

The Plant Press



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Botany Profile

Wood Anatomy Climbs Back to the Smithsonian

By Marcelo R. Pace

The Smithsonian Institution hosts the second largest wood collection in the U.S. and one of the largest in the world, with 5,000 microscopic slides and over 42,500 specimens from 3,000 genera. Such a remarkable wood collection exists thanks to a proud lineage of plant anatomists who have worked at Smithsonian's National Museum of Natural History, including Richard Eyde, Edward Ayensu, and especially William Stern.

Stern was an accomplished wood anatomist who significantly increased the Smithsonian wood collection before becoming a Professor at the University of Maryland. The collection increased from 14,017 samples when Stern started in 1960, to 35,000 samples by 1967 when he left the Smithsonian. His contribution to advances in wood anatomy continued to extend beyond his tenure at the Smithsonian, being an active member of the International Association of Wood Anatomists (IAWA), and mentoring future generations of plant anatomists. Among his students was Regis Miller who would later go on to become a renowned systematic wood anatomist at the Forest Products Laboratory of Madison, Wisconsin, and who later mentored my own doctoral advisor, Veronica Angyalossy (University of São Paulo, Brazil) when she was a post-doctoral fellow in his lab. Angyalossy has since trained most of the wood anatomists in Brazil. I am fortunate to have the opportunity to return to the Smithsonian to work on the wood collection that Stern had built.

The work that I am carrying out in

the anatomy lab of the Department of Botany is inspired by the extraordinary stem anatomy of lianas (woody vines). Unlike stems of trees whose wood is rigid and able to sustain enormous organisms such as the Californian redwoods (*Sequoia sempervirens*, Cupressaceae), the stems of lianas are flexible and pliable. Indeed, unlike trees they tend to get more flexible as they develop (Rowe et al. 2004 *J. Plant Growth Regul.* 23: 108-128) and this is at the very core of the lianescent habit.

Twisting and twirling is critical to climbing trees in order to reach the forest canopy to obtain light. This increase in flexibility happens as a result of radical modifications in their internal anatomies; stiff cells of wood get intermingled by soft tissues, such as nonlignified parenchyma or phloem. These special anatomical features are generally derived from unusual activities of the vascular cambium, generating extraordinary evolutionary novelties known as cambial variants. These variants have evolved multiple times in the evolution of woody plants, being present in distantly related groups such as fossil pteridosperms (*Medullosa*, Dunn et al. 2003 *Rev. Palaeobot. Palynol.* 124: 307-324), gymnosperms (*Gnetum* spp. have multiple cambia), and more than 100 families of angiosperm magnoliids, rosids and asterids (Angyalossy et al. 2015 in the book *Ecology of Lianas*).

It has been known since the 19th century that lianas produce stems of extraordinary anatomies, sometimes with the tissues resulting in unusual shapes when examining the cross section of the stems, such as a cross (tribe Bignonieae,

Bignoniaceae with over 300 species), a ladder (as in *Schnella*, Leguminosae), successive cambia with visible concentric rings of xylem and phloem (as in several Caryophyllales, Menispermaceae, Convolvulaceae), or even a foot (as in *Serjania laruotteana*, Sapindaceae, which has a compound vascular cylinder). Illustrations as early as the pre-Hispanic Aztec civilization in Mexico seem to have made calendars inspired by the anatomy of lianas, such as the first page of the Codex Fejérváry-Mayer (see photo on page 10). In this particular calendar codex illustration, the Aztecs depicted several plants, including a cross section of a Bignoniaceae liana stem and at least two additional plant species—on the left in the illustration a *Ceiba* and on the right *Theobroma cacao*, both members of the Malvaceae.

More interestingly, these unusual shapes in the stem cross-sections tend to be taxon-specific and therefore diagnostic in their taxonomical identification. These features have been used by various taxonomists (e.g., Alwyn Gentry in Bignoniaceae research; Pedro Acevedo-Rodríguez in Sapindaceae research) as key characters for the recognition of genera and even species.

More recently, Pedro Acevedo has been leading a team effort with about 15 contributors to expand and incorporate this knowledge of stem anatomy as a tool for identification of Neotropical lianas and other climbing plants, which include about 11,000 native species from over 660 genera, and 126

Continued on page 10

Travel

Barrett Brooks traveled to Curacao (10/8 – 10/17) to provide technical diving and laboratory support for NMNH's Deep Reef Observation Project (DROP) and to retrieve and deploy Autonomous Reef Monitoring Structures (ARMS) on the reef; and to Las Vegas, Nevada (11/15 – 11/20) to attend equipment training courses and recertification at the annual Diving Equipment & Marketing Association (DEMA) event.

Manuela Dal Forno traveled to Florianópolis, Brazil (10/3 – 10/6) to give a presentation in a lichen symposium hosted at the VIII Congresso Brasileiro de Micologia; and to Itatiaia, Brazil (10/11 – 10/14) to collect lichens in the Itatiaia National Park with colleague Marcela Cáceres (Universidade Federal de Sergipe).

Laurence Dorr traveled to Cambridge, Massachusetts (11/8 – 11/11) and to St. Louis, Missouri (12/11 – 12/16) to conduct research on Malvaceae and historical collections at the Harvard University Herbaria and the Missouri Botanical Garden, respectively.

Ashley Egan traveled to Ithaca, New

York (10/14 – 10/16) to conduct genomic sequencing on plant samples; and to Hangzhou, China (10/19 – 10/25) to give an invited talk at a workshop entitled, "Building Sino-US Collaboration in Biodiversity Studies—New Approaches and Theories."

Vicki Funk traveled to Louisville, Kentucky (11/2 – 11/8) to present talks at the Waterfront Botanical Gardens, Belarmine University, and Kentucky Wesleyan University.

W. John Kress traveled to Durham, North Carolina (11/11 – 11/13) to participate in a board meeting of the Organization for Tropical Studies.

