

Asexuality as a detour, not a dead end

By Kathryn Picard

Historically, asexuality has been seen by evolutionary biologists as a short-term solution to a long-term problem, with any temporary competitive advantages derived from eschewing sex eventually overshadowed by the absence of mechanisms to increase genotypic diversity. Yet, despite its ostensible limitations, asexuality is a widespread reproductive strategy, especially among ferns where it is generally manifested as apomixis.

Apomictic ferns deviate from the typical fern sexual life cycle in two ways: 1) the production of unreduced spores through meiosis, and 2) the development of an adult fern (sporophyte) from the somatic tissue of the free-living gametophyte without the fusion of sperm and egg. For the few fern lineages that have been studied, approximately 10% of species have been found to be apomicts. Across angiosperms, the incidence of apomixis is markedly lower, with fewer than 1% of species understood to exhibit this reproductive mode. With both the potential evolutionary pitfalls of asexuality and the broad disparity between ferns and angiosperms in mind, it seems only natural to ask why apomixis has played such an outsized role in fern diversification.

Reproductive mode and ploidy level are important life history characters that can inform phylogenetic studies and taxonomic revisions of fern taxa, particularly in groups where

homoplasmy due to shared ecological habits can mask—or, alternatively, falsely suggest—hybridization and/or speciation. Yet, for the overwhelming majority of fern specimens housed in herbaria, these data are not available. The primary goal of my postdoctoral work is to apply classical spore analysis techniques to the fern collections in the United States National Herbarium to establish both reproductive mode and ploidy level estimates for the most diverse fern order, Polypodiales.

Comprising approximately 80% of extant fern species, the Polypodiales lineage is distributed globally and exhibits myriad morphologies corresponding to an equally broad range of ecological habits. Unifying these otherwise disparate taxa is the generally consistent production of 64 spores per sporangium in sexually reproducing individuals. By contrast, apomictic individuals produce half the number (usually 32) unreduced spores per sporangium, allowing for the relatively

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Approximately 10% of fern species have been found to reproduce asexually.

Working hard

I think all of us have had a job or two when we were younger that sticks with us because of some lesson or lessons that we learned. I had my share of odd jobs in high school and college. Nothing particularly inspirational, motivational or instructive. Certainly nothing that hinted at my present career. I mowed lawns, painted houses, delivered prescriptions for a drugstore, washed dishes, stocked shelves in a warehouse, worked on a bookmobile, and clerked for a grain company. Some jobs I enjoyed more than others. The job I detested and quit after a few days was conducting marketing surveys. I was expected to stop people on the street in downtown Boston, people minding their own business, and try to get them to answer a series of questions about their use or familiarity with certain commercial products. The information was preliminary to an advertising campaign. It took me almost no time to realize that marketing and sales would not be my future.

The job I took the summer after my first year in college had an unusually strong impact on me because it showed me how very hard people could work when they have goals. I bottled milk for a dairy. It required an odd combination of stamina (standing for long periods), boredom (watching endless gallons of milk move down a conveyor belt), and agility (reaching in to fix something quickly before the stack-

ing machine could crush my hand). (OSHA was in its infancy). Not only did the machines I operated fill the milk bottles, but they also placed them in crates, stacked the crates, and carried the stacked crates into an industrial size cooler where someone else loaded them onto tractor-trailers. The job also required an ability to ignore unpleasant odors, a useful adaptation because milk was constantly spilled on the floor and there was no time to mop it up until the end of a shift.

My coworkers were almost all immigrants from the Cape Verde Islands. I was the chance replacement for a machine operator who had saved enough money to take the summer off to return to Africa to marry. The foreman was tough. In theory, he held his position because he was the only employee who spoke both Portuguese, or Creole, and English. In reality, I think he held his position because he could be intimidating. He was, as best I could tell, the only employee who was a veteran of the Portuguese Colonial War and he told me stories about combat in Angola. He kept order in the dairy even though I noticed that he initiated most of the roughhousing.

I worked a swing shift. I went to work at four each afternoon and worked until at least eleven when I was required to disassemble and clean the bottling machine at the end of my shift. If the last truck from Vermont with raw milk ran late I would stay until the milk was processed, bottled, and the equipment taken apart and cleaned, which meant sometimes I did not head home until five or six in the morning. I was paid \$2.10 an hour, which I thought was great. I also worked six days a week, which might seem a lot except that several of my coworkers (and the person I had temporarily replaced) routinely worked seven days a week.

No one in the dairy, except possibly the chemist who checked the milk after it was pasteurized, thought of his or her job as a career. In southern New England and on

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The staff of Smithsonian's Office of Facility Management and Reliability works to maintain, repair, and service the historic buildings and grounds of the Smithsonian Institution. Supporting the Department of Botany are LeAnthony Bennett (Supervisor), Jose B. Lobo, Nataya Ross, Keith Pollard, Chaddie Matthews, Feron L. Bazemore, and Carlos Umaña. Not present, Marilyn Blue. (photo by G. Krupnick)



HONORS & AWARDS

Museum staff honors its peers

The National Museum of Natural History presented the 2018 Peer Recognition Awards on December 11. 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 14 Museum staff members representing a cross-section of the entire museum community.

Ten awards were presented at the ceremony. Department of Botany's **Ida Lopez** and **Ken Wurdack**, and volunteers **Julia Steirer** and **Lou Woody** received the Green Thumb Team Award. The following is taken from 2018 Award Program:

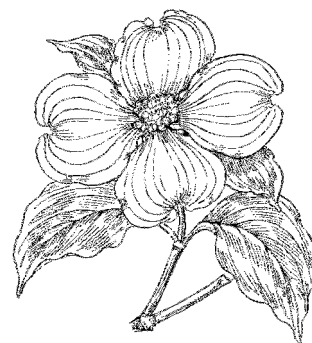
When the unexpected happens and a solution is not in sight, unsung champions often rise and make things right. When the Museum found itself without a green house manager, these four individuals stepped up and decided to do what they could to care for, maintain and protect a valuable collection of nearly 6,000 living plants at the Botany Research Greenhouse. Museum volunteers Julia Steirer and Lou Woody worked numerous

hours watering, pruning, and trimming plants in addition to cleaning floors, equipment and anything else that needed attention. Ida Lopez's devotion is evident by bringing the volunteers together, overseeing the plant care, ensuring all tasks were covered, and providing contracted resources as needed. The greenhouse is a living and breathing facility and its systems are essential to providing the environment for the collection to thrive. Without any professional training in facilities management, Ken Wurdack assumed the necessary duties. By troubleshooting systems and partnering with SI facilities experts, he helped keep the greenhouse facility in working order, monitored structural and mechanical systems, and obtained service and repairs when needed. The sacrifice of the team to save this valuable collection has allowed their fellow curators, and the national and international research communities, to continue their research on living plants. The plants housed in this facility are an important reservoir for genome-quality tissue, and the conservation of these rare and threatened species is vital to our research mission. Without their exceptional efforts, these collections would have perished.

