

The Plant Press



Smithsonian
National Museum of Natural History

New Series - Vol. 13 - No. 1

January-March 2015

Symposium Spotlight Special Agents Seek Change

By Gary A. Krupnick

The National Tropical Botanical Garden and the Department of Botany at Smithsonian's National Museum of Natural History presented a one-day symposium titled, "Agents of Change: Botanic Gardens in the 21st Century" on October 7, 2014, in Washington, DC. The symposium brought together the world's leading scientists, researchers, and garden leaders to share the most pressing issues, trends, and solutions at botanical gardens, to the challenges faced by the natural environment, the struggles to feed the hungry, and the losses of cultural diversity.

The symposium was structured around four over-arching topics: (1) Extinction or survival: conserving plants in a changing world; (2) Feast or famine: how we can and will feed 9 billion people; (3) Biocultural conservation: interpreting the richness of the human experience; and (4) Operational sustainability: are botanic gardens an endangered species? Each topic featured three to four guest speakers and was followed by an expert panel with five leaders in botany.

The event, held in Baird Auditorium at the National Museum of Natural History (NMNH), was convened to help celebrate the 50th anniversary of the National Tropical Botanical Garden (NTBG). Chartered by Congress to serve a great public need, NTBG is a nonprofit institution dedicated to tropical plant research, conservation, and education, with an emphasis on species at risk. NTBG's headquarters, primary science and conservation facilities, four gardens,

and five preserves are all in the Hawaiian Islands, while its fifth garden is located in South Florida. Field exploration expands its work beyond Hawaii into the greater Pacific Islands region.

Kirk Johnson, Sant Director at NMNH, kicked off the day with a welcome to the museum. As a paleobotanist, Johnson said he felt a strong connection with botanical gardens and spoke fondly of botanists whom mentored him during his college years.

A second welcome was given by Chipper Wichman, Director and CEO of NTBG. "Is it enough?" was a phrase Wichman used in his introduction. Is it enough that botanical gardens have cutting-edge research facilities; that they house the best collections of specimens; that they are exploring remote islands in the world; that they are reaching the last plants and protecting them from extinction?

Pointing out the challenging times that we live in, Wichman explained that the role of botanical gardens has evolved since World War II. The world population is putting too much stress on the planet, which is threatening food security, cultural security, energy security, and biosecurity. We are facing one of the greatest extinction crises, and what we are doing, Wichman argued, is not enough. The world needs botanists to be the agents of change and to push the limits.

Peter H. Raven, President Emeritus of

the Missouri Botanical Garden, offered opening remarks, explaining that the first biodiversity symposium (the word "biodiversity" was coined in proceedings from that forum) occurred at the Smithsonian Institution in 1987. In a rapid-fire delivery, Raven then walked the audience through a history of tropical botany and conservation: the 1964 charter to establish the Pacific Tropical Botanical Garden (PTBG); Mildred Mathias as a key figure in the establishment of the Organization for Tropical Studies in 1963; Norman Myers witnessing the state of destruction of the tropics in the

1970s; Terry Erwin estimating tens of millions of species in the tropics; Senator Inouye in 1988 enacting a name change for the garden, from PTBG to NTBG.

Raven went on to explain that an early focus of conservation was about the

desire for prosperity of forests. Rachel Carson's *Silent Spring* and the formation of the Sierra Club brought a new vision of conservation, and with that, NTBG developed stronger conservation views to complement a strong collection of botanical specimens. Endorsing the positive work of NTBG over the past 50 years, Raven now looks forward to the next 50 years of the garden's work.

The first topic of the symposium was "Extinction or Survival: Conserving

***"The world needs
botanists to be
the agents of
change and to
push the limits"***

-Chipper Wichman

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Pedro Acevedo traveled to Salvador, Bahia, Brazil (10/17 – 10/24) to attend the XI Latin American Botanical Congress, where he presented a one-and-a-half-day course entitled “Generic Diversity of Neotropical Lianas & Climbing Plants,” and led the first organizational meeting of the Neotropical Lianas Working Group whose goal is to produce a *Field Guide to the Lianas and Climbing Plants of the Neotropics*; and to Puebla, Mexico (10/31 – 11/13) to collect specimens and data on members of Sapindaceae and climbing plants at several localities in Sierra Madre Oriental.

Barrett Brooks traveled to Colon, Panama (11/10 – 11/26) to participate in a Rapid Algal Assessment of the mangroves and reef areas in the vicinity of Galeta Marine Lab and to present a talk entitled “Plantas Marinas de Galeta: La historia del mundo según las algas.”

Robert Soreng traveled to Berlin, Germany (11/22 – 11/29) to study herbarium specimens of *Poa* and related gen-

era; and to Paris, France (11/29 – 12/13) with **Laurence Dorr** to study herbarium specimens and to locate type specimens of grasses and other plants collected by S.B. Buckley.

Ashley Egan traveled to Salvador, Bahia, Brazil (10/20 – 11/2) to speak at the XI Latin American Botanical Congress, to attend the first official meeting of the Legume Morphology Working Group, to collect legumes in Bahia State, and to discuss collaborative research.

Vicki Funk traveled to Salvador, Bahia, Brazil (10/17 – 11/1) to speak at the XI Latin American Botanical Congress and to collect plants in the field; to Bronx, New York (11/18 – 11/21) to work in the herbarium at the New York Botanical Garden; to Raleigh, North Carolina (11/21 – 11/23) to attend a NESCent meeting; and to Sweden (11/29 – 12/10) to receive the Rolf Dahlgren Prize in Botany from the Royal Physiographic Society in Lund.

Paul Peterson traveled to Sierra Nororiental de Puebla, Mexico (11/9 – 11/25) to collect grasses and participate in an ethnobotanical study (A Biological Approach to Documenting Traditional Ecological Knowledge in Synchronic and Diachronic Perspectives) funded by the National Science Foundation (NSF) and Comisión Nacional para el Conocimiento y Uso de la Biodiversidad (CONABIO).

Eric Schuettpelz traveled to West Java, Indonesia (11/1 – 11/21) to collect

ferns from Mount Halimun Salak and Mount Gede Pangrango National Parks; and to Wilmington, North Carolina (12/1 – 12/2) to attend a thesis defense at the University of North Carolina Wilmington.

Alain Touwaide and **Emanuela Appetiti** traveled to San Antonio, Texas (10/17 – 10/21) to visit the local botanic gardens and the Department of Classics of Trinity University; to Florence, Italy (10/28 – 11/4) to attend the opening of the Academic Year of the University of Florence; to Cordoba, Spain (11/13 – 11/23) to attend the 2014 International Congress of Ethnobotany, where they co-organized a 1-day session on historical ethnobotany; to Leuven, Belgium (11/30 – 12/8) to participate in the international conference “Towards the Authority of Vesalius: Representations of the Human Body in Antiquity, the Middle Ages and the Renaissance”; and to Athens, Greece (12/15 – 1/15) to do research at the National Library of Athens and to work at the National Hellenic Research Foundation with an interdisciplinary team on Byzantine and Ottoman alchemy.

Jun Wen traveled to Delaware Water Gap, Pennsylvania (10/8) to collect moss and sumac gall aphids; to St. Louis, Missouri (12/15 – 12/19) to conduct herbarium studies of Vitaceae at the Missouri Botanical Garden; and to Beijing, China (12/26 – 1/8) to conduct collaborative research.

Visitors

Ning Zhang, Pennsylvania State University; Vitaceae (1/7/13–6/30/15).

Yongli Fan, Xishuangbana Tropical Botanical Garden, China; Pollination studies (1/13/14–1/12/15).

Eduardo Pasini, Universidade Federal do Rio Grande do Sul, Brazil; Compositae (8/18/14–4/30/15).

Carolina Diller, University of Maryland, College Park; Angiosperm pollination (9/2/14–1/31/15).

John Clark, National Tropical Botanical Garden; Pacific *Cyrtandra* (9/29–10/10).

Garrett Louie, George Washington University; Population genetics internship (10/1–12/5).

David Lorence, National Tropical Botanical Garden; Flora of Marquesas and Samoa (10/2–10/10).

Ghilleen Prance, Royal Botanic Gardens Kew, United Kingdom; Neotropical Rhizophoraceae and Anisophylleaceae (10/3–10/8).

Noel and Pat Holmgren, New York Botanical Garden; *Penstemon* (Scrophulariaceae) (10/7).

Deirdre Larkin, Metropolitan Museum of Art Cloisters Gardens; Mediterranean medicinal plants (10/8).

Elizabeth Rhoads, U.S. Botanic Garden; Mediterranean medicinal plants (10/10).

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Reu Series - Vol. 18 - No. 1

Chair of Botany

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Valuing Collections

This year brought dismal news about the world's birds: They are vanishing at an alarming rate. Across 25 European countries, about 420 million fewer birds are present today than in 1980, a 20% decrease, especially in the 36 most common species. In North America, *The State of the Birds Report 2014* indicates that over the past 40 years, the numbers of individuals across 33 species are also down by hundreds of millions. Such assessments highlight the urgency of determining the precise causes of these declines. The knowledge gleaned from the Avian Phylogenomics Project, coupled with ecological and population analyses, should provide new insights into the factors that influence bird declines and extinctions. As the project progresses over the next few years, over 60% of tissue samples for the avian analyses will be derived from archived museum collections. In this era of deteriorating natural environments, a pressing challenge is to continue to build scientific collections for future needs.

Museum collections, and the species they represent, provide windows into the past, inform about the present, and help predict the future of natural habitats and human-altered environments. They are the common language of the biological sciences. An antiquated view of collections suggests drawers of bird skins, empty shells, and dried plants. However, current collections also include living specimens, spirit-preserved samples, deep-frozen tissues, and DNA. These irreplaceable biomaterials are invaluable representatives of Earth's biodiversity, and together with their associated metadata are archived *ex situ* for long-term documentation, public education and exhibition, and scientific and applied research. Although the exact number of collections maintained in museums, botanic gardens, and universities is unknown, estimates as high as three billion specimens suggest the magnitude of this storehouse of information about the natural world.

Many scientists continue to use collections to discover, describe, and document plants and animals with time-proven methods. At the same time, the application of new and multiple technologies to study specimens is blossoming. For example, much of our current understanding of some recently extinct species, such as the Tasmanian tiger, the Caribbean monk seal, and the passenger pigeon, has directly resulted from genomic information extracted from museum collections. And combining DNA-, amino acid- and isotope-based

analyses of a few grams of bone from a historical specimen of an endangered Pacific seabird, the Hawaiian petrel, has illuminated aspects of the bird's diet, past population demographics, food chain dynamics, and the deleterious impacts of industrial fishing on this oceanic predator. Museums are becoming an unparalleled resource of tissue samples for large-scale genomic studies of animals and plants.