Serenity Montaña traveled to Madagascar (11/29 – 12/23) with the Rainforest Trust-National Geographic biological survey expedition to conduct a preliminary evaluation of an unexplored rainforest fragment, to determine its suitability as a site for her dissertation research, as a long-term forest research plot, to collect and process botanical samples of the biodiversity unique to the forest, and to collect locational information for mapping and remote sensing analysis.

Sylvia Orli and **Laura Tancredi** traveled to New Orleans, Louisiana (10/11 – 10/14) to attend the annual North American Axiell User Conference at the National

World War II Museum where Orli gave a presentation about digitization conveyor belt workflows.

Paul Peterson and **Kostyantyn Romaschenko** traveled to San Luis Potosí, Mexico (11/13 – 12/5) to collect grasses with collaborator Yolanda Herrera Arrieta.

Eric Schuettelpelz traveled to the United Kingdom (11/8 – 11/15) to give a keynote presentation at the annual meeting of the British Pteridological Society held at the Royal Horticultural Society Garden Harlow Carr in England and another at the Royal Botanic Garden Edinburgh in Scotland.

Warren Wagner traveled to San Mateo, California (10/11 – 10/14) to attend and give a presentation at a board meeting of the National Tropical Botanical Garden.

Jun Wen traveled to Beijing, China (11/25 – 12/2) to participate in organization meetings for the XIX International Botanical Congress and to conduct herbarium studies on *Vitis* and *Ampelocissus* (Vitaceae).

Kenneth Wurdack traveled to St. Louis, Missouri (12/12 – 12/16) to conduct research in the herbarium of the Missouri Botanical Garden.

Visitors

Monica Carlsen, Missouri Botanical Garden; Araceae and Zingiberales (2/17/15-2/16/17).

Morgan Gostel, George Mason University; Compositae and GGI-Gardens Program (9/1/15-8/31/17).

Patrica Barbera Sanchez, Real Jardín Botánico de Madrid, Spain; Aveninae (Poaceae) (7/27-10/23).

Pedro Jimenez Mejias, New York Botanical Garden; Cyperaceae (9/12-10/12; 12/9-12/10).

Vikram Shivakumar, Alexandria, Virginia; Clauseneae (Rutaceae) (9/12/16-3/10/17).

Lyra Morina, University of Maryland, College Park; Valuing botanical collections (9/14/16-3/10/17).

Yash Kalburgi, Northern Virginia

Community College; Vitaceae (9/19/16-3/15/17).

Sheena Wang, Johns Hopkins University; Connecting botanical data (9/19-12/6).

Olivia Bascle, George Mason University; Bulky bamboo collection digitization (9/27-12/9).

Alison Taylor, American University; Collection management (10/11-12/14).

Marc Appelhans, University Göttingen, Germany; *Zanthoxylum* (Rutaceae) (10/17-10/18).

Chih Chieh Yu, National Taiwan University, Taiwan; *Berberis* (Berberidaceae) (10/17-10/19).

Agathe Haevermans, Muséum National d'Histoire Naturelle, France; Botanical illustration (10/24).

Thomas Haevermans, Muséum National



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New Year's Resolutions

January 1st is the day we all make our New Year's Resolutions and I suspect January 2nd is the day that most of us break them. Whether or not we follow through with our resolve to do better, mid-winter is also a time for reflection. I am no different and while I am generally reluctant to share my personal resolutions (either those still in effect or already abandoned) I am more than happy to share some of my mid-winter reflections especially since I very recently passed something of a milestone; 25 years of service to the Smithsonian Institution. My reflections however also include a confession.

The first time I visited Washington, D.C. I did not visit the Smithsonian. Worse still, I do not think I even knew such a thing existed. One of my aunts was living in the District and about to go overseas so my parents took me and my siblings on a road trip from Boston to Washington. What do I remember? We stayed at a motel in Virginia in what then seemed to me to be the far hinterlands of Arlington. We visited the Lincoln Memorial, which impressed me then and still impresses me now; the apotheosis of Lincoln crucial for our national identity. We visited the yet unfinished Washington National Cathedral and we had a tour of the White House. This last was of course a pilgrimage for anyone born and raised in Boston because John F. Kennedy was president. What else do I remember? My father got a ticket for parking along the National Mall. Some mundane things never change.

The important role the Smithsonian Institution plays in natural history only began to become apparent to me many years later when I started graduate school at the University of North Carolina at Chapel Hill. Although I was already keen on plant taxonomy and systematics, my advisor encouraged me to write a thesis focused on pollination ecology. Our department and university lacked systematic entomological expertise so we boxed up the insects that I had collected during my study and sent them off to the National Museum of Natural History to be identified by experts; Smithsonian and U.S.

Department of Agriculture entomologists. During this same period when I had the occasion over the winter holidays to travel between North Carolina and New England I visited Washington for the second time. This time I completely ignored the monuments, the executive mansion, and the cathedral, and headed straight to what had become for me the most inspiring of all the buildings in our nation's capital, the National Museum of Natural History.

Not keen on writing an autobiography I will jump forward slightly more than a generation. On my daily commute from beyond the hinterlands in Virginia I pass the Lincoln Memorial, the Washington Monument, and the Martin Luther King, Jr. Memorial. I see the White House in the distance and the Jefferson Memorial. I drive the length of the National Mall (assiduously avoiding parking alongside it) and I see the National Gallery of Art and the Capitol Building as I walk from the National Air and Space Museum across the Mall to the Natural History building. I feel very privileged for many reasons and I know that all of us who work here feel equally privileged.

What are the New Year's resolutions that I was reluctant to share? I continue to be resolved to help improve our department and the museum, and I am committed to making the U.S. National Herbarium the finest national herbarium in the world. Ironically for me, I better understand now President Kennedy's exhortation "ask not what our country can do for you – ask what you can do for your country" and I hope his words also resonate with you. Even though I began this brief essay ambivalent about revealing my most significant and personal New Year's resolution I will: I am resolved to be optimistic.