ABOVE: NMNH Sant Director Kirk Johnson presents the Green Thumb Team Award to Ida Lopez, Julia Steirer, Lou Woody, and Ken Wurdack. (photo by James Di Loreto, Smithsonian)

EDITOR'S NOTE

After 21 years in print, *The Plant Press* has a new look. The partial U.S. federal government shutdown delayed the release of this issue, and most of the content was prepared before the shutdown began. The staff of the Department of Botany is happy to be back at work, fulfilling its mission in being a leader in botanical biodiversity research and providing modern responsible stewardship of the national collection. We hope you enjoy the new layout and improved design of the newsletter. The editor of the newsletter welcomes and encourages feedback, which can be sent to krupnick@si.edu.



The Plant Press

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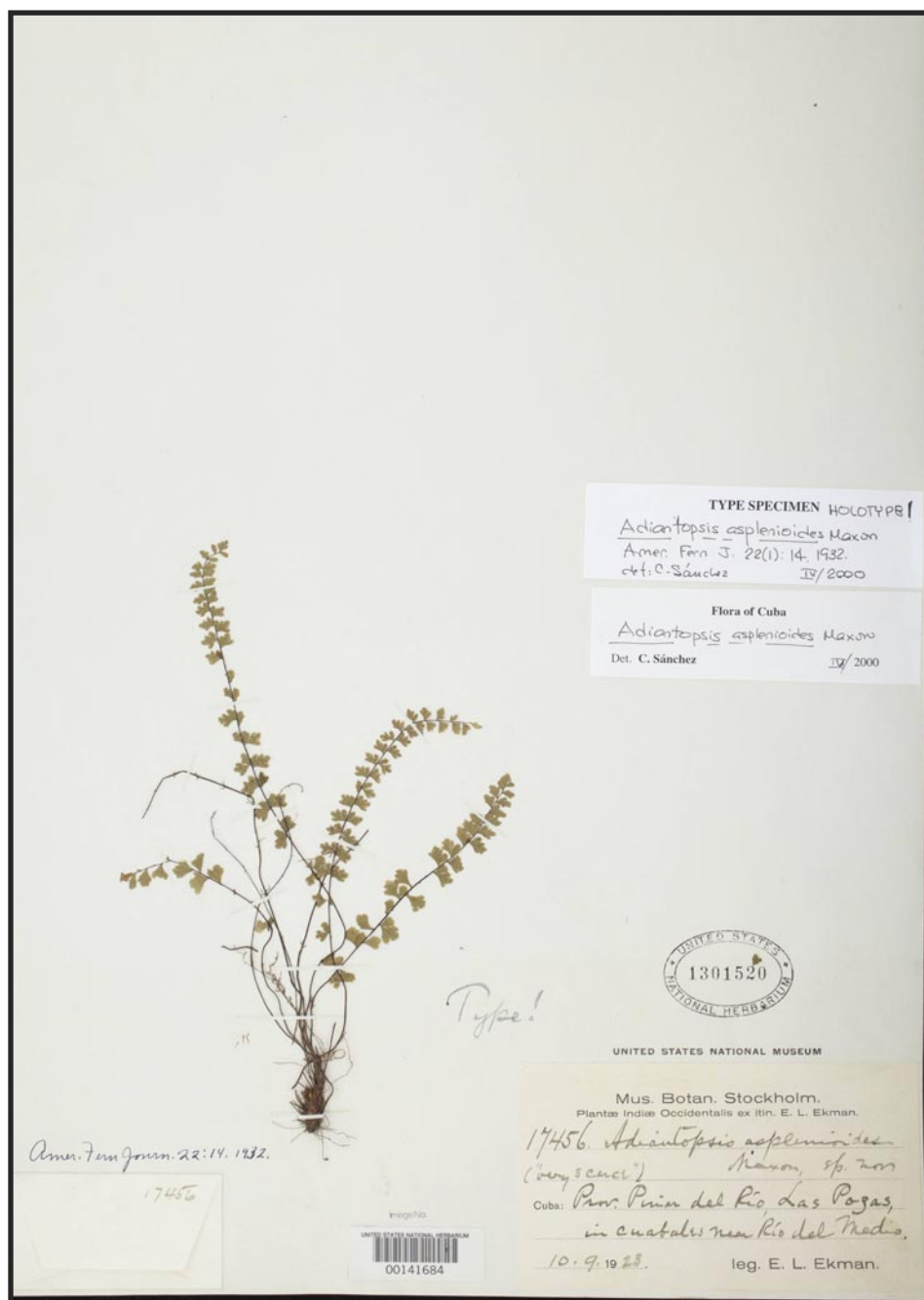
Asexuality

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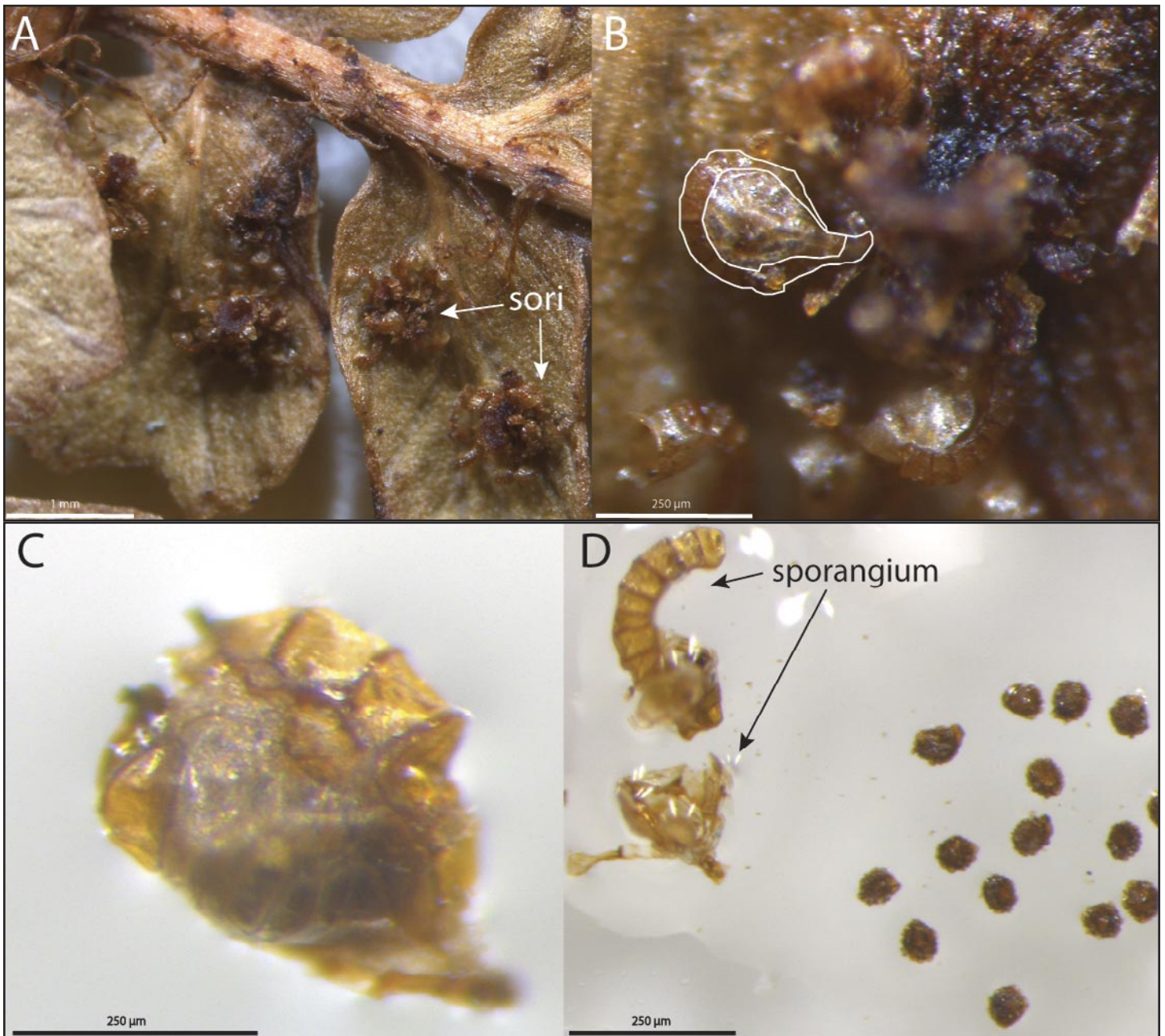
easy discrimination between sexual and asexual individuals. Furthermore, as spore size is positively correlated with genomic content, we can use mean spore diameter to estimate ploidy level for closely related species (and sometimes genera), thus providing insight into the distribution of polyploidy—which is often associated with apomixis—across ferns.