Yet contributions to genomic studies are but one use of museum collections. Extinctions due to human impacts are also readily studied through historical records preserved in scientific collections. These records reveal former patterns of geographic distributions and population abundances of species that today are threatened or extinct.

Museum collections equally contribute to the discovery of previously unknown species, such as the *olinguito*, a carnivorous mammal from South America.

Most museum specimens were not collected for the purposes for which they are now used. Innovation in technologies will

continue to reveal new information previously unanticipated in scientific specimens. Therefore, the most pressing challenge is to build collections for future needs that maximize access and benefit-sharing for all. Collections must be sustained for the long term, which will require increased funding for their physical and scientific curation. A formidable task that has only just begun is the computerized inventory and digitization of the wealth of information that collections represent. At present, most of these data are not accessible electronically or online.

The worldwide decline of birds is just one part of a large and grim picture; the number of individuals of all wild animals on Earth has decreased by 50% since the 1970s. This drastic decline underscores the vital inherent value of museum collections today, tomorrow, and into the future.

-W. John Kress

Interim Under Secretary for Science at the Smithsonian Institution and Distinguished Scientist and Curator of Botany

This editorial originally appeared in the December 12, 2014 issue of Science (346: 1310). Reprinted with permission from AAAS.



Chair

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View

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L.
Wagner



Staff Research & Activities

On 7 November, **Alain Touwaide** and **Emanuela Appetiti** participated in a workshop on the Voynich Manuscript, organized by the Folger Library, in collaboration with the Beinecke Rare Book & Manuscript Library of Yale University.

Alain Touwaide has been elected a Fellow of the International Academy of History of Science.

In November, **Elizabeth Zimmer** presented a talk “Whose *Isoetes* DNA Is It? How Molecules Aid Morphology,” to the Botanical Society of Washington.

New Faces

Craig Costion completed his undergraduate training at the University of Vermont with a major in Ethnobotany in 2003. He went straight from UVM into the Peace Corps in Palau (Micronesia) where he served one year, then was hired as the manager of the Natural History Section of Palau’s National Museum. There he established a national herbarium, and led a floristic inventory of the island. He then went on to complete a M.Sc. in Plant Taxonomy at the Royal Botanic Gardens Edinburgh with distinction. A full scholarship offer then took him to Australia for his doctoral training jointly between the

University of Adelaide and James Cook University in Cairns where he stayed on for a two-year post doc. There Costion built a DNA barcode based super-tree of the northeast Queensland rain forest bioregion, continued research on the Flora of Micronesia, and did climate modeling of mountain-top endemic plants. He was then hired as a private consultant to manage the establishment of a Smithsonian Center for Tropical Forest Science (CTFS) plot in Palau. After living abroad and working on tropical botany for 12 years, Costion has now just recently joined the Smithsonian team as a post-doctoral fellow under **W. John Kress**. His work will be focused on DNA barcoding of four CTFS plots from Hawaii, Palau, and Australia.

Erin Sigel joined the Botany Department as a Peter Buck Postdoctoral Fellow in September 2014, under the supervision of **Eric Schuettpelz** and **Ashley N. Egan**. Sigel is a recent graduate of Duke University, where her doctoral dissertation research focused on gene expression in polyploid ferns and the systematics of the reticulate *Polypodium vulgare* complex. At the Smithsonian she is combining her knowledge of systematics, high throughput sequencing technologies, and bioinformatics to study the phenotypic, genetic, and genomic consequences of polyploidy and hybridization in ferns. Specifically, she has adopted *Polypodium hesperium* as a focal organism for investigating how allopolyploid plants (i.e., those with multiple sets of chromosomes resulting from interspecific hybridization) preferentially express and retain duplicate gene copies

inherited from their parent species.

Mohammad Vatanparast joined the Botany Department as a Postdoctoral Fellow in November 2014 working with **Ashley N. Egan**. Vatanparast completed his Ph.D. at Chiba University, Japan, under Tadashi Kajita, studying legume systematics and population genetics of *Canavalia* and other sea-dispersed plant species. At the Smithsonian he will be working on resolving the relationships within the Phaseoloid and Millettoid legume clades to produce a strong supported phylogenetic hypothesis of these taxa based on hundreds of genes from both the chloroplast and nuclear genomes using a targeted-enrichment approach and next-generation sequencing methods.

Peer Recognition Awards

The National Museum of Natural History presented the 2014 Peer Recognition Award on December 9, 2014. Award recipients are individuals who have given their time and talent to the museum above and beyond what their job calls for and to those who have done something that makes a difference in the outside community, for the museum, or for the larger Smithsonian community. The **Peer Recognition Award Committee** is composed of 11 NMNH staff members representing a cross-section of the entire museum community.

Ingrid Lin and **Sylvia Orli** from the Department of Botany received the Bee’s Knees Team Award, a team which also



News faces in the Department of Botany: Craig Costion, Erin Sigel, and Mohammad Vatanparast.



Representing the Department of Botany, Sylvia Orli (left) and Ingrid Lin (third from left) are presented with the “Bee’s Knees Team Award” by Kirk Johnson, Sant Director of the National Museum of Natural History (fourth from left). (photo by the Smithsonian Institution)

included Erin Bilyeu, Ali Brooks, Brian Harris, Julie Hoskin, Hailey Hultquist, Amanda Lawrence, Jennifer Strotman, Ben Sullivan, Laura Tancredi, and Catherine Winn from the Departments of Entomology and Paleobiology and the Collections Program. This hard-working group undertook the detailed task of preparing tens of thousands of specimens for the Bumble Rapid Capture Pilot Project, and accomplished it with flying colors. Through their careful, efficient work, they were able to digitally capture 44,047 bumble bee specimens in eight weeks (the original goal was 14,400 which was surpassed in three and a half weeks). Through their diligent and dedicated work, this project has garnered attention from the worldwide museum community and various news outlets for its efficient preservation of specimens and their data.

Science Achievement Awards

In 2003, the National Museum of Natural History began awarding Science Achievement Awards, recognizing exceptional scientific publications in natural his-

tory. A maximum of five awards are made in any one calendar year. On December 9, 2014, in close consultation with the Senate of Scientists, an interdisciplinary review committee recognized the outstanding work of five teams of scientists for papers published in 2012 and another five for papers published in 2013.

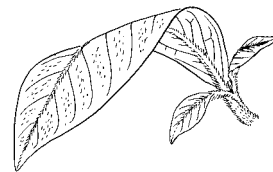
Among the 2012 Science Achievement



Vicki Funk with Professor Ib Friis, University of Copenhagen, at the event on December 2, 2014. Friis read the citation at the annual award ceremony. (photo by Jim Nix)

Award winners are **Pedro Acevedo-Rodríguez** and **Mark Strong** for their publication “Catalogue of Seed Plants of the West Indies” (*Smithson. Contrib. Bot.* 98: 1-1192; 2012).

Among the 2013 Science Achievement Award winners are **Walter Adey** and **William Fitzhugh** (Department of Anthropology) for their co-authored paper “Arctic sea-ice decline archived by multicentury annual-resolution record from crustose coralline algal proxy” (*Proc. Natl. Acad. Sci., USA* 110(49): 19737-19741; 2013); and **W. John Kress** for his co-authored book *The Ornaments of Life: Coevolution and Conservation in the Tropics* (University of Chicago Press. 616 p.; 2013).



Funk Receives Rolf Dahlgren Prize

In December, **Vicki Funk** traveled to Sweden to receive the Rolf Dahlgren Prize from the Royal Physiographic Society in Lund, Academy for the Natural Sciences, Medicine and Technology. The Society was founded on December 2, 1772, and his Majesty, the King of Sweden, is its patron. The goal of the Society is to provide researchers and scholars from differ-

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Dahlgren Prize

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ent disciplines the opportunity to meet and hear presentations of new research results, to exchange thoughts and ideas, and to assist in the publication of those results. The Society is the trustee of several large donations and foundations, and some donations are specified to provide funds for prizes and medals. In these cases it is a question of rewarding outstanding and prestigious research, and, for obvious reasons, it is mostly well-established scholars whose work is considered.

The Rolf M.T. Dahlgren Prize (International award in Botany) is given every three years. Funk, the 2014 recipient of the prize, was cited for her outstanding and pioneering work in phylogenetic systematics, her commitment to collections based research, and her use of molecular phylogenetics in understanding the flowering plant family Compositae. The Prize was presented at the annual dinner and ball on December 2 (the anniversary of the founding of the Society) at the Grand Hotel in Lund.

"For Vicki to be selected for this prize is a great honor," says Botany Chair **Warren Wagner**. "It shows the international recognition and esteem that her research has garnered and her leadership in the community of Compositae workers that brought about the fine book summarizing the current knowledge across this, the largest of plant families. It also, once again, demonstrates the quality of science that the Department is known for around the world."

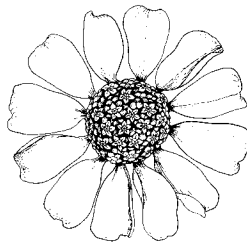
The Prize was instituted in 1988 in memory of Rolf Dahlgren (1932–1987), a Swedish-Danish botanist and professor at the University of Copenhagen from 1973 until his death in a car accident. He studied South African plants and family circumscription in the Monocotyledons. He is perhaps best known for his system of Angiosperm classification based on many characters that had not been used previously including 'chemotaxonomy'. The monetary value of the Prize is 180,000 SEK (ca. \$22,000) and Funk has requested that the funds be placed in the Botany Department account so she can use them for research.

Previous recipients of the Dahlgren Prize include Peter Endress (1990); Peter Goldblatt (1993); Mark W. Chase (1996);



National Museum of Natural History Director Kirk Johnson (center) thanks Harold Robinson and Vicki Funk for a gift establishing an endowment toward research awards to people studying the Compositae collection. (photo by the Smithsonian Institution)

Roland von Bothmer (1999); Pamela and Douglas Soltis (2002); Else Marie Friis (2005); Paula J. Rudall (2008); and Michael J. Donoghue (2011).



Robinson Endowment Fund Announced

The Department of Botany is pleased to announce a generous gift in 2014 in the amount of \$25,000 each from two of its former and current departmental members, **Harold Robinson and Vicki A. Funk**.