Chair
With
A
View
—
L.J.
Dorr



d'Histoire Naturelle, France; New Guinea bamboos (10/24).

Natalia Ruiz Vargas, Universidad Nacional Pedro Henríquez Ureña, Dominican Republic; *Tillandsia ariza-juliae* (Bromeliaceae) (10/26).

Lorena Villanueva-Almanza, University of California, Riverside; *Washingtonia* (Arecaceae) (10/31-11/4).

Nicolas Brignone, Darwinion Botanical Institute, Argentina; *Atriplex* (Amaranthaceae) (11/1-12/10).

Marina Cattai, University of Sao Paulo,

Brazil; Velloziaceae (11/7-11/10).

Allen Jessica and **James Lendemer**, New York Botanical Garden; Lichens (11/7-11/9).

Lucas Bacci and **Thuane Braga**, Universidade Federal do Paraná, Brazil; **Eldis Becquer** and **Wilder Carmenate**, Jardín Botánico Nacional, Cuba; and **Fabian Michelangeli**, New York Botanical Garden; Melastomataceae (11/14-11/16).

Raul Verdecia, Jardín Botánico Nacional, Cuba; *Copernicia* (Arecaceae) (11/14-11/16).

Doug Goldman, U.S. Department of Agriculture, North Carolina; Flora of North America (11/15).

Long Li and **Nareerat Boonchai**, Florida Museum of Natural History; and Elisabeth Wheeler, North Carolina State University; Fossil and modern woods (11/21-11/22).

Steve Manchester, Florida Museum of Natural History; Phyllanthaceae, Euphorbiaceae, Malvaceae (11/21-11/22).

Meng Han, Florida Museum of Natural History; Burseraceae (11/21-11/22).

Continued on page 5

Staff Research & Activities

Gary Krupnick attended the 16th Annual International Conference of the North American Pollinator Protection Campaign (NAPPC) held at the U.S. Department Agriculture's APHIS headquarters in Riverdale, Maryland. At the meeting, NAPPC convened 10 task forces who aim to establish goals surrounding a certain pollinator issue, from issues on honey bee health and bee-friendly farming, to pesticide education and the development of a monarch highway to help reverse monarch butterfly population decline. Krupnick served as co-chair of the NAPPC Rooftop Gardens and Urban Youth Task Force, which aims to (1) expand pollinator gardens in urban areas and promote rooftop gardens through collaboration with American Society of Landscape Architects and others, (2) register urban gardens for the Million Pollinator Garden Challenge, and (3) reach out to urban youth groups to engage them in pollinator friendly practices. Krupnick has been serving on the NAPPC Steering Committee for the past 13 years.

Peer Recognition Awards

The National Museum of Natural History (NMNH) presented the 2016 Peer Recognition Awards on December 13, 2016. Award recipients are individuals and teams who have given their time and talent to the museum above and beyond what their jobs call 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 12 NMNH staff members representing a cross-section of the entire museum community.

A total of 13 awards were presented, with staff and contractors from the Department of Botany represented in two awards.

Mark Strong received the “**The Master of Organization Award**.” Capturing digital images of hundreds of thousands of plant specimens is only half the work – the effort required to curate a collection



Above: Recipients of the “Botany Conveyor Team Award” (left to right): Haley Wallace, Chris Tuccinardi, Laura Tancredi, Rebecca Snyder, Sylvia Orli, Nick Silversson, Rochelle Safo, Amanda Robinson, Ingrid Lin, Peter Olson, Tom Hollowell, Mindy Shull, Justin Donaldson, and Katie Altizer, with NMNH Sant Director Kirk Johnson.

Right: Mark Strong receiving the “The Master of Organization Award” from NMNH Sant Director Kirk Johnson.
(photos by the Smithsonian Institution)



before it hits the conveyor belt is just as important. When Strong learned that the Fabaceae family of bean plants was scheduled to be photographed as part of Botany's mass digitization project, he flew into action. Strong transformed the Fabaceae from a packed and disorganized bunch of folders into a beautiful, taxonomically updated collection rehoused to ensure the long term preservation of these specimens. The time and energy Strong devoted to this project, including the time taken to mentor a contractor in curation strategies and plan workflows, allowed the conveyor belt project to literally move forward. Most impressive of all was the fact that Strong was not obligated to push for this project's completion – prioritizing the care of the Fabaceae specimens was above and beyond the scope of his normal responsibilities as a research assistant for a curator who specializes in other plant groups. His hard work, humble attitude, dedication, and willingness to jump in unasked when

he saw that help was needed made Strong this year's master of organization.

Katie Altizer, Justin Donaldson, Ingrid Lin, Peter Olson, Sylvia Orli, Amanda Robinson, Rochelle Safo, Mindy Shull, Nick Silversson, Laura Tancredi, Chris Tuccinardi, and Haley Wallace, along with Warren Hindley, Tom Hollowell, and Rebecca Snyder from the Information Technology Office, received the “**Botany Conveyor Team Award**.” With increased emphasis on digitization of NMNH's holdings, departments are looking to develop and implement workflows that minimize risk to the specimens/objects while innovatively maximizing efficiency. This is especially true for the talented team tasked with developing a conveyor-based imaging system to digitize parts of the Botany collection. The team of SI staff and contractors included a project manager, conveyor workers, conveyor runners, specimen handlers, data reviewers and data importers, and members of Bio-

informatics. Once photographed, images of the specimens and labels are sent electronically to a company in Suriname for transcription before coming back for review and import into EMu. The team has far surpassed all initial rate and volume projections for the project and effectively doubled the amount of Botany material that is discoverable and viewable online in just a few months. Hats off to the amazingly efficient Botany Conveyor Team!

