Botanical Garden, designing curricula, leading professional development,



By **Dr. Catrina Adams**, **Jennifer Hartley**,  
*Education Director*      *Education Programs  
Supervisor*



and her experiences working in diverse secondary school classrooms will bring new ideas for identifying and helping to address teacher and school administrator challenges with PlantingScience to make the program more accessible and impactful.

## FAREWELL TO JODI CREASAP GEE

Jodi Creasap Gee leaves BSA after 6 years of foundational work building and improving the PlantingScience 2.0 platform and community as part of the NSF Digging Deeper Grant.

We would like to express appreciation for the work Dr. Jodi Creasap Gee has done in her role as Education Technology Manager on behalf of the BSA and PlantingScience communities. Jodi was hired in 2015 to work on the BSA's PlantingScience: Digging Deeper education research grant (DIG) (NSF DRK-12 #1502892). She has spent the past 6 years

developing and improving the PlantingScience website and program, along with helping out with other Education Technology needs of the society.

Under Jodi's management, PlantingScience has made many necessary updates and improvements to the website; doubled our capacity; improved our efficiency at managing large numbers of student teams, and helped hundreds of teachers, mentors, and students work better together in a thriving, active, online mentoring community. During Jodi's time with the BSA, PlantingScience has worked with almost 300 teachers, over 750 scientist mentors and over 9300 students.

Jodi's creative troubleshooting and responsive help to the PlantingScience community have established a great deal of trust that outcomes for students will be met by participating, and that they will get the help they need to have a good experience. Participating teachers are so enthusiastic about the program that they regularly recruit new teachers to participate



*The BSA appreciates the work of Jodi Creasap-Gee (right), seen here with Catrina Adams and BSA Executive Director Heather Cacanindin.*



and share information about the program at local events and conferences. To use just one quote from many we've received from teachers over the years:

*The support I have received so far has been wonderful, so I'm mainly looking for continuation of the current support I have been getting that is responsive to my questions, works with me to troubleshoot, and is helping my students get the most possible out of the experience. - PlantingScience Teacher*

Jodi's background and connections in plant pathology have strengthened existing partnerships with the American Society of Agronomy and the American Phytopathological Society, including coordinated development of 3 new PlantingScience modules by these societies that have been very popular with teachers: "Agronomy Feeds the World", "Plants Get Sick, Too!", and "Treemendous Trees."

For those not involved with PlantingScience, many have worked with Jodi to troubleshoot talks and recordings at virtual meetings over the last few years, have interacted with her as part of the BSA's Technology Committee or Education Committee, or met her during in-person annual meetings helping with registration, hosting the PlantingScience receptions, and recruiting new mentors and Master Plant Science team members. We wish her well in her future endeavors, and appreciate the contributions she's made to botany education and outreach during her time with BSA.

## UPDATE ON PLANTINGSCIENCE AND MASTER PLANT SCIENCE TEAM

Teachers are excited to bring PlantingScience (back) to their classrooms this Fall, and the 13 early-career scientists chosen for this year's BSA-sponsored Master Plant Science Team (MPST) are getting student teams off to a good start.

The Fall 2021 session of PlantingScience is now underway, with students coming online starting in mid-September. Teachers seem to be particularly eager to get started, and many have commented on how pleased they are to have students in their classrooms again! Twenty-nine teachers have signed on this season, of which 14 are returning from previous sessions and 15 are trying out the program for the first time. Their classes include a mix of middle- and high-school students, and even a few undergraduates.

The MPST for this session comprises 31 scientists, of which 13 are new to the program this year. MPST members are sponsored by BSA, the American Society of Plant Biologists, the American Phytopathological Society, the American Society of Agronomy, the Canadian Botanical Association, and the Ecological Society of America. This year's 13 BSA-sponsored MPST members are: **Claudia Anca Barcu, Israel Borokini, Yanni Chen, Dani Davis, Kelsey Fisher, Ana Flores, Sara Johnson, Brooke Kern, Josh Kraft, Guadalupe Maldonado, Jill Marzolino, Shan Wong, and Renate Wuersig.** Congratulations on your sponsorship and welcome to the team!

**Master Plant Science Team** members are graduate students and postdocs who learn more about science outreach and online mentoring and participate behind the scenes by serving as liaisons between PlantingScience teachers and their scientist mentors, helping teachers and new mentors navigate the experience and helping to keep student team conversations with their scientist mentors going strong. Sponsoring societies provide perks in exchange for service with the MPST. More information on the MPST and how to apply for next year's cohort is available here: <https://plantingscience.org/mentorjoin/mpstinfo>

## PLANTINGSCIENCE MENTORS STILL NEEDED FOR SPRING 2022 TEAMS

We are looking forward to a particularly active and conversation-filled session as students are eager to get back to active learning in teams with their peers, getting to know their scientist mentors and experiencing ownership of developing their own plant investigations around a big theme in biology. It's such a rare and vital chance for students to learn how interesting plants can be, whether or not they choose a career involving botany.

If you are interested in working with a student team online to help them through their plant science investigations, we'd love to have you join our mentoring community. Mentoring takes about an hour per team per week and can be done from anywhere with an internet connection. Learn more and register here: <https://plantingscience.org/mentorjoin/mentorjoinmain>

Many thanks to all who have agreed to mentor teams so far this fall, the students and teachers really appreciate your generosity to spend time connecting with them and helping them through the always challenging process of designing and carrying out an investigation.

## PLANTINGSCIENCE INCORPORATED IN SCIENCE OUTREACH COURSE AT SYRACUSE UNIVERSITY

Students enrolled in a science outreach course at Syracuse University had a chance to experience the PlantingScience platform as a student and mentor this past spring, and discussed the program as a model of a successful outreach program. The course was taught by Dr. Katie Becklin, who has been mentoring with PlantingScience since 2008, including serving as a PlantingScience MPST member and a PlantingScience Fellow participating in the Digging Deeper research project. Course goals were for students to be able to: (1) describe science communication and education concepts that inform science outreach practices, (2) describe how outreach can promote diversity and inclusion in science, (3) compare and evaluate strategies for outreach and community engagement, (4) develop an evidence-based science outreach plan, and (5) engage with the public in a dialogue about science.



*Students in Syracuse University's Science Outreach Course, Spring 2021*

Undergraduates and graduate students who participated during the course using the “Wonder of Seeds” seed growth and germination module described running into issues shared by most student participants:

*Most of us had not interacted with plants beyond introductory courses.*

*Initially we had a difficult time designing the experiment...*

Conversations with mentors also revealed concerns shared with younger participants, such as:

*It has been exactly a week since I started the project and none of my seeds have germinated yet!*

When asked about what their experiences led them to believe were the biggest benefits to students, they shared:

*One of the most significant benefits was the opportunity to have an authentic science experience.*

*Describing our own ideas as a team and then receiving helpful feedback pushed us to think deeper.*

*We learned more about our scientist mentor as a person as well as what they do.*

When asked what they experienced while mentoring, they shared:

*We think that the best part of being a mentor on PlantingScience is witnessing the excitement a team of students shows when asking original questions and getting to answer them using data they collected.*

The best collaborations tend to benefit both partners, and the experience of working with Dr. Becklin and her Syracuse University course taught us about some new tools that we are planning to incorporate into PlantingScience mentor training materials. For example, the course began with an activity for scientists to think about their science “impact identity,” as outlined by Risien and Storksdieck (2018) by following a series of prompts to consider where their scholarship overlaps with societal

needs, personal preferences, capabilities and skills and one's institutional context. We feel like this is an excellent activity to include in science mentoring workshops going forward to set the stage and encourage scientists to consider whether PlantingScience is a good fit to meeting their outreach goals. Opportunities to participate in a PlantingScience-sponsored mentor training workshop incorporating this new reflective activity will be coming soon.

## REFERENCES

Risien, J. and M. Storksdieck. 2018. Unveiling impact identities: a path for connecting science and society. *Integrative and Comparative Biology* 58: 58-66.



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# STUDENT SECTION

## Botany 2021 Review

We were so glad to see so many of you at Botany 2021! Our second virtual conference had an incredible number of students in attendance with a total of **832 registered** undergrads and grads. That is almost double the number of students at our last in-person conference. Students made up **42% of the total conference attendees**. They brought a lot of enthusiasm and energy, especially at the student events.

We organized a variety of student events this year. One of the highlights was the *Careers in Botany Luncheon*, where more than 100 students registered to attend. With over 20 professionals sharing lessons on how to set yourself up for success in the botanical job market, students had plenty of small group time to connect personally with our panelists. (Read more about their experiences at this networking event below!) Students also received advice on improving their CVs and resumes at the *CV review sessions*, met other students at the two *Student Socials*, and

learned how to connect people with plants at the *SciComm Celebration*. We hope you were able to participate and enjoy these exclusive student events!

This year, BSA offered registration awards to 25 students and 25 post-docs, and we hope that has energized more students to participate and be active in upcoming conferences. The reduced virtual conference rate and the online format made Botany accessible to even more students. We hope that some of these virtual conference benefits will be continued in the future. We look forward to seeing many of you in Alaska and hopefully some of you virtually next year as well!

To support students throughout the year, BSA has increased the research award for undergraduate projects from \$200 to \$500 starting in Fall 2022. We hope this will support more impactful projects and allow students to expand their scope and data collection. In addition, we launched a new committee to support students and early career professionals through the BSA Early Career Professional Development Committee. This group will focus on helping students and junior botanists meet other professionals, find mentors, and take advantage of various opportunities. The committee's first project was a GRFP workshop where mentors helped students improve their application. Learn more about this new committee at <https://cms.botany.org/home/governance/early-career-committee.html>.



By Imeña Valdes and Ioana Anghel  
*BSA Student Representatives*



We are excited to engage students to be active in the BSA community throughout the year!

Reach us by email or Twitter: Imeña (imenavaldes2020@u.northwestern.edu, @imenarv) and Ioana (studentrep1@botany.org, @ioana\_angel).

## ADVICE FROM THE CAREERS IN BOTANY LUNCHEON

We had an incredible panel of professionals and a great group of students join us for our luncheon, so we wanted to know what piece of advice the professionals would give to all students to help them succeed and to know what the students learned. We can't thank the participants enough and hope to see some new and familiar faces next year!

## PROFESSIONALS



**Dr. Carla Maldonado**

*Herbario Nacional de Bolivia, Instituto de Ecología, Universidad Mayor de San Andrés*

“Risking getting out of your comfort zone is the key to getting ahead.”

“Taking a break between undergraduate and graduate school to gain work or research experience in the field you think you're interested in can be a useful strategy for maximizing your future education/training/career!”



**Dr. Jessamine Finch**

*Native Plant Trust*

“As an introvert, it was a huge breakthrough for me when I realized that ‘networking’ can be as simple as becoming friends with the people you interact with at school and in your research. People graduate, move, get new jobs, and pretty soon you have a diverse network of people who have pursued different careers and live all over the world.”



**Dr. Vera Velasco**

*University of Toronto*

“You need a supportive personal (parents, siblings, friends) community as much as you need an excellent academic community (supervisors, fellow grad students) to help you succeed in graduate school.”

## STUDENTS

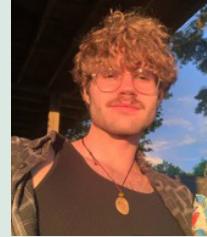


**Jocelyn Pender**

*Atlantic Canada Conservation Data Centre*

“Build a community around you! Building community means joining learning groups, communities of practice, lab groups and attending events in your field to connect with professionals and fellow students. This is hard to do online and through virtual events, but isn't impossible! For me, my network has been my greatest asset in my career. Further, the communities I'm involved with have provided support and wisdom (e.g., student councils, data science learning groups, women in STEM leadership groups). Additionally, I mentioned to all the students I encountered that if they are considering a career pivot, the data field is an exciting place to be! The data field is new, growing and requires very little for entry, other than a STEM degree.”

“Start today! Start now!”



**Matthew Sheik**

*George Mason University*

“The 2021 Careers in Botany Luncheon allowed me to connect with Herbarium curators in order to learn the skills needed to successfully curate a collection. These include the following: 1. ability to secure funding, 2. capability of managing people, 3. understanding best digitization practices. I'll be able to focus on the last year of Graduate School making sure I can practice and gain experience in those three areas to become a more attractive candidate to one day curate a collection.”

“When writing grants you wanna show some preliminary data, show that you have done some of the methods that you are going to apply, but also try something new, meld both old and new knowledge together to achieve a goal.”

**David Hainlen**

*North Dakota State University*


“Network Network Network!!”

## PAPERS TO READ FOR FUTURE LEADERS

As we continue in our careers, we hope to see the academic culture shift to be healthier and more inclusive. Below are a few papers we think you should read if you hope to lead. We hope to continue to recommend “Papers to Read for Future Leaders” to BSA Student members—if you have papers you would like us to include, please share it with us via this google form: <https://tinyurl.com/y5dp8r4m>.

