

The Plant Press



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October-December 2012

Botany Profile

Planted Evidence Found in Research Greenhouse

By Gary A. Krupnick

Walking along a trail in an evergreen forest in the foothills of the Himalayas in north central Myanmar in 2002, Botany Curator John Kress came across a plant that appeared to be a species of *Hitchenia* (Zingiberaceae). The plant had no flowers, so he collected a living specimen and brought it back to Washington, DC, for further study. Placed in the hands of the Botany Research Greenhouse manager, Mike Bordelon, it took two years and plenty of care for the plant to flower. During a hot summer day, while hand-watering and soil-checking, Bordelon found at the base of the plant an inflorescence with open flowers. While examining the flowers, Kress decided that this was not *Hitchenia*, but something new to science instead. What was collected from Myanmar and growing in the greenhouse was a new genus, *Larsenianthus*. The genus was named after Kai Larsen, a Danish botanist and expert on the flora of Thailand and Zingiberaceae. The species was named *L. wardianus*, in honor of the famous British plant collector Francis Kingdon-Ward who explored Upper Burma in the first half of the 20th century.

It is not uncommon for plants to be collected in the field and brought back to the Research Greenhouses to watch them grow. What is uncommon is for a new genus or a new species to be discovered after the collected plant flowers. Currently growing in the greenhouses, for example, are an additional eight different flowering plants of *Curcuma* (Zingiberaceae) from Southeast Asia that may turn out to be species new to science after

further research is completed. Additional *Curcuma* plants in the greenhouse collection have yet to flower—are they known species or are they new species awaiting description?

Gingers and other monsoonal plants that go through a winter dormancy period can be challenge to the greenhouse staff. Some of these plants have a much longer growing season in Asia than what the mid-Atlantic can offer. These longer-season species flower at the end of the growing season, but DC summers are not always long enough for these plants. By cranking up the greenhouse heat in February, the greenhouse staff is attempting to jumpstart the growing season, thus encouraging the plants to come out of dormancy earlier. Time will tell if this approach will help encourage these nameless plants to flower.

The Botany Research Greenhouses, located in Suitland, Maryland, at the Smithsonian's Museum Support Center, plays a significant and supportive role for the National Museum of Natural History's Department of Botany and the U.S. National Herbarium. While the well-known Herbarium has a collection of over 5 million dried, pressed, dead plant specimens, the greenhouses maintain an impressive collection of just under 6,000 living plants.

Constructed in 1994, the greenhouse consist of five separate houses totaling 6,000 square feet under glass, and another 4,000 square feet of outdoor, above ground growing space. The tallest house reaches a height of 28 feet and contains a 25-foot *Ravenala madagascariensis* (Strelitziaceae). The four other houses peak at 15

feet, and each maintains a different set of growing conditions—different seasonal temperatures and different humidity levels.

The living collections come from six continents, with a majority from the tropics, and originate from both wild and cultivated sources. The collections represent the research interests of the curators who have the most active greenhouse research programs: Robert Faden's Comelinaceae, John Kress' Zingiberales, Jun Wen's Vitaceae, and Ken Wurdack's Euphorbiaceae. Other curators with plant material in the greenhouses include Pedro Acevedo's Sapindaceae, Paul Peterson's Poaceae, Warren Wagner's Onagraceae, and Emeritus Research Botanist Laurance Skog's Gesneriaceae. Most impressive are the collections of Commelinaceae and Zingiberales, ranked as the largest living collection under glass in the world of those two families. Collections have been derived from field collections of department staff and donations from individuals and institutions from around the world. Rarely plants can be grown from seeds found on herbarium specimens or from fleshy bases of "dried" specimens that had resisted total desiccation.

In its mission, the Botany Research Greenhouses maintain a living collection which serves six primary purposes: (1) identification, (2) preserved specimens (vouchers), (3) chemical and genetic analyses, (4) documentation of biological processes, (5) scientific illustration, and (6) photography.

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Pedro Acevedo traveled to Grenada (9/12 – 9/14) with **Julissa Rojas-Sandoval** to attend a workshop on Caribbean invasive species (CABI-Invasive Species Compendium).

Walter Adey travelled to Newfoundland, Canada (7/16 – 9/7) to establish a year-long experiment on the control of temperature and light on coralline climate archive species *Clathromorphum compactum*.

Marc Appelhaus traveled to Columbus, Ohio (7/7 – 7/11) to attend the Botany 2012 meetings; and to Bronx, New York (9/12) to use the herbarium and library at the New York Botanical Garden.

Barrett Brooks traveled to Miami, the Keys, and Ft. Meyers, Florida (9/7 – 9/14) with **Cavan Allen** to collect plants; and to Monterey, California (9/23 – 10/10) to attend the American Academy of Underwater Scientists conference.

Leslie Brothers traveled to Toronto, Canada (7/23 – 7/26) to attend the annual

meeting for the Association of Education and Research Greenhouse Curators.

Robert Faden traveled to London, England (9/8 – 9/15) to attend a symposium at the Royal Botanic Gardens Kew celebrating the completion of the Flora of Tropical East Africa.

