PLANT SCIENCE BULLETIN

FALL 2022 VOLUME 68 NUMBER 3

A PUBLICATION OF THE BOTANICAL SOCIETY OF AMERICA

Plants, Science, and the Endangered Species Act

Presidential Address at Botany 2022 by Dr. Vivian Negrón-Ortiz

IN THIS ISSUE...

Examining the Contributions of John Henry Reisner, by Song Shi and Lee B. Kass.... p. 186

Developing a Self- and Community-Care Practice, by Sarah Sims....p. 172

Advice from the Careers in Botany Luncheon, collected by Student Reps Eli Hartung and Ioana Anghel...p. 215

FROM the EDITOR

Greetings,

In this issue of *Plant Science Bulletin*, you will find various summaries and recaps from Botany 2022. This includes the excellent address by Vivian Negrón-Ortiz, "Plants, Science, and the Endangered Species Act". The address of the President-elect is one of my favorite features of *PSB*, as it records the diverse array of issues and topics that BSA leaders have chosen to bring before the entire Society. As far as I can tell, *PSB* began regularly publishing the address of the President-elect in 2003. In the 1950s and '60s, the address of the "retiring" president was typically published. The first presidential address I can find in the archives was published in *PSB's* first year of publication. "Plant Idioblasts: Remarkable Examples of Cell Specialization," by Adriance S. Foster, is included in the winter 1955 issue. I invite you to browse through the *PSB* archives (https://botany.org/psbarchive/view/issues/lct/user/) to enjoy all these contributions.

Sincerely,

TABLE OF CONTENTS

Logo designed by Johanne Stogran
Background image credit: Xiao-Xue Mo and Lian-Bin Tao

Plants, Science, and the Endangered Species Act

[Editor's Note: Dr. Vivian Negrón-Ortiz spoke at Botany 2022 for the Presidential Address.]

The topic for this address is a subject that I have devoted time and effort to for the past 15 years. For this address, I do not intend to explain technical details, but rather give a general overview of how plants have been treated under the Endangered Species Act (ESA) of 1973, as amended, with some new information collected from several interviews with various leaders of the U.S. Fish and Wildlife Service (FWS).

It is evident that science for the ESA is an essential starting point for preventing the extinction of many species, and that combined with policies and full partnership, it can help solve many conservation problems. Conservation is complex and can be defined in multiple ways, but it is the persistence of a species, plants in particular, in their native habitat that we strive to maintain—and this is of importance for the current and foreseeable future. To illustrate how science is used under the ESA, I'm going to present an example from my own research.

By Dr. Vivian Negrón-Ortiz
President of the Botanical Society of America

In the early 1990s I was invited to collaborate on a research project to investigate why seed set is very low or non-existent in an extremely rare cactus geographically restricted to the Florida Keys. This rare species, *Consolea corallicola* Small (Opuntioideae), is a tree-like cactus about 2 m tall, with a dense cluster of branches near at the top of the stem and bearing bright red flowers. Only one population of 13 caged plants was left in the wild in 1995, one population discovered in 1919 was extirpated, and a second population consisting of a few adult plants was found in 2001 (https://ecos.fws.gov/docs/candidate/assessments/2011/r4/Q3HT_P01.pdf). To answer the seed set question, I did hand pollination experiments with the 13 caged plants, involving 173 manipulated and control flowers, resulting in the production of a single fruit by agamospermy. Pollen grains were observed germinating on the stigma of abscised ovaries, but tubes failed to enter and fertilize the ovules (Negrón-Ortiz, 1998).

Given that this information didn't answer the question, we embarked on a research project involving all nine species in this genus, geographically restricted to the Caribbean region. Direct observations of individual plants in the field, dissection of flowers at anthesis, and embryological studies revealed that most species in this genus are composed of females, males, and, in a few species, fruiting males (Strittmatter et al., 2002; Negrón-Ortiz, 2007). We then carried out similar investigations on *C. corallicola*; our results showed that this species is composed of males and fruiting males. We inferred there are no females remaining in the population (Negrón-Ortiz and Strittmatter, 2004); therefore, *C. corallicola* is a functional extinct species.

This information along with other research studies conducted between the 1990s to early 2000s were integral components to help inform the final listing rule of 2013. Listing, the process by which a species is determined to meet the ESA definition of endangered or threatened, requires a thorough scientific evaluation and public review before a final decision is made. While research studies on *C. corallicola* were conducted, multiple internal documents were simultaneously generated (https://ecos.fws.gov/ecp/species/4356) to assess the status of the species since 1985 (50 FR 39526), when the species was first recognized as a candidate species. Therefore, listing is a multi-faceted process.

The ESA approaches its 50th anniversary in 2023. This law, written mostly by a group of lawyers and scientists and enacted with little controversy, is considered the most powerful environmental legislation for saving species from extinction. It has evolved over the last 49 years by defining many phrases and words, but it remains a source of legal interpretations. Many stakeholders and scientists are not content with ESA's performance, based on the limited number of species delisted to date (Greenwald et al., 2019). Of the total 1638 domestic species listed as of 2021 (941 plants, 451 vertebrates, 276 invertebrates; Figure 1), only 4% (N = 69 species: 48 vertebrates, 1

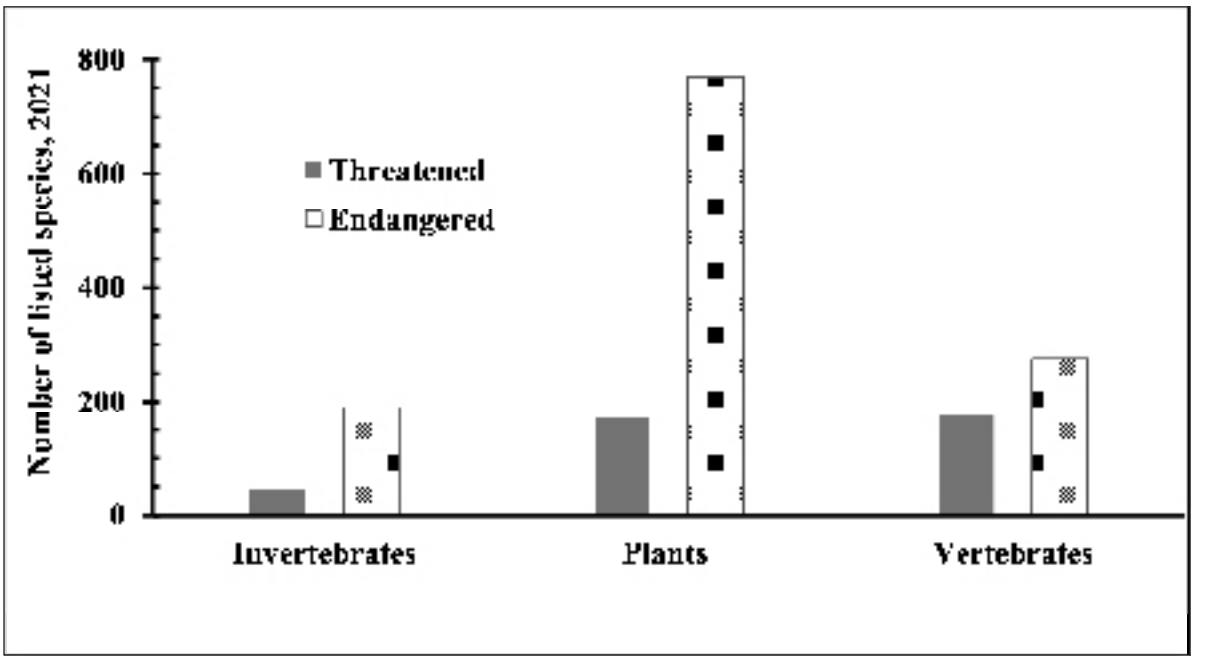


Figure 1. *Number of species by taxonomic group and listing status.*

invertebrate, 20 plants) have been removed from the list due to recovery, which is the goal of the ESA.

But using this metric solely to evaluate the ESA success is not effective, since delisting is only one purpose of the ESA. The recovery process takes on average 24-40 years (years for: birds, 40; fishes, 31; mammals, 24; plants, 27; reptiles, 30) if we have all the 'means' and a suit of partners working continuously on a species. Preventing extinction to keep endangered species stable, however, provides a better measure of the effectiveness of the ESA. Although the ESA doesn't have a definition for 'extinction', and rates of extinction are difficult to quantify, determination of whether a species is extinct is based on analyses including detectability of the species, adequacy of survey efforts, and time since last detection. With these three criteria, only 11 species (all animals) have been determined as extinct after listing (https://ecos.fws.gov/ecp/). One main impediment to delisting plant species is the limited funding (Figure 2) available for the implementation of recovery actions of species at risk of extinction (Figure 1). An additional concern is the steady decline of personnel dedicated to the conservation of threatened and endangered species due to the "trend in agencies to hire generalists or persons with a degree in biology or ecology and expect them to cover all taxonomic groups" (L. Smith, 2022 interview).

The first four plants were listed under the ESA in 1977 (Figure 3). These four species (endemics to the San Clemente Island, CA) were listed as threatened [*Acmispon dendroideus* var. *traskiae* (Fabaceae) and *Castilleja grisea* (Scrophulariaceae)] and endangered [*Delphinium variegatum*

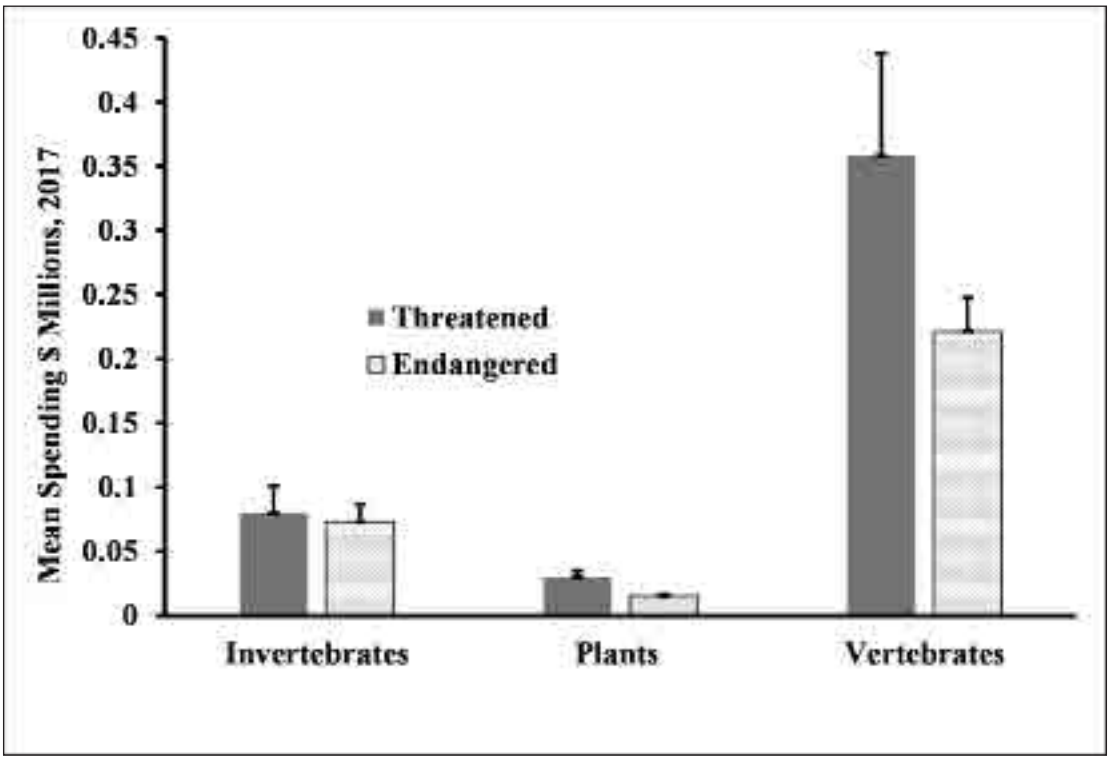


Figure 2. *Average recovery spending per species by taxonomic group and listing status. The error bars represent the standard error of the mean.*

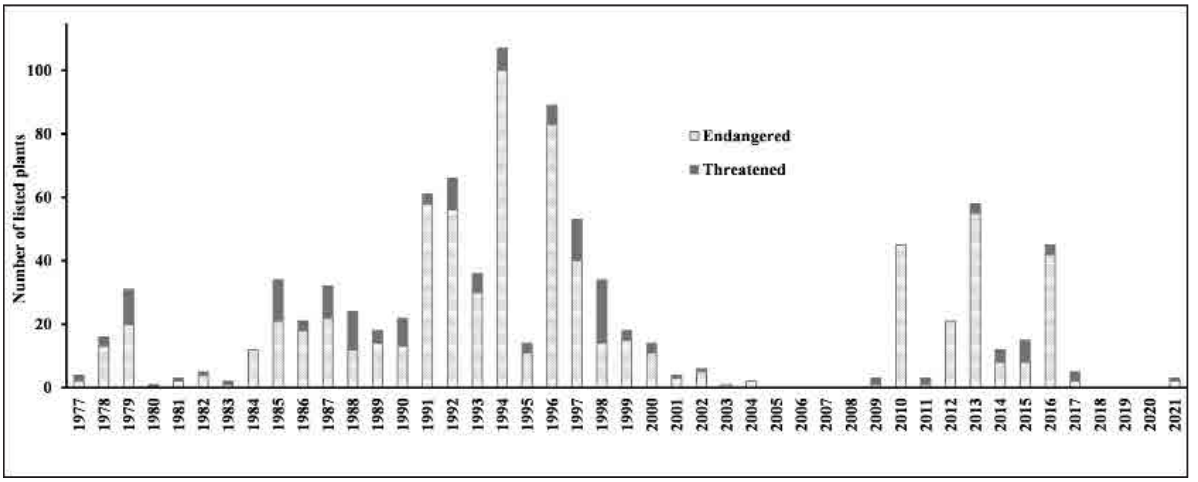


Figure 3. *Number of species listed per year and listing status.*

ssp. *Kinkiense* (Ranunculaceae) and *Malacothamnus clementinus* (Malvaceae)], and successfully recovered 44 years post-listing, in 2021. Since 1994, plants are the taxonomic group most listed, comprising 58% of all federally listed species to date (Figure 1). Federal expenditures, however, are not commensurate (Figure 2; Negrón-Ortiz, 2014) and most funding is allocated to vertebrates. This pattern is not likely to change, as an FWS leader expressed when I interviewed him in 2022, "Funding is not equal across species, and will not be equal, ever!"

Federally listed plants are represented by 394 genera and 941 species within 118 families (Figure 4). About 59% of these genera are represented by one species, while only 2% of the genera (*Astragalus*, *Cyanaea, Cyrtandra, Euphorbia, Melicope, Phyllostegia, Pritchardia,* and *Schiedea*) include ≥11 species with the Hawaiian endemics *Cyanaea* (Campanulaceae) and *Schiedea* (Caryophyllaceae) possessing the most listed (51 and 28 species, respectively). Overall, more than 80% of the listed plants have an endangered status (Figure 3). Many are found in the Pacific (49%), Pacific Southwest (20%), and Southeast regions (18%); and belong to the Asteraceae (11%), Campanulaceae (9%), Fabaceae (6%), and Lamiaceae (5%) (Figure 4). Of the 271 listed plants within these four families, 155 are found in the Pacific (particularly the Campanulaceae), 227 are listed as endangered, and 165 possess high degree of threats. The recovery potential of 110 of species with high threats is low, suggesting that these species are vulnerable to extirpation and possibly extinction.

Federally listed plants are primarily protected on public lands. The only public land managed by FWS are the National Wildlife Refuges (NWRs), where about a third of all the listed species occur in 444 of the 568 NWRs (Defenders of Wildlife, 2020). While 23,086 native plant species have been reported in 396 NWRs, only 207 are federally listed and documented in 93 NWRs. The species requiring federal protection may increase in the near future, since more than 2000 are currently assessed by NatureServe as critically imperiled (G1) and imperiled (G2)—thus, NWRs remain important for preserving biodiversity. The numbers of species projected to require federal protection are greatest

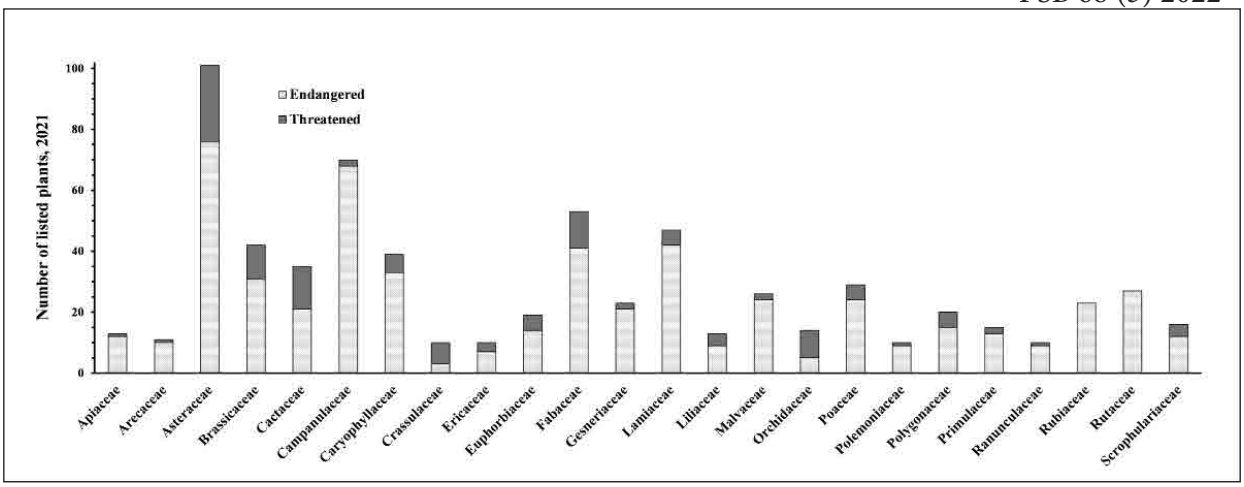


Figure 4. *Families with ≥10 listed plant species. Most families (94) possess < 10 listed plant species, totaling 265.*

in Hawaii, California, and the Southeast. Although there are other federal, state, and local areas home for many of our threatened and endangered species, unfortunately, most of our plants are located on privately owned lands where they do not receive protections under the ESA.

KEY MILESTONES FROM 1973 TO PRESENT

I am going to switch gears and rely on the interviews and discussions with 10 FWS leaders and botanists nationwide to document key milestones within three timelines about 20 years apart that marked significant decisions for species protection, science, and policies under the ESA.

1973 to 1995

- The listing process was solely performed at the FWS headquarters (HQ) from 1973 to 1985, and then it was transferred to the regions until 1992 when it finally was delegated to the field offices.
- Gail Baker, Bruce MacBryde, John Fay, and LaVerne Smith were the only FWS botanists hired between 1975 to 1978. They were stationed at HQ and worked nationwide on a proposed rule to list several hundreds of plants (Baker's recollection is 800 plant species). They gathered information on these plants by contacting state offices to inquire about their plant conservation efforts and providing funding agreements to botanists around the country to inform listing on specific plants.
- Science
  - The immediate actions for these plants were surveys and uncovering new locations, as basic science was scarce or lacking.
  - Research was transferred in 1993 to the National Biological Service, now U.S. Geological Science (Wagner, 1999).
- The driver in the 1980s was to list species "just to be on the safe side," (J. Herrington, 2022 interview), and it was done with minimal data.

- A total of 509 plants were listed within 22 years, of which 80% were assessed as endangered (Figure 3).

1996 to 2015

- The external drivers during this period were trust and partnership. Research was no longer an action to be implemented by the FWS staff; thus, trusting was crucial as partners had the task to collaborate on research projects and get the best available information for the recovery process.

- The internal driver during much of this period was the high volume of lawsuits and their consequences.

    - Lawsuits. Between 2005 and 2015, the FWS received about 141 suits, involving 1441 species, to take actions within deadlines under Section 4 of ESA. In addition, two mega-petitions (formal requests to list species under the ESA) were received: one in 2007 to list 674 species in the Southwest and Mountain-Prairie regions and the other in 2010 to list 404 species in the Southeast region (GAO, 2017).

    - Consequences. Re-assigning FWS staff to work on those litigations delayed the recovery work but conversely, as G. Carmody (2022 interview) stated, "Certain things were done in a way that they would not have been done otherwise." She also stated that "funding was redirected to compensate lawyers' salary and to establish agreements to get the new workload done."

- The overall driver between 2000 and 2009 was "more listing, but not recovery" (J. Herrington, 2022 interview), although no plants were listed from 2005 to 2008 (Figure 3).

- Science

    - Population viability analyses became the ideal approach to estimate the probability of extinction of populations or species and was frequently used as a framework for recovery.

    - Basic science continued to be scarce for most listed plants and for all species in general, and the structured decision-making approach (Runge et al., 2020) was used to explicitly address ambiguity or uncertainty due to knowledge gap.

    - A key issue that marked this period was listing of the polar bear in 2008 (L. Smith, 2022). It triggered the importance of addressing the long-term projection of species vulnerability and extinction risk under climate change scenarios (i.e., forecasting).

    - Management was considered more active and less idealistic as "we don't have the luxury to go as we did in the past" (L. Smith, 2022 interview).

- A total of 378 plants were listed within these 20 years, with 83% of them classified as endangered (Figure 3).

2016 to the present and future

- Science and Policy decisions
    - Greater scientific understanding of species' viability is anticipated to improve because an analytical framework called Species Status Assessment (Smith et al,. 2018) is in place to inform decision-making including processes such as listing and recovery.
    - Better baseline data and research on survival, reproduction, and other vital rates are expected through collaboration with experts outside FWS, as well as an improved assessment of the current and future trajectory of the species.
    - Greater technical participation by experts outside of the FWS is also anticipated to help us integrate and apply the best available data to inform decisions, by characterizing uncertainty and filling data gaps.