Most previous studies of apomixis in ferns focused on the examination of non-type material. However, fern lineages in which polyploidy, hybridization, and apomixis are prevalent are often characterized by cryptic diversity, increasing the possibility of specimen misidentification. Thus, to ensure the accuracy of any reproductive mode assigned to a given taxon,

we will be focusing our efforts on the nearly 4,000 Polypodiales type specimens held at the US National Herbarium. For each specimen with ample fertile tissue, intact sporangia will be isolated, dissected, and separated from the spores within, which will then be counted and measured. By examining spores of type specimens, we will add a sorely needed facet to the life



Reproductive mode data is available for only a few fern lineages, thus the relative abundance of apomictic species is likely underestimated. *Adiantopsis asplenoides* (Pteridaceae, Polypodiales) is the first reported apomictic species for the genus.



Type specimens are examined for fertile tissue (A) bearing intact, undehiscent sporangia (B, outlined; C, removed from specimen). Spores from dissected sporangia (D) are counted and measured to determine reproductive mode and estimate ploidy level, respectively. This specimen, *Dryopteris macropholis*, is a 16-spored apomict originating from the Marquesas Islands. (images by K. Picard)

history data available for these specimens, and provide benchmarks for spore size that can be used in downstream analyses of fern diversification.

Our spore analyses will also ultimately allow us to investigate longstanding questions of fern ecology and evolution, chief among them being the role of asexuality in fern dispersal, diversification, and niche partitioning. Studies across plant and animal taxa suggest asexual species are more

likely to occupy expanded ranges, tolerate more extreme environmental conditions, and more readily establish island populations than their sexual counterparts. In addition to being overrepresented in island floras overall, ferns display clear patterns of habitat differentiation between sexual and asexual populations. Using digitized collection records, we will estimate range sizes for each taxon included in our spore survey and explore the relationship be-

tween reproductive mode, ploidy level, and various environmental gradients.

This project is in collaboration with Amanda Grusz (University of Minnesota-Duluth) and Michael Windham (Duke University).



Ancient plants tell stories of today

By Pamela Tuchscherer

Retired teacher and Department of Invertebrate Zoology volunteer Pamela Tuchscherer explores her experiences attending the Smithsonian Botanical Symposium, “Plants in the Past: Fossils and the Future,” which convened at the National Museum of Natural History in May 2018. She also gives us a first look of the new David H. Koch Hall of Fossils – Deep Time, which is scheduled to open to the public on June 8, 2019.

It’s hard to grasp the concept of deep time. I reflected on this geologic period as I studied a fossil illustration in the rare book, *Antediluvian Phytology*. The plant fossil was 55 million years old. What could I use as time markers in that distant past? It was after the dinosaurs roamed the earth, but before humans existed. Imagine what Edmund T. Artis, 1800s fossil collector and author of the book, thought when he collected the Carboniferous plant fossil fragment. He tried to envision it as a whole organism even though it had little in common with existing plants. Back then, geologic time before humans was a

controversial concept even to some scientists.

I examined Artis’ publication, and other rare books highlighting fossil plants, at the Joseph F. Cullman 3rd Library of Natural History. Having entered through locked doors, I had entered one of the two most secure locations in the museum. (The other being the gem vault). The library, containing 10,000 anthropology and natural science rare books, is used by scientists and researchers working on taxonomy and classification of species. I viewed the books on display during a behind-the-scenes tour offered during the Smithsonian Botanical

Symposium, “Plants in the Past: Fossils and the Future,” where I was introduced not only to unique extinct plant species, but also to the origins of some of today’s plant diversity.

Kirk Johnson, Director of the Museum of Natural History and a paleontologist himself, gave the opening remarks at the Symposium and noted that the discussion of ancient plant fossils coincides with the development of the Natural History Museum’s Deep Time exhibit. A goal of the exhibit is to show the public that paleontology is relevant to modern life. It will demonstrate how ancient plant and animal fossils are key to understanding the interaction of earth

“A person would have to take themselves out of the human context to begin to think in terms of geologic time. They would have to think like a rock.”

Terry Falke, photographer

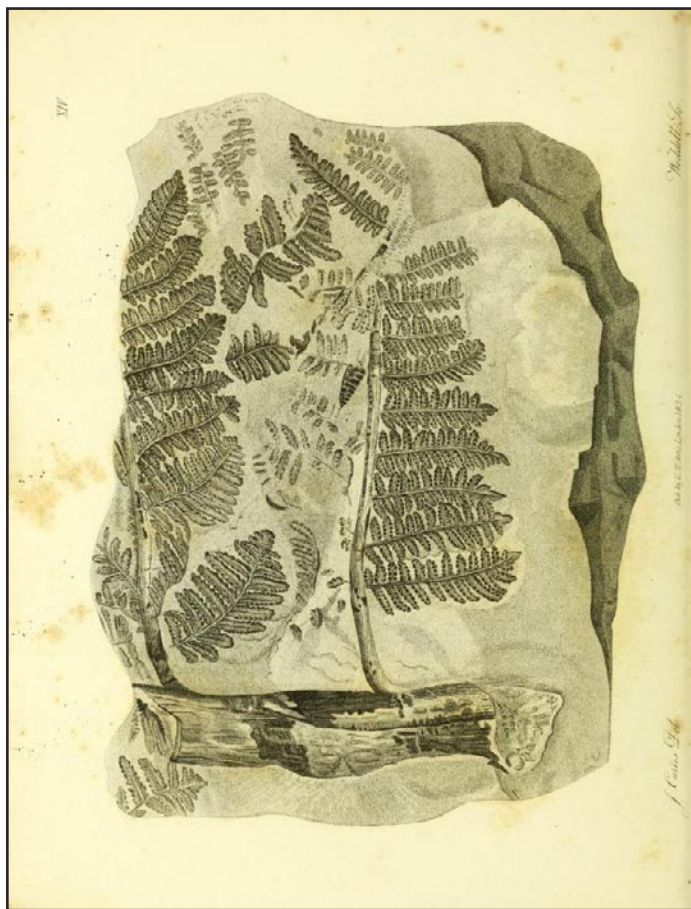
and life systems with more than 30,000 ft² of new fossil displays.