Vicki Funk traveled to Columbus, Ohio (7/7 – 7/12) to the Botany 2012 meetings where she presented a paper in a colloquium honoring the accomplishments of Tod Stuessy & Dan Crawford, moderated a colloquium for the second retirement of John McNeill, and presided over the annual Council meeting of the International Association for Plant Taxonomy as current president; to Montreal, Canada (7/14 – 7/21) to present a paper at The International Compositae Alliance meeting; to Raleigh and Durham, North Carolina (9/11 – 9/14) to give a talk at North Carolina State University and to attend the fall meeting of the Science Board of the National Evolutionary Synthesis Center.

Gabriel Johnson traveled to Columbus, Ohio (7/6 – 7/11) to attend the Botany 2012 meetings and to take part a molecular cytogenetics workshop and volunteer with the PLANTS program.

W. John Kress traveled to Seattle, Washington and Portland, Oregon (7/31 – 8/19) to attend a SIGEO/CTFS workshop and to present a talk at the Ecological Society of America meeting with **David Erickson**; and to Calicut, India (9/6 – 9/16) to deliver an invited plenary lecture at the Sixth International Conference of the Family Zingiberaceae.

Gary Krupnick traveled to Oakland, California (7/14 – 7/19) to attend the North America Congress for Conservation Biology.

Paul Peterson traveled to Dorchester County, Maryland (8/17) to collect plants with the Maryland Department of Natural Resources; and throughout northern Mexico (9/10 – 10/31) with **Konstantin**

Romaschenko to collect plants.

Alice Tangerini traveled to Savannah, Georgia (7/8 – 7/14) to attend the 2012 annual conference of the Guild of Natural Science Illustrators; and to Denver, Colorado (8/3 – 8/5) to teach a three-day class at the Denver Botanic Gardens as part of a guest workshop in conjunction with their Botanical Illustration Program.

Alain Touwaide and **Emanuela Appetiti** traveled to Graz, Austria (9/2 – 9/6) to attend the meeting of the International Society for Ethnopharmacology, where Touwaide delivered the keynote lecture; to Padua, Italy (9/12 – 9/16) to attend the meeting of the International Society for the History of Medicine, where each of them chaired a session and Touwaide delivered a paper and plenary lecture.

Warren Wagner traveled to Columbus, Ohio (7/7 – 7/12) to attend the Botany 2012 meetings; and to St. Louis, Missouri (7/15 – 7/19) to attend the World Flora Online meeting at the Missouri Botanical Garden.

Jun Wen traveled to Columbus, Ohio (7/8 – 7/12) to give a presentation at the Botany 2012 meetings; to Canada throughout New England (8/7 – 8/11) to conduct Vitaceae research with colleagues and collect plants in Quebec, Montreal, New York, Vermont, Massachusetts, Connecticut, Pennsylvania, Maryland, and Virginia.

Kenneth Wurdack traveled to Columbus, Ohio (7/7 – 7/12) with **Jay Horn** to present a paper at the Botany 2012 meetings; to the Loreto region of Peru (7/15 – 8/11) to conduct field work on Euphorbiaceae and their fungal endophytes; and to Bronx, New York (9/12) to use the herbarium and library at the New York Botanical Garden.

Elizabeth Zimmer traveled to Columbus, Ohio (7/7 – 7/12) to give a presentation at the Botany 2012 meetings.



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Chair of Botany

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Visitors

Carlos García-Robledo, Smithsonian Fellow; Plant-herbivore interactions (7/20/10-7/20/12).

Ying Meng, Kunming Institute of Botany, China; Polygonaceae (1/9/11-8/31/12).

Yoomi Park, Konkuk University South

Korea; Pacific *Peperomia* (Piperaceae) (10/1/11-8/31/12).

Rubens Coelho, State University of Campinas, São Paulo, Brazil; Sapindaceae (11/14/11-7/5/12).

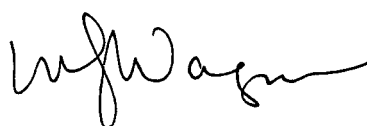
Audrey Wilde, McLean, Virginia; DC

A Tribute to Two Directors

Focus on the future and think big was perhaps the most fundamentally enduring piece of advice given to all museum staff by Dr. Cristián Samper as he wrapped up his nine year tenure as Director of the National Museum of Natural History (NMNH) this past July. While these visionary words can certainly serve as a principle for our own departmental level planning initiatives they also reveal the essential nature of Cristián's gracious influence and generous support within the Department of Botany over the past decade. Under his dedicated and enthusiastic leadership the department recruited two highly productive research scientists, hired two collections support staff, and laid the foundation to re-build the department and position it for long-term stability through a strategic hiring initiative. Through the years matching funds from the Director's office allowed the department to leverage the Cuatrecasas Fellowship awards by extending additional research grants to deserving students and visiting researchers. Moreover, he unreservedly supported the continuation of the Biological Diversity of the Guiana Shield Program and actively participated in the international conference on the Evolution of Life on Pacific Islands and Reefs held in Hawaii in 2011. We remain very grateful to Cristián for his friendship, exceptional leadership, and scientific expertise in tropical botany.

Looking ahead, we eagerly await the arrival of Dr. Kirk Johnson on October 19th as the next Director of NMNH. In his previous capacity at the Denver Museum of Nature & Science, Kirk provided administrative and scientific oversight at multiple levels. Although Kirk is likely more well-known for his geologic and vertebrate paleontologic research he holds graduate degrees in paleobotany and actively stud-

ies the fossil plants of the Great Plains and Rocky Mountains. We look forward to working with Kirk in the years ahead to advance a broad spectrum of departmental research and collections initiatives. Among the activities of his first week at NMNH will be a tour of the department. Please join me in welcoming him to the museum and the Department of Botany.