- Asai, D. 2020. Race Matters. *Cell* 181: 754-757.
- Brown, N. and J. Leigh. 2020. Ableism in Academia: Theorising experiences of disabilities and chronic illnesses in higher education. London: UCL Press. <https://doi.org/10.14324/111.9781787354975>.
- Caviglia-Harris, J., K. E. Hodges, B. Helmuth, et al. 2021. The six dimensions of collective leadership that advance sustainability objectives: rethinking what it means to be an academic leader. *Ecology and Society* 26: 9.
- Cronin, M. R., S. H. Alonzo, S. K. Adamczak, et al. 2021. Anti-racist interventions to transform ecology, evolution and conservation biology departments. *Nature Ecology & Evolution* 5: 1213–1223.
- Hamilton, P. R., J. A. Hulme, and E. D. Harrison. 2020. Experiences of higher education for students with chronic illnesses. *Disability & Society* DOI:10.1080/09687599.2021.1907549.
- Poodry, C. A. and Asai, D. 2018. Questioning Assumptions. *CBE - Life Sciences Education* 17: es7, 1-4.
- Simoneschi, D. 2021. We need to improve the welfare of life science trainees. *PNAS* 118: e2024143118.
- Tseng, M., R. W. El-Sabaawi, M. B. Kantar, et al. Strategies and support for Black, Indigenous, and people of colour in ecology and evolutionary biology. *Nature Ecology & Evolution* 4: 1288–1290.

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# MEMBERSHIP NEWS

## Renewal Season Has Started!

Thank you for your membership support! BSA memberships run from January-December of each year, and our renewal season, which started on October 1, is when we launched our email renewal campaign. You can renew via those emails or renew today at: <https://crm.botany.org>.

Renewing allows you to update your membership information, renew your Sectional Affiliations, donate to awards, the endowment or sections, and give the gift of membership to students or colleagues in developing countries. Not sure if your membership is due to renew? You can always email me at [aneely@botany.org](mailto:aneely@botany.org) and I will be happy to answer any membership questions.

For those of you who do not need to renew, you can also take this time to make donations and purchase gift memberships (<https://crm.botany.org>). Life or Corresponding

members can email [aneely@botany.org](mailto:aneely@botany.org) if you would additionally like to join Sectional Affiliations, or purchase print copies of the *American Journal of Botany*.

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We are very excited to announce a new Three-Year Gift Membership Program for both Student and Developing Nations memberships. For only \$30 you can gift a BSA membership that will keep the Student or Developing Nations member connected and part of the BSA community by giving them access to award opportunities, conference discounts, Society publications, publishing discounts, and the Membership Matters monthly newsletters for a full three years. The 3-year gift memberships can be purchased at any time by visiting <https://crm.botany.org> or when you renew your membership online. Student memberships are good for the full three years even if the member graduates. One-year gift memberships are also still available for \$10.



**By Amelia Neely**

*BSA Membership &  
Communications  
Manager*

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

## INTRODUCING THE 2021-2022 BSA STUDENT SOCIAL MEDIA LIAISON



### TERESSA ALEXANDER

Hello! I am Teresa Alexander. I am currently pursuing a Ph.D. in the University of the West Indies, Trinidad. I currently conduct research on cocoa plants in the International Cocoa Genebank, Trinidad (ICG,T) which is one of the world's largest and most diverse collections of cocoa germplasm. Because of future climate projections of drier climate conditions in the southern Caribbean, my work focuses on the development of drought tolerant trees. Through my passion for sharing science and showcasing the wonders of plants, I plan to consistently share impactful plant science content while breaking down complex scientific language making it useful and accessible to everyone. I look forward to not only engaging with the BSA community of botanists and plant science researchers, but also plant enthusiasts around the world.

## THANK YOU SONAL!

Sonal Gupta joined the BSA Student Social Media Liaison team in October 2020. During her one-year term, she was in charge of BSA's Facebook and Instagram accounts, and she created the Spotlight Series with the aim of highlighting Early Career Scientists. In her role, Sonal worked with BSA staff, student representatives, and helped with the popular SciComm Celebration at Botany 2021 – Virtual!

Sonal is a PhD student in the department of Ecology and Evolutionary Biology at the University of Michigan studying genetics of adaptation in the genus *Ipomoea*. She is graduating soon (Fall 2021) and plans to continue studying the mechanisms of adaptation in plants at New York University, where she will be joining as a postdoctoral researcher. Sonal is also very passionate about teaching, cooking, and learning new languages. Thank you for your service to BSA!



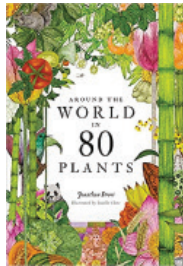


# BOOK REVIEWS

- Around the World in 80 Plants
- Broomrapes of Britain & Ireland
- Ethnobotany of the Mountain Regions of Africa
- Extraordinary Orchids
- Field Guide to the Trees of the Gila Region of New Mexico
- Finding the Mother Tree: Discovering the Wisdom of the Forest
- Global Tea Science: Current Status and Future Needs
- Household Economy at Wall Ridge: A Fourteenth-Century Central Plains Farmstead in the Missouri Valley
- Nevada Mountains: Landforms, Trees, and Vegetation
- Planet Palm
- Rosa: The Story of the Rose
- Temperate Garden Plant Families: The Essential Guide to Identification and Classification
- The Collectors: Creating Hans Sloane's Extraordinary Herbarium
- The Wardian Case: How a Simple Box Moved Plants and Changed the World
- Will Purdom: Agitator, plant-hunter, forester

## Around the World in 80 Plants

Jonathan Drori, illustrations by Lucille Clerc  
2021; ISBN 97817862732300  
Hardcover \$24.99; £20; 216 pp.  
Laurence King Publishing Ltd., London



Around the World in 80 Plants is a beautifully illustrated, general interest book that will readily absorb readers with lively and witty snapshots of edible, ornamental, medicinal, toxic, or archetypal plants from every continent. Jonathan Drori's career as BBC journalist and educator equipped him to prepare a sequel to *Around the World in 80 Trees* (reviewed in *Plant Science Bulletin* 66[3]: 255-256) in collaboration with artist Lucille Clerc. Here is an outstanding opportunity for booklovers of all ages to engage with botany—

through plant history, chemistry, folklore, and even etymology—since Drori delves into the derivation of each plant's Latin binomial, then provides practical, everyday examples (e.g., *Linum L.*, flax, gives us the term *lingerie*).

Drori's Introduction is a forceful advocacy statement for plants and our planet: Eat less meat and poultry to take pressure off the land; diversify the species we eat to avoid monoculture and overreliance on the three major cereals that feed the world: wheat, rice, and maize; and protect crop wild relatives.

Arranged geographically by continent, the book opens with the author's native England, focusing on nettle, featuring its stinging trichomes that protect butterflies from predators as they forage. Trichomes appear again in relation to *Cannabis L.*, with its

capitate stalked trichomes providing the bulk of the active chemical constituent THC and other cannabinoids in the resin. Chemical constituents are also prominent in reading about rhododendron, which produces a toxic “mad honey” adverse to humans, but to which bees are immune. The benefits of iodine contained in kelp, as well as its valuable contribution to carbon sequestration, are balanced against the harm of the arsenic it holds.

Drori’s delightfully written English commands our attention, e.g., as regards tulip cultivation in the Netherlands: “Intensive farming stamps the land with splendid blocks of colour, but presents a dining opportunity for insects and fungi that is held in check only by heroic application of agricultural chemicals.” Then again, readers might need a translator to understand some of Drori’s expressions, e.g., writing about mistletoe, “Cocking a snook at winter.”

*Dieffenbachia* Schott, appropriately nicknamed ‘dumb cane’ contains a “defensive armoury of toxins and irritants, special pressurized cells” containing minuscule needle-like calcium oxalate crystals called raphides. Chewing introduces numerous crystals, bringing intense numbing, oral irritation, excessive drooling, and localized swelling. “Horribly, *dieffenbachia* was used in North America as a punishment and method of torture during the time of slavery.”

Similarly, the report about the castor oil plant, native to the Horn of Africa, was adopted for sinister use, force-fed to political opponents: “By Mussolini’s Fascist thugs, it became an instrument of humiliating and sometimes fatal torture.” Drori describes mangoes “as members of a notoriously well-defended family that includes the malignant poison ivy and cashews, whose nuts possess such caustic

fortifications that it is a marvel that anyone discovered they’re edible.”

Drori’s deft and concise writing conceals the fact that each succinct chapter required many hours of research in Kew’s Library to obtain and then to distill the key facts he selected to introduce. Clerc’s meticulous, imaginative detailed drawings enhance the text. Physically, the book’s pages are of heavy, durable paper stock; the book is well bound and stitched and sturdy, to withstand being thumbed through often. This volume could make a superb textbook supplement for biology classes, to introduce students to the treasures and mysteries that plant biology encompasses.

## REFERENCES

Drori, J. 2020. *Around the World in 80 Trees*. Hachette, London.

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



**Broomrapes of Britain & Ireland. Botanical Society of Britain and Ireland. Handbook 22.**

By Chris Thorogood and Fred Rumsey

2021. ISBN: 9780901158598

Paperback, £17.50; 152 pp.

Botanical Society of Britain and Ireland, Durham, United Kingdom.



This book has a special appeal to me because of frustration working with native British broomrapes while studying weedy broomrapes during a post-doc at the Weed Research Organization in Oxford long ago. For a botanist from Virginia, it was exciting seeing numerous populations of broomrapes in the countryside but challenging determining them. This was especially true for *Orobanche minor* and its many look-alikes. This book would have met that challenge.

Both authors have extensive experience with the genus (and its segregate, *Phelipanche*) and the family as a whole and share this through lucid text and a wonderful array of well-reproduced color images of all species as well as the incomparable drawings of Thorogood. In broomrapes, features of the corolla are important for species determination—diagnostic characters very difficult to determine from exsiccatae.

Extensive field work with each species in Britain and Ireland (and much of Europe) as well as herbarium research are the bases for details presented in line drawings.

The book begins with an introduction to the family Orobanchaceae and a lucid discussion of the complex life cycle of broomrapes as well as a section on other non-photosynthetic plants confused with broomrapes—plants like dodders (species of

*Cuscuta* in the Convolvulaceae); pine drops (species of *Hypopitys* of the Ericaceae); and achlorophyllous orchids (species in the genera *Neottia* and *Corallorhiza*). This is followed by terse but informative information on ecology. I was surprised at how many broomrapes are endangered in Britain and Ireland. Particularly helpful is the “Identification” section, which provides the user with the criteria for distinguishing species. A short section on taxonomic history is especially germane for a genus tormented by fragmentation through splitting but now receiving attention through careful field studies coupled with molecular studies. Yet the authors note—with British understatement—that until further studies occur, “taxonomy in the genus is likely to remain in a state of some flux.”

The bulk of the book is species accounts following the format of the Botanical Society of Britain and Ireland’s (BSBI) handbooks. In addition to conservation status, description, and key characters, there is information on the hosts, color photographs of plants and their habitats, as well as exceptional line drawings for each of the 14 species. The requisite BSBI maps with grids are included for each of the species, subspecies, and varieties. The parasite distribution is helpfully mapped along with the distribution of the hosts.

*Orobanche minor* receives special attention because of difficulty, as noted earlier, separating it from distinct but similar appearing species. No doubt *Broomrapes of Britain and Ireland* will be used to correct determinations in herbaria.

The four sub-specific taxa of *O. minor* are treated in detail. This will be of potential value to weed scientists dealing with this widely spread parasite reported from North America and Australia and perhaps elsewhere where

crop and forage plants are damaged. Do some of the invasions of this parasitic weed involve distinct varieties?

The only other genus of achlorophyllous members of the family in Britain and Ireland, *Lathraea* (with two species), is included. A helpful glossary and references cited conclude what will undoubtedly be the “go to” reference for anyone interested in these beautiful and fascinating plants. As the back cover states: “It is hoped that this book will stimulate interest in broomrapes broadly, and promote their much-needed conservation focus in the region.” It will accomplish that for users in Britain and Ireland and regions far beyond.

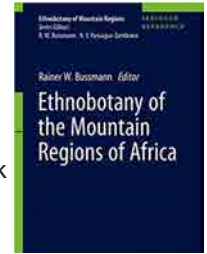
[Note: This review was also published (in a slightly altered format) in *Haustorium*, the newsletter of the International Parasitic Plant Society.]

—*Lytton John Musselman, Blackwater Ecologic Preserve, Old Dominion University, Norfolk, Virginia 23529-0266*

## Ethnobotany of the Mountain Regions of Africa

Rainer W. Bussmann, Ed.  
2021; ISBN: 978-3030383855  
Hardcover, \$699.99, 571.99 €; book with online access, \$1099.99;  
1125 pp.