Significant scientific advances had been made in understanding the biology and ecological needs of many of listed plant species during the 49 years of the ESA implementation, yet basic science remains scarce. Three areas of research (population genetics, reproductive and seed ecology, and demographic modeling) have considerably contributed to guide efforts to protect populations and prevent extinction of endangered and threatened species. But many questions remain to be answered, and the following collective themes emerged through discussions with FWS botanists: What is the life history profile for each species? Are they able to adapt to changing environmental conditions and catastrophic events? How should a "population" be defined? What constitutes a plant vs. a clone? What are the types of soil seed bank? What are the longevity of ex-situ seeds? What are the overall patterns of in-situ seedling recruitment? Is low recruitment sufficient to maintain stable populations? What solutions are needed to conserve species at risk from climate change? Overall, the reality is that many of our species are not improving, current threats are and will be exacerbating species endangerment, and science alone will not lead to prevention of many species' extinctions—but it may help slow down extinction.

In closing, I would like to finish with several quotes that have specific meanings at certain time periods within the 49 years of the ESA implementation. A common phrase constantly being said by botanists since the inception of the ESA to present days is, "Do not forget the plants"—a reminder to the FWS leadership that plants are also listed and need to be included in documents such as strategies, during public speaking, and outreach media. The phrase "The past was a predictor of the future, but not now" refers to how we cannot go back to how species and habitat were previously managed because changes and degradation are happening faster due to the consequences of climate change, and the past management data will not help restore current lands. "Science will prevail" was a quote commonly verbalized during the polar bear listing process and certain key periods (1980s and 2000s) associated with presidential administrations. Finally, Mrs. Gail Baker said during a 1976 interview with a National Public Radio reporter, "It's not love that makes the world go round, it's photosynthesis." A few days later, she received a message from a college student in Boston praising her story and quote!

TERRITORIAL ACKNOWLEDGMENTS

I want to acknowledge the traditional territory and ancestral lands of many indigenous people (https://native-land.ca/). My work area occurs across the NW Florida home of the traditional and ancestral lands of the Mvskoke (Muscogee/Creek) and Apalachees, and since this year the conference was in Anchorage, Alaska, I would like to pay my respect to Elders both past, present, and future.

ACKNOWLEDGMENTS

I wish to acknowledge 10 participants representing FWS leadership and botanists across the nation for their contribution during interviews: Gail Baker (former FWS botanist, 1976-1977, HQ), Sean Blomquist (former Supervisor, Branch of SSA Science Support, HQ), Tara D. Callaway (Washington State Plant Recovery Coordinator, Washington State), Gail Carmody (former Field Supervisor, NW Florida), Craig Hansen (Listing Coordinator, Region 6, CO), Jay Herrington (former Field Supervisor, N Florida), Mark Madison (Historian, National Conservation Training Center, WV), Erin Rivenbark (Listing Biologist, Region 4, Atlanta, GA), LaVerne Smith (former FWS botanist, 1978-1983, HQ), Lauren Weisenberger (Plant Recovery Coordinator, Honolulu, HI), and Marion (Scott) Wiggers (botanist, Mississippi Field Office, MS). Specifically, I was thrilled to interview Gail Baker and LaVerne Smith, who were part of the beginning the ESA implementation. My appreciation is also extended to 10 other FWS staff members for providing many plant images that were featured in this talk at Botany 2022.

REFERENCES

Greenwald N., K. F. Suckling, B. Hartl, and L. A. Mehrhoff. 2019. Extinction and the U.S. Endangered Species Act. *PeerJ* 7: e6803. https://doi.org/10.7717/peerj.6803

Negrón-Ortiz, V. 2014. Pattern of expenditures for plant conservation under the Endangered Species Act. *Biological Conservation* 171: 36-43. https://doi.org/10.1016/j.biocon.2014.01.018

Negrón-Ortiz, V. 2007. Chromosome numbers, nuclear DNA content, and polyploidy in Consolea (Cactaceae), an endemic cactus of the Caribbean Islands. *American Journal of Botany* 94: 1360-1370.

Negrón-Ortiz, V., and L. Strittmatter. 2004. Embryology of floral dimorphism and gender system of *Consolea corallicola* (Cactaceae), a rare species of the Florida Keys. *Haseltonia* 10: 1-10.

Negrón-Ortiz, V. 1998. Reproductive biology of a rare cactus, *Opuntia spinosissima* (Cactaceae), in the Florida Keys: why is seed set very low? *Sexual Plant Reproduction* 11: 208-212.

Runge, M. C., S. J. Converse, J. E. Lyons, and D. R. Smith. 2020. Structured Decision Making: Case studies in natural resource management. Johns Hopkins University Press.

Smith, D. R, N. L. Allan, C. P. McGowan, J. A. Szymanski, S. R. Oetker, and H. M. Bell. 2018. Development of a Species Status Assessment Process for decisions under the U.S. Endangered Species Act. *Journal of Fish and Wildlife Management* 9: 302-320.

Strittmatter, L. I., V. Negrón-Ortiz, and R. J. Hickey. 2002. Subdioecy in *Consolea spinosissima* (Cactaceae): breeding system and embryological studies. *American Journal of Botany* 89: 1373-1387.

U.S. Government Accountability Office (GAO). 2017. Environmental litigation: Information on Endangered Species Act deadline suits. Website: https://www.gao.gov/assets/gao-17-304.pdf.

Wagner, F. H. 1999. Whatever happened to the National Biological Survey? *BioScience* 49: 219–222.

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

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.

Caroline Dowling, University College Dublin, For the Presentation: It's Been a Long Day: Uncovering the genetic control of flowering in *Cannabis sativa*. Co-authors: Jiaqi Shi, Susanne Schilling, Rainer Melzer

SAMUEL NOEL POSTLETHWAIT AWARD

(Teaching Section)

The Samuel Noel Postlethwait Award is given for outstanding service to the BSA Teaching Section.

Dr. Melanie DeVore, Georgia College & State University

MICHAEL CICHAN PALEOBOTANICAL RESEARCH GRANT

(Paleobotanical Section)

The Award is to provide funds for those who have completed a PhD and are currently in a post-doctoral position or non-tenure track position.

Nareerat Boonchai, Florida Museum of Natural History, University of Florida. For the paper titled: "Insights into the Wyoming's Blue Forest: Filling a knowledge gap in diversity of Eocene woody vegetation, paleoenvironment, and paleoclimate."

Andres Elgorriaga, University of Kansas. For the paper titled: "Reconstructing ginkgoalean macroevolutionary patterns through time within a phylogenetic context."

AWARDS FOR STUDENTS

DONALD R. KAPLAN AWARD IN COMPARATIVE MORPHOLOGY

This award was created to promote research in plant comparative morphology, the Kaplan family has established an endowed fund, administered through the Botanical Society of America, to support the Ph.D. research of graduate students in this area.

Yesenia Madrigal Bedoya, University of Antioquia (Colombia). For the Proposal: A morpho-anatomical characterization of the vegetative-to-reproductive meristematic transition in terrestrial and epiphytic neotropical orchids

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

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

THE J. S. KARLING GRADUATE STUDENT RESEARCH AWARD

Jessie Pelosi, University of Florida. For the Proposal: Beyond the genome: methylomics of the alternation of generations

AWARDS FOR STUDENTS GIVEN BY THE SECTIONS

STUDENT PRESENTATION AND POSTER AWARDS

ECOLOGICAL SECTION STUDENT PRESENTATION AWARD

Michael Peyton, University of Wisconsin – Madison. For the Presentation: An investigating into the role of functional traits and spatial scale in Hawaiian understory responses to pig disturbance. Co-author: Sara Hotchkiss

ECOLOGICAL SECTION POSTER AWARDS

Blaire Kleiman, Florida International University. For the Presentation: How weeds affect insects in mango, *Mangifera indica*, cultivation of South Florida.

DEVELOPMENTAL & STRUCTURAL POSTER AWARD

(Best Student Poster)

Deanna Neupert, Miami University. For the Poster: The evolution of structural novelty: A morphological analysis of development in *Mimulus* and its implication for plant architecture and reproduction. Co-authors: Robert Baker, Rich Moore, Jonathan Bauer

ISABEL COOKSON AWARD

(Paleobotanical Section)

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

Kelly Pfeiler, University of Kansas. For the Presentation: Anatomically preserved cheirolepidiaceous pollen cones of western North America. Co-authors: Brian Atkinson, Kelly Matsunaga

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.

Heather Phillips, Cornell University. For the Presentation: To fuse or not to fuse: Investigating the evolution and development of floral fusion in the Zingiberales. Co-authors: Jacob Landis, Chelsea Specht

LI-COR PRIZE
(PHYSIOLOGICAL SECTION)

Each year, the Physiological Section presents the Li-COR prize to acknowledge the best presentation made by any student, regardless of subdiscipline, at the annual meeting. The Li-COR prize is presented annually at the BSA Banquet.

Best Student Oral Presentations

Claudia Garnica Diaz, University of Florida. For the Presentation: Intra-canopy leaf variation in deciduous oaks (genus *Quercus*): from leaf construction to energy return. Co-Authors: Siddarth Machado, Raiza Castillo-Argaez, Nicholas Ash Smith, Daniel J. Johnson, Grace Patricia John

Ana Flores, University of Hawaii at Manoa. For the Presentation: Trait variation as plants grow up: simultaneous effects of ontogeny and phenotypic plasticity. Co-author: Kasey Barton

Best Student Poster

Jordyn Regier, Pepperdine University. For the Presentation: Substrate type affects the drying speed and desiccation tolerance of fern gametophytes. Co-Authors: Mayra Hernandez, Camille Kilayko Sicangco, Stephen Davis, Helen Holmlund

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.*

Keana Tang, University of Kansas. For the Presentation: Crown group Lauraceae in the Late Cretaceous: new evidence from fossil flowers. Co-Authors: Kelly Matsunaga, Brian Atkinson

PHYSIOLOGICAL SECTION STUDENT PRESENTATION AND POSTER AWARDS

Best Student Oral Presentation

Maria Cristina Rengifo Faiffer, Michigan Technological University. For the Presentation: Phenotypic plasticity of *Syntrichia caninervis* in novel climates. Co-authors: Matthew Bowker, Anita Antoninka

Best Student Poster

Marissa Ochoa, University of California, Los Angeles. For the Presentation: How does stomatal anatomy influence leaf conductance from minimum to maximum? Causal relationships and meta-analysis. Co-authors: Lawren Sack, Thomas N. Buckley, Christian Henry, Camila Medeiros, Ruihua Pan, Grace Patricia John

PHYTOCHEMICAL SECTION PRESENTATION AWARDS

Best Presentation

Gordon Younkin, Cornell University. For the Presentation: Comparative transcriptomics of 48 *Erysimum* species guides discovery of cardiac glycoside biosynthetic genes. Co-authors: Martin Alani, Mahdieh Mirzaei, Georg Jander

Best Presentation Honorable Mention

Luis Santiago-Rosario, Louisiana State University. For the Presentation: Contrasts among cationic phytochemical landscapes in the southern United States. Co-author: Kyle Harms

Best Poster

Gemma Takahashi, University of California, Irvine. For the Poster: Differential expression, genome annotation, and enzyme discovery in *Drosera capensis.* Co-authors: Omar Akbari, Ulysses Castelan, Mark Hadadian, Jonathan Le, Jessica Kelz, Elizabeth Diessner, Elliott Einstein, Megha Unhelkar, Ashley Kwok, Marc Sprague-Piercy, Sofiya Woodcock, Allison Pineda, Pauniz Shabakesaz, David Einstein, Alexandra Garabedian, Aden Alemayhu, Jose Uribe, Rachel Martin, Carter Butts

Best Poster Honorable Mention

Anna Ferraro, High Point University. For the Poster: Characterizing plant biochemical responses to pathogenic stress: a spotlight on red leaf spots. Co-authors: Maggie Salley, Bailey McCormick, Andrew Wommack, Nicole Michelle Hughes

Gifts to the BSA Endowment Support Student Research

In 2021, the Botanical Society of America (BSA) revised its strategic plan, updating the mission, goals, and areas of impact for the Society. A gift or planned financial commitment to the BSA will enable the Society to achieve its goals as outlined in the updated strategic plan and to achieve long-term sustainability for BSA. Support for diverse student inclusion and participation emerged as a priority for the continued work of the Society. Among other areas of focus outlined in the strategic plan, making student participation and success a key priority will ensure the overall long-term sustainability and global impact of the BSA.

In 2021, the Society received a large and generous gift from an anonymous donor to endow a new Graduate Student Research Award in Comparative Plant Biology. The first research award for $10,000 from this fund will be offered in 2023. This award significantly increases the support that the Society can provide to graduate students in plant biology. The Society also offers the prestigious Kaplan Dissertation Award in Comparative Morphology, in its third year of funding, which provides a $10,000 research award annually.

You, too, can help by making a donation of any amount to BSA or consider giving a legacy gift to BSA. The intent of the Botanical Society of America's Legacy Society is to ensure a vibrant BSA for tomorrow's botanists, and to assist all members in providing wisely planned giving options. All that is asked is that you remember the BSA as a component in your legacy gifts—no minimum amount. We hope this allows all BSA members to play a meaningful part in the Society's future.

Giving a legacy gift to the BSA is simple: https://crm.botany.org/civicrm/profile/create?gid=46&reset=1. To contact us with your questions, e-mail bsa-manager@botany.org.

By Jennifer Cruse-Sanders
BSA Director at Large for Development

Nurturing Botanists: Developing a Self- and Community-Care Practice: A Botany360 Recap

The mental health crisis in this country, and its implications for students and workers, has been well documented. *Burnout, work-life balance,* and *self-care* are terms and topics that are now commonly used by many, and the botanical community is no exception. But these very serious issues are at times misunderstood or dismissed as overexposed, temporary, or self-indulgent. And self-care has been irresponsibly commercialized and offered as a simple panacea to structural problems. So, what are the nuances of good mental health in the workplace? What are the specific challenges to and opportunities for self- and community-care in the botanical community? In August 2022, the BSA offered a free Botany360 webinar—"Nurturing Botanists: Developing a Self- and Community-Care Practice"—to explore these questions.

By Sarah Sims
BSA Diversity Equity Inclusion and Outreach Programs Coordinator

As the BSA Diversity Equity Inclusion and Outreach Programs Coordinator, I provided participants with information, ideas, and concrete skills to help them build a practice of care for themselves and others in their communities, universities, and workplaces. The workshop interrogated some of the harmful approaches to mental health and instead offered a more nuanced and trauma-informed view of when, how, and why to develop a self- and community-care practice. I'd like to offer a recap of that workshop here in the *Plant Science Bulletin* so that more of our botanical community can take steps to better care for ourselves and one another.

WHAT IS YOUR PROFESSIONAL QUALITY OF LIFE?

Before jumping into self- and community-care practices, the workshop explored mental health challenges in the workplace and introduced the Professional Quality of Life measure as a way to deconstruct and understand our complex feelings about and relationship with our work.

The Professional Quality of Life measure, or ProQOL, is a self-assessment tool that has been used for over 15 years to help individuals understand their level of work satisfaction, fatigue, and burnout. Historically, it was

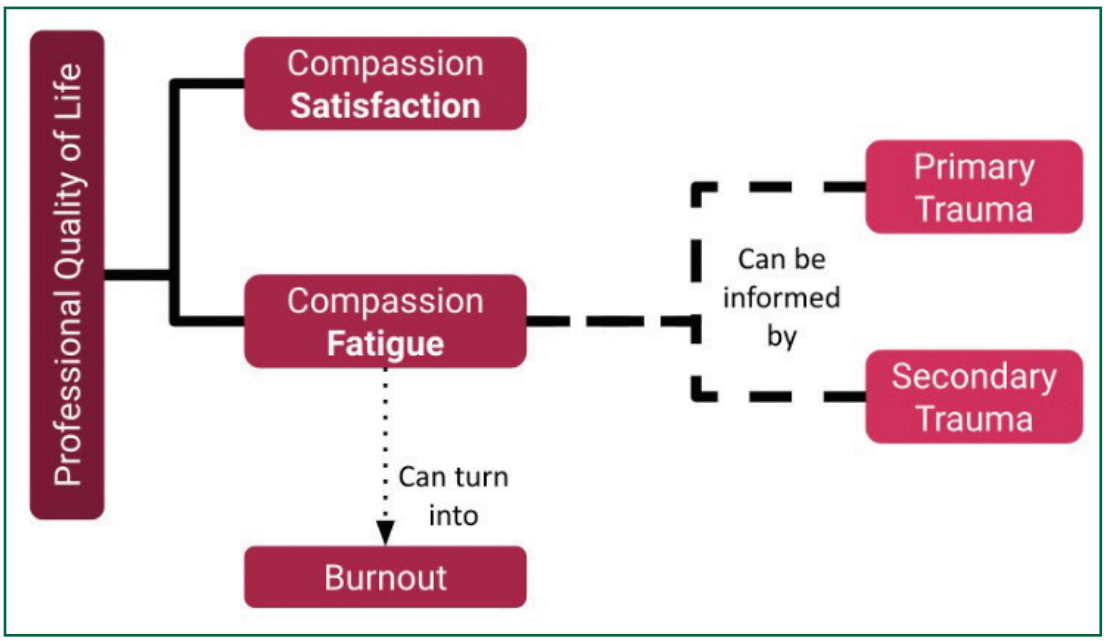
primarily used in the "helping professions," but many different types of workplaces and workers are now using the tool to understand the complexities around what makes us feel good and bad in our careers and what we can do about it. The ProQOL determines your professional quality of life as a balance of the compassion satisfaction and the compassion fatigue you feel. (Note: To learn more about how the the ProQOL defines and measures professional quality of life, or to take your own self-assessment, visit https://proqol.org/.)

Compassion satisfaction is the pleasure you derive from doing your work or that you get from external sources at your workplace. The specifics of what makes you feel satisfied at and with your work will be different for everyone depending on personality, identities, approach to work, etc. Here are some of the factors that our colleagues in botany said make them feel a sense of compassion satisfaction:

- Workplace flexibility
- Seeing our students and colleagues have successes
- Having a sense that you and your colleagues are working together toward a common goal
- Having peers who share some of your marginalized identities
- Having lab mates or co-workers who you can vent to and who in turn will listen to you

Do any of these ring true for you? What makes you feel satisfied with your work?

Compassion fatigue is exhaustion, emotional distress, frustration, anger, or apathy resulting from caring a lot about your work and having negative feelings about your workplace. It can also be influenced by traumatic experiences you



might have either at work or in your personal life. Compassion fatigue, if unchecked, can turn into burnout. Burnout can show up as complete mental and/or physical exhaustion, a cynical detachment from your work, or a reduced sense of self-efficacy (https://hbr.org/2021/04/your-burnout-is-unique-your-recovery-will-be-too). Like compassion satisfaction, what makes you feel fatigued or burnt out is also individual. Here's what some in the botanical community struggle with:

- Unrealistic and increasing workloads and high focus on productivity
- The pressure to give free or undervalued labor
- Unsupportive leaders and/or institutions
- Issues related to the COVID-19 pandemic
- Monotony of work and/or recurring problems with no solutions
- Feeling under-appreciated

Have you ever experienced burnout? What makes you feel compassion fatigue at work?

We often think about burnout specifically as a state of mind that might lead us to drop out of school, quit our job, or find a new profession entirely. These impacts on our careers are certainly true, but perhaps a more insidious consequence of burnout is what it does to our bodies and long-term health if unchecked for too long. Our bodies react in automatic ways to stress, releasing adrenaline and other hormones that can cause changes to blood sugars, heart rates, and blood flow. A short-term change helps us get safely through a stressful or even dangerous situation. But when this is happening all the time, it can lead to heart conditions, metabolic diseases, sleep disorders, harmful coping mechanisms, and more. Thus, the very essential need for self- and community-care: it's not just about keeping us at our jobs and satisfied with our jobs—it's about preserving our health!

SELF-CARE: IT'S MORE NUANCED THAN YOU THINK!

There are a lot of harmful myths about self-care, and one of the biggest ones is that it is all on you. Unfortunately, *self-care* is often used as a catch-all term for what is (or should be) a layered approach to supportive care, which starts with self-soothing or self-regulation, then self-care, followed by community-care, and all of which would (in a perfect world) be enveloped by comprehensive and inclusive structural care.

SELF-SOOTHING/SELF-REGULATION: DO IT NOW!

Self-soothing or *self-regulation* are reactive activities that are easy for you to engage in and provide distraction and/or comfort during a stressful time. The key phrase in the previous sentence is "easy for you." Often, self-care and self-soothing are confused or used interchangeably. As we'll discuss further below, a self-care practice that you've taken time and intention to cultivate and get better at over time can become one of your go-to self-soothing techniques—but it doesn't always automatically start that way. Consider this: have you ever been in a stressful situation, and someone tells you, "Let's just take a break to meditate"? You try, but the stress doesn't go away, and then your stress increases because you become acutely aware that you don't know what you're doing or that you aren't doing it right. And now you are more stressed that you wasted time unsuccessfully trying to destress. Well, meditation wasn't the right self-soothing technique for you, but something else is!

Let's dig a little deeper into the science of how self-soothing works. A good self-soothing technique is one that makes you feel calm. How does that work? Let's take a look at the other term used for self-soothing: *self-regulation*. When we are stressed, we are dysregulated. Dysregulation happens in our bodies. Those stress hormones, mentioned above, make our muscles tense up, or our heart rate increase, or our breathing to become irregular. You likely know what stress or dysregulation looks like in your body. So, to re-regulate (or self-soothe), you need to provide your body with the opposite of the dysregulation symptom you are experiencing. If you feel yourself getting hot and sweaty, enjoying a favorite iced drink may be your go-to. If you experience the stress as body aches, maybe a brisk walk or a session at the boxing gym is what you need. Because dysregulation is unique to you, self-regulation techniques also need to be unique to you.