Science Achievement Awards

The National Museum of Natural History began awarding the Science Achievement Awards in 2003. The awards recognize exceptional scientific publications in natural history. On December 13, 2016, in close consultation with the Senate of Scientists, an interdisciplinary review committee recognized the outstanding work of staff scientists for three books, three papers, and a paper of special mention, each published in 2014 or 2015.

Robert Soreng, **Paul Peterson**, and **Konstantin Romaschenko** were recognized for their co-authored paper "A worldwide phylogenetic classification of the Poaceae (Gramineae)," published in the *Journal of Systematics and Evolution* (53: 117-137; 205).

Memorial Service Held for Dan Nicolson

The Department of Botany, National Museum of Natural History (NMNH), Smithsonian Institution, held a memorial service to celebrate the life of **Dan Henry Nicolson** (1933-2016). The event was held on 18 November 2016 in the Executive Conference Room of NMNH. Relatives, friends, and colleagues from within the Smithsonian and beyond, from Washington DC and afar attended.

Laurence J. Dorr (Smithsonian Department of Botany) welcomed the guests and spoke fondly of Nicolson's years at the Smithsonian. Others paying tribute to Nicolson or aspects of his career included Kanchi Natarajan Gandhi (Harvard University), Scott Mori (New York Botanical Garden), Leslie Overstreet (Smithsonian Institution Libraries), **Warren Wagner** (Smithsonian Department of Botany), and John Wierssema (National Germplasm Resources Laboratory, USDA). The final speaker at the event was Nicolson's wife, Alice, who provided a very personal and touching account of his Smithsonian career.

Nicolson joined the Smithsonian Institution in 1964. He specialized in Asian and West Indian botany and the Araceae. He was deeply involved in botanical

nomenclature and had a strong interest in botanical bibliography and history. After a highly productive career, Nicolson retired from the Smithsonian in 2005. He continued to be active for several years as an emeritus curator until health issues prevented him from coming into the Department of Botany.



Visitors

Continued from page 3

Robert Spielbauer, Florida Museum of Natural History; Platanaceae (11/21-11/22).

Mingwan Li, Florida Museum of Natural History; Rosaceae (11/21-11/22).

Jason Cantley, Bucknell University; Compositae (12/1-12/2).

Sarah Brown, Tarleton State University; Collection management (12/5/16-1/27/17).

Joyce Chery, University of California, Berkeley; Sapindaceae (12/5-12/8).

Hazel Arceo, University of the Philippines; Philippine marine biodiversity (12/6).

Ben Cooper, Northwestern University; Onagraceae (12/12-12/22).

Steffi Ickert-Bond, University of Alaska; *Vitis* (Vitaceae) (12/16-12/22).

Mike Moore, Oberlin College; and **Rick Overson** and **Krissa Skogen**, Chicago Botanic Garden; Onagraceae (12/16-12/19).

Afzal Shah, Quaid-i-Azam University, Pakistan; Tylophorinae (Apocynaceae) (12/29/16-6/1/17).

Yousheng Chen, Chinese Academy of Sciences, China; Pan-Himalayan Cardueae and Gnaphalieae (Asteraceae) (12/31/16-12/30/17).

Xu Su, Qinghai University, China; Triticeae (Poaceae) (12/31/16-3/1/18).



NMNH Sant Director Kirk Johnson presents a 2016 Science Achievement Award to Konstantin Romaschenko, Paul Peterson, and Robert Soreng. (photo by the Smithsonian Institution)

Rusty Leaves for the Field...The Field Museum, That Is!

By Deborah Bell

On a cold morning in February 1975, I walk into the office of the Department of Botany Chairman, Edward Ayensu, to begin my first day of work at the U.S. National Herbarium. Ten minutes later, another new technician enters; **George Frederick Russell III**, aka Rusty. This is one of the few days that I arrive to work before he does during the following 40 years. He is an early bird, and on more than one occasion has shared sunrise pics taken while walking from Union Station or shot from his office window. Rusty was a University of Maryland 'Old Boys' rugby player back then, and came into work on Mondays, scraped, bruised, wrapped, and sometimes limping. Four years later, Rusty became Collections Manager and my boss.

We grew up together in the Herbarium. It's hard to imagine the Botany Department went from carbon paper to Xerox machines, and from typing and retyping manuscripts to word processing. Rusty was one of the first to embrace computers and new technology. When bar codes and scanning appeared in grocery stores, Rusty walked into the office one morning and asked, "What do you think about putting bar codes on specimens, with all the associated collection data attached?" Brilliant! Others thought so too. This pioneered the use of bar codes in museums worldwide.

Over 30 years ago, Rusty organized in the Botany Department the first formal intern program in the National Museum of Natural History (NMNH) specifically dedicated to collections projects. That morphed into the NMNH Intern Program overseen by others. Since that time, he has personally supervised over 280 high school and college interns. He never asked interns to do what he described as 'numb-numb' work, but always assigned meaningful tasks to learn something new and worthwhile to enhance our collections and information.

Collections and data are his passion. It was 37 years ago that he began a specimen inventory program that became a model for our Museum and other herbaria. He participated in the development of the Taxonomic Databases Working



Rusty Russell (photo by Julie Myers)

Group (TDWG). Now called Biodiversity Informational Standards, it guides biological institutions across the globe. He co-convened the first summit for the management of plant species data in Delphi, Greece, and co-edited 'Designs for a Global Plant Species Information System,' which today is referenced for strategies in the creation and sharing of digital content. Seventeen years ago, he designed and installed the first collections-level high resolution digital imaging studio in NMNH, which began by digitally imaging Botany's 100,000+ Type Specimen Collection. That swelled into projects, now managed by others, that will ultimately image all of our 5 million collections. Five years ago, he envisioned and served as co-PI on the Field Book Project, an effort to catalog, conserve, digitize and transcribe the thousands of original field books, journals, diaries and related materials within the SI. This project is working toward the development of an International Field Book Registry. One of the many public websites that Rusty initiated is the Maps Catalog database that began with Botany's map collection and volunteer Jim Harley, 12 years ago. It now encompasses nearly 30,000 searchable images representing maps from every NMNH science department, including many historical and some

hand drawn maps from expeditions. And these are just a smattering of his visionary accomplishments.