Springer Nature, Switzerland



*Ethnobotany of the Mountain Regions of Africa* is the newest addition to Springer’s series, *Ethnobotany of Mountain Regions*, edited by R.W. Bussmann and Narel Y. Paniagua-Zambrana. This compendium, published in two volumes not available separately, opens with an introduction to the mountainous vegetation and ecology of Africa, followed by a second overview that focuses specifically on the mountain vegetation and ecology of East Africa. These and all successive chapters are written by Bussmann, Paniagua-Zambrana, and Grace N. Njoroge. Each author has a proven publication record in ethnobotany.

The remainder of this account consists of a register of 170 species representing the mountain flora of East Africa. The species included are familiar, recognizably of the region, although I was unable to find any discussion about the rationale for these selections. I am surprised to find incorporated some introduced species, e.g., Mexican and Central American *Lantana camara* L. and Indian *Azadirachta indica* A. Juss., common in East Africa. Each mini-review contains supplemental information and photographs about the usage of relatives of the species named in the entry’s title, even from other continents, e.g., Georgia and Pakistan.

The organization of the articles present in this catalog follows an established format, unless topics are omitted where insufficient material is available. Nomenclature, including botanical synonyms, is followed with Local



names, Botany and ecology, Phytochemistry, Local medicinal uses, Local food uses, Local handicraft and other uses, and References. Historical linguists might integrate these assembled local names in their investigations. Along with the novel ethnobotanical approach, readers will applaud the benefit of 666 illustrations, with 657 in color.

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

### Extraordinary Orchids

Sandra Knapp

2021. ISBN 13-978-0-226-77967-

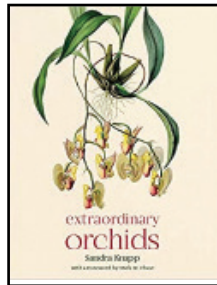
6 Hardcover, ISBN 13-978-0-226-

77970–6 eBook

Cloth: \$30.00; Ebook: \$29.99;

160 pp.

University of Chicago Press



A very large number of botanically accurate, artistically beautiful, and generally excellent illustrations of orchids were accumulated in Europe from approximately the mid 1750s until the early 1900s. Most of the best were produced in the UK (or such is my bias). German and Austrian paintings are very accurate and beautiful, but lack personality (for example, Beer, 1863; Müller, 1904). Those from France and Belgium lack detail and are not always beautiful (as, for instance, Linden, 1885-1906). According to Chinese orchid paintings expert Prof. Choy sin Hew (now retired from the National University of Singapore), the exquisite Chinese painting of mostly Cymbidium orchids native to China, which can date back to hundreds or thousands of years, was/is by artists, not botanical illustrators.

Illustrations in Britain are preserved in books, journals, and several archives including those in the British Museum of Natural History and Kew Gardens. All are in the public domain

due to their age, even if from time to time, miscreants (individuals and/or institutions) try, or have tried, to claim ownership (I ran into two instances of this kind and ignored them) for reasons of ego, control impulse, and/or profit. Over the years I used a few of these illustrations in some of my writings (for example, Arditti and Abdul Ghani, 2000), but it never occurred to me that some/many of these excellent illustrations can be used to illustrate an entire book. A previous book, illustrated with old paintings (Stewart and Stearn, 1993), is devoted to the work of a single artist and his biography: the excellent Franz Bauer (1758-1849), a German who was employed by the Royal Botanic Gardens, Kew. It does not address many aspects of orchids. And, there are few single-volume collections of old prints, but these are not books with text and themes.

The author of this book had the good idea I did not have and used a superb selection of excellent old illustrations produced in the UK and elsewhere to illustrate her book on orchids. Many of the old illustrations are of gaudy, colorful, and large flowers, which are beautiful, noisy (so to speak), and attract attention much in the same way as semi-dressed models (male or female) in an advertisement. Using them would have produced an attractive book to look at without the good information, class, and dignity of this volume.

Fortunately, the author selected tasteful, mostly beautiful, botanically accurate, and scientifically instructive illustrations. She also threw in a few gaudy ones to make it interesting, but even these would stand out among the paintings in illustrated classics like the *Orchid Album* (Warner, Williams, Williams, and Gower, 1882-1897), immense (531 × 726 mm), *The Orchidaceae of Mexico and Guatemala* (Bateman, 1843), and *Monograph*

of *Odontoglossum* (Bateman, 1874). The result is a classy, instructive, informative, and beautiful book, which is a pleasure to behold and read. The text is detailed, clear, accurate, and even entertaining. Orchids are presented, described, and demystified very well and made interesting. The author's words complement and compliment the illustrations very well. A unique and attractive feature are the figure captions. They are not the usual dry captions so common in books and papers (including my own), which do no more than describe what is in the figures. All are well written, and most contain information, which makes them interesting to read and add to the book, making it both beautiful and good.

I did find several items that need attention and one missed opportunity.

- On page 12, “most, if not all, epiphytic orchids use a special form of photosynthesis called crassulacean acid metabolism (CAM)” is problematic for several reasons. First, “use” is teleological and anthropomorphic. Perhaps the word is acceptable in a popular-semi-scientific book like this one, but it would have been better to avoid it. Second, “most, if not all, epiphytic orchids” is inaccurate. Only thick-leaved orchids fix carbon via CAM. Many epiphytic orchids are thick leaved, but certainly “not all.” And third, CAM is not “a special form.” It is one of the three common carbon fixation pathways and found in all succulents regardless of family. The other two, C3 and C4, are limited to non-succulents.
- Ant gardens within orchid roots are described accurately on page 13. However, the description fails to mention that they occur mostly in “trash baskets,” which are root masses in some orchids, as for example *Coryanthes (tropical America)* and *Ansellia (tropical Africa)*.
- The illustration from Gessner's (1516-1565) *Opera Botanica* (Gessner, 1771) on page 98 is described accurately as being probably (“probably” is necessary here because there are orchid illustrations in some incunabulae, not all of which have been examined carefully; according to Prof. Hew seeds are not shown in ancient Chinese orchid paintings) the first to include images of seeds. However, it fails to mention that the painting of *Epipactis palustris* on the same page may well be the first illustration of resupinating orchid flowers. To be fair, one must have worked on resupination as I have and study the painting very carefully to detect evidence of bud and floral torsion in Gessner's painting.
- I own several of the great illustrated orchid books and series from the 1800s. The paper (sadly not acid free) on which the illustrations were printed and/or painted is heavy and of high quality for the time, but somewhat crude and neither glossy or even semi-glossy, nor matte. The pigments used at the time differ from those used in present-day printing. As a result, the illustrations stand out on the old book pages and are sharp. They almost look alive. These qualities are easy to notice even when digitized versions of illustrations from old books are displayed on computer monitors. When these illustrations are reproduced with current inks on modern paper (particularly glossy or semi glossy), something is lost. The illustrations do not stand out

as well, are not as sharp as the originals, and do not seem alive. This is what happens almost always when old illustrations are reproduced in recent books or journals including the old painting I used (Arditti and Abdul Ghani, 2000). It also happened in this case. Paper and inks are selected by publishers and printers, not authors. Therefore, this is not the author's responsibility here as it was not mine.

coffee table volume, and (3) a beautiful gift for anyone who is interested in plants in general and orchids in particular.

## REFERENCES

- Arditti, J., and A. K. Abdul Ghani. 2000. Numerical and physical properties of orchid seeds and their biological implications. *New Phytologist* 145: 367-421.
- Bateman, J. 1843. *The Orchidaceae of Mexico and Guatemala*. J. Ridgeway & Sons. London.
- Bateman, J. 1874. *A Monograph of Odontoglossum*. L. Reeve & Co. London.
- Beer, J. G. 1853. *Beiträge zur mophologie und biologie der familie der orchideen*. Verlag vor Carl Gerold's Sohn.
- Gessner, C. 1771. *Opera Botanica*. M. Seligman, Nuremberg.
- Linden, L., and E. Rodigas. 1885-1906. *Lindenia F.* Meyer-van Loo. Gand.
- Müller, W., and F. Kränzlin. 1904. *Abbildungen der in Deutschland und der angrenzenden Gebieten Orchideen-Arten*. R. Friedländer & Sohn. Berlin.
- Stewart, J., and W. T. Stearn. 1993. *The orchid paintings of Franz Bauer*. Timber Press, Portland.
- Warner, R., B. S. Williams, H. Williams, and W.H. Gower. 1882-1897. *The Orchid Album*, Vols. 1-11. B.S. Williams. London.

—*Joseph Arditti, Professor of Biology Emeritus, Department of Developmental and Cell Biology, University of California, Irvine, USA*

Are these items major problems and do they detract from the book? No! Perhaps only the statement about CAM will be noticed by some readers. And a personal preference of mine rather than a problem: Not all illustrations include artists' names. It would have been good to include artists' names and sources of illustrations in every caption rather than in a separate illustrations index in the back of the book.

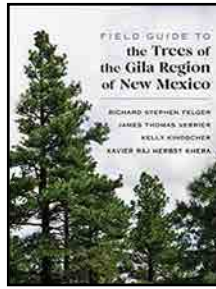
This book is easily one of the most beautiful and best (perhaps the best) popular/semi-scientific orchid books I have had the pleasure of reading and enjoying. An extensive bibliography and a good index enrich it. It is a triple-purpose book: excellent and very affordable as: (1) a popular/semi-scientific work on orchids to have, (2) a very attractive

## Field Guide to the Trees of the Gila Region of New Mexico

By Richard Stephen Felger, James Thomas Verrier, Kelly Kindscher, and Xavier Raj Herbst Khera

2021; ISBN: 978-0-8263-6237-7 (soft cover), 978-0-8263-6238-4 (e-book) - \$24.95; 272 pp.

University of New Mexico Press, Albuquerque, NM



As a botanist relatively new to the state of New Mexico, eager to learn everything I can about the flora, I was pleased to come across the *Field Guide to the Trees of the Gila Region of New Mexico*. This book has all the botanical detail I look for in a field guide, enhanced with an aesthetically appealing layout and abundant photographs. Often poetic, this guide is also a joy to read. For instance, in their explanation of the taxonomy and data used for species accounts, the authors note that taxonomies are dynamic and that “science moves on, even botany, so we must expect change. New findings generate new taxonomies and differences of opinion, sometimes allowing for more than one reality in classification. Plant taxonomy is the poetry of botany.”

The book begins by introducing the area of interest: the Gila region of southwestern New Mexico, USA. The authors remind us of the historical significance of this area for conservation. In 1924, following from the work of Aldo Leopold, the U.S. Forest Service assigned over 300,000 acres of land to the Gila Wilderness—the first specifically designated wilderness area in the world. This wilderness area is in the center of what is now the greater Gila National Forest. The Gila National Forest and adjacent areas encompass the region covered in this field guide. Ecologically diverse, the Gila includes riparian habitats, Chihuahuan desert, grasslands, pinon-

juniper-oak woodland, pine forest, and mixed-conifer forest. The complex geology and topography range in elevation from 4000 to 11,000 feet.

This diversity is epitomized by the 76 tree species representing 22 families that are included and nicely summarized in the Table 1 checklist. Trees in this guide are broadly defined as freestanding plants (so excluding vines) that are at least 5 m tall with a well-formed trunk. Therefore, the authors include species not typically thought of as trees, such as *Yucca elata* and *Fouquieria splendens*. They also include 15 species that are non-native but occur within the Gila.

Each of the four authors has spent significant time in the Gila, and their passion for the flora, especially these tree species, is apparent. Their accumulated knowledge of the region from field experiences, along with published reports and herbarium records, form the foundation of species accounts. Species identifications have been carefully checked with collections from multiple herbaria, and generally two or more vouchers are cited for each taxon.

The majority of the book is comprised of the field guide, which is divided into three main sections: the two major vascular plant groups (gymnosperms and angiosperms) and cultivated species. Within each section, the authors lead you to family identification through a dichotomous key. Then each family is organized alphabetically following the Angiosperm Phylogeny Group IV classification. If multiple genera within a family occur in the Gila, a dichotomous key is provided again. Finally, for each species, characteristics important for identification are described, as well as their current known distribution. Other information such as provenance, etymology of scientific names, common names, and economic or



ethnobotanical information (when available) are provided. The guide concludes with a list summarizing the Gila tree genera and families, an extensive literature cited, and an index for quick searching.

Probably the most notably useful aspect of this particular guide are the comprehensive photos. For each species, there is a figure comprised of multiple high-quality images that capture key characteristics. These included things like male and female cones, close-ups of flowers and fruits, and full views of the trees with a human standing next to the trunk for scale. Each image panel in the figure is well-labeled with the characteristic of interest and date and general location where the photo was taken. The trained botanist will appreciate the dichotomous keys (this was very intuitive for me to follow). However, these detailed photographs and organization by major groups (conifers then angiosperms) should additionally appeal to an average hiker or natural history enthusiast.