The gift will create an award fund to support and sustain the work of early career research fellows conducting research involving Compositae (Asteraceae) collections in the U.S. National Herbarium. The Department of Botany will make awards from the fund that target studies focusing on taxonomy, phylogeny, or anatomy. Robinson and Funk have asked that the fund be managed for future growth to increase the payout and that should the

endowment grow to a sufficient amount, it could be used to support a postdoctoral fellow or even a curator focused on Compositae research.

The U.S. National Herbarium has a rich collection of plant specimens from the Compositae family (currently ca. 500,000)—one of the best in the world. This is due in large part to the long history of research fostered by the Smithsonian (over 150 years). In fact, since its inception, the U.S. National Herbarium has consistently hosted a scientist that studied this family and as a result, an enormous amount of research has been published (over 1,500 papers and books), including papers by Asa Gray, Benjamin L. Robinson, Sidney F. Blake, and José Cuatrecasas. However, due to the large size of the family (ca. 25,000 species), there is still much to be done.

This \$50,000 gift established an endowment known as the *Harold Robinson Endowment Fund* (to be changed to the *Harold Robinson & Vicki Funk Endowment Fund* upon Funk's retirement) in honor of the combined 80+ years of study of the family these two scientists have given the Institution.

Anyone wishing to donate to this fund should contact the Chair of the Botany Department, Warren L. Wagner (wagnerw@si.edu).

Notes from Plant Mounting

By Melinda Peters

I have been here over two years now and 2014 proved to be a challenging and exciting year for the plant mounting program at the U.S. National Herbarium. We will be recruiting volunteer plant mounters in the coming months. If you know of anyone interested in working with a talented, skillful, and spunky crew, please let me know. Last year, volunteer plant mounters contributed **5,000** new specimens, while staff plant mounters contributed **6,200** specimens to the collection. We have been working on “cleaning up” and getting older accessions prepared and into the permanent collection. Stay tuned for highlights from these specimens.

A few plant mounters have been working in the Department of Botany for more than 20 years. **Gwen Petitjean** is a Monday volunteer and has been coming in since April 1987. **Margaret Schweitzer** is a Wednesday volunteer and has been coming since November 1992. Thanks to these two wonderful women for their continued work in the Department.

New acquisitions this year consisted of many specimens for specialists or specific geographic regions. **Laurence Dorr** received an interesting gift in the fall that adds the only specimen of this species to

our collection. The gift brings the naming of this species to fruition. Dorr recognized the need to update the naming of an artificial hybrid, now known as *×Chiranthomontodendron*, which is a cross between two parent plants: *Chiranthodendron* (male parent) and *Fremontodendron* (female parent), completed in 1981. The updated species name, *×Chiranthomontodendron lenzii* was published in 2009 (*Taxon* 58: 1357-1358), and the type specimen is housed at the Rancho Santa Ana Botanic Garden (RSA).

The acquired specimen is a voucher from the residential home of Rudolf Schmid in Kensington, California. Evidently, in February 2014, the tree was topped by a neighbor to get a better view of the San Francisco Bay.

Dorr asked Schmid to salvage a specimen because we did not have any material in the U.S. National Herbarium. It is now properly vouchered and preserved for future researchers.

20th Annual Orchid Exhibition: Interlocking Science and Beauty

Smithsonian Gardens and the United States Botanic Garden opened the 20th annual orchid exhibition, “Orchids: Interlocking Science and Beauty,” at the Smithsonian’s National Museum of Natural History, Saturday, January 24, 2015 (closes April 26, 2015). On any given day, the exhibition will display more than 300 orchids. Change-outs occur often; during the course of the exhibit thousands of orchids will be on view.

“Orchids: Interlocking Science and Beauty” will explore the rich crossroads where orchid botany, horticulture, and technology connect. Featuring orchids from the Smithsonian Gardens Orchid Collection and the United States Botanic Garden Orchid Collection, the exhibit looks at how new ideas, technologies, and inventions change the way we study, protect, and enjoy orchids. Each new innovation is like a puzzle piece: it fills in gaps in our knowledge and creates a larger and more complex picture of orchids.

At first, Victorian explorers and horticulturists found ways to transport

and grow exotic orchids. More recently, we have developed labs to grow these flowers on a massive scale (though some labs concentrate on learning about wild orchids). Our relatively recent awareness of the need to protect wild orchids has spurred conservation efforts, both in nature reserves and in labs.

The future of orchids is full of possibility. Today we use DNA technologies to create new orchid hybrids, and identify wild species and their symbiotic fungi. Meanwhile, imaging technologies reveal new facets of these fascinating flowers.

Kenneth Wurdack, along with members from Smithsonian Gardens and the Office of Exhibits, were part of the exhibition development team. For many years, Department of Botany staff members have participated on the development team for the annual orchid show.

Visitors

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Boris Domenech, Université de Montréal, Canada; *Crudia* (Fabaceae) (10/20-10/24).

Raymund Chan, Independent researcher, Singapore; Compositae (11/3-11/20).

Elizabeth Cochachin, Museo de Historia Natural, Peru; Peruvian Composite (11/3-11/27).

Gabriel Ferreira, Instituto Nacional de Pesquisas da Amazônia, Brazil; Gesneriaceae (11/3-11/28).

Craig Costion, University of Adelaide, Australia; DNA barcoding (11/3/2014-10/31/2015).

Rene Zandbergen, European Spatial Agency, Germany; Medieval manuscripts (11/6).

Paul Manos, Duke University; Fagaceae (11/7-11/8).

Julian Campbell, University of Kentucky; *Fraxinus* (Oleaceae) (11/24-11/26).

Verene Kutter, Independent researcher, Switzerland; *Anemone* (Ranunculaceae) (11/24).

Shelley James, Bishop Museum; New Guinea collections (12/16-12/17).

Joo-Hwan Kim, Gachon University, South Korea; Burmanniaceae, Thismiaceae, Corsiaceae (12/29).



Specimen US 363952 is a hybrid *×Chiranthomontodendron lenzii* from California.

Aaron Goldberg (1917-2014): Parasitologist turned Plant Phylogenist

On December 13, 2014, **Aaron Goldberg** passed away in Holy Cross Hospital in Silver Spring, Maryland. He was 97 years old. A fixture in the Department of Botany, Goldberg was also familiar to many in the National Museum of Natural History because in recent years he probably attended more scientific lectures and presentations than any other person. One could not help but notice the elderly gentleman who would carefully position himself in the front row of a talk to compensate for his diminishing hearing and sight and who often peered through binoculars to see images projected on the screen behind a speaker.

Goldberg was born in Brooklyn, New York on November 4, 1917. Although he did not speak much about his childhood, he fondly remembered being a Boy Scout. He joined the Scouts at the age of 13 and his five-year membership was an experience that he cherished because as he related once, “it took me off the streets and into the countryside, allowing me to follow my interest in nature. It developed my character.” Those of us who knew him during his 42 years as a Research Associate in the Department of Botany will attest to his good character ... and also admit that he was something of a character.

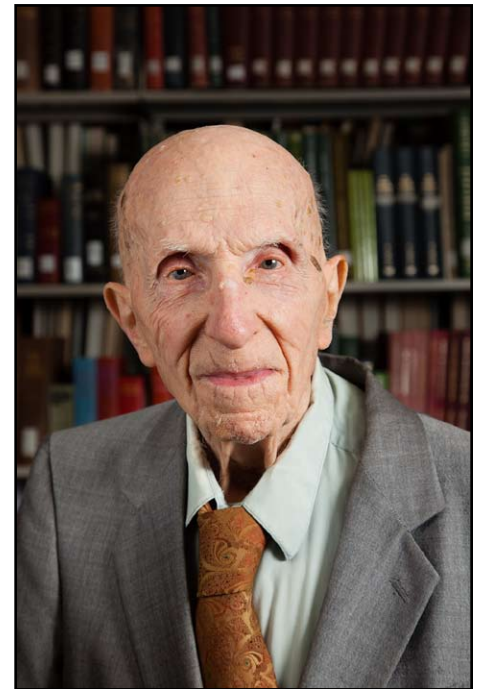
Goldberg received a B.A. (1939) from Brooklyn College. Several years later when the United States entered W.W.II he enlisted in the U.S. Army. After training, he was sent to Europe and he spent the duration of the war working as an X-ray technician in an evacuation hospital. After the war, he was employed by the United States Department of Agriculture as a parasitologist in the Zoological Division of the Bureau of Animal Industry (later Animal Parasitology Unit of the Agricultural Research Service) stationed in Beltsville, Maryland. In his spare time, he pursued his graduate education and came to favor flowering plants over helminths. He received a M.S. (1954) from DePaul University and a Ph.D. (1962) from George Washington University, the latter under the guidance of Lyman B. Smith, who also had a long association with the Department of Botany as a Curator. Goldberg’s doctoral dissertation was a monograph of the genus *Melochia* (Malvaceae:

Byttnerioideae), which was published in 1967.

During his USDA career Goldberg engaged in research that led to at least 19 publications on parasites of wild and domestic mammals in the Maryland area. He collected nearly 100 specimen lots of parasites from livestock (cattle, goats, and sheep) as well as wildlife (Canada geese, groundhogs, mice, opossums, and skunks) between 1947 and 1960. These parasite specimens were donated to the U.S. National Parasite Collection, which coincidentally is currently being relocated to the National Museum of Natural History.

After Goldberg retired from the USDA in late 1972 he became a Research Associate in the Department of Botany in order to pursue his true scientific passion, the taxonomy, evolution, and phylogeny of angiosperms at the family level and above. His research culminated in three major publications: “Classification, evolution, and phylogeny of the families of dicotyledons” (1986); “Classification, evolution, and phylogeny of the families of monocotyledons” (1989); and “Character variation in angiosperm families” (2003). His classification of angiosperms did not receive the critical acclaim or attention that competing contemporary systems proposed by Arthur Cronquist and Armand Takhtajan did. Part of this may have been personality; Goldberg was unassuming and did not have the large public persona that these other two botanists did. In any case, all three systems were mostly elaborated without the benefit of molecular data and have been supplanted by that of the Angiosperm Phylogeny Group. Although Goldberg closely followed new developments in angiosperm phylogeny, he was resistant to hypotheses founded on molecular data when they challenged ideas based on his own observations.