**Chair
With
A
View
—
Warren
L.
Wagner**



Flora internship (1/9-8/1).

Wenna Chen, South China Botanical Garden, Chinese Academy of Sciences; DNA barcoding internship (2/9/12-2/9/13).

Georgina Warren, Christopher Newport University; Flora of Washington-Baltimore (5/7-8/20).

Bryan Piatkowski, Roanoke College; Bulky bamboo internship (5/14-8/6).

James Hancock, Roger Williams University; Seeds of Success internship (5/17-8/26).

Andrea Hall, Bowling Green State University, and **Mahima Iyengar**, University of Michigan; Herbarium curation internship (5/21-8/17)

Cecily Marroquin, George Washington

University; Medical traditions internship (5/24-7/1).

Jaishri Atri, George Washington University, **Juliana Bozhich** and **Baxter Sapp**, St. John's College, **Alexander O'Neill**, Georgetown University; Medical traditions internship (5/24-7/6).

Tanya Volansky, Randolph-Macon College, and **Daniel Woolridge**, Georgetown University; Medical traditions internship (5/24-8/3).

Nils Niemeier, University of Richmond; Medical traditions internship (5/24-8/15).

Gideon Wolf, Columbia University; Plant conservation internship (5/29-8/10).

Joyce Cherry, Cornell University; *Paullinia* (Sapindaceae) internship (5/31-8/1).

Chelsea Frankel, Bard College; U.S. Exploring Expedition (6/1-8/24).

Sean Schifano, Johns Hopkins University; F.R. Fosberg collection (6/1-8/29).

Alanna Coogan, Marist College; Herbarium curation internship (6/4-8/3).

Katie Dykgreve, Colorado State University; San Jacinto collections (6/4-8/30).

Grace Anderson, Smith College; Plant DNA barcoding (6/11-8/24)

Kendra Hay, University of Wisconsin; U.S. Exploring Expedition (6/11-8/3).

Lauren Scangarella, New York University; Flora of Hawaiian Islands (6/11-8/31).

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Staff Research & Activities

Robert Faden attended the Symposium on the Completion of the Flora of Tropical East Africa at the Royal Botanical Garden, Kew on 13 September. The 249 families in the flora, which took 61 years to complete, were published in 263 parts. The flora, which covers Kenya, Uganda and Tanzania, consists of 12,104 species of vascular plants. Twenty-one families have more than 100 species, including the Commelinaceae (124 species, published in 2012), which Faden authored. Other Smithsonian authors include **Laurence Dorr** (Sterculiaceae, with Martin Cheek, 2007) and Lyman Smith and Edward Ayensu (Velloziaceae, 1975). Most of the talks at the symposium stressed the uses of completed floras, such as conservation assessments, and future directions, strategies, and spinoff projects from the flora. Faden also spent a few days working on African Commelinaceae at Kew and the Natural History Museum and on the typification of a Linnean species of *Tradescantia*.

While visiting Hawai'i Island at the end of August, **Christian Feuillet** and Amy Rossman took many plant pictures. These pictures have been given to **Warren Wagner** for the possible inclusion on the Flora of the Hawaiian Islands website <botany.si.edu/pacificislandbiodiversity/hawaiian-flora/index.htm>.

Gary Krupnick and **Alice Tangerini** met with 10 teachers from the Lafayette Science Magnet Workshop, Louisiana, on 31 July as part of a Smithsonian Associates program to show how science can be introduced to elementary through high school students as part of their curricula. Krupnick gave a presentation on plant conservation and tour of the herbarium. Tangerini gave a demonstration of drawing botanical specimens with pen and ink using a minimum of materials and incorporating the techniques to work with various grade levels of artistic ability. She then had the teachers practice the techniques using photocopies of herbarium specimens showing ways to shorten drawing time by tracing with films and vellums. Tangerini furnished copies of digital images of living

plants common to Louisiana for reference in the reconstruction of the pressed specimens.

On 26 July, **Gary Krupnick** gave a tour of the herbarium to Plodprasop Suraswadi, Minister of Science and Technology, Thailand, and Pichai Sonchaeng, the director of the Thai National Science Museum, in addition to an accompanying group of nine other guests. The Minister and Director were visiting with interest in a developing a long-term partnership with the Smithsonian Institution.

Paul M. Peterson, **Robert J. Soreng**, and **Konstantin Romaschenko** spent two months earlier this year in Tanzania collecting specimens of Poaceae. Over 600 collections were made from 15 regions, including Mt. Kilimanjaro. The trip was funded by a grant from the National Geographic Society.

Christopher Puttock spent four weeks in early summer conducting 10 field surveys of American ginseng in six counties in western Maryland. Two reports have been presented and one is being currently reworked for publication in *Economic Botany*.

On 18 July, **Alain Touwaide** delivered an evening seminar for the Smithsonian Resident Associates Program entitled "Ancient Roman Gardens as Urban Pharmacopeia."

Awards & Grants

In August, **Alain Touwaide** and **Emanuela Appetiti** were appointed as members of the recently established Honorary Advisory Board of the Lloyd Library and Museum in Cincinnati, Ohio.