One always knew when Rusty was giving a tour because you would hear recurring bouts of laughter from the group in the Herbarium. He was entertaining as he taught, and engaged audiences of all ages about why we maintain collections. He even intrigued pre-schoolers by putting together a folder of specimens of 'What's in a Candy Bar.' He's at home on stage. We all remember when he hosted the Unsung Hero Awards Ceremonies, and roasted the support staff, curators, and Museum Director alike. On his own time, he has been a thespian, appearing in several plays in Annapolis. As a cycling enthusiast, Rusty taught Spin Class at a nearby gym serving Federal employees where there was always a wait list. People would hover to see if someone didn't show up on time so they could snag a bike to ride to the motivating music Rusty selected to push them gently and expertly through Hell and back.

Rusty's wife, Debbie, of 39 years is delightful and obviously very patient. They have two gorgeous married daughters, two adorable grandsons, and more grandbabies on the way. After 42 years at the U.S. National Herbarium, he is retir-

ing from the Smithsonian and is looking forward to the next professional challenge. Perhaps he feels as Albert Einstein said, "Life is like riding a bicycle. To keep your balance, you must keep moving."

We wish him the very best in his new role as the Director of the Gantz Family Collections Center at The Field Museum in Chicago, where he will provide vision and direction for the collections and programs, and will oversee their 30 million specimens and artifacts. Whew! As one of our colleagues remarked, "While most of us are looking to retirement and winding things down, Rusty is ramping it up!"

Thank you, Rusty, our dear friend and colleague, for all that you have done for the people and collections of the Smithsonian and for the many far afield. Enjoy your journey. You have a lot more ground to cover.



Bordelon Hangs Up His Gardening Gloves

By W. John Kress

Research Greenhouse Manager, **Mike Bordelon**, retired in October 2016 after 22 years of service in the Department of Botany at the Smithsonian's National Museum of Natural History. Bordelon, a University of Maryland graduate (B.S. in Botany), was the greenhouse production manager for 15 years at Behnke Nurseries in Beltsville, Maryland, before I was able to lure him away to manage the brand new Botany Research Greenhouses in 1994. Bordelon had come highly recommended by the staff at the United States Botanic Garden.

The Botany Research Greenhouses, located in Suitland, Maryland, at the Smithsonian's Museum Support Center (MSC), play a significant and supportive role for the National Museum of Natural History's Department of Botany and the U.S. National Herbarium. While the internationally well-known herbarium has a collection of over 5 million dried, pressed,

and preserved plant specimens, the greenhouses maintain an impressive collection of nearly 6,000 living plants. These specimens are used by curators to resolve complex taxonomic problems, to describe new species, and to understand the life histories of plants that are difficult to study in their native habitats. They also serve as an important reservoir for genome-quality tissue and to conserve rare and threatened species.

Bordelon came to the Smithsonian with a strong background in greenhouse maintenance and plant care, which was just what was needed for the new 7,000 square foot growing facility that had just opened on the MSC campus. Previously, the Department of Botany had maintained a very small greenhouse on the roof of the Museum! This facility only received direct sunlight for a few hours a day and was hardly adequate for growing the specimens needed for scientific study.

Although he had extensive training in growing horticulturally important plants, Bordelon knew that he needed more experience growing and propagating diverse research species. I recognized that a good greenhouse manager needed to see how species grow in their native environments so I invited Bordelon along on an expedition to Myanmar in 1998 to help me collect wild gingers, bananas, and prayer plants in the order Zingiberales. Over the next six years together we explored many of the unknown regions of that country, as well as neighboring Thailand and southern China, discovering and collecting many new species of plants. I ended up naming one after Bordelon: *Hedychium bordelonianum*, an epiphytic ginger with bright red flowers. This species is now in cultivation in the Botany Research Greenhouses.

Bordelon's energy and innovations were critical in getting many curators in Botany to start bringing into the greenhouses research plants for cultivation and study. He expanded the growing area to include an outdoor shade house for warm-weather propagation and a small display garden around the entrance to the facility. He initiated a well-organized accession system for all the plant material to track their arrival, growth, use, and sometimes demise. He was also instrumental in systematically sampling tissue and making herbarium voucher specimens for the plants in cultivation. His desire to make the greenhouses an ecologically sustain-

able facility resulted in the implementation of a successful integrated pest management system to decrease pest infestation of the plants. His friendly relationship with the facilities staff at MSC insured that the physical aspects of the greenhouses were always in good shape. And his continued interactions with the staff at the United States Botanic Garden allowed many of the interesting plants in the Botany greenhouses to be displayed for the education of visitors to the Botanic Garden, including a gigantic *Amorphophallus titanum*.

Bordelon's knowledge, talent, and enthusiasm for plants was a great asset to the Department of Botany, and fortunately he transferred those qualities to **Leslie Brothers**, Greenhouse Assistant who is temporarily in charge of the greenhouses while a search is made for the new Manager. We look forward to seeing Mike Bordelon in the Botany Research Greenhouses in the future as he visits the botanical disciples that he cared for over many years.



Greenhouse Manager Mike Bordelon examines a specimen of *Ensete* aff. *superbum* (Musaceae). (photo by Leslie Brothers)

Report from a Smith Fellowship Awardee

Nicolás Brignone from the Instituto de Botánica Darwinion in Buenos Aires, Argentina, visited the National Museum of Natural History from November 1 to December 9 as a recipient of a Lyman B. & Ruth C. Smith Fellowship Award. During his stay he studied the collection of *Atriplex* specimens housed at the U.S. National Herbarium.