One of the practical benefits to Goldberg from developing his morphologically-based classification of angiosperms was a broad knowledge of flowering plant family characters. For many years he was the person to whom staff in the Department of Botany would give our “unknowns” – herbarium specimens that no one else could identify. He used an old “punched card” key and would patiently dissect flowers



Aaron Goldberg (photo by the Don Hurlbert)

or fruits and record characters until he came up with the correct name. Often he would disarmingly approach the person who had requested his help while holding the “unknown” and another specimen for comparison from the U.S. National Herbarium and simply say “I think it is this.” Invariably he was correct. He provided this help until he was well into his 90s and his eyesight deteriorated and he could no longer see dissections through his binocular microscope. His work on an especially difficult “unknown” with unique floral features led to the description of the monotypic genus *Haptanthus* (Goldberg and Nelson, 1989). Initially known from only a single herbarium specimen collected in Honduras, its affinities remained unclear and subject to speculation for many years until the taxon was rediscovered in the wild. Ironically, it was molecular data that settled its placement with Buxaceae (Shipunov and Shipunova, *Am. J. Bot.* 98: 761-763. 2011).

One of Goldberg’s principal pastimes was walking and observing plants. He spent a great deal of time at the U.S. National Arboretum and was familiar with most of our native and cultivated species and when they first came into flower. His observations enabled him to become the most active contributor to a 40-year long project to record first flowering dates of plant species in the Washington, D.C. area. He began contributing spring flower dates

when the project began in 1970 and from the mid-1980s onward he made almost 75 percent of the recorded observations. These data were used in a published analysis (Abu-Asab et al., *Biodivers. Conserv.* 10: 597-612. 2001) that established that a significant number of local species are flowering earlier now than before and that this change is likely due to warmer temperatures.

In 2013 Goldberg proudly received a Career Contributions to Science award at the Museum's Peer Recognition awards ceremony. One of his last visits to the Museum was about a month before he died when the Department of Botany hosted a 97th birthday party in his honor.

— L.J. Dorr (Botany) and
A.J. Phillips (Invertebrate Zoology)

Botanical Eponymy

Agonandra goldbergiana Hiepkö
(Opiliaceae)

Melochia goldbergii Cristóbal
(Malvaceae)

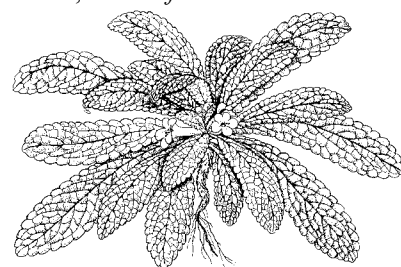
Scientific Publications

Dikmans, G. & A. Goldberg. 1949. A note on *Arthrocephalus lotoris* (Schwartz, 1925) Chandler, 1942 and other round-worm parasites of the skunk, *Mephitis*



Botany Chair Warren Wagner and Kirk Johnson, Sant Director of the National Museum of Natural History, present Aaron Goldberg with the 2013 Career Contributions to Science Award. (photo by the Smithsonian Institution)

- nigra*. *Proc. Helm. Soc. Wash.* 16(1): 9-11.
- Goldberg, A. 1951. Life history of *Oesophagostomum venulosum*, a nematode parasite of sheep and goats. *Proc. Helm. Soc. Wash.* 18(1): 36-47.
- 1952. Effects of the nematode *Oesophagostomum venulosum* on sheep and goats. *J. Parasitol.* 38(1): 35-47.
- 1952. Experimental infection of sheep and goats with the nematode lung-worm, *Dictyocaulus filaria*. *Am. J. Vet. Res.* 13(49): 531-536.
- 1954. Parasites of skunks in the Beltsville, Maryland, area. *Proc. Helm. Soc. Wash.* 21(1): 29-34.
- & R. Rubin. 1956. Survival on pasture of larvae of gastrointestinal nematodes of cattle. *Proc. Helm. Soc. Wash.* 23(1): 65-68.
- 1959. The relationship of diet to gastrointestinal helminth parasitism in cattle. *Am. J. Vet. Res.* 20: 806-814.
- & J. T. Lucker. 1959. Survival on pasture of larvae of gastrointestinal nematodes of cattle. II. Spring contamination. *Proc. Helm. Soc. Wash.* 26(1): 37-42.
- & J. T. Lucker. 1963. Survival on pasture of larvae of gastrointestinal nematodes of cattle. III. Fall contamination. *J. Parasitol.* 49(3): 435-442.
- 1965. Relation of feeding level to gastrointestinal nematode parasitism in cattle. *J. Parasitol.* 51(6): 948-953.
- 1967. The genus *Melochia* L. (Sterculiaceae). *Contrib. U.S. Natl. Herb.* 34(5): 191-363.
- 1968. Development and survival on pasture of gastrointestinal nematode parasites of cattle. *J. Parasitol.* 54(5): 856-862.
- & J. T. Lucker. 1969. Relationship of rotational grazing to gastrointestinal nematode infection in cattle. *Am. J. Vet. Res.* 30(12): 2137-2144.
- 1970. Development, migration, and survival on pasture of gastrointestinal nematodes of cattle: Summer contamination. *Proc. Helm. Soc. Wash.* 37(2): 166-169.
- 1972. Development and survival on pasture of gastrointestinal nematode parasites of cattle, pp. 147-153. In: R. Behme, *Biology of Nematodes: Current Studies*. MSS Information Corporation, New York.
- 1973. Interaction of *Trichostrongylus axei* and *Haemonchus contortus* administered simultaneously to calves. *Proc. Helm. Soc. Wash.* 40(1): 169-170.
- 1973. Interaction of gastrointestinal nematodes established in calves by two spaced inoculations. *Proc. Helm. Soc. Wash.* 40(2): 259-264.
- 1973. Relationship of spaced administration of larvae to worm burden in calves. *Proc. Helm. Soc. Wash.* 40(2): 288-291.
- 1973. Relationship of dose and period of administration of larvae to gastrointestinal nematode burden in calves. *Am. J. Vet. Res.* 34(3): 345-352.
- 1974. Management to control helminth parasitism: Infectiousness of pastures that have been rested or grazed by resistant cattle. *Proc. Helm. Soc. Wash.* 41(1): 109-110.
- 1974. [Review of]: Hutchinson's families: Third edition. *Taxon* 23(4): 627-629.
- & L. B. Smith. 1975. Chave para as famílias espermatofíticas do Brasil. In: R.P. Reitz (ed.), *Flora ilustrada catarinense*, Part I. Herbário "Barboso Rodrigues," Itajaí, Santa Catarina. 204 pp., 69 pls.
- 1982. [Review of]: Cronquist, A., *An integrated system of classification of flowering plants*. *Taxon* 31(3): 599-600.
- 1986. Classification, evolution and phylogeny of the families of dicotyledons. *Smithson. Contrib. Bot.* 58: 1-314.
- 1989. Classification, evolution and phylogeny of the families of monocotyledons. *Smithson. Contrib. Bot.* 71: 1-73.
- & C. Nelson S. 1989. *Haptanthus*, a new dicotyledonous genus from Honduras. *Syst. Bot.* 14(1): 16-19.
- 2003. Character variation in angiosperm families. *Contrib. U.S. Natl. Herb.* 47: 1-185.
- & H. A. Alden. 2005. Taxonomy of *Haptanthus* Goldberg & C. Nelson. *Syst. Bot.* 30(4): 773-778.
- In press. *Melochia* (Malvaceae). In: Flora of North America Editorial Committee, *Flora of North America* 6.



A New Revision of the Grass Genus *Bromus* in Mexico and Central America

By Jeffery M. Saarela and Paul Peterson

The grass genus *Bromus* includes about 160 species distributed in temperate regions around the world. In North America, the bromes of Canada and the United States are well known, but the taxonomy of the group has been much less clear in adjacent Mexico and Central America. Eugène Fournier (*Mexicanas Plantas*, 1886) recognized three species of *Bromus* in México, including one with eight varieties. In an early twentieth century revision of Mexican grasses, Albert S. Hitchcock (*Mexican Grasses*, 1913) recognized seven *Bromus* species in México, and he later recognized two of these in Central America (*The Grasses of Central America*, 1930). Thomas R. Soderstrom and John H. Beaman (*The Genus Bromus in México & Central America*, 1968) produced the first revision of *Bromus* in México and Central America recognizing 16 species. The different names and, in some instances, taxon concepts in these previous revisions have resulted in considerable confusion. Alan A. Beetle (*Las Gramíneas de México*, 1988) and Adolfo Espejo-Serna et al.

(Poaceae in *Las Monocotiledóneas Mexicanas*, 2000) recognized 25 and 26 species, respectively. We recently published a revised taxonomic treatment for *Bromus* in México and Central America (*Phytotaxa* 185: 1-147). We accept 22 species in the flora, of which twelve are native and ten introduced. We include a key to the species in English and Spanish, descriptions, synonymies, complete illustrations of all species, distribution maps, images of representative herbarium specimens, and lists of all specimens examined.

Our revision is based on examination of over 2000 herbarium specimens, including over 400 numbers of *Bromus* collected in Mexico by **Paul Peterson** on numerous trips. Many of these collections have provided important new knowledge on the distribution of *Bromus* species in Mexico, serving as a reminder of the critical importance of new fieldwork as part of revisionary work. Searching for species of *Bromus* in Mexico was one of the main focuses of our expeditions to Mexico in 2008, 2009 and 2010. Studying the plants in the field proved critical for understanding, clarifying and developing species concepts for some taxa. For example, plants that we now recognize in a single species, *B. richardsonii*, are morphologically variable in Mexico, and we experienced considerable difficulty understanding their variation in the context of previous



Summit of Sierra Zapaliname above Saltillo, Coahuila, September 2007.
(photo by Jeffery M. Saarela)

species concepts applied to this variation. Based on careful study of this variation in the herbarium, we concluded that only a single, variable taxon could be recognized.

Highlights of these trips included searching for two rare species (*Bromus densus* and *B. attenuatus*) endemic to the Sierra Madre Oriental in northeastern Mexico. Both of these distinctive species were described by former Smithsonian agrostologist Jason Swallen in 1950. Finding *B. densus* (known from some 18 collections, of which nearly half are Peterson numbers) and *B. attenuatus* (known from nine collections, of which seven are Peterson numbers), which both grow at high elevations, often required travel through remote mountainous areas along trails that barely pass as roads (Sierra Las Cautivas, Tamaulipas), and long, arduous hikes to mountaintops. The best known sites of *B. densus* are Cerro Potosi in Nuevo León, a mountain top to which one can drive because there is a radio tower there, and Sierra Zapalinamé, a range just outside of the city Saltillo, Coahuila. Finding the plants in the latter area requires walking up-hill for several hours. Our collections of *B. densus* and *B. attenuatus* from Cerro de la Luz, San Luis Potosi in 2010, turned out to be the first records of both species for that state. The mountain hike on which we made these collections is memorable because it rained for several hours as we descended to our camp down a slippery, flowing drainage that was dry just hours



S.G. Gómez, J. Valdes-Reyna and P.M. Peterson sorting collections in the Universidad Autónoma Agraria Antonio Narro Herbarium, September 2007. A set of all the collections from northeastern Mexico are deposited in this herbarium (ANSM). (photo by Jeffery M. Saarela)

earlier.