During a September board meeting of the International Society for the History of Medicine (ISHM), Alain Touwaide was reconfirmed as a Vice-President of ISHM.

New Faces

Julissa Rojas-Sandoval started as a postdoctoral fellow in August 2012 and is currently working with **Pedro Acevedo**. Rojas-Sandoval got her undergraduate and master's degrees in Biology at the University of Costa Rica, where she



Julissa Rojas-Sandoval

studied the reproductive phenology and the breeding system of the tropical tree *Ceiba pentandra*. In 2010, Rojas-Sandoval completed her Ph.D. in Ecology at The University of Puerto Rico, where she studied the population dynamics of the endangered Caribbean cactus *Harrisia portoricensis*. She recently completed a post-doctoral fellow at the Center for Applied Tropical Ecology and Conservation (CATEC), where she studied the vegetation community dynamics of Caribbean semiarid systems following experimental removals of exotic grasses. Her fellowship project at the Smithsonian focuses on the identification and evaluation of invasive plant species affecting plant communities in the West Indies. Rojas-Sandoval has conducted field work in Costa Rica, Mexico, and West Indies.

Staff Changes in Botany IT Group

Sylvia Orli has been selected for the new role as supervisor of the Botany Information Technology group, which provides digitization, imaging, specimen inventory and web support in the Department. She will be involved with coordinating Botany's inventory program, soliciting input from staff to be used in establishing

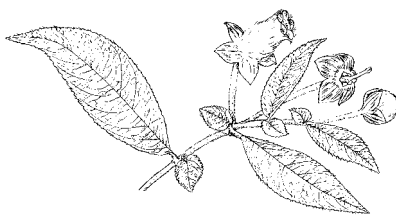
policy and goals (annual and long term) that are compatible with both museum-wide inventory objectives and Botany's research and collections management activities, and providing overall direction to program. She will continue to develop web applications and she and along with the IT group will provide assistance to individuals designing and programming individual web applications and databases. One of her major areas of focus will be to initiate new projects and improve the overall function of existing ones in order to achieve compatibility between various research and image databases in the Department and the Museum so that common output programs and data exchange formats can be used. The group will also help with training in software and operating systems, and provide advice to staff in the selection and acquisition of hardware and software.

Orli has been at NMNH since 1993 and brings a broad range of experience to the position. After receiving her master's degree from the University of Arizona, she initially took a position at NMNH in the Birds Division as a technician for the USFWS. During that first summer she and her supervisor surveyed Breeding Bird Survey routes. She continued to work for the USFWS but later joined the Division of Mammals as a research technician. In 1994 she was selected to work in Botany as a research assistant for Joan Nowicke and Stan Shetler focusing on pollen work with Nowicke and the DC herbarium/flora with Shetler. When Nowicke retired in 1999, Orli began working with Ellen Farr as an assistant webmaster. Her responsibilities in web development, database management, and herbarium curation increased significantly when both Farr and Shetler retired and moved to emeritus status.

Orli will represent one part of a new collaborative leadership team being developed in the Department's collections inventory and digitization programs. The other two members will be **Rusty Russell**, who will focus on the coordination of activities related to developing, funding, and managing, digitization and biodiversity informatics projects, and the collections manager, who is currently being recruited. Together they will help develop, prioritize, and implement collections digitization initiatives, and insure that projects are fully developed from execution to

completion using best practices from both collections and IT perspectives.

Ingrid Pol-Yin Lin has been selected for the position of Multimedia Technician. Lin has worked in Botany last for the past 10 years creating high quality digital images of the Type Collection, as well as images for several other important projects on grant funding. Lin's new role as a full-time employee will expand to include a full range of multimedia activities: importation of multimedia in to the Museum Collections Management System (EMu), creation of new Multimedia records, management of the digital inventory records associated with the multimedia, exportation of EMu inventory and multimedia records, creation of reports, and management of our multimedia devices (e.g., cameras and light tables).



EMu Reaches Milestone

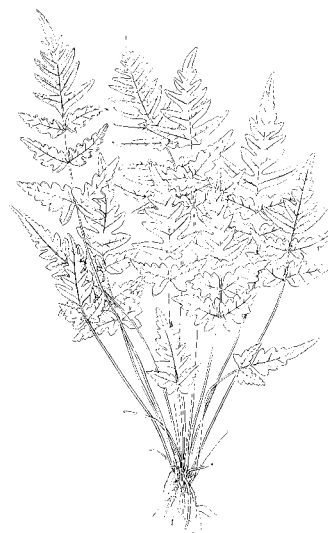
The Department of Botany is pleased to announce that we have reached one million U.S. National Herbarium specimen records in our Museum Collections Database, EMu. This achievement reflects the hard work of almost 50 years of recording our specimen data in a digital format. Digitization efforts in the National Museum of Natural History (NMNH) began in late 1963. In the late 1960s, Botany began digitization with the Type Register, and continued digitizing specimens with a variety of approaches until the migration of our specimen data to EMu in 2002. Migration efforts continue to this day; we have about 400,000 more records to import to EMu in the next year. There are over 5 million herbarium specimens in the US Herbarium in total.

Digital specimen records and their specimen images (about 20 percent of our digital records have images) are used in a variety of ways by scientists and conservationists, and allow greater access to our collections while reducing the wear and tear on the physical specimens. Our online catalog can be found at <http://collections.mnh.si.edu/search/botany/>.