Atriplex L. is one of the largest and more diverse genera of Amaranthaceae, with ca. 300 species of herbs, small shrubs or subshrubs that usually inhabit arid or semi-arid environments, and environments with saline or alkaline soils worldwide.

As a part of revisionary studies in the genus, he is performing the first integrative synopsis of *Atriplex* for South America based on the study of compared external morphology of extensive collections from South American herbaria and from the U.S. National Herbarium. The South American flora includes a total of 55 species of *Atriplex*, ten of which are adventive species and 45 native species.

During his visit, Brignone studied several species native to South America to gather information on geographic distribution and morphological characters. He was able to determine to species level 86 specimens collected in Argentina, Bolivia,

Chile and Venezuela, and to re-determine 52 specimens.

Further, he studied in detail the type specimens of eight species of the genus *Atriplex* native from South America, and one native from North America: *Atriplex asplundii* Standl., *A. chapinii* I.M.Johnst., *A. clivicola* I.M.Johnst., *A. clivicola* var. *lopholepis* I.M.Johnst., *A. hypsophila* I.M.Johnst., *A. oestophora* S.F.Blake, *A. rusbyi* Britton, *A. spatiosa* A. Nelson, *A. taltalensis* I.M.Johnst. and *A. transandina* I.M.Johnst. Type material of *A. cordubensis* subsp. *grandibracteata* Múlgura was found in the general collection, as an isotype. Additionally, one specimen of *A. pentandra* (Jacq.) Standl. from Cuba is a proposed epitype in order to support the lectotype already designated.

The results of his study will be included in future scientific articles which will be submitted to different journals regarding taxonomy, systematics and nomenclatural issues about the South American species of *Atriplex*. He will properly acknowledge the Smithsonian Institution in these articles.

Biological Conservation Newsletter Comes to an End

After 36 years and 383 issues, the *Biological Conservation Newsletter* (BCN) will no longer be in production. The newsletter began in 1981 with the intent of publicizing more widely the concerns in biological and environmental conservation. Spearheaded by the Smithsonian's Office of Biological Conservation, the newsletter sought to develop awareness in the minds of colleagues and the general public to the ever-present changes in the environment caused by human activity. At that time, the two topics generating the most concern among conservation biologists was the increasing deforestation of tropical areas and the worldwide commerce in endangered animal and plant species. Since then, other dominating topics include global climate change, the loss of biodiversity, and the threat of invasive species.

The main purpose of the monthly newsletter was twofold: (1) to highlight stories of conservation research produced by scientists of the Smithsonian Institu-

tion; and (2) to provide a comprehensive list of current literature related to the field of conservation biology. Also included were current news items, information on new publications, fellowships and grants, job announcements, and meetings.

Jane Villa-Lobos edited the newsletter for nearly two decades, effectively pulling together conservation stories and lists of current literature. In 1984, production of the newsletter shifted to the Smithsonian's Department of Botany. After Villa-Lobos retired, Gary Krupnick, head of the Plant Conservation Unit, took over as editor in 1999. He helmed the newsletter for the remaining 18 years.

Krupnick made several improvements to the newsletter during his service. In 2000, he introduced a new look for the newsletter and developed a newsletter website. The website included archived issues available for browsing, links to other newsletters and journals in the fields of biodiversity and conservation biology, and a searchable bibliography. By the final issue in December 2016, the newsletter's bibliography had grown to a total of 66,952 references in conservation biology. These references were obtained from a monthly review of new journals and books and from suggestions submitted by subscribers to the newsletter.

When the newsletter began, news of conservation biology was infrequent and difficult to find. In today's state of electronic media and social networks, conservation stories are now available from multiple sources. Pulling together the current literature section of the newsletter has become overwhelming to a very small staff. What began in the early 1980s as a list of 10-20 references per month has since grown to a monthly list of nearly 500 reference. With today's internet resources, readers now have many options to search for conservation publications, including Google Scholar and the ability to register for email table of contents alerts from most conservation journals.

If you wish to continue reading news about conservation research coming from the Smithsonian Institution, please visit these websites: Smithsonian Newsdesk; Smithsonian Insider; *The Plant Press*; SCBI Conservation News; and STRI News.

The *Biological Conservation Newsletter* will be archived at <http://botany.si.edu/pubs/bcn/index.htm>.



Nicolás Brignone



This specimen of *Fuchsia triphylla*, represents one of 810,000 specimens that have been imaged this past year. The Onagraceae was one of the first plant families completely digitized in the conveyor project. German naturalist Hans Freiherr von Türckheim collected this specimen from the Dominican Republic in 1910. Over two million records are available for searching and viewing in the Botany Specimen Catalog <<http://collections.nmnh.si.edu/search/botany/>>.

Updates from the Botany Digitization Conveyor Project

The Botany Digitization Conveyor project continues to work full speed ahead to digitize the pressed specimens of the U.S. National Herbarium. The conveyor is currently working at a rate of 15,000 new specimen images per week, which are transcribed by an outside contracting company. To date, the Onagraceae, Asteraceae, gymnosperms and pteridophytes have all been completed, and the Fabaceae and Cyperaceae are currently in production. As of early December 2016, over 810,000 specimens have been imaged, and 445,000 new records with full record data including the image have been added to the catalog. The next plant family to be digitized is the Rubiaceae, which is expected to be completed by March 2017, and a small subsection of the algae collection.

The botany catalog records are available for viewing at: <http://collections.nmnh.si.edu/search/botany/>. The two million record mark was reached in October 2016, and we look forward to many more to come.