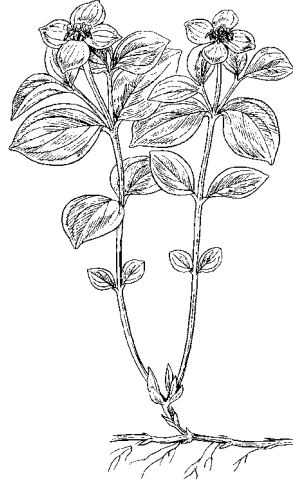
In addition to being rare and poorly known, *Bromus densus*, *B. attenuatus* and the more widespread species *B. dolichocarpus*, distributed from Central Mexico to Guatemala, are interesting because together they represent a unique lineage (clade) that is the sister group of the rest of the genus. We found this in a phylogenetic study of *Bromus* published in 2007. Given their evolutionary affinities, we now recognize these three species in their own section, *Mexibromus*, a new taxon proposed in our revision.

A few native species whose primary distributions are in the southwestern United States are known in Mexico from just one or a few collections. *Bromus lanatipes*, a species characterized by densely woolly lower leaf sheaths, is distributed primarily in the southwestern U.S., but barely extends into México in Maderas del Carmen (part of the Sierra del Carmen) in northern Coahuila, just south of the Texas border, where it grows in high-elevation pine-oak forests. Five of the seven known collections of this species from this region were made by Peterson on four different visits, and the other two made by a different collector in the early 1970s. Maderas del Carmen is a biosphere reserve, and in addition to its interesting plant diversity, one of the only places in Mexico where black bears are still present (we saw one). *Bromus pseudolaevipes*, distributed primarily in the Coastal Ranges of California, is known from a single site in Mexico in northern Baja California (Sierra San Pedro Martír), based on a Peterson collection made in 2000.

The most poorly understood *Bromus* species in Mexico is *B. pinetorum*, another species described by Swallen in 1950, which is now known from only four collections from the central mountains of Coahuila. Additional field work and collections are needed to better understand the circumscription of the taxon and to collect material for molecular analyses.

Like any taxonomic revision, monograph or flora, our new treatment of *Bromus* in Mexico and Central America serves as an up-to-date baseline of information for further exploration of the diversity of this group of grasses in these regions, and contributes to broader understanding of this grass genus from a global perspective. Continued exploration will certainly yield new collections that add to our current

knowledge of the diversity and distribution of species, and may even yield as-yet-unknown species of *Bromus*. This kind of knowledge can only be gained by studying and collecting plant diversity in the field and preserving specimens in herbaria, where they become part of the permanent scientific record documenting the distributions of species in time and space.



Guidance on Pollinator-Friendly Practices on Federal Property

In June 2014, a Presidential Memorandum entitled, “*Creating a Federal Strategy to Promote the Health of Honey Bees and Other Pollinators*,” called for a revision of the Sustainable Practices for Designed Landscapes guidance on Federal properties. The revised guidance issued in October 2014 by the White House Council

on Environmental Quality helps Federal agencies incorporate pollinator-friendly practices in new construction, building renovations, landscaping improvements, and in facility leasing agreements at Federal facilities and on Federal lands. Facility managers can use the updated guidance to actively examine their current buildings, grounds, and practices for opportunities to transition to a richer diversity of pollinator-friendly plant species.

By integrating pollinator-friendly strategies into everyday design, operations, and maintenance activities, Federal agencies can have a big impact. Every day, agency managers make routine decisions that could affect pollinator populations. The easy-to-use guide will help ensure the best possible decisions are made, supporting pollinator health and habitat on millions of acres of Federal land. Additionally, the guide will serve as a valuable resource for further research on pollinators and the plant species that support them.

The inter-agency working group that served as advisors for the revised guidance included Gary Krupnick (National Museum of Natural History), and Graham Davis, William Donnelly, James Gagliardi, Jonathan Kavalier, and Jeffrey Schneider (Smithsonian Gardens). The Smithsonian Gardens NMNH Butterfly Habitat Garden and Urban Bird Habitat serve as exemplary models for pollinator-friendly habitat at Federal facilities.

The guidance is available online at <http://www.whitehouse.gov/administration/eop/ceq/sustainability/landscaping-guidance>.



The Smithsonian Butterfly Habitat Garden outside the National Museum of Natural History. (photo courtesy of Smithsonian Gardens)

A Rapid Assessment of the Marine Plant Ecosystems at the Caribbean Entrance of the Panama Canal

On November 10-26, **Barrett Brooks** led a team of scientists conducting a rapid algal assessment in the vicinity of the Smithsonian Tropical Research Institute's (STRI) Galeta Point Marine Laboratory in Panama. The lab is located near a collection of coral reef and mangrove habitats between Margarita Bay near Colon and Maria Chiquita, northeast of the Panama Canal mouth on the Caribbean side. The study covered about 7 miles of coastline. Gloria Batista de Vega (University of Panama/STRI) and Hector Ruiz (University of Puerto Rico in Mayaguez) collaborated with Brooks on the project.

The Panama Canal is in the final stages of a huge expansion project which will allow the Canal Authority to accommodate today's larger ships. Many of the natural habitats near Punta Galeta are in danger of being destroyed due to the shipping industries efforts to develop areas for shipping container storage. It was the intention of the research team to document much of the submerged mangrove and reef flora prior to any future development.



Galeta is the type locality for several species, including the rare *Augophyllum wysorii*. (photo by Hector Ruiz)

The team collected over 300 specimens of marine plants, representing an estimated 100 species during 13 snorkeling transects and 11 scuba dives in the study area. In situ photographs were taken of many species by Ruiz. Portions of all specimens collected were preserved in formalin. Tissues samples were obtained of each, and dried in silica gel for future DNA barcoding. Herbarium mounts were also prepared for most of the specimens collected.

Reefs were found to be surviving along the study area, dominated by the coral genera *Agaricia* and *Porites*, with some *Siderastras* present. Very few Caribbean

brain corals were encountered, although they had been reported as common in surveys conducted 40 years ago. The fast growing coral of *Acropora*, typical of many Caribbean reefs, were scarce. The reefs appear to be holding up even though they are continually subjected to a heavy burden of siltation from mainland run-off, and they endure heavy wave action seasonally. Coralline algae and other crust forming algae (e.g., *Peyssonnelia*) accounted for a large percentage of reef surface area.

Seagrass beds appear to be remarkably healthy. There are especially robust seagrass beds along the inland sides of Naranjo Arriba and Naranjo Abajo, where some individual blades of *Thalassia testudinum* and *Syringodium filiforme* were estimated to reach nearly one meter in length. Some portions of exposed seagrass appeared to have been grazed recently, most likely by manatees. One large manatee approached the team and escorted them for about 10 minutes while snorkeling just north of the Punta Galeta reef crest (manatee sightings around Galeta are extremely rare). Four species of seagrass were observed: *Thalassia testudinum*, *Syringodium filiforme*, *Halophila decipiens*, and *Halodule wrightii*.

Coralline algae and other crust-forming algae are very prominent on the reef, as well as many species of or closely related to *Gracilaria*. The inshore lagoons exhibit typical abundances of calcifying green algae (*Halimeda*, *Penicillus*, and *Udotea*).



One of the many abundant crustose coralline algae (*Mesophyllum* sp.) around Galeta. (photo by Hector Ruiz)

Large beds of algae typical of coastal waters with abundant nutrient runoff are also present (i.e., *Dictyota*, *Acanthophora*, *Cladophora*, and *Chaetomorpha*). The genus *Bryothamnion* was prominent in a variety of habitats, turning up on the 30 ft. deep sea floor, attached to the sides of the fore reef, and even in the shallows along the mangrove fringe.

The red mangrove, *Rhizophora mangle*, is thriving in the study area, mitigating the detrimental effects of storms and inland nutrient runoff. It grows along the channel where the hydrothermal power plant discharges its cooling waste water, and where there are mid-channel water temperatures of 42°C. Red mangrove appears to be nearly the only species, plant or animal, surviving along that stretch of hot water.

Last Surviving Flora of the Lower Holmes Run Stream Valley: In the Footsteps of Lester Frank Ward

By Rod Simmons, City of Alexandria Dept.
RPCA, Natural Resources Division

Drawn to the largely pristine and exceptionally diverse stream valleys of Four Mile Run and Hunting Creek, numerous botanists and collectors came to Alexandria, Virginia, in the late 19th century from the Smithsonian Institution, U.S. Department of Agriculture, Galludet College, University of Maryland, U.S. National Arboretum, and others. Transportation was readily available from these places via the well-established railroad lines and, later in the early 1890s, when electric trolley cars began operating in Alexandria.

Exploration during this time occurred mainly along the Potomac River and its tidal estuaries and lower stream valleys, largely because transportation routes were well developed to these areas, but also because much of the land to the west was heavily forested, fenced off, or generally inaccessible.

Early significant botanical explorers and collectors in Alexandria include John W. Chickering, Jr., Frank M. Comstock, Frederick V. Coville, Edward Foreman,

Henry W. Henshaw, William Hunter, Charles Louis Pollard, Joseph Nelson Rose, Edward C. Steele, George B. Sudworth, David LeRoy Topping, George Vasey, and Lester F. Ward.

Lester Frank Ward (1841-1913), primarily known as a sociologist, was also a prolific collector of local flora during his years in Washington, D.C., as a botanist and paleontologist with the U.S. Geological Survey and Smithsonian Institution from 1882 to 1905. Of all the earliest botanical explorers of Alexandria, Ward concentrated mainly on the Cameron Run watershed.

Ward's specimens, largely the earliest collected in the Washington, D.C. region, form the foundation of the DC Herbarium of the U.S. National Herbarium (US) at the Smithsonian Institution, as well as the City of Alexandria Flora. In 1881, he published the landmark "Guide to the Flora of Washington and Vicinity" (*Bull. U.S. Natl. Mus.* 22: 1-264; 1881), which included many of his collections from the Cameron Run watershed:

"Passing next to the Lower Potomac, the localities of special interest are... 4. Hunting Creek, a large estuary below Alexandria, including Cameron Run, the stream which debouches into it with its tributaries, Backlick Run and Holmes Run, which unite to form it. Here have been found at various points *Clematis ochroleuca*, [*Matelea carolinensis*], *Itea virginica*...*Micranthemum* [*micranthemoides*], [*Platanthera flava*], *Quercus* [*bicolor*], *Carex gracillima*, *Geum* [*laciniatum* var. *laciniatum*], *Galium asprellum*, and very many other rare plants."