Personalization—got it! But why does it need to be easy? When you're dysregulated, your body reacts, but so does your brain. Specifically, as you become more stressed, key executive functions of your brain, such as your ability to plan ahead, follow multiple complex steps, and even language, become harder to access. On the flip side, you begin to rely more on your limbic system where emotions, memories, and habits live, and your brainstem and cerebellum, which is the autopilot section of your brain where your fight–flight or freeze responses live. This means that if a regulation technique is new or highly complicated, you likely won't be able to perform it successfully.

TRY IT! 5, 4, 3, 2, 1 SENSORY GROUNDING

During the workshop, a couple of self-regulation techniques were explained and practiced. Here's one that you can do anywhere and in any amount of time: find a comfortable place to sit or stand in any type of environment. Take a few deep breaths. Look around and name five things you can concretely see. Take some more deep breaths. Physically use your hand to touch four things and name how they feel. More deep breaths. Name three things you can hear; closing your eyes may help. More deep breaths. You may need to really concentrate this time: name two things you can smell. A final deep breath. Now name one emotion you have.

So, why does this work? Oftentimes when we are dysregulated, we lose an attachment to our body; in other words, we become overtaken by our thoughts or feelings. A great way to reconnect with our bodies and break that dysregulatory cycle is to focus on our senses. Also, if you practice this technique and are currently living without certain disabilities, you'll notice that it starts with the easier to access sense—sight—and then progressively asks you to pay close attention. You'll recall from above that when we are dysregulated, our higher-level thinking skills begin to go offline—so the simpler the task, the easier it is to soothe yourself. This technique slowly reintroduces your executive functions. Next time you're feeling stressed, give it a try!

SELF-CARE: PLAN AND PRACTICE

Self-care is really about cultivating your future well-being. As opposed to self-regulation, which you would engage in when you start to feel dysregulated, you really need to practice self-care when you already feel calm (and when you have full access to all of those executive functions of your brain). It is proactive and intentional. While self-regulation involves activities that purely make you feel soothed, calm, and good, *self-care* should encompass a more holistic definition of good health. Self-soothing often focuses only on your physical, mental, and emotional well-being. With self-care, we want to expand that to include financial, spiritual, social, occupational, environmental, and intellectual health.

This inevitably means that self-care requires some level of commitment. This might mean creatively carving out time to practice something new. Or, and perhaps more difficult for some, it might mean figuring out how to say "no" and stick to your boundaries. It might mean trusting others to fill in for you at work or at home so that you have more time for self-care. It might mean leaning into a new practice that seems hard or awkward at first. For the botanical community, and specifically those in academia, we might need to interrogate the implicit and explicit pressures within our discipline to adhere to scientific, rational thinking and reject anything that might incorporate intuition, emotion, or reflective thinking. This attitude can be at odds with our need to prioritize self-care.

STRUCTURAL CARE (A GOAL TO ADVOCATE FOR) AND COMMUNITY-CARE (WORKING TOGETHER TO CREATE WORKAROUNDS)

Finally, we turn to structural and community-care. *Structural care* consists of systems that support our holistic health and make it possible for individuals to engage in meaningful self-care. These are things like comprehensive universal healthcare, efficient and accessible public transportation, a living wage, paid family leave, etc. They might be mandated by governments or provided by a place of employment. In short, structural care is all the things that would make life just a bit easier.

But we know that structural care is not a universal reality, so cue community-care. *Community-care* is what we develop together in our various communities to provide relief and support when the systems we operate within fail to do so. These can be highly structured, such as worker-owned co-ops or student unions. They can be small and informal, such as childcare collectives, or buy-nothing groups on social media. They can be as simple as the relationships you form with others who share your identities, perspectives, or needs.

Within the workplace setting specifically, communities of care build a culture that normalizes conversations about mental health and the prioritization of self-care. This means actively rejecting language and practices that stigmatize attention to mental health and supporting DEI (diversity, equity, and inclusion) values and ethical behavior more broadly (https://bit.ly/3zkWYOu and https://bit.ly/3N6aWcE). Workplace communities of care establish practices that honor and support each other's self-care preferences and provide opportunities for colleagues to engage in self-care. So what could a botanical community of care look like? First, workshop participants identified some of the barriers we face, including:

- Workloads prohibiting us from taking the time to intentionally build these supports or even think about them
- Being out of practice interacting with our colleagues in a meaningful way after so long in pandemic isolation
- A lack of trust in the larger system to allow communities of care to take place
- Lack of inclusivity within the botanical community

What barriers to creating a community of care do you face in your lab, at your university, or in your place of employment? Identifying the barriers can be a good first step to brainstorming workarounds where care and connection are perhaps the most needed.

Despite the barriers, some supportive community practices are already taking place in pockets across our discipline:

- Normalizing the sharing of pronouns and visual symbols on labs, classrooms, and offices that indicate welcome and inclusivity
- Regular social gatherings for labs or departments
- Conferences and unions providing childcare
- "Pause" days for mental health
- Open acknowledgement of the need to give and receive grace

Many of these community-care practices are small, but like plants, they can and will grow if cultivated. Who is in your communities? Where is care needed the most? What can you do to start or contribute to a community of care at your school or workplace?

PLANT SCIENCE BULLETIN
SPECIAL ISSUE CALL FOR PAPERS

"Art and the Botanical Sciences: Past, Present, and Future"

The *Plant Science Bulletin* (*PSB*) is organizing a special issue titled "Art and the Botanical Sciences: Past, Present, and Future."

Artistic expression has served a critical role in botanical science since its inception, but the accepted formats and perceived value of botanical art have shifted over time. Many contemporary botanists are engaging with art and creativity as a means of being better scientists, improving their scientific communication, and exploring experiences and lenses beyond the traditional academic scope.

This special issue will include a collection of articles and visual media that (1) celebrate and critically re-examine the historical role of art in botany, (2) showcase the complex (and sometimes challenging) experiences of contemporary artist–scientists who seek to bridge the gap between disciplines, and (3) present visions for the future integrations of art and the botanical sciences.

We are interested in compiling a wide variety of submissions, spanning diverse topics and formats, including essays, illustrations, comics, and project showcases. We are committed to a frank examination of the past, present, and future state of art in the botanical sciences. As such, we welcome submissions that reflect all aspects of the author's experience unifying art and science: what works, what doesn't, and what could change.

Our scope for this special issue is broad, including:

- Historical art-science intersections
- Recent botanical sci-art initiatives
- Artist and scientist perspectives on the interplay between the disciplines
- Future directions of sci-art integration
- Art as an avenue for self-actualization
    - Feeding the mind and spirit
    - Forging connections to the world and our study systems

How to submit: Authors interested in contributing to this special issue should email a proposal consisting of a tentative title, proposed author list, and a 200–300-word abstract to the special issue editors at sciartcollective@gmail.com.

The deadline for proposal submission is February 1, 2023. Proposals will be reviewed by the Editor and the special issue editors. Authors will be notified by March 1st as to whether their proposal was accepted.

The Botanical Society of America and its publications are committed to inclusive science that reflects disciplinary, human, and geographic diversity. Proposal submissions from students and other early-career researchers are particularly encouraged.

Authors whose proposals are accepted should submit their contribution by May 1. The target date for publication of the special issue is Fall 2023.

Any questions may be sent to the special issue editors at sciartcollective@gmail.com.

Special Issue Editors:

- **Nicolette Sipperly**, Stonybrook University
- **Patricia Chan**, University of Wisconsin-Madison
- **Kasey Pham**, University of Florida
- **Rosemary Glos**, University of Michigan

BOTANY 2022 AT A GLANCE

"**Botany** will always be my **#1 conference** and I do appreciate all the effort that has gone into organizing this hybrid meeting."

1268

NUMBER OF ATTENDEES:
42% STUDENTS
8% POSTDOCS
50% PROFESSIONALS & OTHER

FIRST HYBRID CONFERENCE

29% VIRTUAL
71% IN PERSON

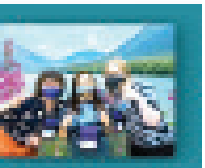
39 COUNTRIES
ALL 50 STATES

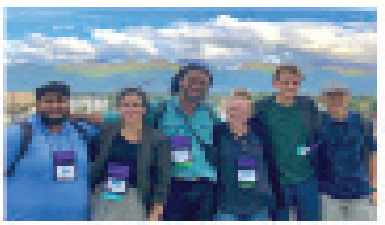
"One of the **undergrads** told me, after presenting her poster, that **she had never felt so confident in herself as a botanist.**"

- **8** Special Lectures
- **6** Symposia
- **8** Colloquia
- **683** Oral Presentations
- **277** Posters
- **9** Mixers / Receptions / Luncheons
- **18** Workshops
- **46** Lightning Talks
- **12** Field Trips

New this year

- **Affinity Groups** including:
  - Alcohol-free Ice Cream Social
  - Asian, Asian American and Pacific Islander Mixer
  - Bots with Tots
  - Disabled in the Botanical Sciences Meetup
  - Encuentro Latine/Latinx Mixer
  - Queer Femmes in Botany
- **Botanical Bingo** during the Lightning Talks
- **Green-Screen Photo Booth**





"The diversity of attendees was fantastic, and the meeting truly felt like a place where our identities as humans were being celebrated, and everyone was encouraged to share who they are as people. **I've never felt that so strongly at Botany before, and it was transformative.**"

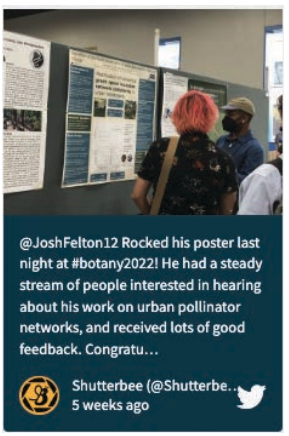
BOTANY 2022
IN YOUR WORDS AND PICTURES!

Botany 2022 was a challenging undertaking! An amazing venue - Anchorage, Alaska!
Our first in-person conference in our changing world!
Our first venture into a hybrid conference and not without complications.
All of you enjoyed the time spent with your colleagues IRL!!

I love these conferences, I love the environment, how friendly it is to students, and I will continue going as I am able. I have been critical of these hybrid models, but Botany will always be my #1 conference and I do appreciate all the effort that has gone into organizing this hybrid meeting. I appreciate all your effort! Thank you for all you do!

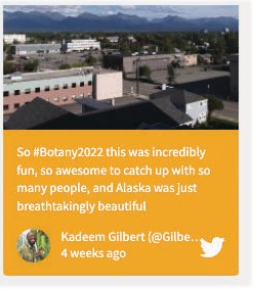
One of the undergrads told me, after presenting her poster, that she had never felt so confident in herself as a botanist. The diversity of attendees was fantastic, and the meeting truly felt like a place where our identities as humans were being celebrated, and everyone was encouraged to share who they are as people. I've never felt that so strongly at Botany before, and it was transformative.

It was great to be back in person. I know that behind the scenes things were somewhat chaotic and I want to thank the BSA staff for their patience and professional conduct. Also, thank you to Melanie Link-Perez.



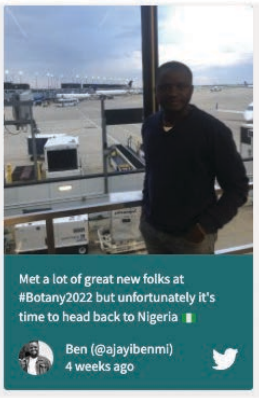
Botany is always a pleasure to attend.

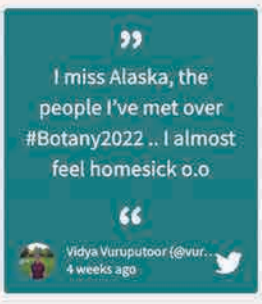
The networking opportunities were phenomenal and overall I had a great experience. As a graduate student, the conference was an unparalleled opportunity for me. However, the technical glitches in both live and virtual presentations, separation of talks and events across two buildings not particularly close to one another, was disappointing.



This is my go-to conference and it is the best!!!!

Compliments on a great meeting! And thank you for opening up another field trip on Sunday! Thank you! I think everyone would have preferred all events at one location, but the walk was a great way to connect and get some fresh air. The meeting was a huge success for me in terms of networking and balancing the Alaskan site and the friendly BSA Staff.

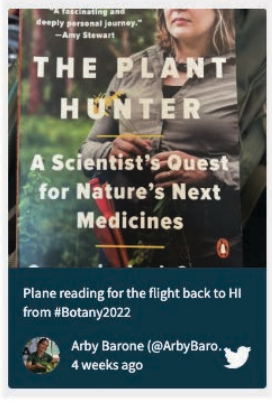


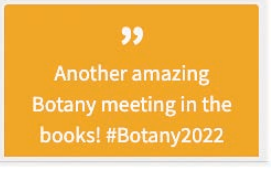


I am very appreciative of the hard work everyone did. There were a few flaws here and there: many cancellations (which you presumably had no control over), but, overall, this conference was very, very good. I'm quite glad I attended, and look forward to Boise next year.

I had an amazing time meeting new people and it made me excited to continue in research! I loved the opportunity to volunteer because I got to see how the conference was run and make new friends.

Botany is one of my favorite meetings. I think it is always well organized, and I appreciate all of the ongoing efforts to promote inclusivity and belonging.





This was my first in-person conference and I had a wonderful time!
Thank you very much for the great conference!

Support Our Conference Exhibitors & Sponsors

WILEY

LI-COR

CHICAGO JOURNALS

BLUE BEEHIVE STUDIO.COM
SINCE 2012

KATRINA VERA WONG

Taylor & Francis
Taylor & Francis Group

NORDIC JOURNAL OF BOTANY
AN INTERNATIONAL JOURNAL FOR BOTANY AND MYCOLOGY

Join us in Boise, Idaho, July 22-26, 2023
for Scientific Talks - Posters -
Special Lectures - Networking - Symposia and Colloquia - Receptions - Exhibits

Botany 2023 will be presented by these Scientific Societies:

BOTANY IN ACTION!

Each year, the Botany conference sponsors a service project in the city that the conference is held—a form of corporate responsibility and an opportunity to give back to our hosts.

This past year in Anchorage, a group of volunteers went to the Taku Lake Park on Sunday morning and helped the U.S. Forest Service to rid the park of the invasive offender: *Prunus padu*s, Bird Cherry!

Consider joining us in Boise for Botany 2023's Botany in Action! You get a t-shirt, breakfast, lunch, and a feeling of doing something good! Watch the conference website and social media for more information!

Anchorage CISMA
Keeping Invasives OUT of the Picture

Botany in Action
Botany 2022 - Plants at the Extreme!

John Henry Reisner (1888-1965):

Contributions to Agricultural Improvement Efforts in China and the Development of the College of Agriculture and Forestry at University of Nanking

ABSTRACT

John H. Reisner came to the Republic of China in 1914 with a graduate education in the field of agriculture and helped establish the College of Agriculture at the University of Nanking. Applying his personal knowledge and ability, Reisner made positive contributions to the preliminary formation and development of China's modern higher education in agriculture, and promoted the distribution and extension of advanced western agricultural science and technology in Republican China. Our study offers a documented perspective, adding to previous research that had overlooked these aspects of Reisner's early contributions.

INTRODUCTION

When Chinese intellectuals of the late 19th century expressed concern for their country's perceived deficiencies, they usually believed that it was the utilitarian power of science and technology that had made Western countries more powerful than China. To them, modern science was a cure-all to promote the country's academics, politics, economy, and social lives. Consequently, science in China was greatly influenced by Western countries, through two

By Song Shi and Lee B. Kass

Song Shi, College of Foreign Studies, Nanjing Agricultural University, No. 1 Weigang, 210095, Nanjing, China.

Lee B. Kass, School of Integrated Plant Science, Cornell University, Ithaca, NY 14853, Division of Plant and Soil Sciences, West Virginia University, Morgantown, WV 26506

Corresponding authors: shisong@njau.edu.cn; lbk7@cornell.edu

channels (Geng, 2015, p. 11). First, Western-educated Chinese scholars served their country and the Chinese people by applying what they had learned abroad mostly in America; second, Westerners went to China to teach or communicate science to their colleagues and the public. Because agriculture has always been of the utmost significance to the Chinese people, and with the food supply being most critical, agricultural science was one of the most relevant fields or disciplines to Chinese concerns at the time.

Among the westerners, John Henry Reisner is a significant person to Chinese agriculture and education. Reisner, who had obtained his undergraduate degree from Yale College (B.A. 1911), and went on to receive a Master's in Agriculture from Cornell (M.S.A. 1915), made contributions to China's agricultural improvement in several respects and in a very comprehensive way. Yet, he has not gained as much deserved attention (Chang, 2014, p. 1), and only a partial history (Stross, 1986, p. 118) has been reported on Reisner, concentrating mostly on his missionary and educational contributions to Chinese Agriculture (Stross, 1986, p. 100). Errors or inconsistencies can be found in current Chinese literature, which offers some brief information about Reisner's membership in the group of Americans going to China and working in agriculture in modern times.

Who was John Henry Reisner? What were his contributions to China's agricultural improvement? The objective of this article is to reacquaint plant scientists and historians with the life and work of Reisner. A careful examination of his achievements and contributions should provide additional insights into the difficult evolution of China's agricultural science and education.

BIOGRAPHICAL SKETCH

John H(enry) Reisner was an agriculturist, born August 27, 1888, in Fredericksburg, Virginia (Shavit, 1990, p. 418). Brought up in a small community in Pennsylvania, he became well acquainted with farm operations (Stross, 1986, p. 86; Reisner, 1962, p. 1). He went to Mercersburg Academy, which offered preparation for college study, and graduated in 1907 to attend Yale College (undergraduate college, founded in 1701, of Yale University, established 1887; Dana et al., 1911, p. 273; Yale University, 1920, pp. 150, 733; Anonymous, 1965). He received the Bachelor of Arts from Yale in 1911 (Dana et al., 1911, pp. 273, 411; Yale University, 1920, pp. 150, 733) and in his later years (1950) received the Honorary Degree of Master of Arts (Anonymous, 1965) in recognition of his devotion and contributions to agricultural mission work. Such efforts included a wide range of agricultural and rural service activities carried out by Christian churches, aiming at promoting these organizations' participation in the struggle to end poverty and foster development of rural communities in developing nations (Holcomb, 1922, pp. 52, 362-363, 560).

Reisner worked with Agricultural Missions, Inc. from 1931 until his retirement in 1956. He assumed his duties as Executive Secretary on July 1, 1931. The group was organized by Dr. John R. Mott in November, 1930. The membership of the Board of Directors was divided equally between representatives of State Colleges of Agriculture, of Foreign Missions Boards, and nonprofessionals interested in agriculture and rural life. Later, Dr. Edna Noble White, Director of the Merrill-Palmer School in Detroit, Michigan, was added to represent Home Economics and

Family Life. Upon retiring, he made several trips to countries in the developing world, to study and conduct research on rural life and agriculture (Anonymous, 1965; Reisner, Unpublished, p. 4). He was an observer [consultant] for various church agencies with the United Nations Food and Agricultural Organization (FAO) on international affairs, and he served as a member of the Advisory Committee to the Director of Food, Agriculture, and Natural Resources Personnel of the Technical Cooperation Administration in the 1950s; thus, he was connected with the U.S. Technical Cooperation (Point IV) Program (Reisner, Unpublished, p. 5).

Reisner recalled that after he graduated from Yale, he was offered a teaching position at the University of Nanking in the Department of Biology (Reisner, 1962, p. 1). The University of Nanking, or Ginlin University (金陵大学), was a private university in the city of Nanking (南京), China, originally founded in 1888 and sponsored by American churches. Reisner did not feel that he had enough training in the field to take the job. Shortly thereafter, word came of the organization of the College of Agriculture and Forestry as an integral part of the University of Nanking, and Reisner indicated that he was much more interested in agriculture than in teaching biology. Being a mathematics graduate from Yale, and with some summer work experience on farms, he decided it would be worthwhile to get some specialized training; thus, he came to Cornell in 1912 to take agricultural courses in summer school. Contrary to a report that Reisner also obtained an undergraduate degree in Biology from Cornell (Stross, 1986, p. 85), it was soon after receiving his B.A. from Yale in 1911 that Reisner attended the short course in Agriculture at Cornell in 1912 (Cornell University, 1913). He would go on to earn a Master of Science in Agriculture (M.S.A.) at Cornell in 1915 (Reisner 1915a; Reisner, 1916; Holcomb, 1922, p. 362; Cline, 1982).

The first contact with scientific agriculture during the summer of 1912 opened Reisner's eyes to the broad field, so that he decided to pursue further study before working in China. He then returned to Cornell in February, 1913 for full-time study, and registered for an M.S. in Agriculture in the Department of Farm Crops (Reisner, Deceased alumni file, Reisner, Graduate School file). He majored in farm crops under Professor Edward Gerrard Montgomery and minored in plant breeding, with Professor A.W. Gilbert of the Plant Breeding Department (Cornell University, 1914b; Reisner, 1915a; Cline, 1982, p. 202; Stross, 1986, p. 86). He was a member of the Plant Breeding Department's Synapsis Club, a graduate student-faculty organization that met weekly for seminars and dinners (Figure 1, Murphy and Kass, 2011, p. 147).

Figure 1. *Department of Plant Breeding, Cornell University, Spring, 1914. Back Row, the first from the left is John Henry Reisner, and Dr. Gilbert, his minor professor of Plant Breeding, is sitting in first row, far left. (Reprinted with permission from Murphy & Kass 2011.)*

Reisner finished the required courses for a master's degree in September, 1914. He passed the qualifying examination but departed for China before completing his thesis. Later, in 1915 at Nanking, Reisner finished writing his thesis on the history of wheat in New York State (Reisner, 1915b; Stross, 1986, p. 86) and was awarded his master's degree from Cornell's Department of Farm Crops on June 16, 1915 (Reisner, 1915a, 1916). The course work that Reisner completed at Cornell, his appointment as Assistant in the Department of Farm Crops (Cornell University, 1914a, p. 181), and his thesis research problem (Reisner, 1915b) well prepared him for his future scientific contributions to agriculture in China.