With a total of 256 pages, the book itself is under an inch thick and easily fits into a day pack for ease of use in the field. The book is a bit on the heavier side, but this is largely due to the higher quality of paper and binding which appear to be able to withstand solid use (this will be tested in the following summers). I think this guide will be especially useful as a resource for students learning the flora of New Mexico. I look forward to using this book with my field courses in the years to come.

—Hannah E. Marx, Ph.D., University of New Mexico, Albuquerque, NM, USA

## Finding the Mother Tree: Discovering the Wisdom of the Forest

By Suzanne Simard  
2021. ISBN 9780525656098  
hardcover; \$28.95; 348pp.  
Alfred A. Knopf, New York.



Simard's autobiographical narrative, like her science, is successful in making connections at many levels. Simard, Professor of Forest and Conservation Sciences at the University of British Columbia (UBC), was born into logging in the Monashee Mountains of south-central British Columbia on land hewn from the forest by her Québécois great-grandparents. The second chapter provides a photo-illustrated description of her family's traditional hand-fall lumbering practices, along with the first of many French phrases and exclamations salted throughout the text, which makes it a fun read. Family is important throughout the book and her family history is a window on the history of logging in the Pacific Northwest. It provides context to her later recognition of former skid-trails through the woods, which provided unintended habitat for subsequent natural regeneration. The chapter also provides the back-story to her opening pages that describe her experience as "the first woman to work for the logging company"—a summer college intern charged to assess replanted seedlings on a clear cut plantation and later tasked to mark the boundaries for the next clear cut. Here was the inroad to her chosen profession, but she knew that something was not right. "My childhood was shouting at me: *The forest is an integrated whole.*"

Serendipitous observations lead to many of the discoveries Simard describes throughout the book. While cycling to watch her cowboy brother bull ride in a neighboring town, she

describes her discovery of fungal threads associated with Ponderosa pine roots as she dug a small hole to bury the apple core from her lunch. She began to teach herself mushroom identification and discovered the small, but growing, academic literature on mycorrhizal fungi. “But why would the fungus give up its water to the tree roots?” became the first of a series of questions that continue to guide Simard’s research. Post-graduation (UBC degree in Forestry) she received an entry-level position in the Provincial Forest Service and her first opportunity to design a scientific research project—an experiment to determine the optimum concentration of Roundup™ to prepare a clear-cut site for seedling replanting. In the chapter “Killing Soil,” she details her experimental design and thoroughly describes its implementation, a strategy she repeats throughout the book as she introduces new technologies, procedures, and expanded experimental designs required to test successive iterations of questions building on new discoveries. Written in a way that is both logical and understandable for a general audience, her writing is also a blueprint for young scientists to follow in developing their own inquiries. It quickly becomes clear that not only was Simard confronting the challenge of being a woman working in a stereotypical man’s job, but her research results could only be interpreted as counter to the established practices and codified regulations governing the Provincial timber industry! Nevertheless, her supervisor encouraged her to pursue an advanced degree to gain credibility. As a student at Oregon State University, she rigorously demonstrated that succession and forest interactions were not just about competition, but also involved cooperation between species. Her Master’s Thesis demonstrated water and nitrogen sharing between alder and pines, and her

Doctoral Dissertation, part of which was published in *Nature* as the “wood-wide web,” established two-way carbon sharing between birch and fir seedlings. This sharing changed dynamically during the growing season with the two species switching from source to sink as the seasons progressed. Yet, her presentations to the Forest Service and industry representatives had no impact and she was derisively chided as “Miss Birch” (perhaps with “r” a typo).

Her 1997 *Nature* article prompted both academic and public interest, and probably professional jealousy. An off-the-record comment to a reporter, “Don’t print this, but between you and me, for all the good the foresters are doing, they might as well paint rocks,” essentially sealed her professional change of career from professional forester to academic professor. In 2002, no longer with the Forest Service and with 2- and 4-year-old daughters, she accepted an assistant professorship at her *alma mater*, UBC, ultimately commuting to and from Nelson, BC (a 9-hour drive). With programming assistance from her husband, her “wood-wide web” was now mapped to include up to 48 distinct trees, one at each node, connected by networks of multiple mycorrhizal species. The expanse of the network extended up to 20 m and, near the center, was a single “mother tree”—what old-time foresters called a “wolf tree.” Her research questions had now evolved to: *Do trees communicate like neural networks? Do trees have intelligence?* Her public impact included inspiration for James Cameron’s 2009 film *Avatar*; the character of Dr. Westerford in Richard Powers’ 2018 Pulitzer Prize winner, *The Overstory* (according to the World Wide Web); and the closing feature of the 2013 PBS *Nature* video “*What Plants Talk About.*”

In 2012 the conifer forests in western North

America were being decimated by a natural pine beetle infestation. The pines, beetle, and a fungus it carries have co-evolved for millennia and periodically undergo coordinated boom/bust cycles. Simard wondered if infested pines produce defensive compounds, monoterpenes, to inhibit the beetle? Do infested trees warn their neighbors? Do trees demonstrate kin selection, like Susan Dudley's sea rockets? Simard and her students were quickly able to provide answers to all of these questions—yes they do!

The 2012–2013 period also brought personal challenges: breast cancer, double mastectomy, and chemotherapy. Just over a year after finishing chemo, she brought her daughters, now 14 and 16, back to her Doctoral research site at Adams Lake, B.C. Together they collected long-term results that verified her predictions 21 years earlier. Connected birch and firs were now twice the size, and healthier, than the controls whose roots were kept separated. "...the species [were] wholly interdependent as my research had been showing me for decades, wisdom long held by Aboriginal peoples the world over." And it is not just the plants! Nitrogen analyses demonstrated salmon nitrogen in the rings of cedar and Sitka spruce from prey carried to the forest by bears. Her current "Mother Tree Project" began in 2015 in nine experimental forests filling an ecological gradient across British Columbia. Her goal is "to further develop an emergent philosophy: complexity science" as an ecological framework for ecosystem studies and as a forestry tool integrating cooperation and competition in a holistic approach to sustainable forest management. Her message to the reader: "Go find a tree—your tree.... Open your senses.... Vive la forêt!"

## REFERENCES

Dudley, S. A., and A. L. File. 2007. Kin recognition in an annual plant. *Biology Letters* 3: 435–438.

Simard, S. W., D. A. Perry, M. D. Jones, D. D. Myrold, D. M. Durall, and R. Molina. 1997. Net transfer of carbon between tree species with shared ectomycorrhizal fungi. *Nature* 388: 579–582.

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### Global Tea Science: Current Status and Future Needs

By Dr. V. S. Sharma, formerly UPASI Tea Research Institute of India, and Dr. M. T. Kumudini Gunasekare, formerly Tea Research Institute

2018; ISBN-13: 9781786761606

Hardcover: £180.00; 558 pp.

Sri Lanka Burleigh Dodds Science Publishing Limited



Tea, from the *Camellia sinensis*, is the most widely consumed beverage in the world, after water (Sharma and Gunasekare, p. 85). It is an important economic cash crop affecting stakeholders, middlemen (viz., blenders, and traders), and consumers. Tea plantings have spread from China to the four corners of the world, from over 2000 years ago to as recently as the early 20th century in Kenya and Turkey. The selection criteria for tea quality combines all of the reconfiguring attributes in which plant grafting, successional environmental factors (e.g., the seasons, altitude, rainfall), and the chemical composition of the tea leaf allow.

*Global Tea Science: Current Status and Future Needs* is divided into five main parts, with its sub-chapters adding layers to the discussion. The chapters of Part 1: Tea Breeding and

Germplasm are divided to introduce and to discuss the diversity of the *C. sinensis* (L.) through its beginnings in rural China to your teapot today. Tea, and the flowering beauties known as camellias, are included in the family of flowering plants, trees, and shrubs of Theaceae. The major cultivated tea plant comprises two varieties: *C. sinensis* var. *sinensis* (small leaf) and *C. sinensis* var. *assamica* (Masters) Kitamura (large leaf); there are cousin varieties grown commercially. Consumption is increasing worldwide and global tea production has almost doubled (in measured metric tons!) since 2001. The micronutrients within a cup of tea have protective health benefits against cancer, cardiovascular diseases, and obesity.

The chapters of Part 2: Cultivation and Agronomy focus on good agricultural practices essential for a plant continuously harvested and pruned for its yield. The growth of the *C. sinensis* originated in “natural forests characterized by warm and humid conditions and nutrient-rich soils.” (Sharma and Gunasekare, p. 53). Today’s tea farmer (like most farmers) must consider land selection and preparation, soil conditional and reconditioning, mulching, manure, and management of pests, disease, and weed. The grafting of these *Camellia* spp. cultivars for clonal development, the climatic seasons that affect any plant growth and in particular affect tea bush growth, all collaterally affect tea leaf growth, and ultimately the taste of your brew of your hot cuppa.

Tea is a finicky plant. When one is considering site selection, it seems that a perfect balance of all measurable agrarian tactics are put into play to nurture the little fussy spot along into a viable crop. Extensive soil rehabilitation to eliminate unwanted vegetation and large rocks, plus soil nutrient amendment with moisture

conservation, are not insignificant measures. One has to literally strip the cultivation site bare, then build it back for fruition. The cultivar qualities of black teas, esteemed for their strength, flavor, and appearance, are part of the subjective sensory assessments directly related to soil quality. An excellent summary of chemical properties that reflect these characteristics include the proportions of Aroma Groups I and II for tea flavor (think: taste), volatile flavor for aroma (think: smell), and caffeine levels in determining briskness. I will leave the remainder of the biochemistry to the reader.

The living world is vulnerable to disease at the various phases of development. Plants are not held in exception, and of course this includes our tea. Part 3: Plant Protection guides the reader/researcher through pathogenicity attributed to fungi, bacteria, or viruses affecting all parts of the *C. sinensis* in all of its life stages. Included here are also the insect-borne diseases with a multitude of sucking, boring, and scavenging pests that shall thrill any entomologist and worry any botanist.

After wading through a dizzying array of what could go wrong with tea plant cultivation at the beginning of the section, we arrive at the latter part where descriptors of Integrated Pest Management (IPM) strategies are engaged. Flexibility of IPMs are key as “...an IPM strategy developed in one country or for a particular pest may not be suitable for adoption in another country or situation” (Sharma and Gunasekare, p. 302). To aid in ready research for all of this biological mayhem, Sharma and Gunasekare provide comprehensive references of books, book chapters, and internet-accessible information that is country-specific in the 47 pages of reference material, for this section, *in toto*.



The surprising revelation of Part 4: Tea Chemistry and Phytochemicals is the length of biochemistry of tea discussed within the two chapters. These practical building blocks, in the guise of amino acids, vitamins, antioxidants, etc., are all quantified, then revealed for their possible function as a healthy food in the consecutive two chapters. Within Chapter 14: The Potential Role for Tea in Combating Chronic Diseases, green tea has been shown to be inhibitory in animal-model research, of the last decade, against cancer at different organ sites (Sharma and Gunasekare, p. 431). Epidemiological studies and mechanistic considerations are given throughout this chapter with a decade of recent research behind the overview. Lowered blood pressure and cholesterol, protection of some neurodegenerative diseases, and reduced malignant neoplasms are "...suggested beneficial health effects of tea consumption in the prevention of chronic diseases" (Sharma and Gunasekare, p. 441) based on animal models.

Part 5: Sustainability consists of three chapters geared toward preserving the good stuff without unduly impacting the tea crops' surrounding environment under changing climatic conditions. This final section closes the circle begun with the Chapter 1 discussion on ensuring the tea woody plant's genetic diversity. Implementing organic farming would protect the environmentally tenuous tracts and water resources of tea crops in the

hills. Sharma and Gunasekare have assembled the papers of academics who cover each of these particulars, and as at the onset of this volume, conclude the sustainable discussion country by country of the major producers of organic tea.

The last chapter, Chapter 18: Supporting Smallholders in Tea Cultivation, ends with the David-and-Goliath scenarios too often seen in agronomy. Tea is no exception with shrinking cultivation ground giving way toward more remunerative green grocery products. "A continual process of farmer empowerment is also a prerequisite to the successful improvement of the position of smallholders in tea agribusiness. In order to improve farmers' standards of living and use farmers' potential to the full, mind-sets in the tea industry must change and effective, fair, trusting and sustainable partnerships be developed between individuals, groups and farmers' institutions with corporate partner institutions" (Sharma and Gunasekare, p. 529).

An interesting book, in its five parts and on the whole, the Sharma and Gunasekare edition of *Global Tea Science: Current Status and Future Needs* would suit the library of any botanical enthusiast, or academic, with its comprehensive collection of relevant publications. The humble tea leaf has mighty roots indeed.