Jonathan Wilson, paleobotanist at Haverford College, and a speaker at the Symposium raised the question, “How can we better estimate the way climate change will impact today’s ecosystems?” Plant fossils, he explained, are key sources of environmental information because their wood structure, as well as leaf shape and size, record and respond to environmental changes in a predictable biophysical way.

Vegetation and climate influence each other. This is referred to vegetation-climate feedback. “For example,” Wilson notes, “drought causes plant death and reduces the amount of carbon dioxide stored in plant tissues, thereby increasing atmospheric CO₂ concentration and global temperatures.”

Wilson used the rich archive of environmental evidence preserved in fossils to understand vegetation-climate feedback in deep time. He thinks it is critical to build an understanding of the whole extinct plants’ physiologies from root-to-stem-to-leaf, rather than trying to reconstruct them based on existing relatives. Extinct plants may not have functioned in ways known today. By comparing the physiology of these plants with today’s living plants strategies, it will help explain the adaptation of an organism to environmental changes over time. Wilson believes, “The history of plant life holds important clues about the planet’s future.”

Scott Wing, Smithsonian curator of fossil plants, has discovered that fossil plant records show evidence for the triggers and effects of global warming. He has studied plant fossils that reveal the intense global warming that occurred 55 million years ago during a period labeled PETM (Paleocene-Eocene Thermal Maximum). In addition to high temperatures,



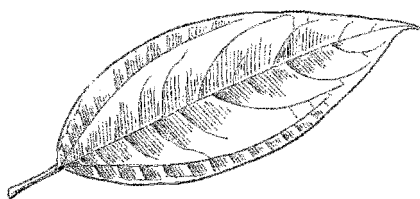
Filicites miltoni from “Antediluvian Phytology, illustrated by a collection of the fossil remains of plants, peculiar to the coal formations of Great Britain” by Edmund T. Artis (1825). (Image courtesy of Biodiversity Heritage Library, <https://biodiversitylibrary.org/page/51300329>)

high levels of carbon in the atmosphere were evident. This period is widely recognized as “the best geological analog for the human-induced global warming that is happening now.”

The new Deep Time exhibit, opening in June 2019, will make comparisons between events in the history of life and our current alterations of Earth systems. Wing points out, “We’ve changed the composition of the atmosphere, changed the climate and the chemistry of the ocean. There is no ecosystem that doesn’t have human fingerprints. We are now as powerful as geological forces were in the past. Things that we do now will echo forward into the future.”

Fossils of pollen grains and leaves will be featured in highlighted displays in the exhibit that will help visitors understand ecological change over time and emphasize the importance of plants in shaping this change. Fossil interactive programs and activities will provide hands-on experiences. In addition to describing current undesirable global changes, the exhibit will reveal practical solutions to global change including urban gardening and conservation programs.

Entering the exhibit, the public will start at the Earth’s creation, 4.6 billion years ago and end with their future. Visitors will walk through individual displays and observe changes over time. As they progress and travel through millions of years, they’ll discover how climate change and plant and animal interactions can transform the environment. There will be dinosaurs, but these extinct species will be shown in the context of their place in the ecosystem and their evolution through time. Plant fossils hold clues to both the past and the future and help scientist understand the results of the rapid biological change taking place today. “What few realize,” Wing notes, “is that this rise in CO₂, and the heat wave it will cause, will persist for thousands or tens of thousands of years.” The hope is that visitors will gain a larger sense of the legacy they leave behind as well as the one they have inherited.



Botany website redesign

The National Museum of Natural History has launched a new website at <https://naturalhistory.si.edu/>. The new visitor-focused site works on both desktop and mobile screens, integrates with multiple Smithsonian-wide systems, and has improved accessibility and adherence to current accessibility standards and requirements. The new Museum website includes a redesign to the research department webpages, including the Department of Botany—now found at <https://naturalhistory.si.edu/research/botany>.

Botany homepage navigation begins with the orange circle in the lower left of the screen. Click on this and you see “Botany” with a subordinate list of choices:

- About
- Research
- Collections Access
- Resources
- Opportunities
- News and Highlights
- Staff
- Contacts

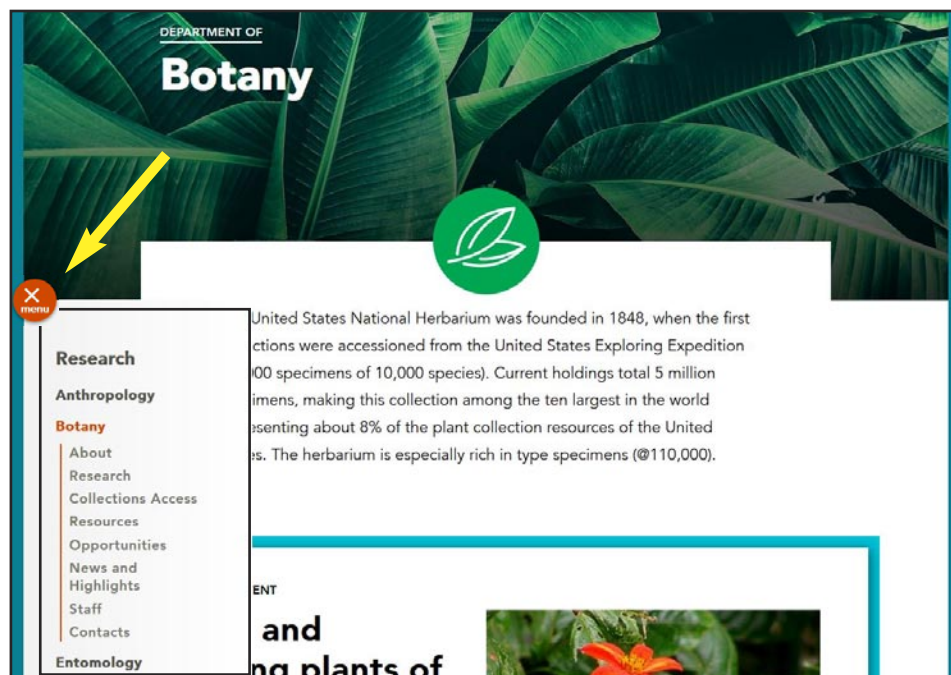
The **About** page presents a short history of the U.S. National Herbarium and the Department of Botany. **Research** dives into the current research specialties of the Botany Curators, organized by geographic,

taxonomic, and other special interests. Examples include Guiana Shield, Hawaiian Islands, West Indies, Lianas and Climbing Plants of the Neotropics, Onagraceae, and Zingiberales.