In September he left for San Francisco, arriving in Nanking about a month later (Newberry, 1998; Bailie, 1964, p. 60). Reisner was on the Faculty of the College of Agriculture and Forestry, University of Nanking from 1914 to 1916, and Dean or Co-Dean from 1916 to 1931 (Yale University, 1920, p. 150; Holcomb, 1922, p. 560; Buck, 1973, p. 9; Shavit, 1990, p. 418). Mrs. Reisner helped to develop a cookbook employing Chinese food stuff. The objective of the book of recipes was for non-Chinese people living in China to use the food grown locally, an initial effort to keep food available for allied soldiers fighting the war in Europe (WWI). It was published bilingually in English and Chinese (American National Red Cross, 1918; Jinling Da Xue, 1924)[1] and was used for many years in most Asian countries (Newberry, 1998). After returning to the United States in 1931, Reisner was active with Agricultural Mission work, for which he was mostly remembered; he died in Hicksville, Long Island, New York, on April 26, 1965 (Anonymous, 1965).

REISNER'S CONTRIBUTIONS TO AGRICULTURAL RESEARCH WHILE WORKING IN CHINA

As mentioned above, Reisner was remembered more for his leadership in agricultural missionary activities, to "accompany and support people of faith and conscience around the world in the struggle to end poverty and injustice that affect rural communities" than for his specific achievements in agricultural research towards early development of China's agricultural science and technology in modern history (Shavit, 1990, p. 418). He was the second person in China to hold a master's degree in agriculture or forestry (Stross, 1986, pp. 85-86). The forestry scientist, An Han (韩安, 1883-1961), had been the first Chinese student to achieve a master's degree in forestry from abroad. Han got his bachelor's degree in 1909 at Cornell University and a master's degree in 1911 at Michigan State University. After graduation, Han returned to work for the Chinese government and became a close friend of Reisner (Reisner, 1962, p. 10; Anonymous, 2016).

[1] The 1918 edition was prepared by the Committee on War Time Economy for the Household. It encouraged Americans overseas to use local food products to help save home food imports for the allied armies. A copy of the 1918 edition is in the Cornell archives, donated by Mrs. Reisner's daughter Jesse. The 1924 revised edition was published with the permission of the Nanking Chapter of the American Red Cross. It was apparently edited by Bertha Reisner, and she is listed as first author in the Stony Brook University Library catalogue.

Reisner was also the first person on the faculty of the University of Nanking trained in agriculture. Clearly there were few men that had extensive training in what is called *scientific agriculture* today (Reisner, 1962, p. 10; Allen, 1982). Considering the fact that the University of Nanking was the earliest institution in China offering degrees in agriculture and forestry—and has long held one of the leading positions in agricultural research, education and extension in modern China—Reisner later recalled, "Almost anything that one did in China at that time was a first" (Reisner, 1962, p. 10; Stross, 1986, p. 86). Since Reisner was the earliest agriculturist on its faculty, his early efforts in applying or communicating scientific agriculture was undoubtedly pioneering and essential to the improvement of China's traditional agriculture based on modern agricultural science (Reisner, 1921a; Stross, 1986, p. 85).

Reisner recalled that his most notable achievement was definitely in crop breeding and improvement. Not only did he institute the Plant Improvement Project, carried on from 1925 to 1931 by Cornell and the University of Nanking with financial aid from the International Education Board (funded by the Rockefeller Foundation), which was regarded as the first notable example of international technical cooperation in agriculture (Love and Reisner, 2012, p. iii), but he also initiated very early trials in crop breeding and improvement upon his arrival in China (Reisner, 1926).

He also recalled, "I developed the first pure strain of wheat from a single plant which yielded very much more than the local farmer's wheat and was used as the check variety in the plant breeding work tests until about 1929 or 1930. I also developed a Chinese yellow corn from selections that I had made, I think, in the fall of the first year that I had been in Nanking. That corn proved to be valuable in very many parts of China" (Reisner, 1962, p. 6). The wheat variety developed by Reisner was No. 26, the first developed with "modern" breeding technology in China, and was quite popular among the farmers. This variety was distributed via the extension service and planted widely. For example, Cornell's Professor C.H. Myers,

TABLE 3. *Yields in bushels per acre of 8 new strains of wheat, compared with a standard variety, Nanking, 1927-1931.*

(from T. H. Shen)

Strain	Source	1927		1928		1929		1930		1931		Average		
		Yield	Gain over Standard	Yield	Gain over Standard	Yield	Gain over Standard	Yield	Gain over Standard	Yield	Gain over Standard	Yield	Gain over Standard	Gain over Standard in %
2902	Selected from Chinese wheat	27.5	9.9	23.2	3.9	41.9	19.7	31.5	5.0	21.9	−0.2	29.2	7.7	35.8
2903	,,	25.4	7.8	25.7	7.3	39.5	17.4	33.9	7.4	20.6	0.5	29.0	8.1	38.7
2905	,,	35.8	16.6	24.6	7.3	44.6	22.5	34.1	8.1	19.6	−0.5	31.7	10.8	51.7
2915	,,	26.8	7.0	22.4	6.2	42.9	20.6	31.8	5.8	23.0	1.8	28.8	8.3	40.5
2941	,,	33.9	10.0	25.4	5.1	46.2	23.4	34.4	5.9	20.5	1.6	32.1	9.2	40.2
516	Red Rock	23.2	11.6	26.8	0.6	35.8	15.4	33.4	8.0	24.9	5.4	28.6	10.0	53.2
2869	Selected from Chinese wheat	29.7	8.5	27.1	7.0	44.1	27.3	33.6	8.1	21.7	−0.4	31.2	9.2	41.8
2919	,,	32.7	7.0	26.0	8.6	39.3	16.7	37.1	8.6	20.7	1.8	31.2	8.5	37.4

Standard variety is No. 26 which yields 7 per cent better than the farmers' variety.

Figure 2. *A table in the final report of the Plant Improvement Project. (Reproduced from C.H. Myers, 1934, no copyright restrictions.)*

on leave at University of Nanking, reported on their Plant Improvement Project. He showed (Figure 2) that wheat No. 26 was used as a standard variety in experiments during 1927 to 1931, yielding 7% better results than the farmers' variety in use at the time (Myers, 1934, p. 60). Such success gave Reisner much confidence in crop breeding, and a strong belief that it would be a very promising career in China (Reisner, 1926; Zhao, 2015). Reisner (1926) predicted that, "Increased agricultural production in China will come most easily and quickly through increasing yield by scientific plant selection."

The corn Reisner introduced to China was named Nanking Yellow. It was developed with completely new and so-called modern breeding technology, as summarized by Love and Reisner (2012, p. 22): "Corn improvement was begun by Dean J.H. Reisner when he first went to the College of Agriculture and Forestry in 1914. He followed the ear-row method that was being used at most experiment stations in the United States at that time by the selection of individual plants and continuing the selection process. The Nanking Yellow developed by this method proved to be a good variety, especially in the area of the Yangtze River, and it also did well in some areas farther away."

Dr. Shen Tsung-han (沈宗翰), a renowned Chinese plant breeder and agriculturist, reflected in 1934 on the origin and development of China's plant breeding career, by saying that China's plant breeding originated in about 1915 and had experienced two stages. Compared to a person's growth, the first stage (1915-1924) was like childhood, while the second stage (1924-1934) was like a teenager. The time of origination was just about the time of Reisner's arrival, and the advancement of the second stage was the Cornell-Nanking Plant Improvement Project, initiated by Reisner. Evidently Reisner holds a close connection with China's early crop breeding programs. Furthermore, Shen also listed several representative personnel within the process of this career, among whom Reisner was specifically named for both stages, respectively (Shen and Ma, 1934, p. 14).

Reisner was one of the earliest individuals to introduce modern breeding methods to China, and thus laid the foundation of China's crop breeding and improvement in Chinese modern history. From the standpoint of crop improvement, no extensive experiments had been conducted previously, other than those made by Dean Reisner and his associates. Within about ten years of Reisner's arrival in China, the Cornell-Nanking Crop Improvement Project began to achieve remarkable success and bring about long-lasting influence to promote the development of China's modern scientific agriculture. In addition to food crop breeding, Reisner also did research on cotton improvement, which resulted in some very valuable results and conclusions for Chinese agriculture (Nanking College of Agriculture, 1920, 1924). We describe next accounts of Reisner's contributions to those efforts. In addition, Reisner's philosophy, initiated for permanent famine prevention, will be described separately below.

Popular accounts of cotton improvement in modern China refer to achievements by foreigners, and most credited American-born J.B. Griffing. Many attributions made no mention of Reisner's earlier contributions (Cotton Millowners [*sic*] Association, 1923; Anonymous, 1924). According to several scholars, the University of Nanking introduced an American cotton variety and domesticated

Chinese local cotton prior to Griffing's arrival in China (Stross, 1986, p. 122; Shen, 2004).

Reisner's earliest involvement in Chinese cotton improvement apparently stems from his university affiliation as early as 1914, his professional training in agriculture, and more importantly his published articles on cotton improvement: "Cotton Seed and Cotton Improvement in China" (Reisner, 1920), and "Dangers and Control of Cotton Seed Importation and Distribution in China" (Reisner, 1921a, pp. 473-474), as found in the Shanghai-issued English magazine "*Millard's Review of the Far East.*" Both of these early reports offered very valuable suggestions and recommendations on China's cotton improvement and were published only months after Griffing and O.F. Cook arrived at the University of Nanking in 1919 to assist with the program (Stross, 1986, p. 121).

As early as 1920, Reisner reported, "In the Egyptian cotton area of Arizona [USA] recently developed, it is illegal and punishable by law to plant any other kind of cotton except Egyptian within the area. Only in this way can improvements made in raw cotton be maintained. This is because of the fact that cotton cross pollinates, and where two plants of different varieties are grown together, cross pollination invariably takes place, and crossing always leads to deterioration … Pure seeds, of improved strains, produced on seed farms with capable supervision is the goal toward which efforts should be directed for the improvement of the native staple." He also pointed out that not enough attention was being paid to the improvement of the local varieties, while it seemed as if undue emphasis was being put upon the importation of foreign seed, especially from America (Reisner, 1920). By 1921, he also used the lesson of the United States to remind Chinese people of the concept of plant quarantines: "The United States has suffered keen losses through the introduction of plant insects and diseases from foreign countries, and yearly expends large sums of money in trying to control such insects and diseases and prevent the introduction of others" (Stross, 1986, p. 127). "The most serious danger connected with the importation of American cotton seed is the introduction of the Mexican Boll Weevil … No less imminent are the dangers of distributing the insects and diseases which now effect *[sic]* Chinese cotton. Of these probably the Pink Boll worm is by far the most important, distributed as it is over practically the entire cotton growing area. Club-leaf disease, associated with the leaf hopper, is an important disease, widely distributed, for which there is no known control" (Reisner, 1921a).

Reisner's suggestion included adequate provision for controlling all importation and scientific means for proper fumigation of all foreign cotton seed, and limitation to one or two ports of entry for importation with prohibition on importation by parcel post, and so forth (Reisner, 1921a). Noteworthy is that Reisner might be one of the earliest agriculturalists to introduce the concept and practice of plant quarantine to China. According to Shi and Zhang (2002, p. 298), it was only Tsou Ping-wen (邹秉文) who had previously mentioned the idea of disease prevention in 1916, which was only a few years before Reisner's suggestion. They also reported that after Reisner, Cai Banghua (蔡邦华) published an article on the need to establish a national plant quarantine station in 1922. And later, in 1929, Zhang Jing'ou (张景欧) started to build plant quarantine stations at Guangzhou and Shanghai by order of the government.

Reading the early articles authored by Reisner, one senses that he was fully acquainted with cotton improvement research and had deep insights into the practical work in China. This was clearly on the basis of his first-hand involvement or understanding of cotton improvement and wide range of knowledge in several disciplines in the field of agriculture. Reisner's earliest commitment and pioneering contributions to China's cotton improvement research may be documented by Griffing (1920): "The work on cotton improvement by the writer may be said to have begun when he accompanied Dr. O.F. Cook of Washington, D.C., U.S.A., and Prof. J.H. Reisner, of the University of Nanking, on an expedition of survey of cotton experiments and cotton problems throughout East, Central and North China. The findings of this investigation have been of inestimable value as a basis for the further work on cotton which we have taken up." Cook was invited by the University of Nanking to offer guidance on cotton improvement, and he came to China in 1919 (Li, 2012, p. 136). Griffing then followed with a successful cotton research project at University of Nanking (Stross, 1986, p. 123).

China's economic development during this time coincided with Reisner's major work in agricultural research on food crops and cotton, reflecting the Chinese peoples' two basic necessities for survival, namely adequate food supply and good quality clothing for warmth. Residing in China for an agricultural mission, Reisner actually chose the most effective ways and means to apply his personal knowledge and ability, as well as fulfill this mission.

DEVELOPING THE COLLEGE OF AGRICULTURE AND FORESTRY AT UNIVERSITY OF NANKING: REISNER AS DEAN, AND HIS ACHIEVEMENTS IN HIGHER AGRICULTURAL EDUCATION

Originally offered the position of teaching at the University of Nanking, Reisner taught courses in agronomy and plant breeding for several years (Allen, 1982). Reisner's achievements in promoting China's higher agricultural education, however, may be considered greater than his classroom teaching contributions. He was the chief person responsible for the initial development of the College of Agriculture and Forestry at University of Nanking, the establishment of which marked the beginning of China's modern higher agricultural education system, as it was the first institute in China to offer a four-year bachelor's degree in the field of agriculture (Dong et al., 2014). Historically, the College of Agriculture and Forestry grew out of the concern of Joseph Bailie, a teacher of mathematics at the University of Nanking, who was the first dean of the College, and succeeded by Reisner (Reisner, 1962, p. 4; Stross, 1986, p. 68; Zhang, 2002, p. 294).

Reisner (1962, p. 5) spoke highly of Bailie's work in establishing the College, while also asserting, "He had been Dean of the College of Agriculture and Forestry but was away

from the College most of the time. Being the one person on the campus with a degree in agriculture, the President turned over to me most of the relationships with the students." Reisner arrived just in time to assist with the instruction of the first class of agriculture students in the College. "I was the first person on the faculty with any training in agriculture. I was supposed to spend a year in language school but the students soon became restless and went to the President and asked that in view of the fact that I was on the campus that I should provide some technical courses, which I did to the detriment of my study of the Chinese language" (Stross, 1986, pp. 67, 86).

When Bailie resigned as Dean of the College, Reisner was appointed to assume his duties in 1916. Reisner had been very involved in administration of the College until returning to America in 1931. During Reisner's era, the College of Agriculture and Forestry developed rapidly. It not only maintained the strongest faculty but turned out the best-trained students in China, many of whom became national leaders in agricultural development, research, teaching, and administration. The budget for the year 1916-1917 was 13,458.36 silver dollars and increased to 188,702.04 silver dollars for the year 1930-1931. The number of students in 1916-1917 was 52 (46 undergraduates and 6 graduates) and stood at 197 in 1930-1931 (163 undergraduates and 34 graduates) (Buck, 1973, p. 11).

Some reasons for the College's rapid progress, during Reisner's administration, include his idea of applying a land grant college system, which was "devoted equally to teaching, research, and extension." Such idea and practice was already very successful as a result of the Morrill Acts (1862, 1890) and Hatch Act (1887) in America, but was innovative in China. The nearly equal emphasis on instruction, research, and extension enlisted support for the College from both missionary organizations and government. This approach to higher agricultural education was later adopted by other institutions in China, including the Agricultural Department of public Nanking Normal College, and the Agricultural Department of Southeast University (later National Central University), among others. Subsequently, this method has become widely influential in China's history of modern education (He, 2011, pp. 42-43).

Another reason for the College's development is that Reisner maintained close personal contact with government, agricultural, and personnel programs, as well as with Cornell University, Cornellians, and agricultural missionaries from the United States. These affiliations offered significant support and help to the College's instruction, research, and extension, afforded by Reisner's first-hand understanding of the many difficulties involved in China's agricultural and economic development. On his first furlough, 1920-1922, he secured $950,000 for the growth and expansion of the College (Reisner, Unpublished, p. 2). Other than financial support, "Many of the students whom I came to know during my year and a half at Cornell [1912-1914] later became professors and heads of departments in the College and have been my friends throughout the years. It was during this time, also, that I met the members of the Department of Plant Breeding; Dr. Love, especially, with whom I was to become closely associated in later years in the development of the Cornell University/ International Education Board/University of Nanking Crop Improvement Project" (Reisner, 1962, p. 2). Additionally, Reisner decided to make some changes to the Nanking College of Agriculture in 1920 and created a department

of agricultural economics and established a formal extension program to convey the College's work to more farmers in China. Therefore, he invited fellow Cornellian John Lossing Buck (1890-1975, Cornell B.S. 1914, M.A. 1925, *The Register,* 1924-1925, pp. 145, 136; Ph.D. 1933) to join him in accomplishing these goals. Buck further embodied the modern approach to agriculture in China, expressing it in the courses he taught, and applying it in research and extension (Allen, 1982).

Due to the advanced scientific ideology and techniques brought and introduced by those invited, who contributed American expertise, the College soon pioneered many aspects of modern agriculture in China under Reisner's leadership. For example, its research studies in farm management and agricultural economics, by J.L. Buck, were noteworthy and are still standard reference materials. Its Price Index was used by both government and business in China. Its crop reporting system was in time transferred to government. It also pioneered in extension programs and techniques, in community development programs, in rural education under J.B. Griffing, in the improvement of sericulture and in plant pathology. Moreover, its work in forestry was for many years the only program of its kind in China (Reisner, unpublished, p. 1).

Furthermore, another policy initiated and maintained by Reisner, demonstrating his ability in management, was to include a competent Chinese colleague as a Co-Dean, thus creating a Chinese-American administration of the College. He voluntarily resigned as Dean in 1925 with the intention of bringing in a Chinese administrator, and he was then elected Co-Dean, which position he held until his resignation in 1931. Reisner's policy proved to be a wise and successful choice considering China's domestic position, and given that local people opposed control by foreigners at that time. For example, The Nanking Incident occurred on March 21-23, 1927, when Chinese Nationalist troops entered the city as part of their Northern Expedition military campaign (1926-1928). Troops particularly targeted the city's foreign residents; several were killed or injured and their property looted. Dr. John Elias Williams (1871-1927), Vice President of University of Nanking, was murdered. The *Cornell Alumni News* reported on the 1927 lootings in Nanking (Anonymous, 1927): Cornell Alumni, Mr. & Mrs. Reisner, Tuan Shin Kuo (Dean of Agriculture and Forestry), John Lossing Buck, and John B. Griffing (graduate student in 1925-1926) had "left the city in safety." And Professor Roy G. Wiggans of Cornell was waiting in Shanghai for word of further developments to proceed on to Nanking.

REISNER'S PHILOSOPHY FOR PERMANENT FAMINE PREVENTION LEADING TO SINO-U.S. EARLY COOPERATION IN CROP INPROVEMENT

Rural Missions or Agricultural Missions include all efforts to achieve a satisfactory agriculture and a satisfying life in rural communities, which was originally a broad field calling for all valid means for expressing Christian redemptive concern for people on the land in concrete ways that they can understand and accept (Moomaw, 1956). As an agricultural missionary, Reisner wanted to help people without "preaching" at them (Reisner, 1956). Therefore, he set his mission to study and analyze local agricultural problems,

and devise and teach practical methods to improve agriculture (Newberry, 1998).

In 1918, L.H. Bailey, former dean of Cornell's College of Agriculture, commented on the missionaries' role in China, "It is estimated that eighty-five percent of the population of China is agricultural. The missionary who can aid the people in their farming will have a double hold" (Bailey, 1918). At that time, frequent flooding, which often caused famine conditions, was the worst problem, so that famine prevention was the most challenging and a complicated task to be tackled by those mission stations. Dean Reisner's predecessor, Dean Bailie, who previously was involved in famine relief work in the Hwai River area, was disturbed by the perennial need for relief in China. To overcome this problem, he sought to establish "a college where men could be trained in both agriculture and forestry; and thus, make their own contribution to solving the famine problem" (Allen, 1982). Possibly influenced by Bailie's work and ideology, Reisner came to two convictions early on: (1) Chinese people must be trained to do the job (in a modern way) and (2) the job itself was complex, involving quite a few aspects, including better seeds, education, flood control, among others (Reisner, Unpublished, p. 1). Following on Bailie's famine relief work, Reisner further developed his understanding of China's need for a famine prevention concept (Murray, 1921, p. 55).

In his book *Reforesting China, Permanent Famine Prevention versus Famine Relief*, Reisner (1921b) defined famine prevention as a comprehensive program involving several factors, including improvements in agriculture. He reemphasized in *Famine Prevention by Reforestation and Improved Agriculture* (Reisner, 1922, p. 1) that "the problems involved in the prevention of famines in China are extremely complicated, interdependent and strike at the very roots of China's present economic and social life and customs. Many factors are involved." He believed that "such statements applied more particularly to the region north of the Yangtze River in which floods and famine are most frequent, but in many cases apply to conditions in the south as well" (Reisner, 1922, p. 2).

On the basis of such a philosophy, Reisner began to seek opportunities to make his unique contribution to China's situation. He planned to apply his work in the College and utilize his personal academic resources and social relations (Reisner, 1921c). He tried to popularize his ideas by instituting a rather comprehensive program to fulfill agricultural improvement and permanent famine prevention. The acceptance of this philosophy is best illustrated by the earliest large-scale Sino-U.S. cooperation: the Cornell-Nanking Crop Improvement Project. Apparently, the science and the education pursuit took precedence over the religious mission of conversion.