In October, **Sylvia Orli**, IT and Digitization Manager, presented a webinar, “Mass Digitizing a Working Herbarium using a Conveyor Belt: Workflows, Strategies, Challenges” through iDigBio (Integrated Digitized Biocollections), a project funded by the National Science Foundation. Orli spoke about conveyor belt workflows, tips and tricks to keep the data flowing efficiently, and lessons learned from a fast-paced digitization project. The webinar is archived for viewing at <https://www.idigbio.org/content/mass-digitizing-working-herbarium-using-conveyor-belt-workflows-strategies-challenges>, and will appeal to those who work on cyberinfrastructure, sustainability, data management, current digitization, and those planning future digitization efforts.

A New Species of Quillwort Named for the U.S. State of Mississippi

Stunningly underwhelming, species of the genus *Isoetes*, commonly known as quillworts, bear amazing similarity to grass plants with which they are often confused. The U.S. state of Mississippi has now given its name to a new species of the enigmatic quillwort group. The study was published in the open access journal *PhytoKeys*.

The new species, *Isoetes mississippiensis*, is an unusually large representative of the genus, first discovered in 1996 by Steve Leonard. For years it was known by the informal name “Big Dog,” a reference to its size.

Further microscopic and cytological study by Rebecca Bray, Lytton Musselman, and Peter Schafran (Old Dominion University), and **W. Carl Taylor** (National Museum of Natural History) revealed that this is in fact a new species, rather than a strange form of the wide-ranging Midwestern *I. melanopoda*. The megaspores of *I. mississippiensis* appear smooth under a hand lens (~30X magnification), only revealing their echinate micro-

ornamentation with magnification >200X. Megaspores of *I. melanopoda* generally display bumps and ridges visible with a hand lens. The coverage of vela over the sporangia also separates these species, where *I. mississippiensis* has 15-33 percent coverage and *I. melanopoda* has 5-15 percent coverage. *Isoetes mississippiensis* is a basic diploid, and is a parent of a tetraploid taxon also occurring in southern Mississippi (Zimmer et al. *in prep*).

Interestingly, despite considerable field work, only two populations of *I. mississippiensis* are known from a tributary stream of the Pearl River suggesting the extreme rarity of this Mississippi endemic, which already puts the new species at risk of extinction from human development.

Despite their understated looks, quillworts can have an important role in biodiversity and conservation science, helping us interpret the environment—water quality, phytogeography, and evolution.

The unexpected and unexplored diversity of quillworts in the American South, for example, could be due to the machinations of glaciers, according to scientists. The last glacial epoch pushed northern quillworts south where they could cross with previously isolated species.

“Understanding the diversity of quillworts and their genetic makeup allows making hypotheses as to the movement of these plants and, by extension, to

Continued on page 10



Lytton Musselman holding a specimen of *Isoetes mississippiensis* upside-down. (photo by Peter Schafran)

Quillwort

Continued from page 9

other plants in the same flora,” comments Musselman. “We do not know how old this species is but we do know that it has been able to survive in its present habitat despite extensive perturbation of hydrology and natural vegetation.”

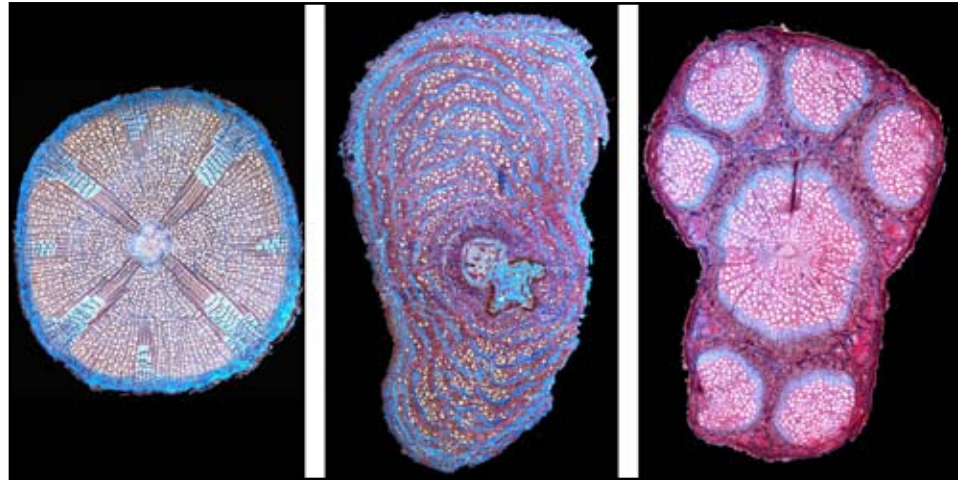
“When one southern Senator was told about an endangered quillwort in his state, he made a public statement questioning why anyone would be interested in this “grass,” shares Musselman. “Despite their ecological importance, quillworts are largely ignored due to their understated appearance. No one knows how many quillworts have been extirpated without being described, and what those could tell us about the past and future of their environment.”

Profile

Continued from page 1

families. The first stage of this project is the development of a webpage “Lianas and Climbing Plants of the Neotropics” <<http://botany.si.edu/lianas/index.html>>, which will soon be followed by a publication in book form. Our mutual interest in lianas and their unusual anatomical architectures along with the lavish wood collection at the Smithsonian have stimulated our collaboration.

The focus of my investigation is to explore the diversity and evolution of cambial variants in Malpighiaceae, and



Stem cross section of lianas (left to right): *Mansoa difficilis* (Bignoniaceae), *Telitoxicum duckei* (Menispermaceae), and *Serjania laruotteana* (Sapindaceae). *Serjania* image courtesy of André C. Lima.

how these features may have affected diversification rates within the family. We hypothesize that cambial variants are likely adaptive features that have made lianas a more successful life form. In Malpighiaceae we have identified at least seven different types of cambial variants distributed in different lineages. These include interxylary phloem islands (all *Dicella* species), phloem wedges (some *Niedenzuella*, *Peixotoa*, *Heteropterys*), and fissured wood (*Callaeum*, *Mezia*, *Flabellaria*) among other stunning types. In contrast, the presence of lianoid lineages within Malpighiaceae that lack cambial variants provide an ideal scenario to test the adaptive value of cambial variants

within the family. Through the analysis of a large sample of stems in light of a well-supported phylogeny, we aim to unravel whether the striking wood anatomy of lianas is not only marvelous, but also a key innovation in the evolution of woody vines.