—Karen Penders St. Clair, PhD

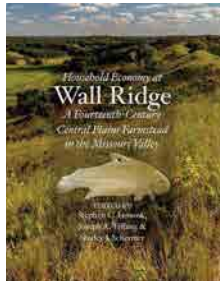
## Household Economy at Wall Ridge: A Fourteenth-Century Central Plains Farmstead in the Missouri Valley

By Stephen C. Lensink, Joseph A. Tiffany, and Shirley J. Schermer [eds]

2020; ISBN: 9781607817734

Hardcover: \$70.00; 288 pp.

University of Utah Press



of the project methodology and results. These chapters stand alone, yet intertwine conversationally as particularities from each of these first five chapters' aspects weave the tale between research teams separated by time. In each chapter, our editors give due consideration to the 1984 excavation team of Michael J. Perry, project archaeologist at the University of Iowa Office of the State Archaeologist. Emphasizing that the Perry-team did not haphazardly approach the site, Lensink et al. commend:

*“We believe the field and laboratory methods utilized in this project represent some of the most disciplined and scientifically rigorous ever applied to a Glenwood phase site. While they are now considered conventional methods in modern archaeological practice, these methods were cutting edge at the time of the field work in 1984. Our only regret is that more time and money were not available to permit the complete excavation of the lodge with the same high degree of spatial control used on the portion so explored.” (p. 23)*

*Household Economy at Wall Ridge* is a beautiful book of 14 chapters inclusive of figures, tables, online resources, and comprehensive references. It's one of those books that make you feel, on initial inspection, that you are in for something special.

“The Wall Ridge project represents the first full-scale systematic recovery and complete identification of environmental data from a Central Plains lodge, taking advantage of the site's high degree of complexity and completeness of the floral and faunal assemblages.” (Tiffany, et al., p. 1)

I could end my review with the above sentence as the remainder of the book is efficiently described. However, the scope of this remarkable discovery, and the careful attention to cataloguing detail that followed, would be diluted, without the due consideration given to our editors and of the researchers who were a precedent to this wonderful archeological finding.

From its onset, *Household Economy at Wall Ridge* is conversational between those who initially uncovered the Central Plains lodge in 1983, during a survey for a road construction project, and those who interpreted that early data with 21st-century technology. The first five chapters introduce and give context to the archaeological site, as well as a vetting

The 21st-century investigators of our editors, Lensink, Tiffany, and Schermer, followed suit with their careful analysis and research. There were additional efforts in the decades that followed Perry to re-examine, or recreate maps of drainage systems, topography, early stratigraphic illustrations, and distribution of phase sites to complete the picture of settlement patterns, food resources, and cultural interactions. It is here that our editors pick up the mantle to pool all of this information into one comprehensive book. This, the compilation of the work conducted and reconnected over the course of decades, is the objective of *Household Economy at*

*Wall Ridge*. The excavation results—viz., the chapters on the ceramics, assortment of stone tools and fragments, smoking pipes, bone or shell tools, spoons, scrapers, or beads—are fascinating in their own right. There are also comprehensive chapters on zoological remains, the lodge’s life told in the history of these remnants and housekeeping bits, and the collective interpretations (and summary) by the editors, with additional colleagues, for the work they elucidated in the previous chapters.

For the purpose of our botanical considerations, I would like to turn the reader’s attention to Chapter 10: Botanical Remains offered by William Green. At the onset, Green “...provides a more comprehensive report on plant remains recovered from the site, incorporating material from the preliminary report and supplying additional data” (Lensink et al., p. 102). The analysis, comparisons, and quantification of all of the botanical specimens, i.e., seeds, nutshells, grasses, trees, is staggering for such an ancient site. Included in the site findings are *Carya* sp. (hickory), *Fraxinus* sp. (ash), *Juglans* sp. (black walnut or butternut), *Quercus* sp. (oak), and *Ulmus* sp. (elm) of which was the predominant wood for construction and fuel by these ancient people.

Almost 1500 pieces and bits of maize account for the majority of archaeobotanical samples over any other collected. Included with maize fragments are the two other legs of the Three Sisters triagonate: beans and squash. Green explains that the variety of plants grown in the home garden of these ancient people suggests possible four-season homesteading rather than a nomadic lifestyle. The botanical chapter offers cohesion of the other chapters to one another because of this perennial lifestyle evidenced with the botanica remnants. The numerous tables and charts comparing small-

seed assemblages, ubiquity percentages, flotation samples, and more, offer hard data of observations and measurements. Botanical Remains is an interesting chapter of forensic botany, local ancient flora, and year-round cultivation study restoring new life to the forgotten.

The depth of information in this, or any of the *Household Economy at Wall Ridge* chapters, is singularly that of a yawning well, then the breadth of a lake one inch deep. Certainly, more laudable than I may outline here for you. With the last point in mind, I would encourage anyone interested in history, science, or mathematics to consider adding *Household Economy at Wall Ridge* to your personal or professional library. The editors have given such personal, credible, attention to the details of the Wall Ridge project that students of any age would benefit from its tutelage.

—Karen Penders St. Clair, PhD

### Nevada Mountains: Landforms, Trees, and Vegetation

David A. Charlet  
2019; ISBN: 978-1-60781-727-7  
\$75.00 (Hardcover); 432 pp.  
University of Utah Press, Salt Lake City, UT



Nearly the entire state of Nevada lies with the geological province of the Basin and Range, which has been subjected to geological extensional processes in an east-to-west direction resulting in block faulting that has produced a series of mountain ranges and valley basins that generally trend north to south. *Nevada Mountains* is summary of all the large and small mountain ranges found in Nevada, which the author documents in

this book as being 319 in total, along with 373 valleys. The author has done an impressive job in compiling this encyclopedia of Nevada's mountains, and the fieldwork that supports the work was certainly a monumental undertaking.

The work is loosely organized as a large scientific paper with an introduction that includes a brief summary of the history of Nevada and the associated cartography and studies of physiography. The methods section discusses geographic names and provides details on the author's development of base maps and the interpretation of primary physiographic features. The results provide a summary of the statistics of his work for the major categories of mountains, valleys, fan piedmonts, and other major features and a very nice set of maps of enlarged sections of the state with each mountain range identified by number that corresponds to its number and description. The enlarged section maps (ESMs) are very well done and are numbered as Figures I.11 - I.23. The area each ESM covers within the state of Nevada is provided on Reference Map Figure I.24.

Unfortunately, there are problems with the figure numbers for these ESMs. The first being that the figure caption for each ESM is one number less than the corresponding area shown on Reference Map Figure I.24, thus I.11 actually corresponds to I.12, I.12 corresponds to I.13, and so on up through the Figure labeled I.20 (Ref. map number I.21). A second problem is that the map identified as Figure I.21 has no corresponding map on the Reference Map and does not fit in the series as it is a map of northeastern California and northwestern Nevada, illustrating the extent of pluvial lakes during the Pleistocene, and appears to be a different enlargement of a section of Figure 1.9 and would fit better near it.

A third puzzling feature of the Reference Map Figure I.24 and the associated enlargements of sections is the numbering system used, which starts in the northwest corner (Fig. I-12) moves east (I-13, then I-14), then drops to southeast (I-15), back up to the central-east (I-16), then back to extreme southern Nevada (I-17), back to center of the state (I-18), etc. It is very confusing to keep the order in mind and to know what the adjacent ESM is to the one that the reader may be viewing.

A final point of inconsistency in these figures and the Reference Map is that the figures are referred to as, e.g., I.12, I.13, I.14, etc. in the captions, whereas on the Reference Map each ESM is listed as I - 12, I - 13, I -14, etc. A minor problem, but it adds to the confusion. These ESMs are the centerpiece of the book and critical to locate mountain ranges, their identification numbers, and descriptions in the remainder of the book. It is surprising there are so many problems with these very important maps. Finally, Figure I.25 shows the location of historic settlements in small green pentagons, which the author discusses within a given mountain range; however, there is no way to identify what specific green point corresponds to a settlement discussed in the mountain range narrative. This map would be enhanced if these green pentagons were included on the ESMs and labeled in some manner.

A larger section on Nevada vegetation follows a brief conclusion, and this section distills and summarizes the extensive vegetation analysis conducted by the author during more than 30 years of field work. The vegetation is primarily classified by a relatively coarse system of life zones that the author developed and describes and allows the author to describe the vegetation in each mountain range in a brief, descriptive and organized



fashion. Supporting figures for this section are in Figure IIA.2 (Rank Order of Flowering Tree Species) and Figure IIA.4 (Rank Order of Conifer Species), which as presented are interesting but would be more informative if the species corresponding to each histogram bar was identified by species or a code tied to the species listings in Appendices D and E, which correspond to the figures, respectively. A nice compendium of large color photos (Figures II.1 to II.7) illustrate the authors life zones.

The core of the book is comprised of the descriptions of each of the 319 named mountain ranges, which occupies 147 pages of the text. The descriptions have a consistent format and narrative, with the first paragraph describing the mountain range location, physiography, and geology; the second paragraph presents a description of cultural features that emphasize the period since colonization; and the third and remaining paragraphs describe the vegetation using the author's life zones and species selected for discussion by the author, which emphasize trees and shrubs. At the end is a listing of the years the author visited the individual mountain range, which in many cases is amazing.

Following the section on mountain ranges are three large appendices that allow the reader to search for mountain ranges and find their description. They list the county, counties, or state(s) the feature is found in which is helpful, although even more helpful would have been

a cross reference to the ESMs found at the beginning of the book so they could be more readily found there as well.

The primary problem with the book is the confusing labeling between the ESM figure captions and their identification on the Reference Map. This can be readily corrected in a subsequent edition but cause the reader confusion in this edition. A nice addition or correction would be to print a new large paper map that could be folded and unfolded that would be used in conjunction with the book. This map could have the full state on one side and selected ESMs on the reverse. The hardbound book appears to be well made, but unfortunately some of the pages of the ESMs came loose during my review of the book.

Overall, this an excellent book for a person looking for an atlas and encyclopedic treatment of the Nevada mountain ranges with an interest in vegetation. For anyone interested in Nevada biology, geology, or geography, or who enjoys traveling and hiking within the state, it is fascinating to peruse and read about the individual mountain ranges and see their similarities and differences to other ranges. This book is also an excellent introduction to vegetation of the Great Basin in Nevada, with the understanding that these life zones are quite coarse.

—Richard Lis, California Department of Fish and Wildlife, Redding, CA

**Planet Palm. How Palm Oil Became an Ingredient in Everything—and Endangered the World**

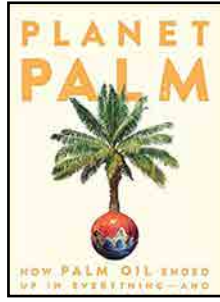
Jocelyn C. Zuckerman

2021; ISBN: 978-1-62097-523-7

Hardcover, \$27.99; ebook

1787383784; 272 pp.

The New Press, Portland, OR



Rising global demand for vegetable oil as biofuel and for product innovations during recent decades has led to a dramatic increase in land area cultivated with West African oil palm, *Elaeis guineensis* Jacq. Especially in Southeast Asia, the oil palm boom has contributed to economic growth but has also led to undesirable environmental effects, contributing to tropical deforestation and loss in biodiversity and ecosystem functions. Financial returns to the majority, smallholder growers, have been meager, while multinational corporations have profited in billions.

Journalist Jocelyn Zuckerman, former deputy editor of *Gourmet*, articles editor of *OnEarth*, and executive editor of *Modern Farmer* has dipped deep into institutional archives to augment her investigative fieldwork about oil palm cultivation in Africa, Asia, and Latin America. A serious journalist with healthy skepticism, Zuckerman researched and interprets oil palm through an ecological and historical lens, delving into complex details dating back to colonialism, fleshing out the scandals described briefly by Gray (2018, previously reviewed in PSB). This is a provocative, pioneering account of the history of oil palm production, with accompanying ecological destruction by the African oil palm industry to the environment, and to impaired human health worldwide. Harvesting and processing the bunches of shiny red fruit is linked to massive greenhouse gas emissions;

forced labor, poor sanitation, and human rights abuses are common on plantations, especially in countries where repressive regimes thrive.

Over the past few decades, oil palm has seeped into every corner of our lives. Worldwide, oil palm production has nearly doubled in just the last decade: in some form it occurs in roughly half the products on U.S. grocery shelves. The oil palm rush has been built on stolen land and slave labor, erasing cultures and devastating the landscapes of Southeast Asia such that iconic orangutans, helmeted hornbills, and many of the world's most biodiverse forests now face extinction. Fires clearing the forest for plantations discharge carbon emissions that surpass those of industrialized nations. The concern is that governments facing deficits "...will be tempted to cut the budgets of enforcement agencies and license new investment projects that could lead to more forest loss" (Fountain 2021, quoting Frances Seymour, World Resources Institute). Rivers have become so contaminated that their waters are no longer potable; the local population that relied on river fish are food insecure, now relying on processed food; the only fish hardy enough to survive is 'él avión,' or "cylindrical and solid, like an armored military aircraft" (photo, p. 177)—inedible, bony, whiskered.