If you are looking for specimens, images, loans, or access to the Herbarium, visit **Collections Access**. The **Resources** page provides digital resources, nomenclatural tools (Index Nominum Genericorum, Appendices I-VII of the International Code of Nomenclature for algae, fungi, and plants), and access to newsletters and journals (Contributions from the U.S. National Herbarium, Smithsonian Contributions to Botany).

The **Opportunities** page offers information for the visiting researcher, such as how to find and apply for travel awards, fellowships, internships, and volunteer positions. The **News and Highlights** page will focus on the latest events and other activities sponsored by the department, such as the Smithsonian Botanical Symposium.

If you are looking for a staff member of the Department of Botany, visit the **Staff** page. The Department’s mailing address, phone number, fax number, and email address is available on the **Contacts** page.



Navigation of the newly redesigned Department of Botany website at <https://naturalhistory.si.edu/research/botany> begins with the orange circle on the left of the screen.

The digitization conveyor project hits 2 million scans

After three years of production, the Department of Botany is excited to announce that the Botany Digitization Conveyor Belt has reached 2 million scans of botanical specimens this December 2018. This number also coincides with the transcription of 1.5 million conveyor specimen images. Total number of inventoried specimens from the US National Herbarium has now reached over 3 million records, and can be found in our online catalog (<https://collections.nmnh.si.edu/search/botany/>).

These landmark figures are the result of very hard work from the Department of Botany and the Smithsonian's Digitization Program Office staff, in collaboration with the digitization company Picturae. The Botany Conveyor Belt runs five days a week, capturing the images of 3,000-4,000

pressed specimens every day, or one specimen image every 4-6 seconds. Staff are continually preparing, moving, scanning, filing, and repairing botanical specimens for this long-term project.

Which plant families can be found in the online catalog? The digitization team has completed a large portion of the dicotyledons, including Asteraceae, Fabaceae, Rubiaceae, Melastomataceae, Acanthaceae,

Ericaceae, and many more. The pteridophytes and Cyperaceae are also complete. The team is now working their way through the last third of the dicots, and expect to be 80 percent complete with this group by late spring 2019. The goal is to digitize all pressed specimens in the US National Herbarium within the next three years, funding permitted. Stay tuned for updates in the coming months and years.



Clockwise from top: Sarah Evans prepares to scan an herbarium specimen; *Euonymus americanus* (Celastraceae), just one of the 2 million scanned botanical specimens from the US National Herbarium; the digitization team – Julie Weinstein, Sarah Evans, Victor Shields, and Genevieve Stegner-Freitag. (staff photos by I. Lin)



The 2019 Smithsonian Botanical Symposium, May 17, to explore plant domestication

The Department of Botany and the United States Botanic Garden will convene the 2019 Smithsonian Botanical Symposium, “**Beneath their Notice: Domestication of Useful Plants**,” to be held at the National Museum of Natural History in Washington, D.C., on May 17, 2019.



Darwin was not only interested in Galapagos finches, but he also spent a considerable amount of time experimenting and thinking about domestication of animals and plants. He took a dim view of progress in understanding domestication in the vegetable kingdom and wrote, “Botanists have generally neglected cultivated varieties, as beneath their notice” (*The Variation of Animals and Plants under Domestication*, 1868). This is no longer the case. There is a resurgence of research focused on the plants most essential to human life.

The 17th Smithsonian Botanical Symposium will highlight current research into the domestication of crops and their wild relatives as well as ornamental plants. Speakers will include archaeobotanists, botanists, geneticists, and paleoethnobotanists utilizing molecular and genomic tools unknown to Darwin.

A full lineup of speakers will present their talks during the day at the National Museum of Natural History’s Baird Auditorium. The event will be followed by a reception and poster session at the U.S. Botanic Garden that evening.

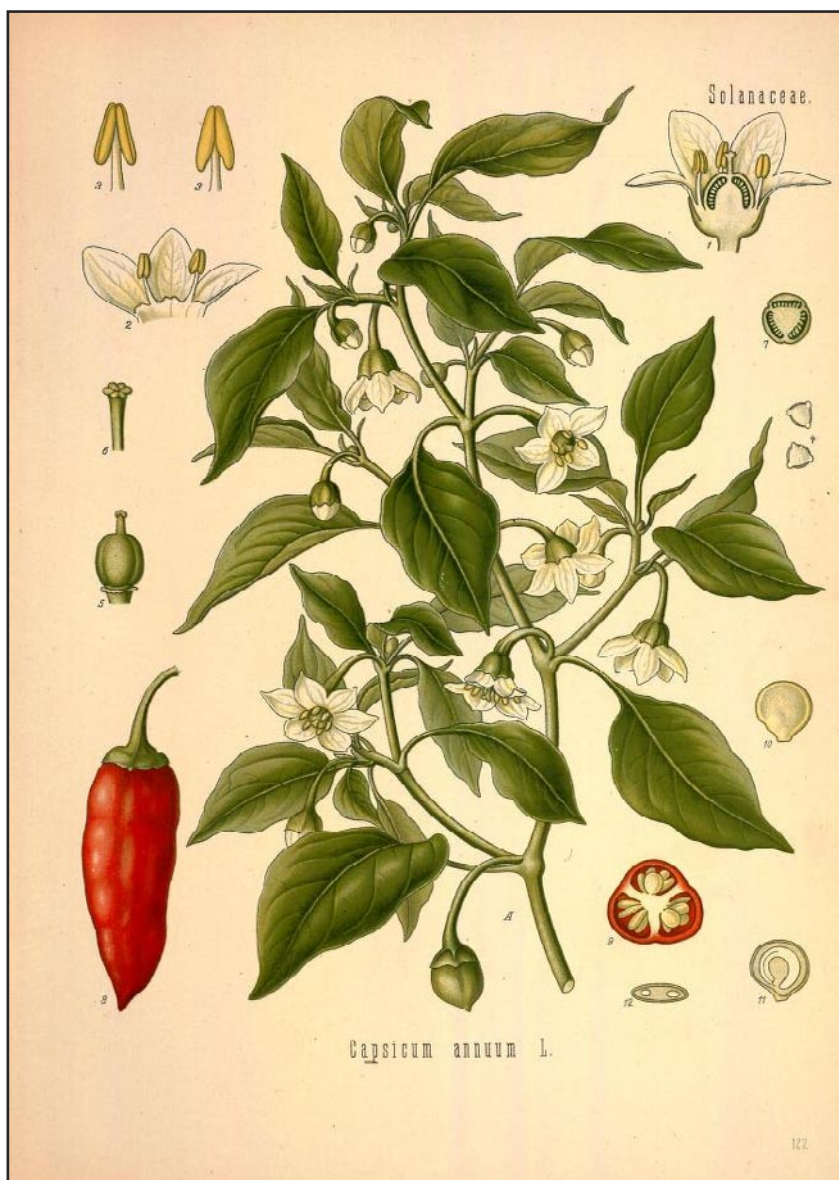
In addition, the 17th José Cuatrecasas Medal in Tropical Botany will be awarded at the Symposium. This prestigious award is presented annually to an international scholar who has contributed significantly to advancing the field of tropical botany. The award is named in honor of Dr. José Cuatrecasas, a pioneering botanist who spent many years working in the Department of Botany at the Smithsonian and devoted his career to plant exploration in tropical South America.