The Cornell-Nanking story originated from another serious famine occurring in the same general Hwai River area in 1920. U.S. President Woodrow Wilson responded by setting up a Committee of One Hundred for China Famine Relief. The famine relief work ended sooner than had been anticipated and the Committee found itself with considerable unused funds and the problem of how they could be most wisely and widely used (Stross, 1986, p. 139). At that time, most international famine relief work groups devoted their efforts to public works projects beyond emergency

relief—particularly emphasizing river control projects, represented by the China International Relief Commission (Li, 2007, p. 302).

China International Famine Relief Commission was formed in September 1921 and became a permanent relief organization composed of existing famine relief groups. It functioned for almost two decades as the key private voluntary organization of relief operations. Its directors and constituents were both Chinese and foreigners, and it had branches and projects in most of the provinces in China. It saw itself not as an emergency relief group but as an organization dedicated to seeking a "permanent improvement" of conditions in China.

Just at this time, Reisner submitted a proposal to the Committee of One Hundred for China Famine Relief, requesting that some of the unused funds be used for long-term famine prevention purposes, especially in the field of agriculture. His proposal was soon approved. Thus, the College of Agriculture at University of Nanking was appropriated around $750,000 (Love and Reisner, 2012, p. 3). Reisner's next step was to design an effective and comprehensive program, to best apply his philosophy and fulfill his mission, and to help alleviate hunger and poverty in China. In 1924, Co-Dean Reisner proposed to Dr. H.H. Love, of the Department of Plant Breeding at Cornell University, a cooperative institutional arrangement whereby he and two of his associates would spend one year each at the College of Agriculture and Forestry in Nanking to help develop its plant breeding program and give further training to its staff (Figure 3) (Stross, 1986, p. 144, see also Chapter 6; Love and Reisner, 2012, p. 2). Actually, each professor made a second visit during a six-year period. Through a series of summer training courses, practically every plant breeder in China received training. Many of these students were further trained at Cornell. The outstanding practical result was in better seeds for the farmers. Their account of these accomplishments, *The Cornell – Nanking Story: the First International Technical Cooperation Program in Agriculture by Cornell University,* first published in 1963 (Love and Reisner, 1963, reprinted 1964 and 2012), reports the significance of the program: "Higher yielding strains of wheat, barley, rice, kaoliang [*Sorghum bicolor*] and soybeans, cotton and millet—all of them important crops in east and north China—were developed and put into distribution to farmers. Crop improvement methods were standardized throughout the area and later adopted throughout most of China. Detailed plans for small grain breeding and testing were prepared and made available in the Chinese language" (Love and Reisner, 2012, p. 55). Later, Dr. Love was invited to China by the Ministry of Agriculture and helped to establish its National Agricultural Research Bureau. The contributions accruing to Cornell were generously acknowledged (Zuidema, 2013, p. 8).

The Cornell-Nanking Story was undoubtedly a very comprehensive cooperation, involving education, extension, agricultural research, and many other practices. Another value of such cooperation was its creation of an approach, called "educational assistance." The latter brought training for the U.S. Point IV Program and the widely accepted method of "Technical Assistance" (Buck, 1973, p. 5; Turk, 1974, p. 13).

At the time of the Cornell-Nanking program, the term "technical assistance" had not yet come into the prominence it attained

Figure 3. *In front of the College of Agriculture, University of Nanking. Front row, the 11th from the left is Reisner, and the 13th is Dr. Love [date ca. 1925]. (Image used with permission of Plant Breeding and Genetics, Cornell University.)*

later. From most viewpoints it means the development of international understanding and good will; the transfer of technical knowledge to a host country; the establishment of an ongoing program definitely related to a pressing national need; and the creation of a reservoir of well-trained nationals capable of carrying on when the "technicians" departed. Such a program could be rated as "technical assistance" at its best, in modern terms, without the demand of religious conversion. With the results obtained and in terms of its low cost, it probably set some kind of a record (Love and Reisner, 2012, p. 56). We may also conclude that Reisner's philosophy and initiation for permanent famine prevention led to an innovative project of the later Point IV Program, and pioneering trial of the technical assistance programs, which is still very significant and popular in current international society.

CONCLUSIONS

Over the centuries, the vast land of China has resisted changes that successive waves of foreign reformers sought to force upon its people. As a foreign innovator, Mr. Reisner had early realized that the fundamental situation in China then was not just its government, its social institutions, or its commercial development, but also its agriculture, because those millions of people must be clothed, fed, and supported, and the standard of living must certainly rise. Like the first man to walk on the moon, Reisner never bragged of being first in his scientific accomplishments, and he believed that he was only doing his job (Kalb, 2012). Unlike those who are famously remembered for being first, Reisner's new, unique, and innovative achievements seem to have been overlooked in many historical

accounts. And the difficulties he overcame to accomplish his goals have not been lauded or imbedded in most memories. Reisner's major interest was in the rural people of China, and the whole developing world, and in their aspiration for a better life. His contributions to agricultural improvement work in China were creative and pioneering. His long residence in China proved to be both successful and influential and are still remembered there to this day.

ACKNOWLEDGMENTS

The authors thank Prof. Max Pfeffer for inviting Song Shi to do research as visiting scholar at Cornell University and Prof. Ronnie Coffman for recommending Prof. Lee B. Kass as mentor to Song Shi; Kass appreciates the invitation to co-author the manuscript. The authors also thank staff at International Programs, College of Agriculture and Life Science (IP CALS), Cornell University, especially Prof. Coffman and Ms. Denise M. Percey, for offering a nice workplace and environment, and much kind help for Shi's research. Additionally, the authors are grateful to Ms. Eileen Keating and Ms. Elaine Engst, archivists and librarians at Division of Rare & Manuscript Collections, Kroch Library, Cornell University, for their kind help with archival searches. Song Shi thanks Jesse Reisner Middlemast for sharing her father's, J.H. Reisner, Unpublished "Memorandum," which had been distributed to his eight grandchildren on June 4, 1965. We are grateful to Allan Paul Shatkin, President, Bright Star Educational Services (Monterey Park, CA) and Bai Yongbo, President, Be-There Education Abroad (Hangzhou, China), for reviews of Chinese names. Finally, the authors thank Prof. Mark Tauger, West Virginia University, for his critical comments and editorial suggestions on early drafts of the manuscript.

REFERENCES

Allen, M. J. 1982. Taking root in foreign soil: Techniques planted by Cornellians survive a hectic half century in China. *Cornell Alumni News* 84: 24-29.

American National Red Cross, Nanking Chapter. 1918. *American Red Cross Book of Recipes for the use of Chinese Foodstuffs*. Shanghai, China, American Presbyterian Mission Press. [book reprinted and enlarged in 1924; see Jinling Da Xue]

Anonymous. 1924. Improved Chinese cotton: Results of mill tests on staple produced by the University of Nanking: Encouraging features: A review of the present situation. *The North - China Herald and Supreme Court & Consular Gazette* (1870-1941), 01 March: 346.

Anonymous. 1927. Cornellians in Nanking. Cornell Alumni News 29:324. https://ecommons-new.library.cornell.edu/handle/1813/26839

Anonymous. 1965. John H. Reisner, 77, Led farm missions. *New York Times* (1923-Current File), 27 Apr: 37.

Anonymous. 2016. Jin Dai Nong Ye Ren Wu - Han An. *Zhong Guo Liang Shi Jing Ji* 29: 69.

Bailie, V. W. 1964. *Bailie's activities in China: An account of the life and work of Professor Joseph Bailie in and for China, 1890-1935.* Pacific Books, Palo Alto, CA.

Bailey, L. H. 1918. The point of view in China. *The American Museum Journal* 18: 263-268.

Buck, J. L. 1973. Development of Agricultural Economics at the University of Nanking: Nanking, China, 1926-1946. *Cornell International Agricultural Development Bulletin* 25. https://hdl.handle.net/1813/42407

Chang, D. 2014. *An economic analysis of calamities and conflicts in Rural China, 1929-1933*. Cornell University, Ithaca, NY; Master's Thesis, August 2014.

Cline, M.C. 1982. J.H. Reisner, p. 202. *Agronomy at Cornell 1868 to 1980*. Department of Agronomy, Cornell University, Ithaca, NY.

Cornell University. 1913. *Catalogue Number 1912-1913*, Volume IV, No. 16(August 1). Ithaca, NY. (Summer Session 1912, Reisner, p. 123; Students registered for 1912-1913, Reisner, p. 82).

Cornell University. 1914a. *Proceedings of the Board of Trustees of Cornell University, 1913-1914* (June 24), Ithaca, NY.

Cornell University. 1914b. *Catalogue Number 1913-14*, Volume V, No. 16(Sept 1). Ithaca, NY. [Degrees Conferred, Feb. 4, 1914, Bachelors of Science (unnumbered p., follows two pages after p. 158); Graduate Students 1913-1914: Reisner, John Henry, B.A. (Yale) 1911, Farm Crops, Plant Breeding (Montgomery, Gilbert) M.S. in Agr. (p. 115)]

Cotton Millowners [*sic*] Association. 1923. Improvement work in Nanking. *The North - China Herald and Supreme Court and Consular Gazette* (1870-1941), 06 Oct: 39.

Dana, J. D., R. A. Gibney, and H. S. Irons. 1911. History of the Class of 1911, Yale College, Vol. I. Yale University, New Haven, CT. https://archive.org/details/historyofclass1yale/page/n7

Dong, W. C., C. Y. Dengand, and J. M. Yuan. 2014. Jinling Da Xue Nong Xue Yuan Ruo Gan Zhong Yao Shi Yan Jiu. *Zhong Guo Nong Shi* 34: 128-137.

Geng, X. 2015. Serving China through agricultural science: American-trained Chinese scholars and "Scientific Nationalism" in decentralized China (1911-1945). University of Minnesota, Minneapolis, MN. Ph.D. Dissertation, August 2015. https://conservancy.umn.edu/handle/11299/175439

Griffing, J.B. 1920. Cotton improvement in China: Introduction of American seed--Training Chinese expert workers--Antiquated methods--Insects and disease--Educating the farmer. *The North - China Herald and Supreme Court & Consular Gazette*, (1870-1941), 16 Oct: 181.

He, S. Q. 2011. *Mei Guo Nong Ke Jiao San Wei Yi Ti Mu Shi De Yin Ru Ji Qi Ying Xiang Yan Jiu*. Nanjing Agricultural University, Nanjing, China. [Dissertation]

Holcomb, J. M. Jr. (ed). 1922. History of the Class of 1911, Yale College, Volume III-Decennial record. Knickerbocker Press, New Rochelle, NY. (Reisner's photo appears following p. 376). https://babel.hathitrust.org/cgi/pt?id=njp.32101068034683&view=1up&seq=9

Jinling Da Xue [University of Nanking]. 1924. *The Nanking Cook Book: An Enlargement and Revision of the American Red Cross Book of Recipes for the Use of Chinese Foodstuffs*. Women's Auxiliary of the University of Nanking [Editors], Presbyterian Mission Press, Shanghai, China.

Kalb, I. 2012. Neil Armstrong shows us the potent branding power of being the first to do something. Business Insider 27 Aug 2012. https://www.businessinsider.com/neil-armstrong-and-the-brand-power-of-being-first-2012-8

Li, L. M. 2007. *Fighting famine in North China*. Stanford University Press, Stanford, CA.

Li, Y. 2012. *Min Guo Shi Qi Chang Jiang San Jiao Zhou Mian Ye Yan Jiu*. Nanjing Agricultural University, Nanjing, China.

Love, H. H., and J. H. Reisner. 1963. The Cornell-Nanking Story: the First International Technical Cooperation Program in Agriculture by Cornell University. The Department of Plant Breeding, New York State College of Agriculture, Ithaca, NY, USA: 82. https://babel.hathitrust.org/cgi/pt?id=coo.31924073954210&view=1up&seq=3

[Reprinted in 1964 as Cornell International Development Bulletin 4]

Love, H. H. and J. H. Reisner. 1964(April). The Cornell Nanking Story. Cornell International Development Bulletin 4. New York State College of Agriculture, Cornell University, Ithaca, NY. https://archive.org/details/cornellnankingst00love

Love, H. H. and J. H. Reisner. 2012. The Cornell-Nanking Story: The First International Technical Cooperation Program in Agriculture by Cornell University. The Internet-First University Press, Cornell University, Ithaca, NY. [e-book]. https://hdl.handle.net/1813/29080

[Reprint of Love and Reisner 1963, with additional notes by publisher]

Moomaw, I. C. 1956. I. Why Rural Missions? In: I. C. Moomaw, J. H. Reisner, R. A. Felton, F. W. Price. New dimensions in rural missions, A symposium. Occasional Bulletin from the Missionary Research Library New York, NY. http://www.internationalbulletin.org/issues/1956-00/1956-04-001-moomaw.pdf

Murphy, R. P. and L. B. Kass. 2011. Evolution of Plant Breeding at Cornell University: a Centennial History, 1907-2006. Rev. ed. The Internet-First University Press, Ithaca, NY. http://hdl.handle.net/1813/23087

Murray, J. L. 1921. *Missionary education movement of the United States and Canada*. World Friendship, Inc., New York, NY.

Myers, C.H. 1934. *Final report of the plant improvement project, Nanking, China*. College of Agriculture and Forestry, University of Nanking, Nanking, China.

Nanking College of Agriculture. 1920. Report of the College of Agriculture and Forestry, Nanking University. *Millard's Review of the Far East* (1919-1921), 07 Feb: 491.

Nanking College of Agriculture. 1924. Satisfactory results in improvement of cotton and grain: Some statistics. *The North - China Herald and Supreme Court & Consular Gazette* (1870-1941), Shanghai, 13 Dec: 446.

Newberry, S. P. 1998. The life and achievements of John H. Reisner Jr., Ph.D. *Microscopy and Microanalysis* 4: 435-440.

Reisner, John Henry. Deceased alumni file [Grad. 1915], Cornell University Public Affairs Records, Deceased Alumni Files, Coll. #41-2-877 (in the first batch), Division of Rare and Manuscript Collections, Cornell University Library, Ithaca, NY.

Reisner, John Henry. Graduate School file, Cornell University Graduate School Student Records 1891-2014, Coll. #12-5-636, box 49, Division of Rare and Manuscript Collections, Cornell University Library, Ithaca, NY.

Reisner, John Henry. Unpublished. Memorandum, John H Reisner (1888-1965). [Distributed on June 4, 1965, by his daughter Jessie Reisner Middlemast.]

Reisner, John Henry. 1915a. Registered for an M.S. in Agriculture, 1914:60. *The Register of Cornell University 1914-1915*. Cornell University, Ithaca, NY.

Reisner, J.H. 1915b. Wheat in New York State with particular reference to a history of its culture: the varieties grown, their origin, description, improvement, classification, synonyms and history; its milling and flour qualities; present day distribution and problems, and statistical data, with additional chapters on implements of wheat culture, cultural methods and management, fertilizers and manures, wheat diseases and insects, flour mills and flour, and spring wheat. Cornell University, Ithaca, NY. [Thesis M.S. in Agr. Cornell University, 1915]

Reisner, J. H. 1916. Master's degree awarded 1915 for thesis: *Wheat in New York State with particular reference to a history of its culture*. *The Register of Cornell University 1915-1916*. Cornell University, Ithaca, NY, p. 203.

Reisner, J. H. 1920. Cotton seed and cotton improvement in China. *Millard's Review of the Far East* (1919-1921), 31 Jan: 442.

Reisner, J. H. 1921a. Dangers and control of cotton seed importation and distribution in China. *Millard's Review of the Far East* (1919-1921), 29 January 1921: 473-474.

Reisner, J. H. 1921b. Reforesting China, Permanent Famine Prevention Versus Famine Relief. China Society of America, New York, NY, 15 pp. https://archive.org/details/reforestingchina00reis

Reisner, J. H. 1921c. Agricultural education in China. *World Agriculture* II: 97-98.

Reisner, J. H. 1922. *Famine Prevention by Reforestation and Improved Agriculture.*

[Shanghai, China]: [publisher not identified], 13 pp. "Reprinted from *The* [*China*] *Weekly Review of the Far East,* January 14, 1922, Shanghai, China." https://www.worldcat.org/title/famine-prevention-by-reforestation-and-improved-agriculture/oclc/775824208&referer=brief_results

Reisner, J. H. 1926. Better agriculture in China. *The China Weekly Review* (1923-1950). Shanghai, 27 Feb.:353.

Reisner, J. H. 1956. II. Rural missions since the war. *In*: *New dimensions in Rural Missions, A symposium*, by Ira C. Moomaw, John H. Reisner, Ralph A. Felton, Frank W. Price. Occasional Bulletin from the Missionary Research Library 7, New York, NY: 6-8. http://www.internationalbulletin.org/issues/1956-00/1956-04-006-reisner.pdf

Reisner, J. H. 1888-[1965]. 1962. Oral history interview with Gould P. Colman, 8 Nov. 1962. In: Cornell-in-China oral histories, Coll. #13-6-321, trsc. #2457. Division of Rare and Manuscript Collections, Cornell University Library. Ithaca, NY.

Shavit, D. 1990. The United States in Asia: A Historical Dictionary. Greenwood Press, New York, NY.

Shen, Z. Z. 2004. Mei Guo Zuo Wu Pin Zhong Gai Liang Ji Shu Zai Jin Dai Zhong Guo De Yin Jin Yu Li Yong – Yi Jinling Da Xue Nong Xue Yuan, Zhongyang Da Xue Nong Xue Yuan Wei Zhong Xin De Yan Jiu. Zhong Guo Nong Shi 23: 24-31.

Shen, Z. H. and B. Z. Ma. 1934. Zhong Guo Zuo Wu Yu Zhong Shi Ye Zhi Guo Qu Xian Zai Ji Jiang Lai, Zhong Guo Zuo Wu Gai Liang Yan Jiu Hui Yi Yan Jiang Ji. Shi Ye Bu Zhong Yang Nong Ye Shi Yan Suo, Nanjing, China. [On Z.H./T.H. Shen, see Stross 1986, Chap. 8 (Cornell student 1924, p. 193); on T.H..(Z.H.) Shen, Cornell Ph.D. 1928, see Murphy and Kass, 2011, pp. 46, 120].

Shi, Y. C. and X. Q. Zhang (Eds.). 2002. *Chinese Academic Canon in the 20th Century,* Agricultural Science (20 Shi Ji Zhong Guo Xue Shu Da Dian. Nong Ye Ke Xue). Fujian Jiao Yu Chu Ban She, Fuzhou, China.

Stross, R. E. 1986. The Stubborn Earth: American Agriculturalists on Chinese Soil, 1898-1937. Berkeley: University of California Press. http://ark.cdlib.org/ark:/13030/ft2g5004m0/

The Register 1924-1925 (1 Sept, 1925); Vol. 16. No. 17, Cornell University, Ithaca, NY. https://ecommons.cornell.edu/handle/1813/22354

Turk, K. L. 1974. *The Cornell-Los Baños story*. Cornell University, Ithaca, NY.

Yale University. 1920. *Alumni Directory of Yale University* (Graduates and Non-graduates). Yale University, New Haven, CT. https://babel.hathitrust.org/cgi/pt?id=uc2.ark:/13960/t5p84bc8k&view=1up&seq=7

Zhang, X. 2002. *Jinling Da Xue Shi*. Nanjing Da Xue Chu Ban She, Nanjing, China.

Zhao, X. Y. 2015. Si Xiang Yu Shi Jian: Nong Ye Chuan Jiao Shi Yu Zhong Guo Nong Ye Xian Dai Hua – Yi Jinling Da Xue Nong Xue Yuan Wei Zhong Xin. *Zhong Guo Nong Shi* 35:36-48.

Zuidema, L. W. 2013. Cornell University meets the challenge of world agriculture. In: Royal D. Colle, Editor, Cornell University – The Global Dimension. Cornell Association of Professors Emeriti (CAPE), Ithaca, NY. Chapter 3. https://ecommons.cornell.edu/bitstream/handle/1813/11117/Chapter3.pdf?sequence=16&isAllowed=y; (Incremental e-book on-line 2008, Chapter 3 submitted 2013, https://ecommons.cornell.edu/handle/1813/11117)


TAYLOR & FRANCIS
#PlantSocial Award
FIND OUT MORE

MEMBERSHIP NEWS

BSA SPOTLIGHT SERIES

The BSA Spotlight Series (https://botany.org/home/careers-jobs/careers-in-botany/bsa-spotlight-series.html) highlights **early career scientists** in the **BSA community** and shares both scientific goals and achievements, as well as personal interests of the botanical scientists, so you can get to know your BSA community better.

Here are the latest Spotlights:



Molly Edwards, Science Communicator, Science IRL Productions
https://botany.org/home/careers-jobs/careers-in-botany/bsa-spotlight-series/molly-edwards.html

Brandon Corder, Graduate Student, University of Wisconsin-Madison
https://botany.org/home/careers-jobs/careers-in-botany/bsa-spotlight-series/brandon-corder.html

Greg Tooley, Graduate Student, Kansas State University
https://botany.org/home/careers-jobs/careers-in-botany/bsa-spotlight-series/greg-tooley.htm

Would you like to nominate yourself or another early career scientist to be in the Spotlight Series?
Fill out this form: https://forms.gle/vivajCaCaqQrDL648.

By Amelia Neely

BSA Membership & Communications Manager

E-mail: ANeely@botany.org

THANK YOU, TERESSA ALEXANDER!

A big thank you to **Teressa Alexander**, the 2021-2022 BSA Student Social Media Liaison, for her amazing work this year supporting BSA on our social media platforms.