Part 1 reports on the oil palm trade's colonial beginnings, with British imperialists George Goldie and William Lever marching arrogantly into Africa in the 19th century and monopolizing the oil palm business. Both exploited African labor while pushing indigenous traders out of their own markets. African oil palm was one among other natural resources that provoked the scramble for Africa by European colonizers through the late 19th century. Zuckerman provides evidence that the British soap-making company Lever

Brothers (now part of Unilever) used slave labor to harvest oil palm on the 1.8 million acres it controlled in the Belgian Congo.

Part 2 holds the core of Zuckerman's exposé, as she relates a disturbing catalogue of contemporary evils associated with the oil palm trade, including the exploitative practices of today's multinational corporations, sequentially documented methodically by Qaim et al. (2020). Plantation workers in Honduras are subjected to hazardous chemicals, with no protective gear, for appallingly low wages; electrocutions and other workplace accidents are common, and workers meet violent retribution when they try to organize unions. She reports its biological damage as well as the adverse health effects of oil palm by its use in cheap, high-calorie foods: "It's common to blame sugar for the world's weight problems, but in the last half-century, refined vegetable oils have added far more calories to the global diet than has any other food group." Zuckerman links the cultivation and production of oil palm to "the combined twenty-first-century crises of obesity, malnutrition, and climate change." Health impacts of oil palm—epidemics of obesity and heart disease in parts of the developing world, where it is increasingly used to produce inexpensive snacks—are dire; when processed at high temperatures, it can even cause cancer.

An ingredient in everything from toothpaste to non-dairy creamer, bread, instant noodles, cookies, ice cream, chocolate, detergent, lipstick and lotion, oil palm now accounts for a third of the world's vegetable oil consumption. Many products that use oil palm aren't clearly labeled. Oil palm and its derivatives can appear under many names, including: Vegetable Oil, Vegetable Fat, Palm Kernel, Palm Kernel Oil, Palm Fruit Oil, Palmate,

Palmitate, Palmolein, Glyceryl stearate, Stearic Acid, *Elaeis Guineensis*, Palmitic Acid, Palm Stearin, Palmitoyl Oxostearamide, Palmitoyl Tetrapeptide-3, Sodium Laureth Sulfate, Sodium Lauryl Sulfate, Sodium Kernelate, Sodium Palm Kernelate, Cetyl palmitate, Sodium Lauryl Lactylate/Sulphate, Hydrated Palm Glycerides, Ethyl Palmitate, Octyl Palmitate, and Palmityl Alcohol (World Wildlife Fund, n.d.).

Zuckerman's documentation is outstanding for the most part, but occasionally she, as other writers do, repeats and misrepresents unverified data as fact (e.g., on page 8: "Archaeological findings suggest that the Egyptians were trading palm oil as early as 3000 BC"; her Notes cite a secondary source, but having spent hours pursuing that citation, it led only to another secondary source [Raymond, 1961]). According to esteemed archaeobotanist Dorian Fuller, "No I have never come across evidence for this, and think is it very unlikely. Although wild oil palm use in Ghana goes back to middle/early Holocene, evidence for cultivation or at least management of forests to increase oil palms, probably starts around 2000–1500 BC only. There is NO evidence for trade between western Africa and the Nile that early. Although Egyptians did trade out into the desert in the Old Kingdom, it is not entirely clear where they were headed; it seems very unlikely that they were in contact with any region further than Lake Chad. By far most of their trade was Eastern Mediterranean, Red Sea, and with Nubia/Sudan via the Nile." It is frustrating to search for Literature Cited buried in 45 pages of Notes, and those lack full references.

Zuckerman's prose is engaging, and her advocacy is superb. I recommend wholeheartedly this general interest book

about a crop that has become an environmental, public health, and humanitarian disaster. Closing with the author's own cautionary words from the Epilogue: "If we have any hope of feeding 9 billion people by 2050, we must stop planting land with commodities destined for animals' stomachs and fuel tanks and instead cultivate crops meant for humans, in particular nutritious options like healthy grains, fruits, vegetables, and legumes."

## REFERENCES

- Fountain, H. 2021. Covid slowed the world, yet deforestation sped up. *The New York Times* March 31, p A11.
- Gray, F. 2018. Palm. Reaktion Books, Ltd., London.
- Qaim, M., K. T. Sibhatu, H. Siregar, and I. Grass. 2020. Environmental, economic, and social consequences of the oil palm boom. *Annual Review of Resource Economics* 12: 321-344.
- Raymond, W. D. 1961. The Oil Palm Industry. *Tropical Science* 3: 69-89.
- World Wildlife Fund. n.d. Website: <https://www.worldwildlife.org/pages/which-everyday-products-contain-palm-oil>.

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## Rosa: The Story of the Rose

Peter E. Kukielski with Charles Phillips  
2021; ISBN: 9780300251111  
Hardcover, \$30, £22.00;  
256 pp.  
Yale University Press,  
New Haven CT



The perennially popular ornamental *Rosa* L. acquired a new volume that praises its virtues, considering its impact in world societies and religious practices throughout history, enhanced with 143 color illustrations. Kukielski curated the New York Botanical Garden's rose garden, between 2006 and 2014. His passion is palpable. The authors depict *Rosa* as exceptional: no other flower has the same magnetism or significance. A symbol of beauty, affection, sovereignty, and celebration, roses appear literally and symbolically in art, fashion, perfume, ornaments, literature, poetry, song, mythology, politics, medicine, and cuisine.

Classification and nomenclature of roses open this story. Against the authors' suggestion of Anatolia as its source, Iwata et al. (2000) indicate the foothills of central Asia; Kiani et al. (2010a, b), using RAPDs and SSRs, reported that the germplasm of *R. damascena* Mill. in Iran is more diverse than that found in Bulgaria or Turkey. Accordingly, *R. damascena* in these countries was probably obtained from Iran; given the high diversity found for this species in Iran, the latter seems a major center of diversity for the species.

Extraction of its prized oil used carrier oils, and later, distillation. Quoting the authors: "Rose oil was made by immersing rose petals in oils such as almond, sesame, and olive"; "For roses, sesame oil was used because of its thicker qualities that held the fragrance." "Thicker qualities" notwithstanding, overlooked is



the enfleurage extraction method, whereby rose petals are spread over trays coated with a layer of fat, or upon a bed of sesame seeds that become saturated with rose essential oils by diffusion. Depleted petals are replaced repeatedly with fresh ones; those augmented sesame seeds are crushed with mortar and pestle to obtain high-quality concentrates, forming rose absolute (Bedigian, 2011, p. 9).

Despite the authors' global scope, examples from Armenia are conspicuously absent. The Armenian term վարդ (*vard*) is a Northwestern Iranian loan word (Beekes, 2010), cognate with the Iranian root *\*vrda-*: "The word is certainly borrowed from the East... Arm[enian] *vard* 'rose' from OIran. *\*urda*."

Roses feature prominently in Armenian culture, religious practice, poetry, and song, since antiquity. *Armenian Legends and Poems* (Boyajian, 1916) contains dozens of references to rose—literal and metaphorical—in essay, lullaby, poem, and riddle. The famed bard and poet Sayat Nova [Sayatyan (1712–1795)] wrote the following lament, which I felt firsthand a month ago when a vandal climbed up a steep bank to clip our roses, just as they had begun flowering this year:

"I made a garden, others plucked the rose.

Theirs was the sweetness, mine the thorny close."

It was customary in early days—still retained in some places—for a man to test the girl he wishes to marry with a riddle (Boyajian, 1916, p. 117). Her correct answer sealed the deal. Among riddles used on these occasions: "What rose is it that opens in the winter and in due time fades and is gone?" Answer: "Snow is the rose that opens in the winter; when

summer comes, it fades and is gone."

The mediaeval Catholicos Grigoris of Aghtamar (15th century) analyzed the poetics of love symbolized by the rose and nightingale, borrowing from the Persian:

When the nightingale persists in her demand for a single red rose, the rose tree says that there is one way that could be arranged. The nightingale would have to pierce her heart on one of the rose tree's thorns and sing all night by moonlight while the blood flowed out of her body and into the tree.

Since rosewater and water features are showcased in *Rosa*, the Armenian water festival Vardavar [վարդավար] (Raffi, 1916; Taqizadeh, 1940; Villa and Matossian, 1982; Rose, 2011; Najarian, 2012; Antonyan and Siekierski, 2013; Abrahamyan, 2014; Ohanyan, 2014; Catlin, 2018), must be mentioned. Vardavar is a joyous summer ritual observance that occurs 98 days after Easter, which in the Christian calendar became designated as Transfiguration. While Christian, this ritual has pagan antecedents related to the cult of fertility goddess Astghik (Assyria and Babylon: Ishtar; Greece: Artemis, Aphrodite; Rome: Diana, Anahit). Armenians have retained the popular festival tradition of sprinkling, even pelting, one another with water and rose petals; in some places, they release white doves, in remembrance of Noah after the Flood.

Accustomed as I am to academic writing, it is disappointing that so many topics were touched on lightly, without attribution. There is also geographic disarray that is jarring: under the section heading "Persian Poetry and Roses," the Kama Sutra appears in the final paragraph. The two-page chapter titled "The Delights of Turkey" jumbles cuneiform tablets, Boeotia (a region in central Greece),

and Cyrenaica (eastern coastal Libya), leading to choppiness that is difficult to follow. Another serious problem is that the authors provided no explanation of the methods used to elicit and edit their data. This book may be appreciated by casual readers, but scholars wishing for sources with more substance should study Başer et al. (2012), upon which the authors relied heavily; also, Devi et al. (2015), Hamed et al. (2013), Horwood (2018), Mahboubi (2016), Pifer (2020), Sardari et al. (2019) and Widrlechner (1981). Although published sources about roses are plentiful, the Bibliography (two pages) is brief.

Well-bound, *Rosa* should hold up to heavy use as a general interest library book. The value of this book lies in its capacity to encourage the browser of popular books to engage with science. Via the vehicle of the venerated rose, readers can venture into the world of plant biology through the doorway that ethnobotany opens, bringing together traditional and scientific knowledge to promote plant-based content in the humanities.

## REFERENCES

- Abrahamyan H. 2014. The Vardavar celebration among Armenians. PhD dissertation, Institute of Archaeology and Ethnography, National Academy of Science, Yerevan. [In Armenian].
- Antonyan, Y., and K. Siekierski. 2013. A neopagan movement in Armenia: The children of Ara. In: K. Aitamurto, S. Simpson (Eds). *Modern Pagan and Native Faith Movements in Central and Eastern Europe*. Acumen Publ. Ltd, Durham UK and Bristol CT. pp. 266-282.
- Başer, K. H. C., A. Altıntaş, and M. Kürkçüoğlu. 2012. Turkish rose. A review of the history, ethnobotany, and modern uses of rose petals, rose oil, rose water, and other rose products. *Herbalgram* 96: 40-53.
- Bedigian, D. 2011. Introduction. History of the cultivation and use of sesame. In Bedigian D, Ed. *Sesame: the genus *Sesamum**. Medicinal and Aromatic Plants - Industrial Profiles series. CRC Press, Taylor & Francis Group, Boca Raton, FL. pp. 1-31.
- Beekes, R. 2010. *Etymological Dictionary of Greek*. Online Etymological Dictionary <https://www.etymonline.com/word/rose> Brill, Leiden, Netherlands.
- Boyajian, Z. C., compiler. 1916. *Armenian Legends and Poems*. E.P. Dutton & Co., NY.
- Catlin, R. 2018. The point of Armenia's splashy holiday is getting wet. *Smithsonian Magazine* July 3 <https://www.smithsonianmag.com/smithsonian-institution/when-point-splashy-holiday-getting-wet-180969520/>
- Devi, M. P., S. Chakrabarty, S. K. Ghosh, and N. Bhowmick. 2015. Essential oil: Its economic aspect, extraction, importance, uses, hazards and quality. In: AB Sharangi, S. Datta, Eds. *Value Addition of Horticultural Crops: Recent Trends 269 and Future Directions*. pp. 269-278.
- Grigoris of Aghtamar. 15<sup>th</sup> c. Concerning the rose and the nightingale. In: Z. C. Boyajian, compiler, 1916. *Armenian Legends and Poems*. E.P. Dutton & Co., NY. pp. 79-83.
- Horwood, C. 2018. *Rose*. Reaktion Books, London.
- Iwata, H., T. Kato, and S. Ohno. 2000. Triparental origin of Damask roses. *Gene* 259: 53-59.
- Kiani, M., Z. Zamani, A. Khalighi, R. Fatahi, and D. H. Byrne. 2010a. Microsatellite analysis of Iranian Damask rose (*Rosa damascena* Mill.) germplasm. *Plant Breeding* 129: 551-557.
- Kiani, M., Z. Zamani, A. Khalighi, R. Fatahi, and D. H. Byrne. 2010b. A unique germplasm of Damask roses in Iran. *Acta Horticulturae* 870: 131-136.
- Mahboubi, M. 2016. *Rosa damascena* as holy ancient herb with novel applications. *Journal of Traditional and Complementary Medicine* 6: 10-16.
- Najarian, T. 2012. *Armenian Traditions: Vartavar*. <https://tamarnajarian.wordpress.com/2012/07/15/armenian-traditions-vartavar/>
- Mahboubi, M. 2016. *Rosa damascena* as holy ancient herb with novel applications. *Journal of Traditional and Complementary Medicine* 6: 10-16.
- Ohanian, H. 2015. Water as a symbol of spiritual rebirth in the Armenian Apostolic Orthodox Holy Church. M.S. thesis. Patriarch Athenagoras Orthodox Institute, Graduate Theological Union, University of California Berkeley, Burbank CA.
- Pifer, M. 2020. The Rose of Muḥammad, the fragrance of Christ: Liminal poetics in medieval Anatolia. *Medieval Encounters* 26: 285-320.
- Raffi, A. 1916. Armenia: Its epics, folk songs, and mediaeval poetry. In: Z. C. Boyajian, compiler. *Armenian Legends and Poems*. E.P. Dutton & Co., NY. p. 167.
- Rose, J. 2011. In praise of the good waters: Continu-