Ward also visited other locales in Alexandria, including the "vast quantities" of Cameron Valley sand ("Rappahannock Series") that extended westward in the deltaic hills and valley on the north side of Cameron Run (lower Holmes Run), and "Chinkapin Hollow" (Taylor Run ravine at Chinquapin Park) where he collected a freshwater mollusk fossil (*Unio* sp.). He also surveyed the extensive sand and gravel pits in the Franconia region of Springfield, Virginia, in the 1890s with William M. Fontaine and documented the exposed paleoflora of the Potomac Formation (Ward, L.F. 1895. *The Potomac Formation*. USGS Annual Report for 1893-1894).

After nearly a hundred years since Ward's excursions in the Cameron Run watershed, a surprising diversity of native plants were discovered in remnant natural areas of the watershed (Cameron Run Regional Park, Clermont Swamp Forest, and Tarleton Park), during extensive floristic and geologic surveys conducted by the City of Alexandria's Natural Resources Division. A number of these plants are rare in Alexandria (and regionally); represent the sole occurrence in Alexandria; or still persist at the same locations where L.F. Ward documented them in the late 1800s.

Perhaps the single greatest collection of remnant flora occurs in a several-acre expanse of rich, alluvial floodplain forest along the old Cameron Run channel at Cameron Run Regional Park. This tract, which has come to be known as "Ward's Woods," is also the sole remaining representative in the City of a natural

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L.F. Ward and Miss Moorehead in his office at the Smithsonian Institution in 1886.
Photo courtesy Chicago Botanic Garden.

Lower Holmes Run

Continued from page 13

community type that was once much more widespread throughout the lower watershed.

Uncommon to rare plants in Alexandria at Cameron Run Regional Park include:

- Green Dragon (*Arisaema dracontium*) – sole occurrence in City
- Dutchman's Breeches (*Dicentra cucullaria*) – sole occurrence in City
- Beadle's Oak (*Quercus x beadlei*) – sole occurrence in City
- Swamp Chestnut Oak (*Quercus michauxii*) – sole occurrence in City
- Flat-spiked Sedge (*Carex planispicata*) – one of two City stations
- Yellow Corydalis (*Corydalis flavula*) – one of two City stations
- Potato Dandelion (*Krigia dandelion*) – one of two City stations
- Violet Wood-sorrel (*Oxalis violacea*) – one of two City stations
- Autumn Bluegrass (*Poa autumnalis*) – one of two City stations
- Early Bluegrass (*Poa cuspidata*) – one of two City stations
- Eastern Figwort (*Scrophularia marilandica*) – one of two City stations
- Slender Wedgegrass (*Sphenopholis obtusata* var. *major*) – one of two City stations
- Bladdernut (*Staphylea trifolia*) – one of two City stations

- Field Thistle (*Cirsium discolor*) – one of three City stations
- Virgin's-bower (*Clematis virginiana*) – one of three City stations
- Bottlebrush Grass (*Elymus hystrix* var. *hystrix*) – one of three City stations
- Canada Moonseed (*Menispermum canadense*) – one of three City stations
- Foxglove Beard-tongue (*Penstemon digitalis*) – one of three City stations
- Bartram's Oak (*Quercus x heterophylla*) – one of three City stations
- Carolina Sedge (*Carex caroliniana*) – one of four City stations
- Bloodroot (*Sanguinaria canadensis*) – one of five City stations
- Eastern Redbud (*Cercis canadensis*) – natural populations are rare in Alexandria
- Red Mulberry (*Morus rubra*) – uncommon to rare in Alexandria
- Common Tall Meadow-rue (*Thalictrum pubescens*) – uncommon to rare in Alexandria

Today, a third century of natural heritage inventories and research are underway with efforts to refine our understanding of local vegetation types as part of the U.S. National Vegetation Classification (USNVC) – National Capital Region project through quantitative compositional and environmental data collected at a 400 m² forested plot in “Ward’s Woods,” as well as a similar plot at the old Cameron Run



Eastern Figwort (*Scrophularia marilandica*). (photo by Tony Reznicek)

channel swamp forest. Extensive geologic field surveys and research are also being conducted throughout the City, including the lower Holmes Run stream valley, to revise and update the Geologic Atlas of the City of Alexandria.

Considering what little of the natural world remains in the Cameron Valley watershed – “probably the most intensely altered geologic terrain in the City” (*pers. comm.*, Tony Fleming) – Lester Ward’s comments from 1881 on urbanization, habitat loss, and extinction in the Washington, D.C. region are even more applicable today: “There were doubtless large areas of primeval forest then within our limits which are now under cultivation, and a much greater variety of soil and woodland was then open to the researches of the botanist. As a consequence, we ought to expect that it would sustain a much richer flora...the botanist takes no delight in the ‘march of civilization’, the ax and plow are to him symbols of barbarism, and the reclaiming of waste lands and opening up of his favorite haunts to cultivation he instinctively denounces as acts of vandalism.”

Rod Simmons is a Research Collaborator with the National Museum of Natural History, Smithsonian Institution; a member of the Virginia Botanical Associates; and Natural Resource Manager and plant ecologist with the City of Alexandria.



Geologist Tony Fleming examining a massive lithified outcrop of Cameron Valley sand along the only natural remaining stretch of Backlick Run in Alexandria at Ben Brenman Park, just west of its confluence with Holmes Run. At that point, the stream becomes Cameron Run and flows southeastward to the confluence of Hooff's Run, where it becomes Hunting Creek and continues to the mouth of the Potomac River. (photo by R.H. Simmons)

Agents

Continued from page 1

plants in a changing world.” John R. Clark, Co-Director of Science and Conservation at NTBG, spoke about how his research on *Cyrtandra* allowed him to travel around the Pacific to learn about species, endemism, evolution and conservation. He has been struck by the large number of localities where species were once found no longer exist due to deforestation and the threat of invasive species. His early focus on biogeography and systematics was about solving a large puzzle about species relationships. Now, as he sees that these missing pieces of the puzzle are being thrown away, he has turned his research to a focus on conservation biology.

Kayri Havens, the Medard and Elizabeth Welch Director of Plant Science and Conservation at the Chicago Botanic Garden, stressed that the environmental grand challenges that we face today require expert botanical knowledge. She argued that the Global Strategy for Plant Conservation is a wonderful roadmap. Botanical gardens are serving an important role in ex situ conservation as a low cost methods to conserve a large numbers of species. Collecting and banking of seeds in the US is making good progress, Haven said, but we are only at 40 percent of the G1-G3 species (NatureServe conservation status *critically imperiled*, *imperiled*,



Speakers of the symposium “Agents of Change: Botanic Gardens in the 21st Century”: John Rashford, Warren Wagner, Michael Maunder, Kawika Winter, Will McClatchey, John Clark, David Rae, Andy Jasper, Alain Touwaide, Sir Tim Smit, Sir Ghilleen Prance, Gaynor Coley, Peter Raven, Lucinda McDade, Chipper Wichman, Kayri Havens, David Lorence, and Sophia Shaw. Image courtesy of the National Tropical Botanical Garden.

and *vulnerable*). She asked if we should change seed sourcing practices in light of climate change. To make the appropriate decisions about seed sourcing in areas with large seed zones, such as in the eastern US, will not be as difficult as those in areas with fine-grained seed zones found in the western US. She concluded her talk

by discussing a paradigm shift—that we are not restoring ecosystems to the way they once were, but looking at today’s challenges in a changing world. She concluded her talk by proclaiming, “We are the agents of change.”

Lucinda McDade, the Executive Director of the Rancho Santa Ana Botanic Garden, began her presentation talking about “green blindness”—how people view plants as just the green background for animals. Botanical gardens are essential to battle this affliction. She dared botanical gardens with a series of challenges: to embrace all land plants, including lycophytes and ferns; to grow plants with recalcitrant seeds and to grow parasitic plants, hemiparasites, and obligate mutualists; and to embrace modern methods in plant breeding and next-generation sequencing. McDade noted that big data approaches can enhance research, and networks and collaborations are essential going forward.

The second topic of the day was “Feast or Famine: How we can and will feed 9 billion people.” Diane Ragone, Director of the Breadfruit Institute at NTBG, explained that gender and population issues cannot be pulled out from food security issues. Her research focus is on



Kayri Havens, John Clark, and Lucinda McDade answer questions from the audience while discussing “Extinction or Survival: Conserving plants in a changing world.” Image courtesy of the National Tropical Botanical Garden.

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the traditional uses of breadfruit in the Pacific, with an emphasis on biocultural preservation, conservation and sustainability. The Breadfruit Institute manages 120 varieties of breadfruit and breadnut, with a purpose not on academics, but on how to use this diversity and understand it. A current focus of the institute is on identifying nutrient-rich varieties of breadfruit that can help vitamin A and iron deficiency.

Eija Pehu, the advisor on Science and Technology in the Agriculture and Rural Development Department of The World Bank, focused on food security. She began with the dire statistic that one in eight people suffer from chronic hunger and that more than a billion people are malnourished. Agriculture is vulnerable to climate change. Global cereal yields are decreasing by one-fifth in productivity and African farmer yields are decreasing by 50 percent. Pehu described Climate-Smart Agriculture (CSA) as an approach that improves techniques in crop rotation, water management, and the use of drought tolerant crops. CSA enhances carbon sequestration in soils and forests while reducing pressure in forests. She presented a case study about the Loess Plateau Watershed in China and how an integrated landscape approach has seen benefits in sustainability and reductions in poverty. Pehu stressed the importance and need of

botanists to help the World Bank on these issues.

Danielle Nierenberg, President of Food Tank, spoke about two ways to build a food system that eliminates hunger, malnutrition, and obesity. The first is to support family farmers who play an important role as teachers, business people, stewards of land, and fosterers of equality. About 500 million family farmers worldwide contribute to the food system for 2 billion people. The current challenge is to make small farming careers intellectually stimulating and economically viable for young people. The second approach is to recognize the importance of indigenous crops. Nierenberg explained that food selection has become narrower and less nutritious—with an unhealthy emphasis on starchy staples and a lack of investment in fruits and vegetables. A challenge is to teach those working on indigenous crops to not just grow the food we eat, but to teach them how to process, cook, eat, and market the food better.