Teressa is now in her 5th year at the University of the West Indies, Trinidad, where she is pursuing a Ph.D. in Plant Science. She continues to study the response of cacao (*Theobroma cacao*) to drought stress toward strategies to buffer the effects of climate change on the crop in the southern Caribbean. Teressa will continue to work diligently in science, art, and outreach. Using science as the foundation, she has been communicating plant science mainly through photography and has plans to produce short films. She is also the co-founder of STEMNoire, a scientific conference and wellness retreat for black women in STEM, and she mentors Caribbean students seeking direction in STEM careers through the Cariscolar program and independently.

DID YOU KNOW?

Do you want to know more about what the BSA has to offer you as a member? Each month a new BSA resource will be highlighted in the BSA *Membership Matters* newsletter in the "Did You know" section. Below are the three most recent resources. Visit www.botany.org and browse the website to find even more great information.

- BSA has a brand new Student Member Hub (https://botany.org/home/membership/bsa-student-members.html)! The 2021-2022 BSA Student Representatives, Imeña Valdes and Ioana Anghel, gathered information into one spot to help student members navigate and get the most out of being in the BSA community. If you have ideas to include on this web page, email them to current BSA Student Representatives Ioana Anghel (studentrep1@botany.org) and Eli Hartung (elishartung@gmail.com).

- **You can access the current BSA Strategic Plan!** Want to know the Society's strategic priorities, goals, and strategies? To access the entire strategic plan, see https://bit.ly/3gSDfzg. Included is our new mission statement: *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.*

- **You can show your support of BSA with a Zoom background!** Virtual meetings seem here to stay, so why not show off your membership with BSA by using a free BSA Zoom background? Visit: https://botany.org/home/membership/zoom-backgrounds.html. Click on the photo you would like to use and you will be led to a hi-resolution photo to right-click and download. Have some great ideas for a Zoom background? Email aneely@botany.org.

BOTANY360 CONTINUES TO GROW

Botany360 is a series of programming that connects our botanical community during the 360 days outside of Botany Conferences. The Botany360 event calendar is a tool to highlight those events. **To access the calendar, see recordings, register for events, or apply to have your event included in Botany360, go to https://botany.org/home/resources/botany360.html.**

Recent and Upcoming Events

- **Intro to Reviews and Meta-analysis**
  (November 7, 2022) - Recording now available.
  Introduction to writing a review article, including question formulation, quantitative vs. qualitative approaches, systematic review methods. Available at https://bit.ly/3U4hk6o.

- **Utilizing Botany Conference Content in Your Teaching**
  (November 2, 2022) - Recording now available.
  Brought to you by the BSA Teaching Section
  Through the pandemic, our annual Botany conference has changed to allow virtual and asynchronous participation, hosting for a year our online talks and other materials. Our students, classrooms, and labs could benefit from engaging with Botany conference content throughout the year.

- **Applying to Grad School A Q&A Session**
  (September 20, 2022) - Recording now available.
  Brought to you by the BSA Early Career Professional Development Committee
  This event was aimed at providing helpful information and guidance for students thinking about applying to graduate school in plant sciences. Panelists have a range of experience and come from a variety of institution types. After brief introductions and some initial questions from the host, an open and moderated Q&A was conducted.

NEW BSA AWARD! GRADUATE STUDENT DISSERTATION AWARD IN COMPARATIVE PLANT BIOLOGY

We are very excited to share that thanks to an anonymous donor and long-time BSA member, the Society has established an **endowed fund to support the PhD research of graduate students in the area of comparative plant biology, broadly speaking, from genome to whole organism**. The new award of up to **$10,000** may be used to support equipment and supplies, travel for research and to attend meetings, and for summer support. **International students are welcome to apply.** The online portal for applications will open in a few months, and the deadline for submissions is February 15. Learn more about the new award at https://botany.org/home/awards/awards-for-students/cpd-award.html.

This award joins the other $10,000 BSA award, the **Donald R. Kaplan Dissertation Award in Comparative Morphology**. The Kaplan comparative morphology award, established with an endowed fund by the Kaplan family, promotes research in plant comparative morphology and supports the PhD research of graduate students in this area. For more information about this award, go to https://botany.org/home/awards/awards-for-students/kaplancomparativemorhpology.html.

We want to show our appreciation for both families for helping us fulfill the goals in our strategic plan by supporting students and botanical research. To discuss the ways in which you can support the Society through endowed gifts, please email BSA Executive Director Heather Cacanindin at hcacanindin@botany.org.

BSA STUDENT CHAPTER UPDATES AND EVENT NOTIFICATIONS DUE DECEMBER 31, 2022

BSA Student Chapter officers and advisors were notified of changes to the Student Chapter program earlier this year. The deadline to make the updates to chapters, and to turn in two event forms, is December 31, 2022. Any chapters that do not have these two things finished by that deadline will be under consideration for termination from the program.

To learn more about the changes, see the New Student Chapter Application at https://botany.org/home/membership/student-chapters.html#application.

Would you like to start your own Student Chapter at your Institution? Visit the page above and fill out the form to get started.

IT'S RENEWAL SEASON!

Thank you for your current BSA membership support! BSA provides annual memberships that run from January to December of each year. This year there are slight increases in dues for the Professional and Retired membership categories—the first dues increase since 2014, to help cover increasing costs of doing business

While renewing, you can also renew **your sectional affiliations**, **donate to the BSA endowment, award funds, and section award funds**, and **purchase gift memberships**. If you are not due to renew this year, we hope you will consider donating to BSA and giving gift memberships during the fourth quarter.

Year-end Giving

BSA is proud to provide over $120,000 in awards and grants to our members every year. Most of these are funded **directly by the generosity of our members** via donations to specific award funds. We hope that you will consider making a donation to our many funds including student, professional, and sectional award funding, when you renew your membership this year. You can also visit www.botany.org and **click Donate** to start giving right now.

Professional members are given the opportunity of increasing their annual dues by $25 in order to support the Graduate Student Research Award fund. Together with GSRA donations, over $29,407 in additional funds

were raised for the GSRA in the last fiscal year and 31 GSRA awards were able to be given in 2022. Thank you to all of our members who made this possible.

Both the **Endowment Fund** and the **Unrestricted Fund** have very important roles in the stability and longevity of BSA. We hope you will consider making donations to these funds when choosing your year-end donation plans. Donations to these funds are being used to move BSA into the future, and to support our global community like never before.

Want an even more lasting way to support BSA? Consider joining the **Legacy Society**. To learn more about the society see our latest Legacy Society email at https://mailchi.mp/botany.org/bsa-legacy-society-2022-dr1, or visit our Legacy Society web page at https://botany.org/home/membership/the-bsa-legacy-society.html.

BSA Gift Memberships

The 2022 Gift Membership Drive has begun! This year our goal will be 175 gift memberships from now through December 31, 2022! BSA Gift Memberships are a great way to introduce students and developing nations' colleagues to the BSA community. You can purchase one-year ($10) or three-year ($30) gift memberships by visiting: https://botany.org and choosing "Give a Gift Membership."

Don't have anyone specific for whom to purchase a gift membership? Not a problem! You can put your own name and email in the gift membership fields and we will make sure they get to those students and developing nations' colleagues who need financial assistance. Questions about gift memberships or other ways to donate? Email Amelia Neely at aneely@botany.org.

We are giving back! Any gift membership recipient who starts their membership before January 31, 2023 **will be entered into a drawing for a free registration for Botany 2023**!

BOTANICAL SOCIETY OF AMERICA

FROM THE *PSB* ARCHIVES

60 years ago

"An awareness of the nature and of the urgency, which I feel very keenly, of these problems and of the taxonomists' possible roles in their solutions brings with it definite responsibilities. We must educate and 'sell' to the public, to the politicians, to the statesmen on the world scene, and even to many of our own colleagues in related sciences, a vigorous program of exploration for, and conservation of, plant materials today unknown.

"There are other matters in which we have responsibilities, and which need our attention: For example, the recruitment of young workers to our field, a more adequate use of youngsters and amateurs in our research programs, the preservation of local natural areas for future educational and training programs. All of these and others, if properly handled, could furnish us with much greater opportunities."

--Sharp, A.J. 1962. Responsibilities and Opportunities of the Taxonomist Today. *PSB* 8(3): 7-9

50 years ago

"Consider the chemistry of any of the modern herbicides or pesticides. Knowledge of the compound's basic molecular structure, its method of synthesis, and most modifications of its structure is the product of decades of basic organic chemistry — not information gained in the last few years as the compound became useful. In fact, had it not been for years of basic research we simply would not have the arsenal of chemicals used in our everyday life. On second thought, that might be a good argument against basic research.

"Finally it would be fun to speculate on the consequences to present-day plant breeding and genetics if, back in the mid-1800's, some Chairman or Dean Friar had walked up to a certain monk and said "Gregor!, get these damn wrinkled, yellow peas out of here and get on to something important like growing bigger potatoes!"

. . .The Editor's comment notwithstanding, it seems to me that there is still a place for any kind of well-done research, be it immediately relevant or not. [M. Taylor, PSB *editor]*

--Rickson, Fred R. 1972. To Be Basic is Basic. *PSB* 18(4):40-41

40 years ago

"Creationism suffered a reversal in Arkansas. Judge Overton, in a landmark decision (*Science* 19 Feb. 1982), overturned a state law that required creationism be given equal time in the schools when evolution was taught. The judge's decision is not binding in other Federal District Courts but it is certain to be heeded widely. For example, the New York State Commissioner of Education waited for the decision before declaring that creationism need NOT be given equal time in New York schools. The creationist ploy of requesting equal time—'fair play'—is based on the assumption that there is a science of creationism and that, as such, it is the alternative to the evolutionary explanation of life on earth. The trial convinced Judge Overton that 'creation science' is simply a cover for a religious belief, hence something to be barred constitutionally from the schools."

--Banks, Harlan P. Creationism: A Call to Arms. 1982. *PSB* 28(5): 34-35.

PlantingScience Welcomes the 2022-2023 Master Plant Science Team!

By Dr. Catrina Adams, *Education Director*

Jennifer Hartley, *Education Programs Supervisor*

The 2022-2023 school year is underway, and we are looking forward to another great year with PlantingScience! We're especially excited to be working with the BSA-sponsored members of this year's Master Plant Science Team! The following early-career scientists will be representing BSA in our work with 6th-12th+ classrooms through the spring semester in 2023!

Israel Borokini
Yanni Chen
Lyanna DeLeon
Ana Flores
Nitin Gaikwad
Waqar Hussain
Devani Jolman
Jacqueline Lemmon
Guadalupe Maldonado Andrade
Allyssa Richards
Juan Diego Rojas-Gutierrez
Cierra Sullivan
Jessica Szetela
Shan Wong

PLANTINGSCIENCE'S FALL 2022 SESSION IS UNDERWAY!

Our Fall 2022 session began in mid-September. This session includes seven middle schools, seven high schools, and two undergraduate biology classes. This session is smaller than previous fall sessions, as we are gearing up for our Digging Deeper {F_2} research session coming up in 2023. However, all together they comprise 118 teams of students that are working on plant science themes under the guidance of our wonderful scientist mentors!

DIGGING DEEPER {F_2} IS RECRUITING TEACHERS!

Recruiting is now underway for the PlantingScience Digging Deeper {F_2} initiative. This study will replicate the research conducted in 2016 and 2017 on the impacts that scientist mentors have on student outcomes, including their understanding of the concepts studied and their perceptions of scientists and science careers. That research, which was published in the *Journal of Research in Science Teaching*, demonstrated significant positive shifts in both areas. The current initiative will repeat the earlier format, but also explore the impacts of teacher professional development conducted remotely.

Please consider sharing this opportunity with high school teachers in your network. Selected applicants will receive stipends, professional development, classroom materials, and curriculum resources. The application link can be found on the PlantingScience.org homepage.

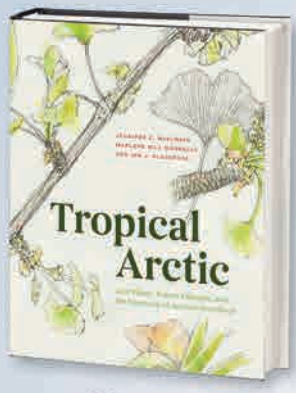
LIFE DISCOVERY CONFERENCE 2023

Plans are underway for the 8th annual Life Discovery Conference, which will take place March 22-25, 2023 at Florida A&M University in Tallahassee, Florida. This education-focused conference is organized as a joint effort between the Ecological Society of America, the Society for the Study of Evolution, and the Botanical Society of America. Educators who teach high school, community college, and undergraduate courses in life sciences are invited to take advantage of this unique opportunity to network with educators at the various levels. This year's theme is '"Variants in Biology Education: What can we learn from pandemics" Find more info at https://www.esa.org/ldc/.

California Botanists Meet in Anchorage

The California Botanists Luncheon, started back in 2008, is an ongoing event at the Botany meetings for anyone interested in California plants to get together, mingle, and hear about important events in California botany such as projects, funding, and new positions. This year's short presentations included the progress of the California Consortium of Herbaria projects (CCH1 & CCH2.org), the state's allocation of major funding for "biorepository upgrades and orphan collections," updates in the Jepson eFlora, and notification of the upcoming Southern California Botanists meeting (hosted by CalBG.org). After the three-year hiatus, it was wonderful to see in person some of our community of California botanists. We hope to see many of you next year in Boise!

BOTANY *from* CHICAGO



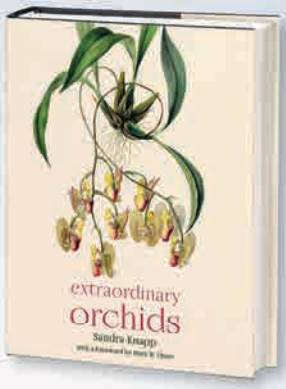
Tropical Arctic

Lost Plants, Future Climates, and the Discovery of Ancient Greenland

Jennifer McElwain, Marlene Hill Donnelly, and Ian J. Glasspool

"*Tropical Arctic* is a story about how plants—the fundamental underpinnings of terrestrial ecosystems—weathered the Triassic-Jurassic mass extinction event."—*Current Biology*

CLOTH $30.00



Extraordinary Orchids

Sandra Knapp

With a Foreword by Mark W. Chase

"Knapp's lucid text emphasizes the orchid family's inventive adaptations in both form and function. Illustrated with rare prints and paintings from archival sources, many known only to collectors, the book, like its subject matter, is elegance incarnate."—*Natural History*

CLOTH $30.00

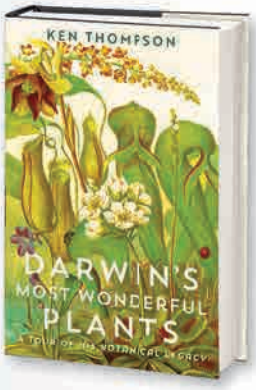
Darwin's Most Wonderful Plants

A Tour of His Botanical Legacy

Ken Thompson

"In this quietly riveting study, plant biologist Ken Thompson reveals Charles Darwin as a botanical revolutionary."
—*Nature*

CLOTH $25.00



Now in Paperback

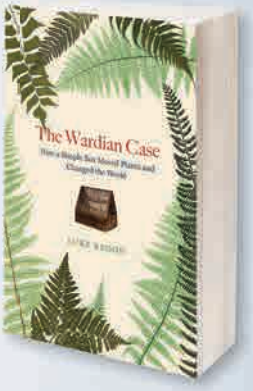
The Wardian Case

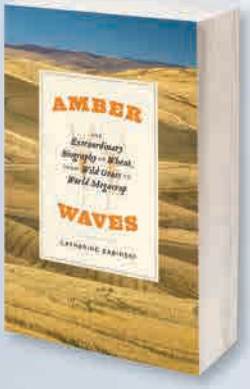
How a Simple Box Moved Plants and Changed the World

Luke Keogh

"Keogh is to be congratulated on bringing the story of this humble, but world-changing, box to greater prominence and adding to the debate about botanical Imperialism."
—*Botany One*

PAPER $26.00





Now in Paperback

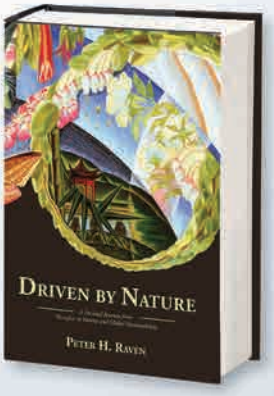
Amber Waves

The Extraordinary Biography of Wheat, from Wild Grass to World Megacrop

Catherine Zabinski

"This book is recommended to everyone who wants to discover that wheat is much more than just the basis of regular bread." —*Economic Botany*

PAPER $17.00



From the **Missouri Botanical Garden Press**

Driven by Nature

A Personal Journey from Shanghai to Botany and Global Sustainability

Peter H. Raven

Edited by Eric Engles

With a Foreword by E. O. Wilson

"I highly recommend it to all those who wish to know more about the person behind so many profound contributions to our field."—*Systematic Botany*

CLOTH $35.00

THE UNIVERSITY OF CHICAGO PRESS www.press.uchicago.edu

STUDENT SECTION

Botany 2022 Review

It was so great seeing so many of your faces again in person at Botany 2022 in Anchorage! Students made up 42% of the total conference attendees with 534 total students. About a quarter of the students were undergraduates, and three quarters were graduate students. About two thirds of total students attended the conference in person. Returning face-to-face highlighted how important it is to have in-person interactions to cultivate our botanical network. At the same time, about a third of students attended virtually. We hope the opportunity to tune in remotely helped students stay connected to the botanical community this year, even though they couldn't be there in person. The hybrid meeting format was challenging, and we are working with the BSA Board to make it a more integrated piece of the conference in future years.

The Student Reps worked to encourage more interactions between students and the botanical community at a variety of events. Our first event of the week was the *Planting the Seeds of Science Communication Workshop* on Sunday, where 10 superstars in their respective areas of sci-comm shared tips for engaging audiences about plants. The next day, we held the widely popular *Careers in Botany Luncheon* where students were able to connect with 20 panelists. We then helped host a very well-attended *Student Social* at the Top of the World Deck of the Hilton where we chatted late into the night. We also held three in-person *CV Review Sessions* and a few more online for those attending remotely. We also had a *Student Chapter Meet-up* where we discussed ideas to connect members with other chapters across the country.

For those of you who have not filled out the Conference Survey, please visit https://www.surveymonkey.com/r/KLG7CQ5 to help us make the conference a better experience for you in the future.

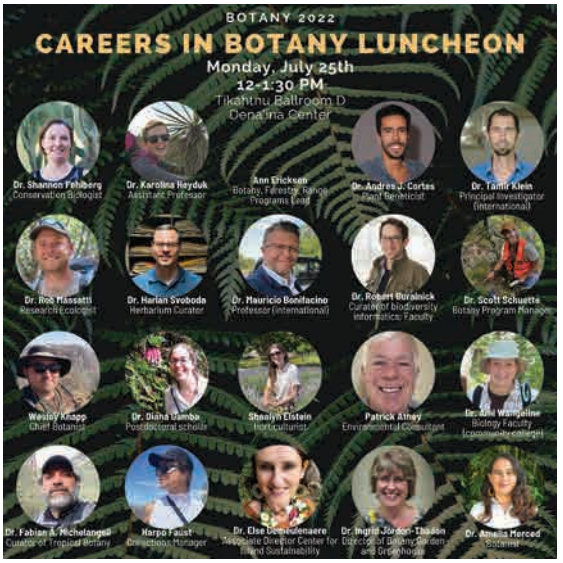
Reach us by email or Twitter:
Ioana: studentrep1@botany.org; @ioana_anghel
Eli: elishartung@gmail.com; @hartung_eli

By Ioana Anghel and Eli Hartung
BSA Student Representatives

CAREERS IN BOTANY LUNCHEON

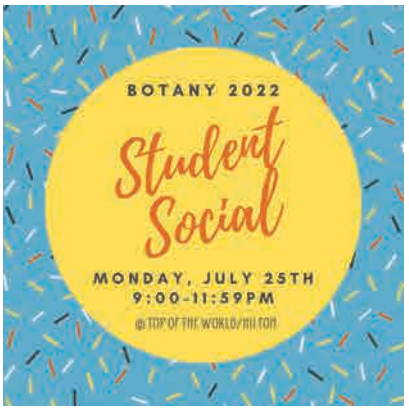
At the Careers in Botany Luncheon, we had 20 panelists with careers in academia, government, non-governmental organizations, consulting companies, herbaria, botanical gardens and museums. They represented the spectrum of career

stages, and they worked in five countries, eleven U.S. states, and two territories. A total of 83 students attended, with approximately half graduate students and half undergraduates. Below was the flier we used to advertise the event, and here is where you can read more about the panelists at the Careers in Botany Profiles: https://botany.org/home/careers-jobs/careers-in-botany/careers-in-botany-profiles-2022.html.



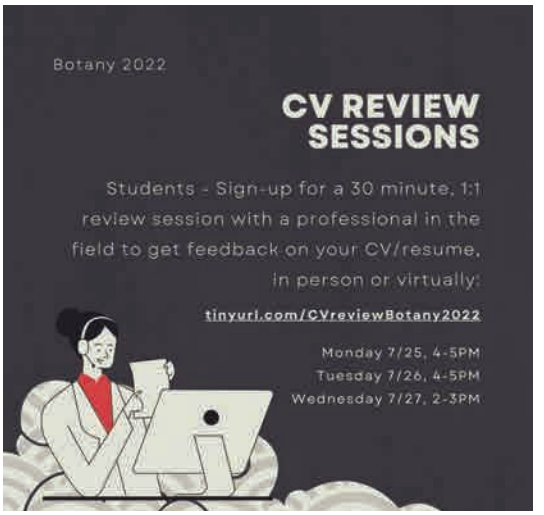
STUDENT SOCIAL

Thank you to the 175 of you who attended the Student Social! We had a great time getting to know each other in the never-ending daylight of Anchorage.



CV REVIEW SESSIONS

We had three in-person opportunities for students to work with botany professionals to improve their resume. We also paired remote attending students and professionals to do the same. We had a total of 18 students and nine professionals working together on resumes. Thank you so much to Jacob Landis, Jenny Xiang, Matthew Rubin, Elizabeth Hunter, Suneeti Jog, Angela McDonnell, Sara Handy, Brittany Sutherland, and Naomi Fraga for helping students with this important career skill!