ity and purpose in Zoroastrian lay rituals. In: N. Bagherpour-Kashani, T. Stöllner, Eds. *Water and Caves in Ancient Iranian Religion: Aspects of Archaeology, Cultural History and Religion*. pp. 141-155.

Sardari, F. A., G. Mosleh, A. Azadi, A. Mohagheghzadeh, and P. Badr. 2019. Traditional and recent evidence on five phytopharmaceuticals from *Rosa damascena* Herrm. *Research Journal of Pharmacognosy* 6: 77-84.

Sayatyan, H. [Sayat Nova, (1712-1795)]. 1916. Without thee what are song and dance to me? In: Z. C. Boyajian, compiler. *Armenian Legends and Poems*. E.P. Dutton & Co., NY. p. 35.

Taqizadeh, S. H. 1940. Iranian festivals adopted by the Christians and condemned by the Jews. *Bulletin of the School of Oriental and African Studies, University of London* 10: 632-653.

Villa, S. H., and M. K. Matossian. 1982. *Armenian Village Life Before 1914*. Wayne State University Press, Detroit MI.

Widrechner, M. P. 1981. History and utilization of *Rosa damascena*. *Economic Botany* 35: 42-58.

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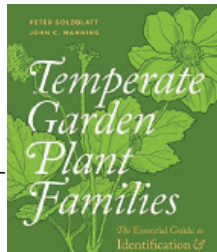
### Temperate Garden Plant Families: The Essential Guide to Identification and Classification

Peter Goldblatt and John C. Manning

2019; ISBN: 9781604694987

Hardcover: \$45.00; 296 pp.

Portland, OR: Timber Press.



For many botanists, our vocation began as a fascination with the plants we encountered in the world around us. “What is this plant?” we wondered, quickly followed by, “How is this one different than the next? How are they similar? Why are they interesting or useful to humans? What is their broader role in the natural world?” Those of us whose interests lie in teaching or mentoring the next generation of plant enthusiasts not only ask these questions on our own, but also dedicate ourselves to teaching our students how to ask—and answer—them.

For this reason, Goldblatt and Manning’s *Temperate Garden Plant Families* can best be viewed not just as a gardener’s reference, but as a valuable teaching tool. Reminiscent of Deborah Madison’s (2013) family-based cookbook *Vegetable Literacy*, the Guide challenges readers to think about their daily experiences in human-managed landscapes from a deeper phylogenetic perspective. The 2019 release from Timber Press reviews 157 plant families (of a total of ~450 globally) whose constituent species are cultivated in temperate gardens. Well-researched and elegantly composed two experts—Dr. Goldblatt in Iridaceae and Dr. Manning in Iridaceae and Hyacinthaceae—this book will be of obvious use to horticulturists and gardeners with a scholarly bent. But just as importantly, it will also serve as an essential resource to teachers of plant biology seeking to ground students’ developing ad hoc plant identification skills within a greater evolutionary and ecological context.

As a teaching tool, *Temperate Garden Plant Families* is clearly and intuitively organized. The bulk of the text corresponds to an A-Z guide to the 92 plant families singled out by Goldblatt and Manning for detailed description. Each entry includes the focal family’s common name(s); counts or estimates of the genera and species contained therein; information about the family’s geographic range, vegetative form, flowers, and fruits; and a narrative section providing natural history and horticultural information. Selected genera are also highlighted for large families. An additional 35 families are presented as addenda within the A-Z segment. For instance, the peonies (*Paeonia* spp.) were long considered part of the buttercup family, Ranunculaceae, but have subsequently been reclassified based on molecular evidence as a monogeneric family in the Saxifragales.

By describing Paeoniaceae briefly at the end of the Ranunculaceae entry, rather than that for Saxifragaceae, Goldblatt and Manning provide an updated systematic treatment while honoring the previous placement of the peonies. Such thoughtful touches make it easy for intermediate or advanced botanists to locate even relatively obscure groups of plants within the A-Z portion of the book, without alienating novices.

Some additional text blanketing the alphabetical listing of major temperate horticultural plant families contributes helpful context to the encyclopedic A-Z treatment. The book's Introduction details the authors' motivations and orients a beginning reader to modern conventions in systematics (with particular focus on the family through species level); areas of disagreement or rapid change in family classification (e.g., the recent subsumption of the horse chestnuts [Hippocastanaceae] into the soapberry family [Sapindaceae]); and to the language used to describe the morphology of vegetative parts, inflorescences, flowers, and fruits. The last section, which provides language necessary for new botanists to parse many of the A-Z descriptions (e.g., the flowers of Asparagaceae are "usually bisexual, sometimes unisexual, in racemes, spikes, or axillary clusters" [p. 61]), would have benefited, by my lights, from some expansion and illustration. For instance, even simple ink illustrations of leaf shapes, inflorescence patterns, flower structures, etc. along the lines of those in *Harris and Harris's Plant Identification Terminology* (1994) would have served as helpful visual guides complementing the descriptive text. A glossary following the A-Z section clarifies some of these terms, but illustrations would have been, in my opinion, more accessible to some readers. And finally, the end matter of the book is rounded out by brief treatment

of 30 families represented in temperate gardens by only a single genus (e.g., *Asimina* [Annonaceae], known in the temperate world largely as home of the pawpaw, *A. triloba*) and not covered in the A-Z section. Generally, though, it is a strength of this Guide that the majority of its pages are devoted to a simple and formulaic structure, with minimal and helpful material on either end providing context and additional connections in a way that does not distract from the main text. I anticipate that most readers, regardless of background, will dive right into the A-Z section and will only appeal to the text preceding or following it as necessary.

Having enjoyed reading *Temperate Garden Plant Families* on my own, I look forward to including it as a supplementary text in my teaching of Plant Biology at Swarthmore College this fall. The Guide will be especially helpful in encouraging new botanists to cultivate what MacKenzie and colleagues (2019) call "plant love": a deeper relationship of appreciation for and understanding of plants using a variety on sensuous and intellectual modalities. I intend for students to rely on Goldblatt and Manning's text as a guide to the deeper evolutionary patterns behind the juxtaposed floral similarity and diversity within the peas (Fabaceae) or the characteristic aromas of some of the temperate laurels (Lauraceae). Plant families, which provide a broad and simple enough superstructure to enclose the often-overwhelming diversity of genera species, are the perfect place for students to start developing plant love. And the thoughtful, clear, and modern approach taken by Goldblatt and Manning has resulted in a useful and gratifying resource for them, as well as for their instructor.



## REFERENCES

Harris, J. G., and M. W. Harris. 1994. *Plant Identification Terminology*. Spring Lake, UT: Spring Lake Publishing.

MacKenzie, C. M., S. Kuebbing, R. S. Barak, M. Bletz, J. Dudley, B. M. McGill, M. A. Nocco, et al. 2019. We do not want to “cure plant blindness” we want to grow plant love. *Plants, People, Planet* 1: 139-141.

Madison, D. 2013. *Vegetable Literacy*. Berkeley: Ten Speed Press.

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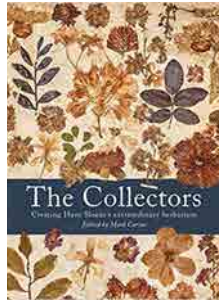
### **The Collectors: Creating Hans Sloane's Extraordinary Herbarium**

Mark Carine (Editor)

2020; ISBN 978-0565094881

Hardcover, \$34.75; 192 pp.

Natural History Museum, London



In 1687, Sir Hans Sloane went to Jamaica as the personal physician of the Duke of Albemarle, its newly appointed governor. There he began to amass an extraordinary, vast biological collection that eventually formed the basis of the British Museum. In 1881, Sloane's botanical collections were transferred to the newly established Natural History Museum. Twenty-four contributors to *The Collectors* help readers to understand how Sloane (1660–1759) and his contemporaries collected, organized, and classified the world, providing readers with a visual view of the colonial footprint upon plant taxonomy. The Sloane Herbarium is, in fact, a collection of collections, representing the rich history of exploration and discovery that began in the late 17th century. More than 300 people contributed to its network as collectors; more than 70 countries and territories were included.

Historian James Delbourgo's pivotal essay about Sir Hans Sloane, based on expertise from research for his acclaimed 2017 history *Collecting the World*, explores the complex interconnections between botanical aspects and their human informants, many of whom were slaves. Regarding Sloane's attention to *Theobroma cacao* L. the species, and chocolate as a commodity, Delbourgo states, "His motivations as a collector in Jamaica were scientific, medicinal, commercial and imperialist" (p. 128).

The Sloane Herbarium specimens collected during his voyage to Jamaica (1687–1689) are the first plant specimens to be brought back to England from that region. Those specimens were used in preparing the illustrations and text for Sloane's *Voyage to the Islands Madera, Barbados, Nieves, S. Christophers, and Jamaica*. Delbourgo's closing words epitomize vastly complex contrasting forces: "It demonstrates the scientific productivity of slavery and imperialism during the long history of the Columbian Exchange that remade Europe, the Americas and Africa ecologically and economically in the early modern era. As such, it raises fundamental and challenging questions about whose labour and knowledge it contains, how it was produced, and how to confront its legacy today" (p. 133).

Similarly, Kathleen Murphy's essay about Edward Bartar remarks on the intersection of botanical exploration with the British slave trade. Of interest to taxonomists: "Bartar's collecting efforts ultimately did not meet his English friends' high expectations" (p. 126). Included is botanist James Petiver's complaint, still often expressed by contemporary botanists about incomplete vouchers: Some of Bartar's specimens contained "only leaves and [were] wanting either flower or fruit or both" (p. 127).

Studying this book about the Sloane herbarium has specific appeal to this reader for several reasons. Sir Hans Sloane and Samuel Browne both figured prominently in early research about African origins of sesame cultivation in the Americas. The British Museum's Sloane herbarium holds two voucher specimens of sesame: Richardson 191, BM; Sloane 192, BM, the latter named *Sesamum ueterum*, collected in Jamaica (Bedigian, 2013, p. 92).

Even more significantly, *The Collectors* cites Hortus Malabaricus (p. 172), compiled by Hendrik van Rheede tot Drakenstein, whose engraving, originally published by Burman (1689: 107, Tab. 55), is the earliest known illustration of *Sesamum indicum* L. subsp. *malabaricum* (Burm.) Bedigian, now recognized as the progenitor of domesticated sesame (Bedigian, 1984). That engraving has been revitalized as Figures 1 and 28, respectively (Bedigian, 2014, p. 7; 2015, p. 28).

It has been an absolute delight to read this outstanding series of essays, so well researched and clearly written by scholars who are expert botanists and historians of science; the editing is also superb. Sir Hans Sloane's herbarium embodies a priceless history of plant exploration that remains of considerable scientific and historical value today. This elegant, bountifully illustrated volume reveals the lives of the people who assembled the vast biological collection, with accounts of their adventures as they searched. It can be valued by botanists in all disciplines as a carefully composed contribution to the history of plant taxonomy.