Dennis Dimick, the Executive Editor of the Environment for *National Geographic* magazine, closed out this session with a presentation about the New Food Revolution, a cover story featured in the May 2014 issue of the magazine. Food and agriculture isn't a new topic to *National Geographic*; soil conservation was a cover issue in 2008. But with global climate change, fossil- and bio-fuel issues, frack-

ing, population growth, and water conservation being such hot topics lately, it was an appropriate focus for the magazine. The editors of the magazine wanted to start a conversation about the agricultural footprint and to discuss ways in which resources could be used more wisely. The striking photographs and images in the article are a way to reconnect eaters with the farmers and the landscape. The New Food Revolution looks at biotechnology, GMOs, and challenges in how to feed a growing population. Examples included drought tolerant rice and ways to transform and improve the photosynthesis of food plants.

The third themed topic of the symposium was "Biocultural Conservation: Interpreting the richness of the human experience." Ethnobotanist Kawika Winter, the Director of the Limahuli Garden and Preserve at NTBG, briefly spoke about the agricultural terraces at the garden as footprints of our ancestors. These terraces are relevant in the community as they serve as a preservation of tradition. Further, tourists who visit Hawaii often have a high interest in Hawaiian culture, and the terraces can serve as a focal point for interpretation.

Alain Touwaide, a Visiting Researcher in Smithsonian's Department of Botany at NMNH, gave a quick 10-minute overview of 2,000 years of ethnobotany and history. He explained that images of plants in historic books were more than just a collection of species but an explanation of how plants were grown and used. He provided examples from the Roman Empire in 1st century A.D., and he demonstrated a link between frescos and gardens. Images of pineapples in Mediterranean paintings tell us about introductions of New World plants into Old World culture. Touwaide explained that the first description of a banana tree was in 1562, and that the writings from botanic gardens serve as a history of plants.

Will McClatchey, the Vice President and Director of Research at Botanical Research Institute of Texas, concluded the morning session with a talk about how botanical gardens are cultural artifacts. When one enters a Japanese garden, one gets a certain feeling. "Why is that?" asked McClatchey. He explained that one cannot separate the physical environment from the cultural environment. When entering a garden, one feels like they are



Danielle Nierenberg, Diane Ragone, and Eija Pehu tackle the subject "Feast or Famine: How we can and will feed 9 billion people." Image courtesy of the National Tropical Botanical Garden.



Sir Tim Smit, KBE, challenges the audience with his audacious ideas during his talk, “Fiddling While Rome Burns: The Case for Punk Science,” as Chipper Wichman looks on. Image courtesy of the National Tropical Botanical Garden.

either home or in someone else’s home. He gave an example about the Hamilton Gardens of New Zealand where a large section is managed by the Maori community. New Zealand’s first and only traditional Maori garden, it has an active center where people gather—where they think of it as home. At these centers, the elders can teach young Maori about botanical knowledge and how to use plants. McClatchey parted with a message to botanical gardens to create environments where locals feel like they are a part of the community.

After a lunch break, the talk, “Fiddling While Rome Burns: The Case for Punk Science,” was given by keynote speaker Sir Tim Smit, KBE, the Executive Chairman of *Eden Regeneration Ltd* and co-founder of the award-winning Eden Project in Cornwall, England. Smit challenged those in the audience to rediscover awe in the face of nature. He explained that cultivation started civilization, and that botanists need the courage to stand up for plants. “How come politicians don’t see our importance?” asked Smit. Botanical gardens do not need more stuff, he argued, but they do need a compelling story. He urged the audience to be aggressively positive with messaging. There is much that Smit would change about botanical gardens. He could not understand why conservation is such a difficult sell, considering that people hate change. He also complained that most of

what comes out of botanical gardens in the digital world is too dull and too full of facts. The art of storytelling can make plants cool to kids. Smit said that with serious leadership, botanical gardens can become cultural icons, full of soul with a sense of direction.

The final topic of the symposium was “Operational Sustainability: Are Botanic Gardens an endangered species?” David Rae, the Director of Horticulture and Learning at Royal Botanic Garden Edinburgh, explained that with 3,000 botanical gardens throughout the world, the one thing that they have in common is horticulture. Most have an education component, and some have a research component. Rae explained that no other type of institution in the world does all three of these things (horticulture, education, and research) together in one place. He explained that new botanical gardens are getting started more frequently now than in any other time in history, but they are also being hit financially. He notes this significance in the light of climate change and sustainability.

Sophia Shaw, the President and CEO of Chicago Botanic Garden (CBG), contended that botanical gardens are not an endangered species. Attendance at CBG has increased 44 percent since 2005 without any major new exhibits. She stressed that botanical gardens need to hone their focus and services to address the issues

and challenges of our time. She said that CBG’s success has depended on fulfilling the needs of its customers. She argued that botanical gardens mostly serve affluent white people, and that their customers should reflect the local diversity. She highlighted 10 changes that have made a difference at CBG: (1) developing a mission statement that inspires, “We cultivate the power of plants to sustain and enrich life;” (2) staying open during a recent Chicago power outage, which attracted youth camps and elderly from senior citizen centers; (3) training staff to speak Spanish; (4) participating in Chicago’s annual gay pride parade; (5) staying open on Christmas to attract Jewish families; (6) building a large urban farm that included jobs training, and inviting community outreach participants into the garden; (7) creating a supplier diversity policy in which everyone at work participates; (8) building a training, therapy, and hospitality program for veterans; (9) conducting a language study and discovering that on average 24 different languages were spoken each day at CBG; and (10) providing free admission. By increasing attendance, CBG’s capital campaign and annual membership has increased as well.

Gaynor Coley, the Director of Public Programs at Royal Botanic Gardens, Kew, concluded the final topic of the day with a talk on sustainability in botanical gardens and messages about the environment, finance and society. Coley was recruited to transform the Eden Project into a botanically and economically successful garden. She spoke about recruiting people on their ability to connect with an audience. She said that access and inclusion makes business sense. She urged those in the audience to work together to invite people into the gardens and to impel all people to love plants. Like the Eden Project, which was built in an area of high poverty, gardens need to tell a story of hope.

The symposium also featured a panel of four experts to discuss a path forward. The panel was chaired by Michael Maunder, the Associate Dean of Research Engagement at Florida International University and the Interim Director of The Kampong of NTBG. Before opening the floor to questions, he asked each speaker for introductory remarks. Paul Alan Cox, the Director of the Institute for Ethnomedicine, opened the panel with a discussion

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on how to properly staff botanical gardens. He recommended that gardens invest in training.

David Lorence, the Co-Director of Science and Conservation at NTBG, provided a vision of what gardens will be like in 50 years—meeting new challenges of global climate change, adopting new technologies, and supporting a living collection of endangered plant species. He stressed that botanical exploration is still a key part of conservation. What other organisms await discovery? Can they eliminate disease and hunger?

John H. Rashford, Professor of Anthropology at College of Charleston, gave insight into how botanical gardens can help stem the loss of biodiversity. He urged botanical gardens to step up to the front line in contributing to sustainable agriculture.

Warren Wagner, NTBG's McBryde Chair of Hawaiian Plant Studies and Chair of Botany at NMNH, discussed how botanical gardens can slow down the current rate of extinction. He urged botanical gardens to integrate new technology in novel ways. He emphasized the importance of herbarium specimens, which serves as a record of morphology, but urged that botanical gardens to also address what pollinates the plant, how the plant grows, and the habitat requirements of the plant. He suggested that citizen science, which brings the public into science, can help attain scientific goals. One example he gave was crowd-sourcing of specimen label transcription.

The day-long symposium ended with closing remarks by Sir Ghillelan Prance, FRS, former Director of Royal Botanic Gardens, Kew, and Trustee of the Eden Project. He began by highlighting five current challenges that botanical gardens face. The first is population growth, which can be addressed through the education of women—an opportunity in botanical gardens around the world. The second is climate change, a challenge for the conservation of plant species. One solution may be restoration and assisted migration, which he described as an enormous challenge. The third is species extinction, which Prance hopes that botanical gardens can help reduce the rate. The fourth is food security, which he urged botanical gardens



Thomas Friedman gives a speech in honor of the NTBG's 50th anniversary at the gala dinner. Image courtesy of the National Tropical Botanical Garden.

to not drift too far from their agricultural roots. The fifth challenge is ethnobotany, where the wisdom of elders may help reduce poverty and the food crisis.

Prance discussed the importance of education at botanical gardens. Education works at many levels in the community. He indicated that there will be no new botanists unless we train them. He recounted an occasion from when he gave a tour of Eden Project's rain forest to a group of urban poor kids. While pointing out that rosy periwinkle (*Catharanthus roseus*) has provided a cure for childhood leukemia, a boy spoke up discussing that his brother was afflicted and treated for the disease. Prance described how after that exchange the boy became engaged and enthused for the rest of the tour.

Prance's final message was that botanical gardens should not continue as is, but enter a new age and become more active. He proclaimed that botanical gardens can show the world that plants are the basis of life.

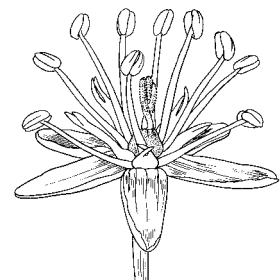
The gala dinner was well attended and the highlight of the evening was the dinner speech by Thomas Friedman. Friedman, a political analyst and author who writes extensively in his twice-weekly column for *The New York Times* about foreign affairs, the Middle East, and environmental issues, put together a unique speech in honor of the NTBG's 50th anniversary. Acknowledging the work of NTBG in conserving tropical plant diversity, he used

his riveting talk to draw comparisons to the natural world and to highlight trends on geopolitics in the Middle East.

He talked in depth about the role of invasive species and the conditions under which they are able to disrupt native ecosystems. He then compared that to the rise of ISIS and how they are "invading" the diverse native "poly-cultural ecosystems" of Iraq and Syria with the goal of reducing diversity and turning them into bleak "monocultures" of Jihadist fundamentalism.

It was a fascinating talk coming on the heels of the Agents of Change Symposium where the participants and audience were challenged to consider if botanical gardens are doing enough to conserve biodiversity and mitigate the spread of invasive species that undermine diverse ecosystems. Friedman subsequently used his speech for one of his columns in *The New York Times*.

Videos of the symposium presentations and Thomas Friedman's talk are available on NTBG's YouTube channel <<http://www.youtube.com/ntbgsaveplants>>.