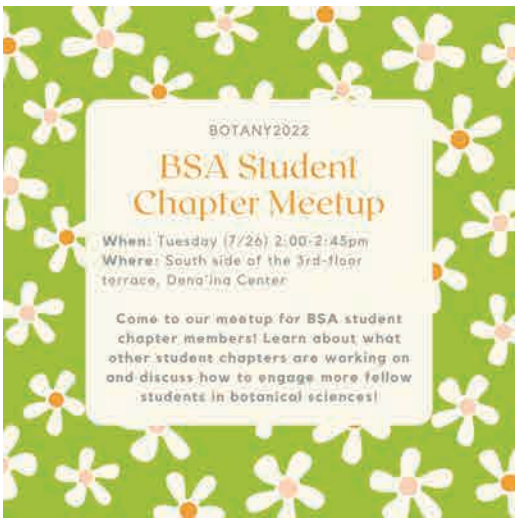
PLANTING THE SEEDS OF SCIENCE COMMUNICATION WORKSHOP

Our first sci-comm workshop was a great success with 10 panelists and 20 attendees. The workshop panelists were a diverse group of plant science communicators who reach people through various platforms including community outreach, museums

and botanical gardens, social media, video, and writing. First, the panelists spent a few minutes introducing themselves and their work. Then, we had small group discussions on a variety of topics including what it's like to get started in video sci-comm, strategies to tell compelling stories in social media posts, and how to engage in social media arguments about science more productively. We learned so much from the panelists, both through their engaging presentation content and style, and in the super interesting small discussions. Read the section "Heard at the Planting the Seeds of Science Communication Workshop" to learn some tips from our panelists.

STUDENT CHAPTER MEET-UP

We held our first-ever Student Chapter Meet-up at the conference this year. The event was initiated and organized by Anisa Khalid, a motivated undergraduate who is the President of her local BSA Student Chapter at University of Central Florida. We would love to host this at the conference each year. To maintain this momentum, the Student Reps are organizing a Student Chapter Meet-up as part of the Botany360 program (https://botany.org/home/resources/botany360.html). We are planning to hold it very soon. Stay tuned on the @Botanical_ Twitter and BSA Student Newsletter to hear more details.



NETWORKING BOARD

For our conference Networking Board, we heard from 11 labs recruiting for more than 18 positions including master's and PhD student, research assistant, post-doc, and technician openings in 10 states across the country. About half of those recruiting did not attend Botany, so be sure to reach out to them using the contact information listed on the board!

We also heard from 32 early career researchers looking for graduate school positions; post-docs; and jobs in industry, government, lab, or field positions. For those of you recruiting, please check out this list!

https://tinyurl.com/264nuk7t

BEYOND THE CONFERENCE

Last year, we launched a new committee to support students and early career professionals through the BSA Early Career Professional Development Committee. This group is working hard to help students and junior botanists meet other professionals, find mentors, and take advantage of various opportunities. Their GRFP workshop and mentorship opportunity is aimed at helping students applying for the NSF award this year, and it has already kicked off earlier in September.

They also put together an "Applying to Graduate School" workshop in September, which can be viewed at https://tinyurl.com/2p8x5wej.

Learn more about the committee at: https://cms.botany.org/home/governance/early-career-committee.html.

ADVICE FROM THE CAREERS IN BOTANY LUNCHEON

We had another great time at this year's Careers in Botany Luncheon. First, thanks again to the professionals and students who came and helped make this such a great event! We got great feedback from professionals and students alike from this event and wanted to share what we've gained. We asked the professionals, "What was an important piece of advice that you gave at the Careers in Botany Luncheon that you think students should remember?" We asked the students, "What was the most important advice you learned at the Careers in Botany Luncheon at Botany 2022?"

Professionals

"Plants matter! Botany is so fundamental to life, that you would be surprised how diverse a job market is out there: from Agro-Tech to botanical surveying, from academy to NGOs; just follow your passion!" -***Tamir Klein****, Weizmann Institute of Science*

"It is never too soon to start planning for retirement. Even if you don't yet have a "real job," start a Roth IRA and try to max it out every year. You may feel like you have no money, but being able to squirrel away in your 20s, will make you so far ahead of the game in your 40s. It goes by quicker than you think!" -***Ann Erickson****, Bureau of Land Management*

"Work around your priorities. Life is full of compromises, but when your priorities are clear you can better assess what sacrifices or risks are worth taking. This requires self-reflection and being honest with yourself. Adopt a growth mindset. Knowing how to learn is one of the most valuable lessons for a person. Things you don't know become things you don't know yet. Be brave, work hard, and show up. Know your plant(s)! Whether it is a molecular mechanism or an ecological process you're investigating, learn about the biology of the organism you're studying. Be interested in other levels of organization: molecular-organismal-ecological-evolutionary. Does it make biological sense? Also, learn about the plants that surround you and get interested in your local flora. At some point this will be very

useful. Not all advice is good advice for everyone, so take what resonates with you. What works for me doesn't necessarily work for others." *-**Amelia Merced***

"Network, network, network. You never know who might change your life or introduce you to a partner that will be critical for future success. Meet as many people in your field as possible. A close second is to always say 'yes' to an opportunity." *-**Wesley Knapp**, NatureServe*

"Clearly communicating your expectations and limitations is key to avoiding misunderstandings with your colleagues and maintaining a good network of collaborations." *-**Andrés J. Cortés**, Colombian Agricultural Research Corporation*

Students

"You can tailor a job to fit your interests."

"We all can learn from people at different career stages (younger or older)."

HEARD AT THE *PLANTING THE SEEDS OF SCIENCE COMMUNICATION* WORKSHOP

We had a great turnout for the *Planting the Seeds of Science Communication* workshop. We asked those who attended what sci-comm advice they gained (or gave) at the workshop would be valuable and impactful to the broader botanical and scientific community:

"Be your authentic and true self. All your plant (science, cat, etc.) love will shine through! It is ok to take social media breaks. Be mindful of what you are saying." *-**Tanisha Williams**, Bucknell University*

"The world will be a better place with more science communicators. The barrier to entry is low, and there are never too many." *-**Jacob Suissa**, Cornell University*

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 the BSA community recommends reading 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.

- Allen, K., J. Reardon, Y. Lu, D. V. Smith, E. Rainsford, and L. Walsh. 2022. Towards improving peer review: Crowd-sourced insights from Twitter. *Journal of University Teaching & Learning Practice* 19(3). https://ro.uow.edu.au/jutlp/vol19/iss3/02
- Gin, L. E., N. J. Wiesenthal, I. Ferreira, and K. M. Cooper. 2021. PhDepression: Examining how graduate research and teaching affect depression in life sciences PhD students. *CBE—Life Sciences Education* 20(3).
- Herz, N., O. Dan, N. Censor, and Y. Bar-Haim. 2020. Opinion: Authors overestimate their contribution to scientific work, demonstrating a strong bias. *Proceedings of the National Academy of Sciences* 117: 6282–6285.
- Ramírez-Castañeda, V., E. P. Westeen, J. Frederick, S. Amini, D. R. Wait, A. S. Achmadi, N. Andayana, et al. 2022. A set of principles and practical suggestions for equitable fieldwork in biology. *Proceedings of the National Academy of Sciences*, 119(34). https://doi.org/10.1073/pnas.2122667119
- Tilghman, S., B. Alberts, D. Colón-Ramos, K. Dzirasa, J. Kimble, and H. Varmus. 2021. Concrete steps to diversify the scientific workforce. *Science* 372: 133–135.

ANNOUNCEMENTS

IN MEMORIAM

JONATHAN GIDDENS (1986-2021)

Dr. Jonathan Giddens passed away unexpectedly on November 12, 2021, at age 35. Jon was a lifelong Oklahoman, growing up in Jenks, OK before completing his undergraduate and graduate degrees at the University of Oklahoma (OU).

At OU, Jon pursued his interests in plants and environment, first earning an undergraduate degree in Interdisciplinary Perspectives of the Environment in 2008. Then, in 2014 he earned his Master's in Plant Biology, working with Dr. Wayne Elisens on morphological variation in the Iva Annua Complex (Asteraceae: Heliantheae). It was during this time that I first got to know Jon, initially as a committee member, and then as his major advisor for his PhD work. Over the course of his PhD, he developed a series of research projects focused on water use and drought tolerance in eastern redcedar (*Juniperus virginiana*). He was especially drawn to studying plant hydraulics and how hydraulic traits might help explain why this species is so successful in encroaching into Oklahoma grasslands. Jon defended his Plant Biology PhD in May 2021, and we were still working on transitioning his dissertation chapters into manuscripts for journal submission.

Although Jon was early in his career, he had already impacted so many people with his love for plant biology. He was a teaching assistant for multiple plant courses at OU, including Introduction to Plant Biology, where his enthusiasm motivated many students to give plants a second look. He even converted some of them to Plant Biology majors! He received multiple university level teaching awards based on evaluations from the students he taught.

Finally, Jon was well known within BSA. He was very actively involved, serving in multiple roles in the student section, including as Student Representative to the Executive Committee from 2013 to 2015. He was always a friendly and enthusiastic presence.

I deeply regret that we will never be able to know what Jon would have done next in his life and career. But it is clear that he had already impacted so many and will remain with them.

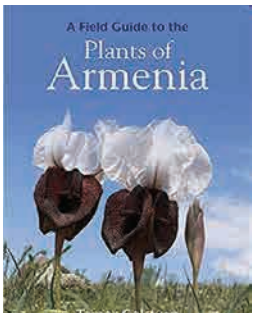
-Heather McCarthy, Associate Professor of Plant Biology, University of Oklahoma

BOOK REVIEWS

- A Field Guide to the Plants of Armenia
- The Hidden Beauty of Seeds & Fruits: The Botanical photography of Levon Biss
- Kaplan's Principles of Plant Morphology
- Orchid Species from Himalaya and South East Asia Vol 2 (G-P), Vol 3 (R-Z).
- The Western Woodlands of Ethiopia: A Study of the Woody Vegetation and Flora Between the Ethiopian Highlands and the Lowlands of the Nile Valley in the Sudan and South Sudan

A Field Guide to the Plants of Armenia

Tamar Galstyan
2021;
ISBN: 978-1-9997345-8-9
£25 (Paperback); 592 pp.
Filbert Press, UK



The Republic of Armenia is a landlocked country in the southern Caucasus, situated northeast in the Armenian Highland, with a mixture of lava plateaus, volcanic cones, fault-fold ranges, and Lake Sevan in a tectonic depression. Armenia has a highland continental, dry climate, with cold winters and warm summers. Temperatures depend upon elevation. Average midwinter temperature is 0°C; midsummer temperature exceeds 25°C. Average precipitation ranges from 250 mm per year in the lower Araxes River Valley, to 800 mm at the highest altitudes, with heaviest rainfall in the mountains. Its specialized habitats support a multiplicity of species in breathtaking landscapes.

Plants of Armenia is the first English-language guide to Armenia's diverse flora, including more than 1000 species. Arrangement is alphabetical by family; monocots separated from dicots with colored margin tabs. The guide holds 1900 color photographs, each identified by its Latin binomial, name in Armenian, short diagnostic description, flowering time, and elevation range. Nearly 1800 range maps show geographic distribution; where applicable, they indicate critical or endangered/vulnerable status (red dot) and endemism (green). The plates are clear, and the guide is well bound for frequent use, with rounded corners for safety; the coated cover provides protection from moisture and soil, and its compact 21 × 14.5 cm size fits in a backpack.

The introductory pages briefly describe Armenia's biogeography, climate, geomorphology, and native vegetation. A glossary of botanical terms and species index close the book. "Field guides are a way for people to connect with the environment by putting a specific face on the term biodiversity (Stevenson et al., 2001: 15-16). The economics of traditional publishing dictate that paper field guides must have commercial viability,

so they tend to focus on popular geographic areas." In this instance, the book relies on residents, tourists, and the Armenian diaspora, satisfying pride and longing for our ancestral homeland.

Personally, I am smitten with the extraordinary Oncocyclus section *Iris*; the guide's cover shows *Iris iberica* subsp. *elegantissima* (Sosn.) Fed. & Takht., with "flowers up to 10cm in diameter, the stems usually 20-30cm height. The falls reflex very sharply so that the blade lies almost vertically" (Mathew, 1989: 52). I had an opportunity to observe these beauties in abundance on the rocky high plateaus surrounding Erzurum, Kars, and Lake Van, in early May 1997. "By May or June, the rhizomes are getting a consistent baking every day, continuing for several months" (Mathew, 1972: 130); these alpine growth conditions are difficult to replicate in temperate areas.

Markarian (2004: 43) recounts details about Dr. Giovanni Franceso Gemelli Careri's visit to Armenia on May 26, 1694. Mr. Careri described a unique flower in the Talin area in Armenia: "In those villages I saw a vague and a strange flower, that every Italian prince would definitely pay much to have in his garden. The stalk is no more than a half palm high, on top of which are three white flowers that are straight, and three others, that fall into the form of a triangle of purple color with a tiny black rose in the middle, and other three of lighter color entangled in the same flower."

By coincidence, *Srpazan* [Archbishop Ashjian] had read this account on May 25, last year. Immediately he decided to go to the village of Talin to find the flower, taking photographers with him. "We visited the Armeno-Turkish frontier, prayed in the Haygavank Church, admired the monastery of Horomos, and finally reached Talin. We started our search with some shepherds. No hope. We inquired whether there was a knowledgeable woman in those parts who might have some special love towards flowers. We found one. She was the wife of the principal of the school, Mrs. Rima Hakobian, who told us of a lady in town who a couple weeks ago brought some flowers from the fields 'like the one you described.' We rushed to see Mrs. Siranoush Gevorgian and her collection of wildflowers. We were late; they had wilted. But we kept insisting, so the lady told us to go to St. Christopher's Cemetery, suggesting that we might find it there. We rushed and, lo and behold, several flowers of the type described were there smiling at us, like little urchins, teasing us, and how happy we were to finally get to them. We kissed the flowers, made a bouquet of them, then prayed for the man from whose tomb we had picked them. The name of that man? Ardoush, son of Sedrak Grigorian, 1924-1976. 'Sorry Ardoush, instead of bringing flowers to your grave, we just stole what nature had given to you. Forgive us.' Later Archbishop Ashjian learned the scientific name for this flower, *Iris elegantissima*."

Galstyan's travels to see plants in their natural habitats led to a Facebook page, "Plants of Armenia," a career as a guide for botanical tours in Armenia, and the creation of a travel company, SkyGreen. We owe gratitude to the author and those photographers and enthusiasts she consulted for contributing to this splendid volume. We also acknowledge the "largely unsung toils of taxonomists and field biologists who provided the very basic knowledge that is required for field guides to exist" (Holt, 2016: S94).

Although *Plants of Armenia* was written for a general audience, it ranks as an authoritative reference for species identification, often providing two views to show variable

morphology, which should also interest professional botanists. Highly recommended for its illustrations, range maps, and layout, it could also prove informative for use in surrounding regions.

REFERENCES

Holt, R. D. 2016. Geographical variation in the availability of natural history field guides? Personal reflections, causes, and consequences. *The American Naturalist* 188: S90-S95.

Markarian, H. 2004. Etchmiadzin Chronicles. *Outreach* 26: 37-43.

Mathew, B. 1972. Plant Portraits. *Iris elegantissima. Bulletin of the Alpine Garden Society* 40: 130-131.

Mathew, B. 1989. *The Iris*. B.T. Batsford Ltd., London.

Stevenson, R. D., W. A. Haber, and R. A. Morris. 2001. Standing on the shoulders of taxonomists: Electronic field guides and user communities in the ecoinformatics revolution. Website: http://citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.195.2801&rep=rep1&type=pdf

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

The Hidden Beauty of Seeds & Fruits: The Botanical Photography of Levon Biss
Levon Biss
2021.
ISBN: 9781419752155
Hardcover, $40.00; 144 pp.
Abrams Books, NY

An herbarium's carpological collection contains plant parts that are too chunky to be pressed on an herbarium sheet: seeds, bark, gum, fruits (e.g., cones), and leaves. Many of these cross reference with herbarium sheets and help to enrich the preserved collection. Taxonomists have made use of carpological collections to correct identifications, e.g., Farjon (1995) lectotypified a Mexican pine with an ovuliferous cone found among carpological material in the herbarium at Vienna (W).

Levon Biss is an award-winning British photographer, widely praised for producing peerless images with a macro lens of his generation. Biss polished his skills when compiling photographs for *Microsculpture (2017), a* unique photographic study of insects in exceptional magnification. Applying his skills as a professional photographer, his artist's eye, his background in graphic design, and eagerness to tackle technical challenges, Biss devised a customized technique for macrophotography, using instruments he designed, shooting numerous "stacked" photos to maintain sharp focus throughout, and subsequently compiling the segments into magnificent prints. The resulting photographs possess considerable depth, revealing every minute detail. Biss explains that in mounting a camera onto a microscope, one obtains only a very shallow depth of field. Consequently, he creates a composite view by combining many photographs, then flattens them down to produce one single high-resolution file. Hence each final photograph might be the combination of 8000 to 10,000 individual photographs.

Microsculpture led to international exhibitions that ensued from it that displayed large format photographs across Europe, the Middle East, South America, and the USA, with solo shows in 22 countries. Later his acclaim opened exceptional access to treasured historical museum collections, entrée normally granted only to research scholars whose credentials warrant admission to these vaults holding scientific specimens, and viewed by the lay public as mere cabinets of curiosities.

Biss was welcomed to work with the carpological collection at the renowned Royal Botanic Garden Edinburgh herbarium. Over a period of 6 months, he inspected many thousands of specimens. Ultimately, Biss selected 100 fruits and seeds to photograph for the project. The final images display seeds and fruits from around the world in exquisite detail, enabling the viewer to appreciate their intricate textures and their anatomy, which offers potentials for environmental adaptations. For the viewer, Biss' stylish photographs generate admiration for the beauty of the hidden natural world. If one accepts the premise that there is nothing more transformative than the healing forces of the visual and musical arts, in this meeting where art meets science in the botanical photography of Biss can be found emotional as well as educational support and ample examples to inspire appreciation of nature's biodiversity, so urgently in need of protection.

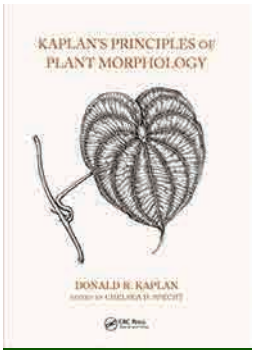
REFERENCES

Biss L. 2017. Microsculpture: Portraits of Insects. Abrams Books, NY.

Farjon A. 1995. Typification of *Pinus apulcensis* Lindley (Pinaceae), a misinterpreted name for a Latin American pine. *Novon* 5: 252-256.

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

Kaplan's Principles of Plant Morphology



Donald R. Kaplan. Edited and compiled by Chelsea D. Specht.
2022. ISBN 9781482245196 (hardback), 9780367655419 (paperback), 9781315118642 (e-book)
1317 pp; US$300.00.
CRC Press, Taylor & Francis Group, LLC, Boca Raton, FL

To paraphrase Dennis Stevenson's summary of Chapter 23, on Angiosperm Inflorescence Morphology: "There is an extensive amount of literature on morphology published in German. This book is an excellent synopsis of that work." It is true that Don Kaplan was a master of the German morphologists, from Hoffmeister through von Goebel, on to Troll and finally Hagemann, and their ideas and illustrations form a solid foundation for Kaplan to build upon. But besides simply compiling, organizing, and interpreting this massive German literature, he extends their work using his own prolific research and that of his many students.

Kaplan's goals are simple: "1) to teach the reader how to analyze the basic structural features of plants that are altered to produce the major variations in plant form and 2) to determine the significance of the morphological variants in the environments in which the plants grow." And Kaplan is an excellent teacher (a recipient of the BSA's Charles Edwin Bessey Teaching Award) who realized that the only way for students to develop a deep understanding of a concept is to be presented with a variety of perspectives and challenges, in a variety of situations, and to be led to the most logical conclusion. This is the goal of the book.

Kaplan begins with the concept of homology in Chapter 1, where he introduces the three criteria that will be used to analyze morphological structure throughout the text. The first is position within the body of the plant. Second are any special criteria or distinctive characteristics of the structure in question, and third is the existence of intermediates between distinctive structures. He then demonstrates how to apply these criteria using familiar flowering plants. In Chapter 2, he views these concepts from the perspective of the entire plant kingdom (*sensu lato*) and then ties them to internal anatomy and development in the next four chapters.

Kaplan's is not the traditional American approach to plant morphology, which focuses on evolutionary relationships and adaptive trends. Rather, the constraints are the morphological principles themselves as they influence ontogeny. Chapter 3, describing the relationship between morphology and anatomy, provides an opportunity for Kaplan to question the traditional maxim that the cell is the "building block of the organism" and morphology is the result of how the blocks are put together. Kaplan's morphological approach begins analysis at the whole plant level and brings it down to the cell. He presents his alternative "organismal theory," which argues that cells "fill in" the morphological form determined by the organism (Kaplan and Hagemann, 1991). Clear examples of morphology's primacy are the complex forms of coenocytic algae, with multiple nuclei but no cellular compartmentalization, which I continue to find intriguing.

The next 12 chapters address specific aspects of organogenesis, or the development and variability of major organ systems of the plant. Because of Kaplan's step-by-step approach in applying the morphological principles, documented with detailed illustrations, this third of the book is a treasure trove of examples illustrating virtually every variation of vegetative plant structure you can think of (and probably many you weren't aware of). In more than one instance, Kaplan delights in teaching you that there can be more than one way to achieve what appears to be a very similar structure and only careful study will permit a determination. And again, like a good teacher, Kaplan will frequently end a section with a comment like: "However, to date there have been no developmental studies made to see if…", as a way of pointing out future projects the reader may be interested in pursuing.