PBS Series 'Time Team America' Visits NMNH

On August 14, a producer from Oregon Public Broadcasting came to the department to interview **Greg McKee** about the kind of work done in herbaria. This was in conjunction with a visit to the Department of Archaeology by students from the "Time Team America" program. This program takes local students of high school age and exposes them to the kind of work done at archaeological sites in the hope that it will generate future scientists. The focus of McKee's interview was how a herbarium is used by researchers to identify and store plant specimens, and how a herbarium is built from collections and exchanges. Of particular interest to the producer were plants considered medicinal by the medieval doctrine of signatures, *Pulmonaria lobaria* (lungwort lichen) being one example.

The following day McKee gave two lectures to "Time Team America" students on the application of botany to archaeology. The lectures took place at the Needwood Mansion in Montgomery County, Maryland, where there is an active dig by state archaeologists researching early African-American culture. The focus of the talk was on artifacts constructed of plant material, such as vine or bark baskets, gourd containers and a child's training blow gun from Ecuador. In addition to plant food sources and construction materials, soil structure and seed banks were discussed, as well as signs of disturbed soil (e.g., aerial photographs) and their interpretation were covered.



Bright African Fruit has the Natural World's Most Intense Color

The metallic blue color on the fruit wall in *Pollia condensata* (Commelinaceae) has been found to be more intense than any other biological material, according to a study published in the *Proceedings of the National Academy of Sciences of the United States of America*. The structure of the wall of the fruit in *Pollia*, a pantropical genus of Commelinaceae, has always been of interest to **Robert Faden**, one of the authors of the study, because the indehiscent fruits, although showy and often metallic blue on the surface, like Christmas tree ornaments, entirely lack flesh but instead are fully packed with dry seeds. Faden has always thought it likely that these fruits mimic truly fleshy berries and drupes and are dispersed when they are eaten in error by birds. It has also been suggested that some birds and mammals decorate their nests with such baubles, but that has yet to be demonstrated in *Pollia*.

Three species of *Pollia* occur in mainland Africa and *P. condensata* is the most widespread, ranging from West Africa (Ivory Coast) to Ethiopia and south to Angola and Mozambique. Like other species of this tropical and warm temperate genus it is a forest understory herb that can spread rapidly by means of stolons. (*Pollia japonica* is a hardy temperate species because it spreads by means of underground rhizomes.) The erect shoots are usually up to 1-meter tall, unbranched and terminate in a single, very dense inflorescence. The white flowers have three fertile stamens on one side and three minute staminodes on the other side of the



Pollia condensata, native to Africa, uses structural coloration instead of pigments to produce the most intense color ever studied in biological tissue.

flower. The infructescences are very dense and contain up to 40 spherical, metallic blue fruits.

Pollia fruits maintain their color indefinitely, in nature when the shoots dry up or the fruits fall to the ground, or as pressed and dried herbarium specimens. It has always seemed logical to Faden that they must have a structural color, not one based on a pigment. He suggested that the structure of the *Pollia* fruit wall might make a good study to Paula Rudall, Jodrell Laboratory, Royal Botanic Gardens Kew in 2009, when he was working in the Kew herbarium. At first the study was going to include ornithologists, but the laws of the United Kingdom, with regard to the use of birds in experiments, were so onerous that that idea was abandoned.

After it was determined that the fruits lacked pigment, the structure of the fruit wall was studied by transmission electron microscopy in the United Kingdom and was found to be very complex and unique in nature. The color varies from cell to cell, producing a pixilated effect at high magnification, according to lead authored Silvia Vignolini from the University of Cambridge's Department of Physics. Developmental studies of the fruit wall in

P. condensata have yet to be conducted and the structure of fruit walls of other *Pollia* species, particularly those that are not metallic blue at maturity, has not been studied.

Reviewing the Use of Nuclear Gene Data

Elizabeth Zimmer and Jun Wen recently published a review, "Using Nuclear Gene Data for Plant Phylogenetics: Progress and Prospects" in *Molecular Phylogenetics and Evolution*. Zimmer and Wen review the use of low and single copy nuclear markers that have been applied successfully in plant phylogenetics to date, and discuss case studies highlighting the potential of massively parallel high throughput or next-generation sequencing (NGS) approaches for molecular phylogenetic and evolutionary investigations. They also present and evaluate the current state, prospects and challenges of specific single- or low-copy plant nuclear markers as well as phylogenomic case studies. This is the most recent review of a rapidly



changing area of research tools and should be invaluable to a broad spectrum of scientists moving into use of these tools.

Florida "Senator" Arrives at U.S. National Herbarium

By Nancy Khan

While it is not unusual for the Department of Botany to come into possession of interesting or botanically significant specimens, it is rare for them to arrive with a notable history and nearly iconic status. At first glance the nondescript, charred piece of wood which arrived at the herbarium in late Spring seems insignificant, but the 4-inch by 8-inch sample is from a *Taxodium distichum* (bald cypress), estimated to be about 3,500 years-old, that once ranked as the fifth oldest living tree in the world and overall state champion in Florida.

The tree received its name, The Senator, and notoriety as a Central Florida landmark when Senator Moses O. Overstreet donated 6 acres, including the ancient tree, to Seminole County in 1927 for a public park thereby protecting the giant tree and the surrounding remnant of cypress forest. As a child I recall visiting the park with my family and I was upset to see that the tree made national headlines as it burned to the ground on January 16, 2012. Initial reports speculated that perhaps the tree had been ignited by a lightning strike, but within a few months it was determined to be arson and an arrest was made.