Publications

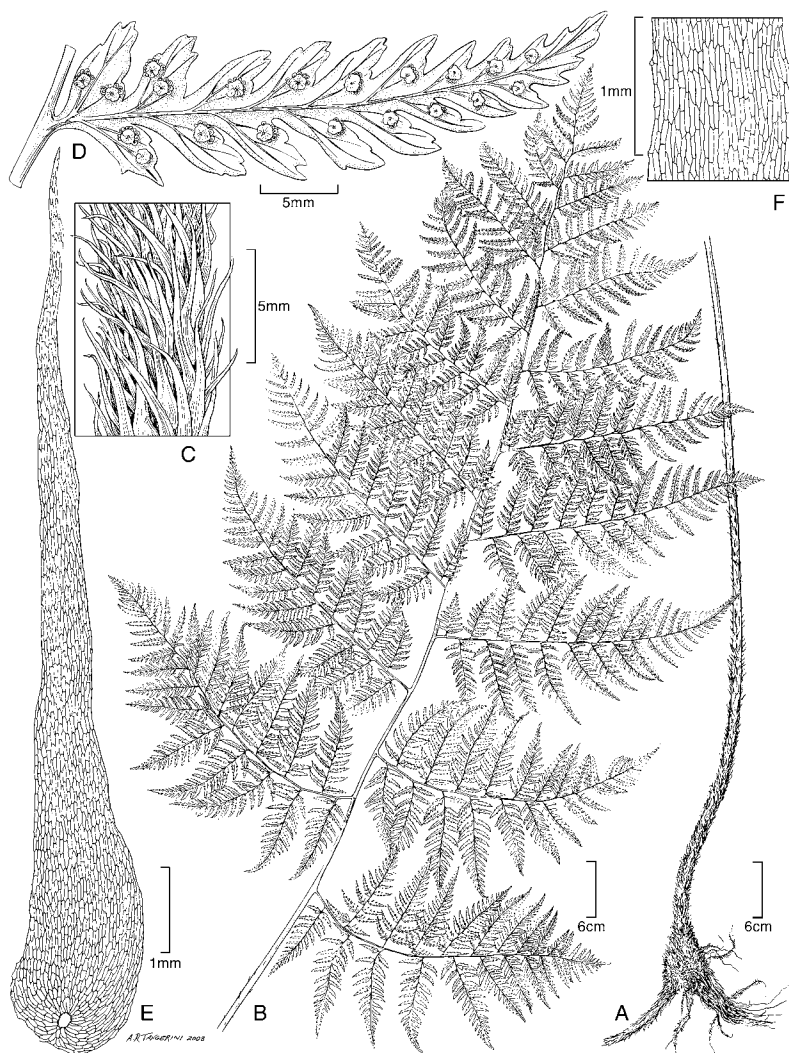
- Buck, W.R. and **R.R. Ireland**. 2014. Family Stereophyllaceae, pp. 469-473. Flora of North America Editorial Committee, Flora of North America North of Mexico, Vol. 28, Bryophytes: Mosses, part 2. Oxford University Press, New York.
- Dorr, L.J.** 2014. The correct author citation of the combination *Eriolaena quinquelocularis* (Malvaceae: Dombeyoideae) and typification of its basionym. *Taxon* 63(6): 1340-1341. <http://dx.doi.org/10.12705/636.2>
- Dorr, L.J.** and B. Stergios. 2014. Four new species of Andean *Pilea* (Urticaceae), with additional notes on the genus in Venezuela. *Phytokeys* 42: 57-76. <http://dx.doi.org/10.3897/phytokeys.42.8455>
- Funk, V.A.** and K.R. Wood. 2014. *Bidens meyeri* (Asteraceae, Coreopsidae): a new critically endangered species from Rapa, Austral Islands. *Phytokeys* 42: 39-47. <http://dx.doi.org/10.3897/phytokeys.42.8408>
- Harris, A., **S. Lutz**, **P. Acevedo** and **J. Wen**. 2014. The utility of the morphological variation of pollen for resolving the evolutionary history of *Billia* (subfam. Hippocastanoideae, Sapindaceae). *J. Syst. Evol.* <http://dx.doi.org/10.1111/jse.12130>
- Horn, J.W.**, Z. Xi, R. Riina, **J.A. Peirson**, Y. Yang, B.L. Dorsey, P.E. Berry, C.C. Davis and **K.J. Wurdack**. 2014. Evolutionary bursts in *Euphorbia* (Euphorbiaceae) are linked with photosynthetic pathway. *Evolution* 68(12): 3485-3504. <http://dx.doi.org/10.1111/evo.12534>
- Ireland, R.R.** 2014. Family Plagiotheriaceae, pp. 483-488; Family Pleuroziopsaceae, pp. 512-514; Family Hypnaceae, genera *Buckiella*, pp. 518-519, *Dacryophyllum*, pp. 524-525, *Herzogiella*, pp. 527-529, *Isopterygiopsis*, 549-552, *Isopterygium*, pp. 552-554, *Pseudotaxiphyllum*, pp. 559-562, and *Taxiphyllum*, pp. 566-569. Flora of North America Editorial Committee, Flora of North America North of Mexico, Vol. 28, Bryophytes: Mosses, part 2. Oxford University Press, New York.
- Kress, W.J.** 2014. Valuing collections. *Science*, 346(6215): 1310. <http://dx.doi.org/10.1126/science.aaa4115>
- Kress, W.J.**, **C. García-Robledo**, M. Uriarte and **D.L. Erickson**. 2014. DNA barcodes for ecology, evolution, and conservation. *Trends Ecol. Evol.* 30(1): 25-35. <http://dx.doi.org/10.1016/j.tree.2014.10.008>
- Meng, Y., Z. Nie, T. Deng, **J. Wen** and Y. Yang. 2014. Phylogenetics and evolution of phyllotaxy in the Solomon's seal genus *Polygonatum* (Asparagaceae: Polygonateae). *Bot. J. Linn. Soc.* 176(4): 435-451. <http://dx.doi.org/10.1111/boj.12218>
- Muscarella, R., M. Uriarte, **D.L. Erickson**, N.G. Swenson, J.K. Zimmerman and **W.J. Kress**. 2014. A well-resolved phylogeny of the trees of Puerto Rico based on DNA barcode sequence data. *PloS One* 9(11): e112843 <http://dx.doi.org/10.1371/journal.pone.0112843>
- Norris, J.N.** 2014. Marine algae of the Northern Gulf of California II: Rhodophyta. *Smithson. Contrib. Bot.* 96: 1-555. <http://dx.doi.org/10.5479/si.19382812.96>
- Peterson, P.M.**, **K. Romaschenko**, Y. Herrera Arrieta and J.M. Saarela. 2014. A molecular phylogeny and new subgeneric classification of *Sporobolus* (Poaceae: Chloridoideae: Sporobolinae). *Taxon* 63(6): 1212-1243. <http://dx.doi.org/10.12705/636.19>
- Peterson, P.M.**, **K. Romaschenko**, Y. Herrera Arrieta and J.M. Saarela. 2014. Proposal to conserve the name *Sporobolus* against *Spartina*, *Crypsis*, *Poncelletia*, and *Heleochloa* (Poaceae: Chloridoideae: Sporobolinae). *Taxon* 63(6): 1373-1374. <http://dx.doi.org/10.12705/636.23>
- Saarela, J.M., **P.M. Peterson** and J. Valdés-Reyna. 2014. A taxonomic revision of *Bromus* (Poaceae: Pooideae: Bromeae) in México and Central America. *Phytotaxa* 185(1): 1-147. <http://dx.doi.org/10.11646/phytotaxa.185.1.1>
- Schofield, W.B., W.R. Buck and **R.R. Ireland**. 2014. Family Hypnaceae, pp. 515-517. Flora of North America Editorial Committee, Flora of North America North of Mexico, Vol. 28, Bryophytes: Mosses, part 2. Oxford University Press, New York.
- Sigel, E.M.**, M.D. Windham and K.M. Pryer. 2014. Evidence for reciprocal origins in *Polypodium hesperium* (Polypodiaceae): a fern model system for investigating how multiple origins shape allopolyploid genomes. *Am. J. Bot.* 101(9): 1476-1485. <http://dx.doi.org/10.3732/ajb.1400190>
- Touwaide, A.** 2014. Al-Ghâfiqî's Kitâb fî al-adwiya al-mufrada, Dioscorides' De materia medica and Mediterranean Herbal Traditions, pp. 84-120. In J. Ragep, F. Wallis, P. Miller and A. Gacek, eds. *The Herbal of al-Ghâfiqî. A Facsimile Edition of MS 7508 in the Osler Library of the History of Medicine, McGill University, with Critical Essays*. McGill-Queen's University Press, Montreal and Kingston.
- Touwaide, A.** and **E. Appetiti**. 2014. Food and medicines in the Mediterranean tradition a systematic analysis of the earliest extant body of textual evidence. *J. Ethnopharmacol.* <http://dx.doi.org/10.1016/j.jep.2014.10.035>
- Wagner, W.L.**, **N.R. Khan**, D.H. Lorence and D.R. Herbst. 2014. Native vascular plants of the Hawaiian Islands, pp. 255-287. In R.J. Gustafson, D.R. Herbst and P.W. Rundel, eds. *Hawaiian Plant Life: Vegetation and Flora*. University of Hawai'i Press, Honolulu.
- Wen, J.**, **J. Boggan** and Z. Nie. 2014. Synopsis of *Nekemias* Raf., a segregate genus from *Ampelopsis* Michx. (Vitaceae) disjunct between eastern/southeastern Asia and eastern North America, with ten new combinations. *Phytokeys* 42: 11-19. <http://dx.doi.org/10.3897/phytokeys.42.7704>



Art by Alice Tangerini

***Dryopteris sweetiorum* Lorence & W.L. Wagner**

Dryopteris sweetiorum is a terrestrial fern known from collections made by Ken Wood on Fatu Hiva in the Marquesas Islands and published as a new species by David Lorence and Warren Wagner in 2011 in *PhytoKeys* (4: 5-51). The endangered species is only known from one small area (Teavapuhiau ridge to Mt. Touaouoho) on the small island of Fatu Hiva. The epithet *sweetiorum* was given in honor to Barbara K. and Cyrus B. Sweet III, who have generously supported scientific research at the National Tropical Botanical Garden (NTBG) and particularly the Vascular Flora of the Marquesas Islands project. The drawing by Tangerini was made from five herbarium specimens representing portions of the stipe, rhizome and frond. The specimens were photocopied and duplicated to make an entire frond with stipe and rhizome to a full height of 180 cm. Tangerini assembled the copies on a large table, taped them together, had the resulting collage photographed by Don Hurlbert (NMNH Photographic Services Unit), and reduced to 60 cm in print form. Tangerini traced the print in ink, added details of the pinnae and sporangia, and scanned the drawings into a publishable size image. A large framed print of *Dryopteris sweetiorum* was presented as a gift to Barbara and Cyrus Sweet in appreciation of their support given to the NTBG.



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