The second half of the book (six chapters) deals almost exclusively with reproductive structures, mostly pteridophytes (192 pp.) and gymnosperms (290 pp.). Floral shoots, floral organs, and inflorescences are covered in three separate chapters totaling 148 pages. Throughout these reproduction chapters, Kaplan regularly reminds the reader of the morphological and developmental convergence between vegetative and reproductive phases of growth, always following the common morphological principles. A final short chapter covers the root.

In addition to the thorough descriptions of form and its development, the book is filled with little bits of information I either had forgotten about or never knew. For instance, why is it that many conifer pollen grains develop their "wings?" The traditional, and "obvious," explanation is to facilitate wind-borne pollination. No, they are "water wings!" While Gifford and Foster (1989) mention this in a paragraph in the third edition of their text, who remembers? Kaplan understood that you need deep explanations to overcome common

misconceptions. He spends 10 pages and 7 figures, mostly from the publications of Joseph Doyle, examining the correlations between variations in megagametophyte structure and presentation (at the time of pollination), with presence and size of "air bladders" on the microgametophyes (pollen grains) in a range of gymnosperm genera. If the ovules are inverted with the micropyle pointed down, the pollination drop is exuded at the bottom and the pollen grains have buoyant sacci so they float up to the nucellus within the ovule. If the ovules are orthotropous, with a pollination drop on top, the grains lack sacci and sink down to the nucellus. And who even knew about the prodigious output of Joseph Doyle, "one of the most notable students of Gymnosperm structure and evolution in this century"? Kaplan notes that because Doyle published mostly in a local Irish journal, "his reputation suffered" [p. 974].

So how does this compendium compare with the original four-volume "Odin Readers" Kaplan (1998) published for students in his later classes? First, the equivalent of a fifth volume was added. The original series ended with what is now Chapter 19. Kaplan had drafts of the next four chapters, which Specht edited and compiled along with files from the mostly finished final chapter (Specht, personal communication). Almost nothing is missing from the original (except for his section on classification, which, as noted in a footnote, continues to change with ongoing phylogenetic work). Second, each new chapter begins with a paginated outline of topics (a useful device to scan for your interests), and third, figures are inserted into the text rather than compiled at the end of a chapter. Changes in nomenclature have been made, as necessary, throughout the text, and several, but not all, of his original hand-drawn illustrations have been professionally re-done. Line drawings are crisp, as are most photo images. However, if they were poor quality in the originals, there is only so much enhancement you can do. Especially on some whole specimen and habitat shots, I would have preferred to see new, sharper, images presented. Some, but not all, of the chapters have a summary or update section bringing new information to bear on the topics covered. Most useful were: Michael Christianson's contribution to seedling development in Chapter 6; Rolf Rutishauser's observations and updates on phyllotaxy in Chapter 7; Jennifer Richards' commentary on specialized shoot branches in Chapter 13; Julie Kang and Nancy Dengler's review of molecular controls on leaf symmetry in Chapter 15; Alejandra Vasco and Barbara Ambrose's reviews and edits of the pteridophytes in Chapter 19; Dennis Wm. Stevenson's summary of inflorescence morphology in Chapter 23; and James Seago's contributions to the final chapter on roots.

Unfortunately, there is not much of a market for an advanced plant morphology textbook these days. But, there is a huge need for plant geneticists and breeders, developmental botanists and physiologists, and plant ecologists and evolutionary biologists to be able to understand the foundations of plant morphology relevant to their specific research interests (Minelli, 2018). At the very least, there should be a copy of *Kaplan's Principles of Plant Morphology* in every library supporting plant researchers.

Finally, in answer to Stevenson's challenge about a controversy between "the Trollians (including Don Kaplan)" and Laurie Johnson at the 14th International Botanical Congress in Berlin (1987): "Guess who prevailed!" It was not Kaplan.

REFERENCES

Gifford, E. M. and A. S. Foster. 1989. *Morphology and evolution of vascular plants*, 3rd ed. New York. W.H. Freeman and Company.

Kaplan, D. R. 1998. Plant Biology 107. *Principles of plant morphology, Volumes 1-4.* Berkeley, CA. Odin Readers.

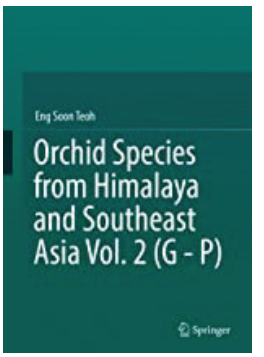
Kaplan, D. R., and W. Hagemann. 1991. The relationship of cell and organism in vascular plants. *BioScience* 41: 693-703.

Minelli, A. 2018. *Plant evolutionary biology. The Evolvability of the phenotype*. New York. Cambridge University Press.

-Marshall D. Sundberg, Roe R Cross Professor of Biology, Emporia State University, Emporia, KS.

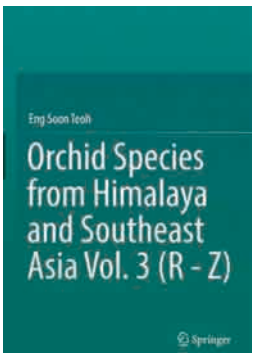
Orchid Species from Himalaya and South East Asia Vol 2 (G-P), Vol 3 (R-Z).

Eng Soon Teoh



Vol. 2 (G-P) 2021, ISBN 978-3-030-80427-5, ISBN 978-3-030-80428-2 (eBook)

Hard cover, $179.99; ebook, $169.00; MyCopy, a Springer service which allows library patrons of institutions with subscriptions to SpringerLink, to order a personal, print-on-demand soft cover edition of an eBook for $39.99 364 pp.



Vol. 3 (R-Z) 2022, ISBN 978-3-030-97629-3, ISBN 978-3-030-97630-9 (eBook)

Hard cover, $179.99; ebook, $169.00; My copy, $39.99
Three volume set, $499.99. 181 pp.; Springer Nature Switzerland AG, Geweberstrasse 11, 6330, Chem, Switzerland.

(Full disclosure: Dr. Teoh and I have been friends since 1974.)

This three-volume monumental work—I reviewed volume 1 previously (Arditti, 2021)—describes and illustrates a total of 118 genera, 879 species, and approximately 232 hybrids. Not included in the 879 species number are color variations and cultivated varieties of species. Whenever possible, species are shown in their natural habitats. Some were photographed in botanical gardens, private collections, commercial establishments, and a variety of sites. Altogether there are 1304 illustrations of species and 255 images of

hybrids. The total number of illustrations is a staggering 1559. Of the species included in the three volumes, sixteen in seven genera were first described in the 21st century and may not be well known.

I am amazed by the large number of photographs Dr. Teoh has included in this book because not all of the illustrated species are in cultivation (or are cultivated rarely). In addition to photographing many species in Singapore, Dr. Teoh photographed a large number in other countries (and many locales in each country), to which he traveled for the sole purpose of photographing orchids. Some photographs, all properly acknowledged, are by others.

In addition to photographs, paintings from classic old orchid books are included. A few of these books are available in Singapore, but not many. A fair number of these illustrations can be found online and downloaded, but the resolution is too low for quality publication. Collecting and accumulating these illustrations in proper format and resolution was not easy. Having searched for illustrations myself, I know how difficult this can be.

In text quality, organization, format, style of writing, and other details, these two volumes are as excellent as the first volume. Having already dealt with that volume (Arditti, 2021), I will not repeat my statements here for the sake of brevity. Suffice to say that volumes 2 and 3 describe and illustrate 388 species and many of their variants (I did not count them) plus approximately 177 hybrids clearly, well, and in great detail. Like volume 1, volumes 2 and 3 are a pleasure to read and look at. Together these three volumes describe a very large number of orchids and should satisfy the curiosity and/or needs of many orchid aficionados and plant scientists in general.

In the words of the author himself, "This work is not a comprehensive flora of the region. No single sane person should try to write a comprehensive illustrated flora of the region, there being, I am told 1256 species in India, 4000 species in Indonesia . . ." And 3000 species in Malaysia, 900 in the Philippines, 1300 in Thailand, 1040 in Myanmar, and many more in other countries of the region. New species are being described almost daily. Many species are found in more than one country, and orchid taxonomists never cease to add and delete (or maybe "add" and "delete") species by splitting and combining taxa (and always arguing about it). Therefore, to accurately determine the number of species "from Himalaya and Southeast Asia" is indeed a task, which can drive a "single sane person" to insanity.

Comprehensive orchid floras of countries or even parts thereof, regions, or continents, and/or encyclopedias of the family are notoriously difficult (or close to impossible) to write. Many ambitious such books, single or multi volume (the latest is six volumes), by one or more well- or lesser-known authors, which languish in my library and collect dust on its attest to this. Therefore, Dr. Teoh was wise to present only a judicious and impressive selection of the myriad orchid species, which are found from the Himalayas to Southeast Asia.

Some of these species deserve special mention for a variety of reasons:

- *Grammatophyllum scriptum* was given its specific epithet because the markings on its sepals and petals were thought to resemble Hebrew letters. It was first described by the "blind seer of Ambon," Georgius Everhardus Rumphius (1627, Wölfersheim, Germany – 1702, Ambon, Indonesia) who drew it on a coconut tree.

- *Grammatophyllum speciosum* plants may well produce the largest of all orchid plants. They can weigh as much as 2000 kg. A plant I saw on a tree in the Bogor Botanical Gardens in Indonesia many years ago was that large or perhaps larger.

- Several orchids in the region, known as Jewel Orchids—as for example, *Ludisia* and *Macodes*—have beautiful foliage that is shown very well in Dr. Teoh's photographs. They are cultivated for their foliage. Their flowers are not impressive.

- *Paphiopedilum henryanum* was named by a combative and controversial private taxonomist (i.e., one not associated with a scientific institution) for a convicted orchid poacher and smuggler, probably to spite established orchid scientists with whom both the "namer" and "namee" did not get along. Unusual and eccentric individuals are common in the orchid world.

- *Papilionanthe* Miss Joaquim, the Singapore National flower as *Vanda* Miss Joaquim, is a natural hybrid, a single plant, which was discovered in 1893 by Miss Agnes Joaquim (1854-1899), an avid gardener who is not known to have grown orchids, in a clump of bamboo in her garden. Henry Ridley (1855-1956), then director of the Singapore Botanic Gardens, named it in her honor. According to an urban legend, Agnes Joaquim herself took the orchid to Henry Ridley. This is probably not true. The herbarium specimen has a date and a note in Ridley's own hand indicating that he received the plant from her brother, Joe Joaquim (ca. 1850-1899), a lawyer who grew orchids. About 20 years ago, a non-orchid expert with a personal agenda suggested that Miss Joaquim actually bred the orchid. There is not a shred of evidence to support this suggestion (Arditti, 2022), but it created a controversy that still continues (Arditti and Hew, 2007). As a co-author of a book about *Vanda Miss Joaquim* (Hew et al., 2002), I am in the middle of it.

- *Spathoglottis* Primrose (*Spathoglottis aurea* × *Spathoglottis plicata*) is the very first human-made orchid hybrid produced in Singapore in 1932 by R. E. Holttum (1895-1990), then Director of the Singapore Botanic Gardens. Holttum produced the hybrid only after he learned how to use Knudson's asymbiotic method of seed germination (solution B) from the German mycorrhiza expert Hans Burgeff (1883-1976), who visited Singapore on his way to the Bogor Botanical Gardens in Indonesia.

- *Taeniophyllum* is a leafless epiphytic orchid. Its fleshy roots are green and probably fix carbon via CAM. I saw many plants on trees in the Bogor Botanical Garden. Sometimes they are hard to see.

These books are not free of problems. An error by the author is the use of "pod" in the *Spathoglottis* section to describe orchid fruits, which are capsules. All other problems are due to inattention to detail, sloppy (if any) editing, careless production, and low editorial standards—all of which I encountered in some of my books that were published by Springer-Verlag.

- Volume 1 has lists of references for every genus and a general list of references. There is only a general list of references in volume 2. Like volume 1, volume 3 has a list of references for every genus and a general list of references. A careful publisher would have insisted that a major three-volume work like this should have only a single list of references (or literature cited) for all volumes in volume 3.

- There are indexes of species and hybrids (in this order) in volume 1, but no index of countries. The order of indexes in volume 2 is hybrids, species, countries. In volume 3 the order is species, countries, hybrids. A publisher who pays attention to detail and has high editorial standards would have insisted on the same three indexes in all volumes, all in identical order. Better yet, the indexes should have been combined (one each for species, hybrids, and countries) in volume 3.

- There is no general index. A non-sloppy publisher would have insisted on, or provided, a general index for an interesting and complex work like this, which contains a great wealth of information. The lack of such an index renders difficult the use of this terrific book. An excellent publisher like John Wiley and Sons (my favorite) did that for several one-, two-, or three-volume books of mine. In multi-volume books, Wiley moved all indexes and a sole list of reference to the last volume.

In book reviews it is often stated at the end that whatever faults or problems a book has do not detract from its value. I would like to end by stating that the value Dr. Teoh's truly excellent book was reduced by the mediocre, even low, publication standards of Springer.

REFERENCES

Arditti, J. 2021. *Orchid species from Himalaya and South East Asia.* Vol. 1 (A-E). *Plant Science Bulletin 67: 137-139.*

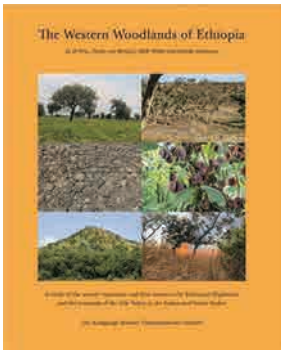
Arditti, J. 2021. *Papilionanthe* Miss Joaquim. How did it originate? Orchids 90: 926-930.

Arditti, J., and C. S. Hew. 2007. The origin of *Vanda* Miss Joaquim. In: K. M. Cameron, J. Arditti and T. Kull [eds.], *Orchid Biology, Reviews and Perspectives*, Vol. IX, 261-309. The New York Botanical Garden Press, New York.

Hew, C. S., T. W. Yam, and J. Arditti. 2002. *Biology of* Vanda *Miss Joaquim.* National University of Singapore Press, Singapore.

– Joseph Arditti, Professor Emeritus, University of California, Irvine.

The Western Woodlands of Ethiopia: A Study of the Woody Vegetation and Flora Between the Ethiopian Highlands and the Lowlands of the Nile Valley in the Sudan and South Sudan



Scientia Danica. Series B, Biologica, vol. 9
Ib Friis, Paulo van Breugel, Odile Weber, and Sebsebe Demissew
2022. ISBN: 978-87-7304-440-7
Hardcover, 386,00 kr; (~$40); 521 pp.
Det Kongelige Danske Videnskabernes Selskab.

Plant biodiversity is deeply endangered, yet we have not identified many species that exist on our planet. There is much that we do not know about how such unknown species contribute to the ecosystem. We are at risk of losing vital taxa before they have been named. This is particularly true for forests, which hold immense biodiversity. Major new threats to biodiversity and individual species include habitat degradation, climate change, over-exploitation, increased pollution, mining, unsustainable logging (e.g., roads and infrastructure) and oil exploration—all direct results of human activities. Such destruction also exacerbates climate change, since the woodland forests retain a large proportion of the world's carbon that would otherwise be in the atmosphere. By reshaping the biodiversity in an area, humans are restructuring the whole ecosystem and making it less resilient to natural disasters.

Realizing that the western woodlands of Ethiopia had been less studied than the highlands, a collaboration in field and herbarium studies was initiated in 1980 between the Ethiopian government and the University of Copenhagen to increase information about those still largely intact western woodlands. That led to establishment of the Ethiopian Flora project, funded by SAREC (Swedish Agency for Research Cooperation with Developing Countries).

The Western Woodlands of Ethiopia represents the pinnacle of four decades of collaboration between Friis, Demmisew, van Breugel, Weber, and numerous other collaborators. It follows up their previous 10-volume floristic characterization (Friis et al., 2010). This opus magnus, weighing nearly 9 pounds (with its contents matching its heft), holds a treasure trove of topics, including botany, geology, history, phytogeography, and soils. The volume is dense with data.

Data collection was done using a technique termed *relevé,* an initial concept that was developed by Swiss ecologist Jacques Braun-Blanquet during the mid-20th century. *Relevé* is useful to classify species diversity of plant cover in large areas. Specifically, % Cover Concept: Individual species (taxon) is said to have 10% cover if it covers 10% of the area of a *relevé.* In field data collection, each taxon (species) is rated with a cover class of 1–5, with 1 being 75%–100% to 5 (1%–5%). Sociability Concept: Class 1—Species occurs in large, nearly pure stand; Class 2—Species occurs in large aggregates or carpets; Class 3—Species occurs in small aggregates or clusters; Class 4—Species occurs in isolated clumps or bunches; Class 5—Single occurrence of species in *relevé.*

The authors used their data for clustering and principal component analyses to study continuity and discontinuity of the vegetation and the drivers of variation. They found that their clusters relate to variables such as

latitude, altitude, climate, and soil types, while slope, fire frequency, and other parameters were less important.

The decade-long controversy involving the Grand Ethiopian Renaissance Dam (GERD) is central to the results reported in this monograph. Ethiopia's western highlands hold important tributaries to the Nile, particularly through the Blue Nile, but also through 10 or more other rivers running to the Nile. The new Ethiopian GERD reservoir will encompass substantial areas investigated here. The authors warn (p. 398) that "much of the area with relatively high species-richness, will be flooded by the reservoir behind the GERD dam if the project develops as planned."

The reference work concludes with seven appendices documenting the authors' findings. Particularly useful are the complete records of field observations and species lists in Appendix 1, distribution of taxa on geographical areas in Appendix 4, and ecological adaptations of species in Appendix 5. The book closes with a valuable 15-page List of References, containing some venerable rare titles including Poncet (1709)—a source that I found useful when preparing literature reviews about the desert regions of Kenya and Sudan—and an indispensable 8-page index to plant names. The stature of the authors and their long devotion to this project provides reliably precise data and computations that will inform future Ethiopian students to recognize the ecological and environmental uniqueness of their western woodlands, hopefully leading to further support for its preservation. The mapping and analyses are made with prevailing, tested techniques (including DIVA-GIS, ArcMap, Q-GIS, UPGMA, various ordination methods) and careful attention to detail. This subject is unquestionably significant, and I would expect that this monograph will become adopted as the standard reference for specialists, and may serve as a model for other regional biogeographers.

Paper quality is an essential consideration for a book such as this, to retain permanently each plant photograph and colorful map. Printed in Denmark by Narayana Press on sturdy paper stock, this robust hardcover copy should withstand long-term handling well.

REFERENCES

Friis, I., S. Demissew, and P. van Breugel. 2010. Atlas of the potential vegetation of Ethiopia. Royal Danish Academy of Sciences and Letters. *Biologiske Skrifter* 58.

Poncet, C. J. 1709. A Voyage to AEthiopia, made in the years 1698, 1699, and 1700. Describing particularly that Famous Empire; as also the Kingdoms of Dongola, Sennar, part of Egypt, &c, with The Natural History of those Parts. London. https://www.google.com/books/edition/A_Voyage_to_AEthiopia_Made_in_the_Years/HEEGAAAAQAAJ?hl=en&gbpv=0.

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

Plant Science Bulletin

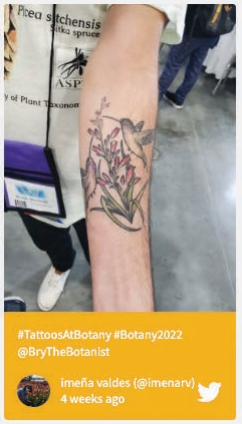
ISSN 0032-0919
Published 3 times a year by
Botanical Society of America, Inc.
4475 Castleman Avenue
St. Louis, MO 63166-0299

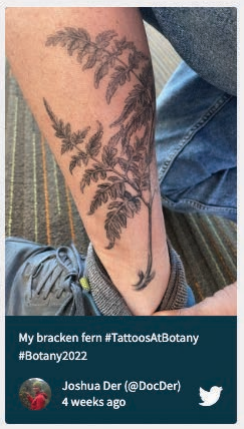
Periodicals postage is paid at
St. Louis, MO & additional
mailing offices.
POSTMASTER:
Send address changes to:
Botanical Society of America
Business Office
P.O. Box 299
St. Louis, MO 63166-0299
bsa-manager@botany.org

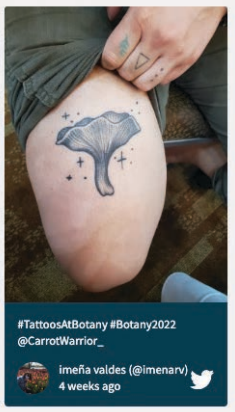
The yearly subscription rate
of $15 is included
in the membership
Address Editorial Matters (only) to:
Mackenzie Taylor, Editor
Department of Biology
Creighton University
2500 California Plaza
Omaha, NE 68178
Phone 402-280-2157
psb@botany.org

The Botanical Society of America is a membership society whose mission is to: promote botany, the field of basic science dealing with the study & inquiry into the form, function, development, diversity, reproduction, evolution, & uses of plants & their interactions within the biosphere.

Spotted at Botany 2022







Wearing your Botany on your sleeve!

Put science in your students' hands

The LI-COR Environmental Education Fund (LEEF) Program offers grants towards the purchase of research-grade instrumentation for primarily undergraduate institutions.

LEEF plant physiology packages are available for the LI-600 Porometer/Fluorometer and the LI-6800 Portable Photosynthesis System.

Empower your students to explore the environment: **licor.com/LEEF**

Investigate and analyze complex plant processes:

- Chlorophyll *a* fluorescence
- Stomatal conductance
- Photosynthetic gas exchange
- Aspects of plant architecture