Nancy Khan displaying a specimen of The Senator, a 3,500 year-old bald cypress (*Taxodium distichum*) from Florida. (Photo by Elaine Haug)

The Seminole County Board of Commissioners has recently decided to honor and memorialize the special tree by distributing any remaining pieces to scientific institutions and artists for continued public access. By deed of gift the County Commissioners presented the U.S. National Herbarium with a piece of this national treasure which is now part of the Wood Collection (US Wood #42707) where it will remain available for scientific observation. **Stanley Yankowski**, Manager of the Wood Collection, in acknowledging receipt of the specimen, remarked that "it is already one of our most unique specimens for its age, popular appeal, and scientific interest."

The pointless loss of such a venerated tree is certainly regrettable, but recent news accounts also report that one of seven clones propagated by foresters at the University of Florida about 15 years ago will be planted at the Big Tree Park in Longwood, Florida. In Washington, DC, the grounds division has confirmed that another descendant of The Senator was planted at the U.S. Capitol in the late 1980s as part of the collection of trees with historical or special significance. Each tree bears a commemorative plaque. The 40-foot tall bald cypress, a living offspring of The Senator, is near the settee adjacent to the sidewalk along Northeast Drive.

Visitors

Continued from page 3

Bruno Amorim, Universidade Federale de Pernambuco, Brazil; Brazilian *Myrcia* (Myrtaceae) (6/18-7/17).

Chantal Cough-Schulze, Oregon State University; Seeds of Success internship (6/18-8/24).

Leah Isaman, Northwestern University; Seeds of Success internship (6/18-9/7).

Gaia Khairina, Clark University; Seeds of Success internship (6/18-8/10).

Emmie Miller, Colorado State University; Historical Expeditions project (6/18-9/30).

Julia Quigley, University of Chicago; Historical Expeditions project (6/18-8/1).

Jorge Mario Velez Puerta, Universidad Nacional, Colombia; *Solanum* (Solanaceae) (6/18- 7/13).

Panya Vij, Alexandria, Virginia; *Silene caroliniana* (Caryophyllaceae) (6/22/12-1/19/13).

Clara Monsma, Oberlin College; Plant conservation internship (6/25-8/17).

Meghan Studer, Lynn University; Seeds of Success internship (6/25-8/6).

Ana Isabel Vasquez-Velez, Universidad del Valle, Colombia; Colombian *Pilea* (Urticaceae) (7/2-8/1).

Alison Shapcott, University of the Sunshine Coast, Australia; Southeast Queensland rainforest plant DNA barcoding (7/3-12/15).

Christopher Blackwell and **Amy Blackwell**, Furman University; Renaissance botanical illustration (7/5).

Dean Papavassiliou, World Bank; Ancient Greek medicine (7/6).

Ellen Danford, Stanford University; Herbarium curation internship (7/9-10/5).

Patrick Andrist, Bibliothèque de la Bourgeoisie de Berne, Switzerland, and **Caroline Mace**, Université Catholique de Louvain, Belgium; History of botany (7/12).

Fabián Medina, Universidad Nacional de Colombia, Colombia; *Ficus* subgenus *Urostigma* (Moraceae) (7/12-8/30).

Philip Bethge, *Der Spiegel*, San Francisco Office; Traditional medicine in the ancient Mediterranean (7/20).

Sabine Thomas, Bastyr University; Ethnobotany and ethnomedicine (7/20).

Cedric Baker, Mercer University; Medieval Islamic pharmacy and medicine (7/26).

Marcela Firens, Universidade Estadual de Campinas, Brazil; *Manettia* (Rubiaceae) (8/7-8/10).

Scheherazade Khan, University of Richmond; Medicinal plants in Antiquity (8/10).

Stephanie Koontz, Chicago Botanic Garden, and **Diane Pavék**, National Park Service; Rare and threatened plants (8/13).

Traci Pantuso, Bastyr University; Contagious diseases in the ancient Mediterranean

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Visitors

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nean (8/13-8/28).

Rebecca Widiss, Voice of America, Washington, D.C.; Medicinal plants of Antiquity (8/17).

David Spencer-Sanchez, Independent scholar; New World ethnobotany (8/22).

Sarah Owen, George Washington University; Maps intern (8/27-12/7).

Fabian Michelangeli, New York Botanical Garden; Melastomataceae (8/28-8/29).

Ryan Grant, American University; Maps Intern (9/4-12/7).

Jorge Perez-Zapala, University of California Davis; *Prunus* (Rosaceae) (9/5-9/23).

Liu Qiuqun, Huazhong Agricultural University, China; Vitaceae (9/15/11-9/15/12).

Jess Gersky, Pan American Health and Education Foundation; Medicinal plants of Antiquity (9/20).

Sheila Pinsker, National Museum of Health and Medicine; Medicinal plants of Antiquity (9/20).

Juan Chen, South China Botanical Garden, Chinese Academy of Sciences; *Curcuma* (Zingiberaceae) (9/24-9/28).