Abstracts for poster presentations may be emailed to sbs@si.edu. Topic must be related to the study of plant domestication

and contain original research. The deadline for abstract submission is April 12, 2019. Abstract submissions should include the following: Author(s) name(s) including affiliation(s) and email address(es); list the title in sentence case; titles are limited to 150 characters; abstracts may not exceed 1,500 characters

including spaces. Posters should be no larger than 30” x 40” (portrait orientation). Presenting authors are required to attend the poster session (6:30 pm – 8:30 pm) to take advantage of opportunities to discuss their work with symposium participants.

There is no registration fee to attend the symposium or reception, but attendees must register online at <http://sbs19.eventbrite.com/>. Email sbs@si.edu for more information.



Capsicum annuum L. from Köhler's *Medizinal-Pflanzen in Naturgetreuen Abbildungen mit Kurz Erläuterndem Texte*. 1883-1914. Gera-Untermhaus, Germany. <http://biodiversitylibrary.org/page/303190>

The search for *Santessonia* continues

By Julia Beros

"It was a good story while it lasted," he chortled while shuffling the lichen Type folders back into their cabinet shelf. From the cabinet marked "SAG - SAZ," and no sight of the elusive *Santessonia*. He tapped the folders back in place, assumed a posture of momentary reflection, and ushered us to his office. The story began after lunch as Harold Robinson, of bryophyte, cryptogram, Diptera, and Asteraceae fame, regaled the tale of Mason Hale's eminent discovery of the highly unusual lichen, *Santessonia namibensis*, the first of its kind. Hale was a prominent lichenologist, George Llano's successor at the Smithsonian Institution, and made major contributions to taxonomy, in particular to Parmeliaceae. Well-traveled and a remarkable linguist, able to read and write in Japanese, Finnish, and Tamil for starters, he once even corrected Robinson's grammar along with another notable linguist George Steyskal, explaining that the origin of the article "a" is the abbreviated form of "an."

Well into his career studying lichens, Hale was on a trip to Namibia collecting in the desert amongst the obscure welwitschia plants, two leaves extending endlessly into the landscape of sand. It was there behind a vale of drying shredded leaf ends curled around the base of a welwit-

schia that he noticed something distantly familiar: with black globular apothecia speckling the surface, it resembled a cosmic system (of lichen). Immediately he knew it was a remarkable find. A chance discovery. Without even looking at the spores Hale was certain that this was a new genus.

Before DNA analysis was practical and popular, spores were the main indicator of genetic differentiation among species. Upon returning to the Smithsonian, working at his most enthusiastic as Robinson describes, Hale looked closer: peculiar as well, the double-celled thick walls of the spores were similar to the genus *Buellia*, though they lacked any other semblance. To describe the species Hale chose a collection made by E. R. Robinson, another significant lichenologist and prolific collector, to make the type. Enlisting Gernot Vobis to help in authoring the new lichen, Hale paid tribute to Swedish lichenologist Rolf Santesson. In 1978 their new species *Santessonia namibensis* was published in the journal *Botaniska Notiser* v.131.

Entrenched in Robinson's storytelling, I wanted to see the type specimen in the lichen-flesh. We hurried down the hall to the cabinets, only to be left unrewarded and puzzled. "I seem to be misleading my-

I wanted to see the type specimen in the lichen-flesh, only to be left unrewarded and puzzled.

self," Robinson said aloud. "No," I reassured, "you are misleading *both* of us." Certain of his history, Robinson found his (and formerly Hale's) copy of the 3rd volume of the *Index Nominum Genericorum* (Plantarum). Near to the back, printed on all of about a centimeter of the page, his story was confirmed: "*Santessonia Hale & Vobis*, published 1978." Yet where had the original specimen vanished?

Upon returning the next day to the herbarium, I found a packet of papers lain across my work station: a printed email correspondence with John Boggan (collections management of the Type Specimen Herbarium) and a scanned copy of the original genus publication, both gifts from Robinson. What great proof! Proof, maybe, of the great poof, the vanishing of the type. To my disappointment the correspondence only confirmed that there was no paper trail leading to the location of the specimen, and it was certainly a mystery that it was unfindable. Equally disappoint-



A specimen of *Santessonia namibensis* collected from the Skeleton Coast National Park, Namibia, by Mason Hale in 1986. (photo by G. Krupnick)

ing was the publication, which pointed out that as a co-authored genus two isotypes were sent to Lund and Uppsala, and the Holotype was sent with Hale to the Smithsonian.

Boggan continued to clarify the murky details of this somewhat foolish pursuit. While the Smithsonian does have multiple accessible specimens of *Santessonina nami-bensis*, some of which are Hale's, "none of them predate the publication of the name." Boggan further explained that in 1990, at only 61 years old, Hale passed away from illness, leaving much of the work he had begun without closure. It is quite sad to think that his work was cut short because of something beyond his control, but perhaps it holds the potential for new lichenologists to pick up some of his loose ends.

Frustrating to say the least, on the brink of this wild goose chase unfolding, the government shutdown closed off potential routes to continue the search. A story like this is not uncommon with herbarium specimens. Collections are so vast and so old, and collectors have a voracious appetite, tirelessly adding new specimens and increasing their workload. There is great clutter and chaos, even in the most diligent of institutions, and among the clutter and chaos are great treasures: specimens of great importance lost to the backlog of bureaucracy or the ephemerality of botanical fame, misidentified specimens that could hold the key to a family reorganization, seed packets of extinct species, or even a love letter tucked away in a collector's folders. Despite the setbacks of disorder and the capricious state of the government, the search for the *Santessonina* type continues. Perhaps under a pile of loans, or misread and misplaced, or possibly in a cabinet in Sweden, the missing type waits to be found. To honor the legacy of the foundational work of Hale and others and to provide foundations for future studies, scientists will forever be busy in the Herbarium, making discoveries of their own.

Julia Beros is a volunteer working with Research Associate G. Karen Golinski on the bryophyte collection reorganization. She studied botany at Sarah Lawrence College and worked in botanical science at the New York Botanical Garden.