## REFERENCES

- Bedigian, D. 1984. *Sesamum indicum* L. Crop origin, diversity, chemistry and ethnobotany. Ph.D. dissertation, University of Illinois, Urbana-Champaign.
- Bedigian, D. 2013. African origins of sesame cultivation in the Americas. In: R. Voeks, J. Rashford (Eds). African Ethnobotany in the Americas. Springer, NY. pp 67-120.
- Bedigian, D. 2014. A new combination for the Indian progenitor of sesame, *Sesamum indicum* L. (Pedaliaceae). *Novon* 23: 5-13.
- Bedigian, D. 2015. Systematics and evolution in *Sesamum* L. (Pedaliaceae), part 1: Evidence regarding the origin of sesame and its closest relatives. *Webbia* 70: 1-42.
- Delbourgo, J. 2017. Collecting the World. Hans Sloane and the Origins of the British Museum. Harvard University Press, Cambridge, MA.
- Dorothea Bedigian, Research Associate, Missouri Botanical Garden, St. Louis, Missouri, USA

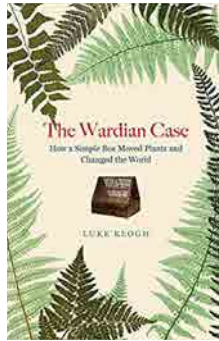
## The Wardian Case: How a Simple Box Moved Plants and Changed the World

By Luke Keogh

2020. ISBN: 9780226713618

Hardcover, US\$35.00; 288 pp.

University of Chicago Press,  
Chicago



From the beginning of the age of discovery, voyagers attempted to ship exotic plants to their homelands, to return with some of the botanical wonders they had encountered. Besides the scarcity of potable water on ships and the salinity of sea breezes, plants on deck could be subjected to blazing sun and violent storms. It is amazing that despite these problems, many new species arrived in Europe, often as carefully packed seeds, cuttings, or seedlings. A significant advance in the movement of plants came in 1829 when a British physician named Nathaniel Ward developed what became the Wardian case, although he never patented it. Ward was studying the life cycle of moths. For observation purposes, he put eggs along with some soil and leaf debris into a wide-mouthed glass bottle and covered it with a lid. The insects flourished, but a fern and a grass plant also began growing in the moist environment and lived there for three years.

As Luke Keogh describes in his fascinating and well-written book on the invention, this success gave Ward the idea of growing plants in boxes with glass lids to let sunlight in as a way to protect delicate species from London pollution. He also thought a different version of the case could be used for transporting plants on long ocean voyages. An avid gardener, Ward was friendly with the nurseryman, George Loddiges. Together they filled two glass-lidded wooden boxes with ferns, mosses, and grasses, and loaded them onto a ship

bound for Australia. Five months later the cases arrived at their destination with most of their contents alive and in good condition. In the second part of the experiment, the same boxes, now filled with Australian species, were shipped back to England. These too fared well, and word of this success spread quickly in the horticultural community. Soon plant hunters for British nurseries such as Veitch & Sons and botanists such as William Jackson Hooker at the Royal Botanic Gardens, Kew were shipping plants at a much faster rate than in the past, and with better results. After Nathaniel Wallich, director of the Calcutta Botanic Garden, sent cases of plants to the Jardin des Plantes in Paris, French botanists were soon using them too. Eventually, the French and Germans employed more cases than did the British.

There were still problems. On shipboard, plants did best when cared for by a gardener or crewman with horticultural expertise. Also, shorter voyages brought better results, with the introduction of steamships a real boon. What all this transport meant was not only the successful introduction of exotics into Europe but their movement around the world. Robert Fortune shipped tea plants from China to India along with expert Chinese growers who made sure that the plants thrived in their new location. As Alistair Watt (2017) reveals in a book on Fortune's travels, the collector did not "steal" tea plants from China, as the story is often told, but sent them with the cognizance of Chinese officials. In fact, Fortune left England with three Wardian cases filled with plants that he gave as gifts to Chinese nurserymen. Meanwhile the British also shipped cinchona seedlings to India from Kew, where they had been grown from seeds Richard Spruce had collected in South America. The French and Dutch sent plants from their colonial gardens back to their homelands as well as to other

colonies. Through such transplantations, Brazilian rubber trees and Mexican vanilla orchids came to be grown on Southeast Asian plantations and 70% of cocoa beans from the South American cacao tree are now produced in West Africa.

For many of us, it is in horticulture that the effect of the Wardian case is most obvious with plants from around the world flourishing in our gardens. Yes, many of these species were moved in the years before the case became popular, but the pace of introductions increased dramatically with its use. Needless to say, the number of invasive species all over the world also rose accordingly. As Keogh notes, the Wardian case didn't just move plants, it moved ecosystems, since soil contains many seeds, including those of weeds, along with fungi and insects—these could all cause problems in new environments. By the early 20<sup>th</sup> century, such problems were leading to control of shipments. Fewer cases were used and those that were had to be sanitized after each trip; eventually each case was only used once. Air travel made plant shipments much faster, and so containers fit for long-term travel were no longer needed.

Keogh writes that when he began his project, he attempted to find old Wardian cases at botanic gardens around the world. He was surprised at how difficult it was to ferret them out, and his hunt only turned up 15 of them,

with one, of course, at Kew. By the time his research was completed, he realized that this dearth was probably because most of the cases had been destroyed to prevent contagion. It is ironic that, reminiscent of their first use in breeding insects, the last shipments were of insects rather than plants, in particular insects like lady bugs used to fight invasive pests.

In addition to transportation, Wardian cases were 19th-century display pieces. Glass cases, often edged in metal, held orchids and ferns, two extremely popular plant groups at the time and two that required controlled conditions. Some of these containers fit on tabletops, others were larger and more elaborate, and they returned in the 20th century in the form of terrariums that were a 1970s fad. What the Wardian case in all its manifestations indicates is how thirsty humans are for contact with plants in their infinite variety.

## REFERENCES

Watt, A. 2017. *Robert Fortune: A Plant Hunter in the Orient*. Kew Publishing, Kew, UK.

—Maura C. Flannery, Professor Emerita, St. John's University, NY; Research Associate, A.C. Moore Herbarium, University of South Carolina, Columbia, USA



**Will Purdom: Agitator,  
Plant-hunter, Forester**

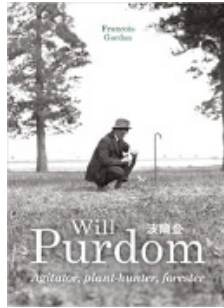
Francois Gordon

2021. ISBN: 978-1-910877-37-1

Hardcover, US\$26.00; 252 pp.

Royal Botanic Garden Edin-

burgh, Edinburgh, SCT



Francois Gordon's biography of British botanist William "Will" Purdom (1880-1921) is an enjoyable tale which evokes the mythos of a classic hero's journey. The hero's journey, describes Joseph Campbell, is transformative: "We have not even to risk the adventure alone, for the heroes of all time have gone before us ... And where we had thought to slay another, we shall slay ourselves. And where we had thought to travel outward, we shall come to the center of our own existence" (Moyers, 1988).

The book is an expertly researched tapestry of British and American horticultural history, the tumultuous development story of modern China, and botanical adventure. His curiosity piqued by an article and photograph, Gordon initially concluded that not enough was known about Will to warrant a full biography. Several years later, his search of the archives of the Royal Botanic Gardens at Edinburgh and Kew, the Arnold Arboretum, and the Royal Horticultural Society convinced him that not only could Will's story be told, but that its telling would enhance our understanding of the sociopolitical context that shaped and ultimately obscured his legacy. Gordon says, "I hope to put the record straight concerning the achievements of a man who by sheer ability and determination overcame the formidable obstacles which society set in his path and who left the world a better place for his passage."

The book is a chronological account of Will's short life, focused on his professional

accomplishments but including enough personal detail to paint a convincing psychological portrait. By collating scattered evidence such as correspondence, magazine articles, photographs, and nursery ledgers, Gordon reconstructs Will's timeline and sheds light on his obscure decision-making process. Will was the third of seven children born to an estate gardener in Ambleside and a member of the first generation to benefit from a contested decision to provide free public education. He pursued botanical study early, and, at age 22, gained admittance to a prestigious two-year program at Kew Gardens designed to train gardeners for mid-level positions throughout the British empire. Will was an exceptionally talented arboriculturist and quickly rose to the highest position available to students. However, his involvement in seeking fair compensation for Kew laborers deeply embroiled him in the trade union movement, a role that impacted the remainder of his career.

The subtitle of the book describes three professional phases. Will's success as a political "agitator" caused him to misperceive the once-in-a-lifetime nature of an offer to step into the Assistant Superintendent position at Boston's Arnold Arboretum, and he was never able to regain the planned career track for a Kew-trained gardener. Here, Gordon introduces a tension that he found at the heart of Will's life: the devastating mismatch between the botanist's uncommon talents and drive and the career options actually available to him. Luckily, Will was soon recruited as a plant-hunter; he accepted a two-year contract offered by the Arnold Arboretum and British horticultural "titan" James Veitch & Sons "to investigate botanically unexplored territory" in northwest China and return with seeds and photographs.

The remainder of the book primarily details Will's time in Shansi, Shensi, and Kansu Provinces: as a plant-hunter from 1909 to 1912 and as a guide and companion for alpine plant expert Reginald Farrer from 1914 to 1915. Gordon's writing is compelling. We learn that China was in the throes of modernization, and frequent uprisings by provincial warlords made travel there extremely dangerous. Yet Will moved easily between the British expatriate community and rural Chinese by quickly learning Mandarin, hiring local guides, and befriending everyone he met. Although his travels were colored by difficulty and privation, he rarely mentioned these aspects to his employers. Photographs, taken with a Sanderson glass-plate camera (54 are included in the book), show intriguing landscapes, smiling laborers, and Will surrounded by local leaders and notable members of the British Legation.

In spite of collecting 891 specimens representing 374 species, several new to the West, and producing dozens of photographs, Will did not receive a warm reception when he returned to Britain in 1912. Gordon attributes this to several factors. Will was compared to another botanist, Ernest Wilson, a charismatic gentleman-explorer able to attract expedition funding and notorious for over-collecting immense amounts of material. Wilson collected in one of China's biodiversity hotspots, while Will had been sent to a low-diversity and highly deforested region. Also, Will's background, as a member of the landless class and an activist, might have predisposed his employers to consider him unworthy of career advancement. After two years seeking suitable employment and living with family, Will received an offer to accompany Farrer to northwest China. Gordon suggests that the memory of his liberation from rigid social

constraints while in China and the realization that he might never attain the career to which he aspired by staying in Britain motivated him to seize the opportunity. In true hero fashion, Will left his homeland to seek his rightful place.

I will not spoil your reading of this grand adventure by describing the final transformation. Readers will find that Gordon has carefully planted seeds to suggest that Will himself was cultivating a strategy to attain in China the mature position that he was denied elsewhere. For example, the appendices contain two reports written by Will on "the afforestation question in China." As Divisional Director of the Chinese Forestry Service from 1916 until his death in 1921, Will implemented a visionary and sustainable forestry program that both eased China's path to modernization and allowed him to exercise his capacity for leadership. Francois Gordon's first book is a well-written and inspiring tale of heroic proportions. He succeeds in "put[ting] the record straight," conveying the inseparability between Will and his times, and uncovering evidence to explain the near erasure of Will's story despite several species and a Forest Park in China bearing his name. I highly recommend *Will Purdom* to anyone seeking a glimpse of the oft-hidden dimension of botanical exploration.

## REFERENCES

Moyers, Bill. 1988. "Episode 1: Joseph Campbell and The Power of Myth - The Hero's Adventure." Website: <https://billmoyers.com/content/ep-1-joseph-campbell-and-the-power-of-myth-the-hero%E2%80%99s-adventure-audio/> [accessed 15 August 2021].

—*Andrea G. Kornbluh, Member, Botanical Society of America*



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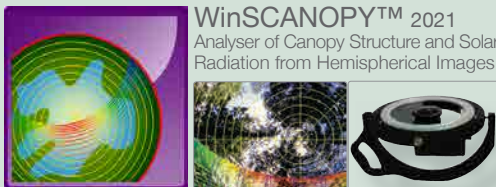
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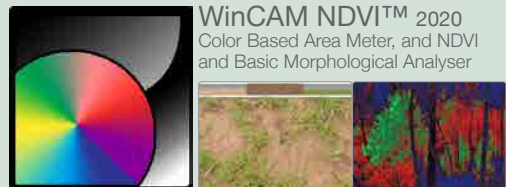
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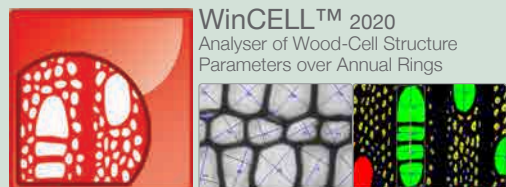
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