Profile

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One purpose of the living collection is the documentation, identification, and description of a species. As exemplified in the *Larsenianthus* story, precise identification in the field may be difficult for a plant not in flower. Thus material is collected and grown in the greenhouses until it flowers and can be identified. Such is the case of another ginger, *Curcuma arracanensis*, from the cloud forests of Myanmar, a species that Kress and former Ph.D. student Vinita Gowda described and named earlier this year. A plant may also be identified and vouchered in the field, but after it flowers again in the greenhouse, a second voucher is necessary to verify the original identification. On occasion a curator will be asked to verify an identification of a species, and thus they will request to see the plant in person, asking for cuttings, seeds or the whole plant. These plants are



***Larsenianthus wardianus* W.J. Kress, Thet Htun & Bordelon, one of four new species in this genus of gingers (Zingiberaceae) from Asia. (Photo by Leslie Brothers)**

maintained in the greenhouse as well.

A second purpose of the greenhouse is the preservation of specimens. When wild plants are pressed in the field, material such as flowers or seeds may be missed during the original collection. Growing a plant in the greenhouses allows the collector to make a more complete voucher. Plants obtained from other institutions are almost never in flower, so they must be grown until they do flower and a voucher specimen can be prepared.

A third purpose is that living plants in the greenhouse are a more convenient source for chemical and molecular analyses. Proteins, which may be used in population studies, are easier to extract from living material than dried specimens. Proteins from fresh material are not degraded compared to preserved plants. In addition, the living collections provide the best and most convenient tissue for genomic investigations. It is important to maintain plants over a long period of time because new techniques, e.g. phylogenetic studies using DNA (or RNA) and new techniques for studying chromosomes, often require living plants. Studies of comparative plant anatomy of different species and genera of Commelinaceae, for example, have often served as research projects for interns.

A fourth purpose is that different stages

of a plant's life history can be documented. While making collections in the field, only one life stage of a plant will be seen on the day that it is collected—typically, either the vegetative or reproductive stage. In the greenhouse, each stage, from seedling, to flowering, to fruiting can be documented. In addition, the type of flowers a plant produces may change over the course of a single day, and those changes can be recorded as well. In recording floral phenology, the exact time of day the flowers open and fade, the position within an inflorescence, and the sequence of opening and closing of different flower types, such as male and bisexual or female flowers, can be studied with living plants.

An extreme case study of phenology was the observation of flowering in a plant of *Palisota hirsuta*, originally from Ghana, over the course of two flowering seasons. The plant produced more than 16,000 male and female flowers the first year and more than 22,000 flowers the next year. Since individual flowers only open once for a few hours, observations had to be made daily between December and May.

Scientific illustration of a plant species serves an additional purpose for maintaining a living collection. Often, plant illustrators like the Botany Department's Alice Tangerini will use herbarium species to

ascertain morphological detail while drawing. Photographs can provide an additional source for the illustrator. But a living plant can allow for an easier and more complete illustration than a pressed specimen or a photograph, and in the case of plants whose flowers are ephemeral, such as all Commelinaceae, living plants are by far the best material for illustration.

Finally, in addition to illustrations, documenting a plant in flower can be captured with photography in the greenhouse. Photographs can catch the shape and color of a plant lost in a herbarium specimen. The Greenhouse Highlight webpage <botany.si.edu/ghhighlight/index.html> draws attention to some of the interesting plants among the collections housed in the departmental greenhouses.

The online photographs have lead to the identification of new species too. In 2001 and 2002, the greenhouse posted photos of two plants identified as *Peliosanthes* sp. (Asparagaceae), both with beautiful dark purple inflorescences that were collected in Thailand in 1999. Japanese botanist Noriyuki Tanaka found the pictures online and was convinced that these plants were not members of *Peliosanthes*. Tanaka requested living plants, and so plants and desiccated flowers from the greenhouses were sent to him for further study. In 2010 he published these plants as two new species: *Tupistra urceola* and *T. kressii*.



***Tupistra kressii* N.Tanaka, a newly described species from Thailand. (Photo by Leslie Brothers)**



The Botany Research Greenhouses are located at Smithsonian's Museum Support Center in Suitland, Maryland. (Photo by Leslie Brothers)

lota and *T. kressii*.

An additional purpose of the collections, not explicitly spelled out in its mission, is the value for ex situ conservation. The plants in the greenhouse are collected for research and identification, and not specifically for conservation. However, after the plants are accessioned by the greenhouse, and their conservation status is assessed, every effort is made to maintain the plants of threatened species.

Recently, a portion of the greenhouse living collections were uploaded to Botanic Gardens Conservation International's (BGCI) Plant Search webpage <www.bgci.org/plant_search.php>. Plant Search allows users to locate rare and threatened plant species in cultivation around the world for research purposes, using a database of living collections submitted to BGCI by the world's botanic gardens. According to the database, one-fourth of the known species in the research greenhouse collections (178 of 707 species) occur in no other botanic garden or greenhouse collection. This number will surely climb as more unspecified taxa in the collection are identified. Fourteen species in the greenhouse collections are listed as threatened (i.e., Critically Endangered, Endangered, or Vulnerable) in the IUCN Red List. Many more species in the collection may in fact be threatened, especially those collected from Africa and Asia, but the conservation status of these species have yet to be assessed by IUCN.

The role of maintaining threatened species in the greenhouse is important, given that the goal of Target 8 of the Global Strategy for Plant Conservation is to have "at least 75 percent of all threatened plant species in ex situ collections."