IN MEMORIAM

Karen Adey, producer and executive producer of more than a hundred Smithsonian films, passed away on December 29, 2018. Wife of Research Botanist Emeritus, **Walter Adey**, she has spent the past 20 years managing and accompanying research cruises aboard the Adey research vessel *Alca i* in the North Atlantic. Adey worked closely with her husband on directing underwater videos and on

the research and development of new water cleaning technology. Early in her career, she founded the Smithsonian's Motion Picture Unit in 1969, and in the 1980s, she was the Deputy Director of Smithsonian Productions, a now shuttered film, video, and radio unit. Her productions won 5 Emmy Awards and more than 70 national and international honors.



DEPARTURES

Farewell to Ida Lopez

By W. John Kress

Ida Lopez came to the Smithsonian in June 1998 as a Museum Specialist to work with me to develop the Zingiberales and Monocot Research Program in Botany. I could tell immediately when I first met her that our partnership in pursuing science, collection development, and running the day-to-day operations of the lab had the potential to be a long-term interaction. Now, twenty years later, my first impression has proven correct. Congratulations, Ida, on a tremendously successful career.

I do not think Ida knew much about Museum Collections when she arrived, but

the enthusiasm and welcoming spirit of the Collections Management Team in Botany quickly solved that problem and she became a specimen devotee. This was not only true concerning herbarium specimens, but also the development of our extensive and important living collection in the Botany Greenhouses. Over the years the improved care and maintenance of both living and preserved specimens became one of her prime concerns. And the devotion she has shown towards our living collections, not only the Zingiberales, but all of our research specimens, especially

over the last several years with the lack of adequate greenhouse management, has been beyond the call of duty. All of us in the Department thank her for her efforts.

With regards to research, Ida has been instrumental in most if not all of the hundreds of papers and books that have been published through our lab during her tenure. Not only has she been a co-author on a number of those papers, but her keen eye for effective and clear figures and illustrations was unsurpassed. The book I published with Ted Fleming on the “Ornaments of Life” (University of Chicago Press) is loaded with Ida’s handiwork and our opus on “Methods and Protocols of DNA Barcoding” (Humana Press/Springer) could not have been done without her contributions.

Whenever I came back from a field trip that was focused on pollination of *Heliconia* in the Caribbean or searching for new gingers in Southeast Asia, I realized that Ida also needed that kind of field experience to help her manage all the other aspects of the lab. So off we went to Dominica to build an experimental shade house for breeding system studies in *Heliconia*, and off we went to Myanmar to work with the Forestry Department, and off we went to Yunnan, China, to collect gingers. I was right: her excellent assistance in the field provided a much better background for coordinating our research activities at home. Time to go back to the field, huh, Ida?!?

In addition to those full-time activities in research and collections, Ida managed the lab and all the lab workers within. Not only did she manage the funds for our research grants, both internal and external, but she also initiated the contracts and placed all the orders. Probably most important was the wonderful care that she provided for the scholarly visitors, the interns, the post-docs, the students, and all the other colleagues who passed through the lab. It was an unending stream of personalities. Probably one of her most rewarding activities was mentoring young scientists through the YES Program at NMNH and through local high schools. I thank her for all of these interactions that made the lab so rich and vibrant.

This short summary of Ida’s time at the Smithsonian is starting to sound like a “career performance appraisal” for Ida. Ho-

wever, performance appraisals really do not always get to the core of one's contributions to the museum and to science. Ida was deeply committed to learning about and participating in natural history science. And I think she made our lab exceptional in that way because everyone who came to the lab learned to share that commitment. Our scholarly activities were a success because to her. Thanks, Ida. Yes, thanks so much.

Chair With A View

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Cape Cod, Cape Verdeans traditionally provided a cheap source of labor, a mean tradition going back to whaling ship days. Working long hours gave each of the men (they were all men) in the dairy a chance to save and possibly start a family. Alternatively, if they were raising or had raised a family, the goal was to retire and purchase a farm in the Cape Verde Islands. I hope they all did well. I never saw a single one of my co-workers after that summer and there was certainly no easy way to communicate. Apart from the supervisor, no one spoke English and my Portuguese was limited to a few choice swear words.

Is there a moral to my story other than that it is a long-winded explanation as to why I am not terribly fond of milk? I think there are several. A number of us working in this department are lucky. We get to pursue ideas for a living and if our job is physically challenging it is only because we opt to head into the field to hunt for plants in exotic locations. Some (but not all) of us are empathetic and appreciate how much our privilege is built on the work of others who deal with support activities: house-keeping, maintenance, security, finance, and administration. I try not to forget this and although I am not demonstrative (reticent Yankee that I am), I do appreciate all the hard work done by staff that lets us turn objects into wonder.

TRAVEL

Pedro Acevedo traveled to Quito, Ecuador (10/15 – 10/28) to attend the XII Congreso Latinoamericano de Botánica; and to São Paulo, Brazil (10/29 – 12/22) to conduct fieldwork in the states of Rondonia and Para, Brazil.



NEW FACES

Kathryn Picard joined the Department of Botany as a postdoctoral fellow in October 2018. Working under the supervision of **Eric Schuettelpelz**, she is studying the incidence and evolutionary consequences of apomixis in the diverse fern order Polypodiales. Picard earned her Master's degree at the University of Alabama where she modeled the early evolution of plant-fungal symbioses using a chytrid-alga system.

For her doctoral research at Duke University, Picard explored the phylogenetic diversity of marine fungi and developed high-throughput molecular tools for generating reference sequence data from uncultured marine taxa. Her research interests include systematics of the flagellated fungi, the evolution of plant-fungal mutualisms, and developing genetic resources for "dark taxa".

Barrett Brooks traveled to Tahoe City, California (10/8 – 10/14) to attend the 2018 American Association of Underwater Scientist Symposium, where he was recertified as an Instructor for the Divers Alert Network Divers First Aid course.

Laurence Dorr traveled to Houghton, Michigan (11/27 – 12/2) as an invited speaker to Michigan Tech University to give a talk on machine learning using digitized data.

Pedro Jiménez Mejías traveled to Natal, Brazil (10/6 – 10/26) to participate in the Monocots VI Meeting and to collect plants.

Joseph Kirkbride and **John Wiersema** traveled to Quito, Ecuador (10/21 – 10/26) to attend the XII Congreso Latinoameri-

cano de Botánica; and to lowland Ecuador (10/27 – 11/14) to conduct field studies.

W. John Kress traveled to Natal, Brazil (10/5 – 10/12) to present a keynote lecture, "Monocots in the Anthropocene: species interactions in a rapidly changing world," at the Monocots VI Meeting.

Paul Peterson traveled to Natal, Brazil (10/5 – 10/16) to present two lectures at the Monocots VI Meeting; and to Aguascalientes, Mexico (10/29 – 11/29) to collect plants with colleagues from the Instituto Politécnico Nacional.

Peter Schafran traveled to Alexandria, Louisiana (10/23 – 10/26) to attend the 12th Biennial Longleaf Conference and conduct field work.