Publications

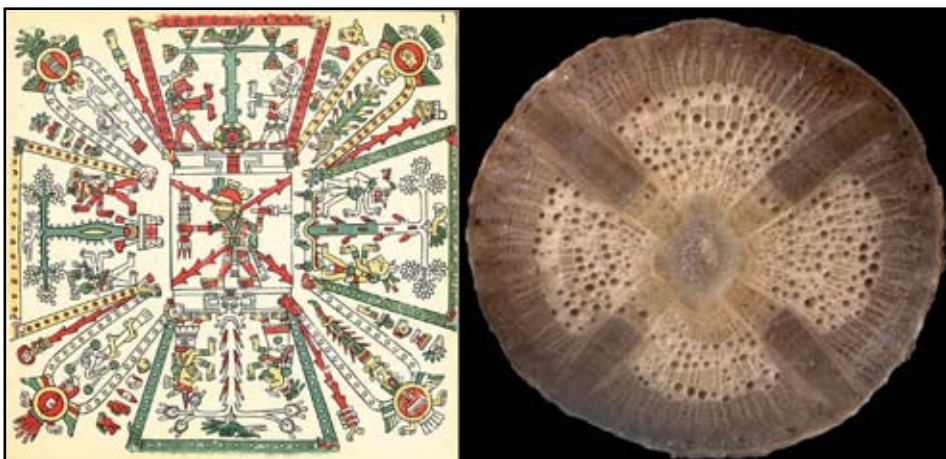
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A picture of the first page of Codex Fejérváry-Mayer (image on left). A representation of the Aztec cosmos, represented by branches of a cross, which as suggested by Karel Verbeek of the *Houtstudiecentrum voor het Technisch Onderwijs*, was likely inspired by the cross-section of a Bignoniaceae liana stem (image on the right). In the center of the picture Xiuhtecuhtli, Lord Time and Fire, is depicted sending his blood to the four corners of the world (cardinal directions, north is the left hand side), which would correspond to the four phloem wedges of the Bignoniaceous stem.

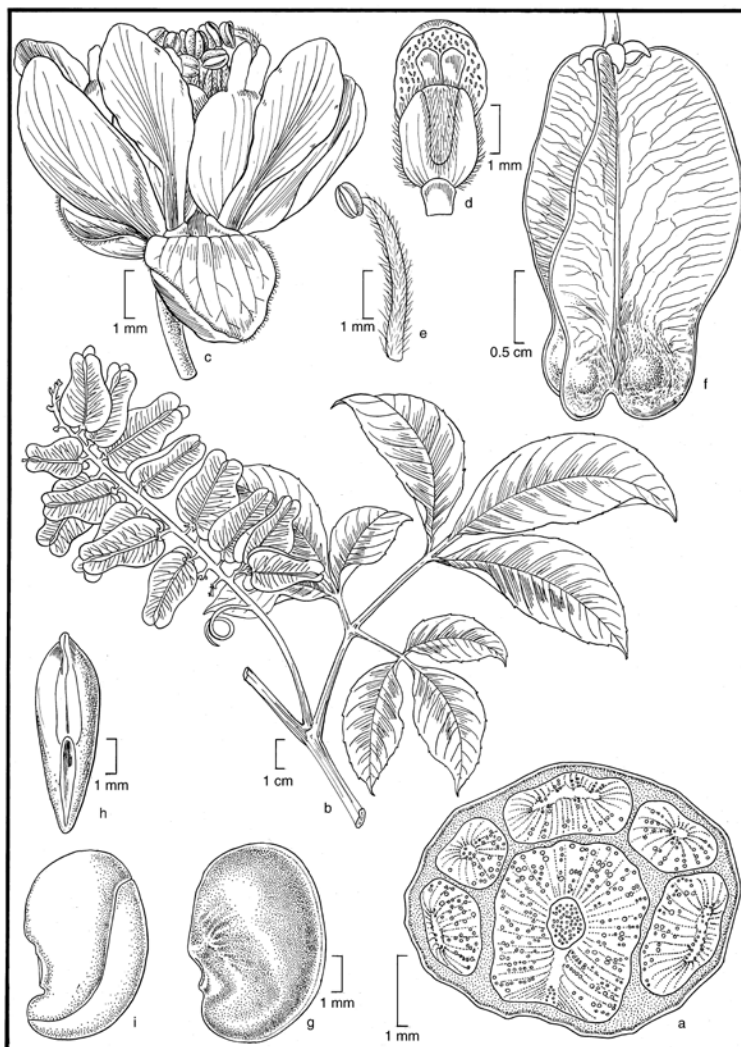
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Art by Alice Tangerini

***Serjania laruotteana* Cambess.**

Serjania laruotteana is a common woody vine (liana) occurring in semi-dry forests and open or disturbed areas of southeastern Brazil, Paraguay, and Argentina. This illustration was primarily made from collections on loan from the New York Botanical Garden. One specimen collected by Acevedo-Rodríguez and Badini in 1986 from Minas Gerais, Brazil, provided a fruiting branch and seed views for the plate. The other specimen was a P. Dusen collection from 1909 that provided floral details. A collection of Acevedo-Rodríguez and G.L. Folli was used to illustrate anatomical features of the wood, an important character in differentiating this species from other species of *Serjania*. These anatomical features have been traditionally used in differentiating climbing genera and species within Sapindaceae.



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