The research greenhouse would not function so smoothly if not for the care and dedication of the greenhouse staff. Mike Bordelon has been the Greenhouse

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***Drymonia ecuadorensis* Wiehl, an endangered gesneriad from Ecuador. (Photo by Leslie Brothers)**

Profile

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Collections Manager for the past 18 years. 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 Kress sought him out to manage the research greenhouses in 1994.

Leslie Brothers, the Assistant Manager, cares for the plants, manages the specimen data and serves as the greenhouse photographer. Also a graduate of the University of Maryland (B.S. in Zoology), Brothers first joined the National Museum of Natural History in 1985 as inventory specialist and then data management for the Department of Entomology, and then joined the Department of Botany in 1989 as Skog's research assistant. Brothers transitioned from the herbarium to the greenhouse in 1995.

Bordelon and Brothers have seen an ebb and flow of volunteers in the past 18 years, most notably, Audrey Faden who volunteers as her husband Robert Faden's greenhouse assistant, and Neil Berg, a dedicated volunteer for 12 years who recently completed his time assisting in the greenhouse, leaving this past May for



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

his retirement.

The original Botany Research Greenhouse was built in 1977, in the east courtyard of the National Museum of Natural History. Deborah Bell was the original Greenhouse Collections Manager followed by Susan Richardson, and Curator Robert Read was instrumental in its design. It was located on top of the Osteology Preparation Laboratory, a place where a colony of dermestid beetles would consume all soft tissue on animal skeletons for museum research and display. The overwhelming odors from lab were something to be endured by the greenhouse staff and researchers.

The original greenhouse consisted of one room and 1,000 square feet and was reached by climbing up a two-story metal staircase outside of the building. Supplies and materials were clumsily delivered using a chain-operated outdoor lift. From September until March, the greenhouse had no direct sunlight, blocked by the main building and the museum's east wing, and thus supplemental light was a necessity. The greenhouse was populated with Read's bromeliads, Skog's gesneriads, Thomas Soderstrom's herbaceous bamboos, Edward Ayensu's dioscoreas, and plants that were needed for the museum's Insect Zoo exhibits. When Faden joined the Botany Department in 1980 he brought with him a large collection of living Commelinaceae. A few plants in the original collection still exist today, including *Aneilema beniniense* that Faden collected in 1969 in Kenya and *Palisota hirsuta* that Faden collected in 1974 in Ghana. In 1994 the Botany Department moved the greenhouse collection to the larger, more modern facility at MSC, and the museum filled the east courtyard with offices and collection space.

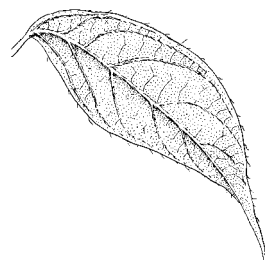
The current challenges that face Bordelon and Brothers are not too different from what most greenhouse staff encounter: controlling insect pests and maintaining complex machinery. The greenhouse practices Integrated Pest Management (IPM), using predatory insects such as the mealy bug destroyer (*Cryptolaemus montrouzieri*), *Rhyzobius* beetles, and parasitic wasps to control for mealy bugs, scales, aphids, thrips, and whiteflies. Soft insecticides are also employed, which have short re-entry intervals and tend to be less harmful – though not harmless – to the beneficial insects that are used. Pathogens



Palisota hirsuta K.Schum. is among the original Commelinaceae collection in the greenhouse. This specimen was collected in Ghana in 1980. (Photo by Leslie Brothers)

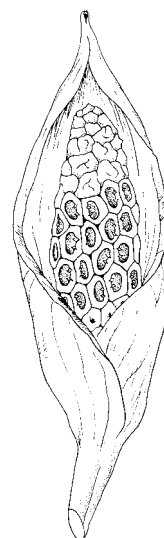
prove difficult to control, especially in the gesneriad collection, which is susceptible to impatiens necrotic spot virus (INSV). The biggest day-to-day challenge is the need to maintain effective machinery, such as transformers, vents, fans, control boards, fog systems, and lights. Earlier this year, the greenhouses were hit during a lightning storm, which blew out almost all of the transformers. Two years ago, a significant snow storm collapsed the roof of the shade house. Fortunately, the 2011 earthquake did not lead to any structural damage.

The greenhouse is not open to public, although it is often included on SI Resident Associate tours of the MSC complex. It is used by researchers and visiting scientists that have a direct need to use the greenhouse. Access to the facilities is allowed with prior arrangement or notification of the greenhouse staff, which aids in the timing of pesticide applications and other needs.



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Art by Alice Tangerini

***Curcuma arracanensis* W.J Kress & V. Gowda**

This illustration of *Curcuma arracanensis* (Zingiberaceae) was drawn from living plants in the Botany Research Greenhouse when the plants were in flower at the end of August 2006.

Tangerini initially drew the plant habit and then flowers and dissections in a couple of days working in the Greenhouse but returned in September to draw the tuberous rhizome to complete all of the figures needed for the publication (see "Publications" on page 11).

Leslie Brothers supplied close up photographs to supplement the sketches since the final ink drawing was done in Tangerini's office. Having the live plant was necessary to show details of the flowers and their spatial positions which are usually lost in pressed material. The leaf and inflorescence attitude of the live plant habit enabled Tangerini to give a natural look to the drawing.



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