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Travel

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Eric Schuettelpelz traveled to Taipei, Taiwan (10/8 – 10/19) to give a keynote presentation, “As the spores settle: seeking stability in pteridophyte systematics,” at the Asian Symposium of Ferns and Lycophytes, and to conduct fieldwork.

Alice Tangerini traveled to St. Louis, Missouri (10/10 – 10/14) to participate in a conference of the American Society of Botanical Artists.

Jun Wen traveled throughout China (9/25 – 10/15) to give an invited speech on “Plant systematics: A century of progress and outlook for 2050” at the 90th anniversary celebration of the Institute of Botany, Chinese Academy of Sciences, to conduct field and herbarium work in Hubei, Shanxi, and Yunnan, and to receive an award on outstanding contribution to IBC 2017 from the Botanical Society of China.

Elizabeth Zimmer traveled to Norfolk, Virginia (11/29 – 12/1) to present a talk on “Using DNA data for plant evolutionary genetics: progress and prospects,” and to attend a dissertation committee meeting of graduate fellow **Peter Schafran** at the Old Dominion University.

STAFF ACTIVITIES

Gary Krupnick attended the 18th Annual International Conference of the North American Pollinator Protection Campaign (NAPPC) held at the U.S. Department of Agriculture in Washington, DC. At the meeting, NAPPC convened nine 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 urban pollinators. Krupnick co-chaired the Selecting Plants for Pollinators task force that explored pollinator-friendly practices for producing plant materials and accessibility for consumers.

VISITORS

Jie Yu, Southwest University, China; Plant DNA Barcoding (1/22/18-1/4/19).

YaLi Wang, Kunming University, China; *Alpinia* (Zingiberaceae) (7/25-11/30).

Elizabeth Joyce, Australian Tropical Herbarium and James Cook University, Australia; *Aglaia elaeagnoidea* (Meliaceae) (9/17-10/5).

Boy Scout Troop #36, Carrollton, Virginia; Plant science merit badge (10/6).

Simone Cartaxo Pinto, Museu Nacional, Brazil; Vitaceae pollen (10/15-10/19).

Susy Castillo Ramon, Museo de Historia Natural, Peru; South American *Gentianella* (Gentianaceae) (10/15-11/2).

Betsabe Castro Escobar and **Victor De Jesus Reyes**, University of California at Berkeley; Bignoniaceae (10/29-11/1).

Fred Barrie, Missouri Botanical Garden; Flora Mesoamericana (11/5-11/26).

Jackeline Salazar, Universidad Autónoma de Santo Domingo, Dominican Republic; Canellaceae (11/9-12/6).

Raymund Chan, Independent researcher, Singapore; Compositae (11/12-11/17).

Jennifer DeMuria, Alta Terra, LLC, New York; Asian and Pacific Violaceae (11/13-11/16).

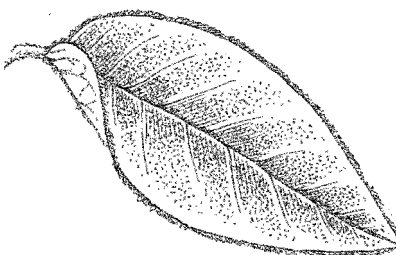
Marcelo Pace, Universidad Nacional Autónoma de México; Malpighiaceae (11/13-11/16).

Patricia Chan, Cornell University; *Isoetes* internship (11/19/18-02/28/19).

Julia Campbell-Such, National Museum of African Art, **Kathryn Gabrielli** and **Casey Mallinckrodt**, Virginia Museum of Fine Art; African woods (11/27).

Terry Lott, Florida Museum of Natural History; Veinless winged seeds of Amaryllidaceae, Bombacaceae, Malvaceae, Tiliaceae, Celastraceae, Meliaceae, Myrtaceae, and Proteaceae (11/29-11/30).

Fernando Matos, New York Botanical Garden; *Elaphoglossum* (Dryopteridaceae) (12/3-12/4).



PUBLICATIONS

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Art by Alice Tangerini

Dryopteris macropholis Lorence & W.L.Wagner

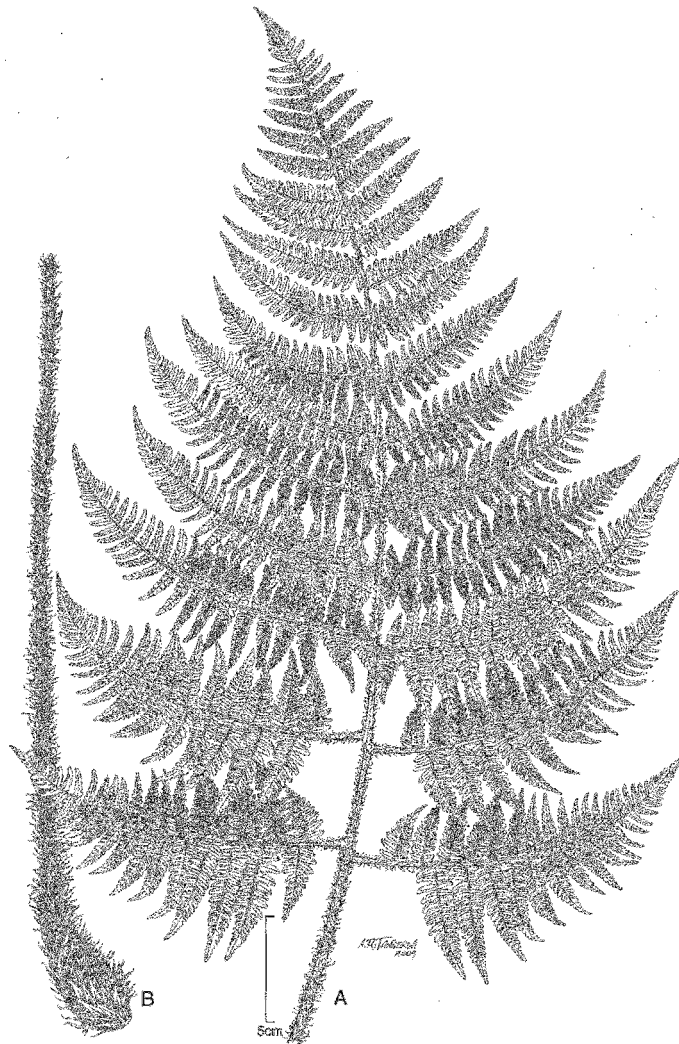
Asexuality, in the form of apomixis, may help ferns colonize islands more readily, but little is known about the incidence of asexuality across the group.

Dryopteris macropholis is an endangered fern endemic to the Marquesas Islands.

Recent analysis of spores from the type specimen revealed that it is an apomict (see cover article). Alice

Tangerini began this illustration in Kauai at the National Tropical Botanical Gardens in September 2005.

She was on a two-week assignment illustrating Marquesas Island ferns for Warren Wagner. Tangerini penciled the drawings at NTBG using collections from Wood 10489. She later inked them in 2009 for the publication.



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