NATIONAL MUSEUM of NATURAL HISTORY

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Department of Botany & the U.S. National Herbarium

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Species discovery is propelled as scientists use drones to discover rare Hawaiian plants

By Jon Letman, National Tropical Botanical Garden

Scientists in Hawai'i have achieved what is believed to be the first new species discovery using aerial drone technology. Researchers from the National Tropical Botanical Garden (NTBG), Smithsonian Institution, Outreach Robotics, and Hawai'i's Division of Forestry and Wildlife discovered a previously unknown cliff-dwelling plant using drones and a robotic collecting arm on the island of Kaua'i.

The plant, *Schiedea waiahuluensis*, is a member of Caryophyllaceae, the carnation family, and one of 36 *Schiedea* species native to Hawai'i, 12 of which are found only on Kaua'i.

The discovery reveals new possibilities for plant conservation in extreme cliff habitat and also yielded the collection of a tiny native insect called a mirid bug which, if proven to be a new species, may also be the first collected by drone.

First photographed by NTBG drone operator Ben Nyberg in January 2022, the *Schiedea* was presumed to be a species classified as extinct. In March 2022, after plant cuttings were collected using a robotic arm called the Mamba, researchers believed they had found a new species.

Seeds from the plants were sent to botanists Ann Sakai and Steve Weller at the University of California, Irvine, who specialize in the genus *Schiedea*. Examination of plants grown from seed confirmed it was indeed a species new to science. They said using drones provides detailed information on plant population size and enhances the ability to develop more comprehensive conservation planning.

Smithsonian research botanist and NTBG McBryde chair of Hawaiian Plant Studies Warren Wagner and NTBG senior research biologist Ken Wood named the species *Schiedea waiahuluensis* for the region in which it was discovered.

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> **"Using drone technology increases chances to better understand the diversity of lineages in Hawai'i in sheer cliff habitat."**
>
> *- Warren Wagner, Smithsonian Botanist*

Species discovery

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Follow-up collecting using drones and the Mamba have provided additional seeds and herbarium specimens. Scientists estimate the new *Schiedea* numbers around 345 individual plants known only from inaccessible rocky cliffs.

NTBG's drone operator, Ben Nyberg, called use of the new technology "a game-changer for extreme cliff habitats."

"We are learning so much about these often overlooked environments with drones and the Mamba robotic arm assisting plant conservation in ways we never thought possible," Nyberg said.

Wagner, lead author of a paper describing the new *Schiedea* in the open-access journal *PhytoKeys* (2024; https://doi.org/10.3897/phytokeys.247.130241), said, "using drone technology increases chances to better understand the diversity of lineages in Hawai'i in sheer cliff habitat. Moreover, combining drone technology with field collecting and research programs will decrease the impact on sensitive areas and allow for more effective surveys of invasive species."

While discovery of *Schiedea waiahuluensis* is the first of its kind, it isn't the first time NTBG, Québec-based Outreach Robotics, and Adam Williams, a botanist at Hawai'i's Division of Forestry and Wildlife, have successfully located and collected rare plants on Hawai'i's high cliffs. In 2019, NTBG used a drone to rediscover *Hibiscadelphus woodii*, a hibiscus relative previously thought to have gone extinct.

Since 2022, NTBG and its partners, including the Plant Extinction Prevention Program, have used drones to locate and collect plant material from at least 15 rare and endangered native Hawaiian plant species in extreme cliff habitat.

Tiffany Knight, NTBG's director of science and conservation said, "NTBG has a long history throughout the Pacific of

Drone collected specimen with endemic mirid bug on upper right bud. (photo by Ben Nyberg)

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On the cover: The flowers of a drone-collected specimen of *Schiedea waiahuluensis*. (photo by K.R. Wood)

improving our understanding of plant diversity through floristic discovery — finding and describing new plant species and rediscovering species that were presumed extinct. Discovering and collecting this new *Schiedea* demonstrates the conservation value of employing new technology and our tools and capacity just keep getting better."

Read more about the discovery of *Schiedea waiahuluensis* at https://blog.pensoft.net/2024/10/09/drone-discovers-new-plant-species-in-hawaii/ and read the newly published description at https://doi.org/10.3897/phytokeys.247.130241.

- Reprinted from NTBG Stories, October 9, 2024

Top: With drone in background, *Schiedea waiahuluensis* as seen growing on bare rock surfaces in small pockets of soil on the dry cliffs of Waiahulu on the island of Kauaʻi. (photo by Adam Williams). Bottom: Hanging from drone, the collecting arm with a specimen. (photo by Ben Nyberg)

It's time to get serious about nature

When John Kress (Curator Emeritus) returned from Cali, Colombia, after attending the 16th Conference of the Parties to the United Nations Convention on Biological Diversity (COP16), he and two other attendees representing Vermont submitted an op-ed to a local on-line newspaper, Vermont Digger. *In it, they encourage all Vermonters to get involved in the conservation of biodiversity and especially to support the implementation of Act 59 in Vermont. Kress also was at COP16 representing the global scientific and museum community on the issue of Digital Sequence Information (DSI) to promote the open access of DNA for benefit sharing (see page 5 in this issue of* The Plant Press*).*

The opinion article is reprinted here in its entirety.

This commentary is by W. John Kress of Dorset, Curt Lindberg of Waitsfield, and Walter Poleman of Burlington. They are members of the Vermont Biodiversity Alliance.

The 16th Conference of the Parties to the United Nations Convention on Biological Diversity, convened in Cali, Colombia, has ended. The two weeks were packed with plenaries, regional meetings, contact groups, friends of the chairs, summits, side events, focus groups, presentations, informal discussions and outside protests.

With 23,000 participants representing more than 190 countries, the conference halls were bursting. With all the political, economic and social turmoil going on in the world, it is refreshing that the one thing on everyone's mind at this conference was the planet's biodiversity and how to conserve it. More simply put: life on Earth.

The three goals of the convention are the conservation of biodiversity, the sustainable use of biodiversity, and the equitable access and benefit sharing of biodiversity. To achieve these goals the convention has identified 23 essential targets. These are known as the global biodiversity framework, and it was established at the 15th Conference of the Parties.

These targets address plans for protected areas, habitat restoration, capacity building, invasive species, genetic resources, digital sequence information, business and finance, and the rights of Indigenous peoples, women and youth. Of course, everyone has strong opinions and positions on each issue. Following the adoption of these 23 targets at COP15 in Montreal in 2022, the parties met this year in Colombia to discuss progress and strategies toward meeting them.

We Vermonters attended the first week of COP16 representing the Vermont Biodiversity Alliance as observers to see what this whole thing was about and bring our own state's perspective and experience in protecting biodiversity to this international forum. Of concern to many of us is the fact the United States has never actually ratified the Convention on Biological Diversity. Although it was signed by President Bill Clinton many years ago, the U.S. Senate has yet to take action.

This means that we, as Americans, are the only U.N. member state that has no seat at the negotiating table, and our voices can only be heard from the outside. It is also a little embarrassing that our national government has more or less ignored this critical global forum (The U.S. State Department was represented, but not as a formal party to the negotiations).

One thing that we came to Cali to determine was if we need an active statewide coalition so that Vermont will have a stronger voice at the Convention on Biological Diversity. The clear answer to that proposition is YES.

Everyone we talked to in Cali from around the world was keenly interested in what we are doing in Vermont, especially our Act 59 (Vermont State H.126) (Community Resilience and Biodiversity Protection Act) that mandates the protection of 30% of land in the state by the year 2030 and 50% by the year 2050.

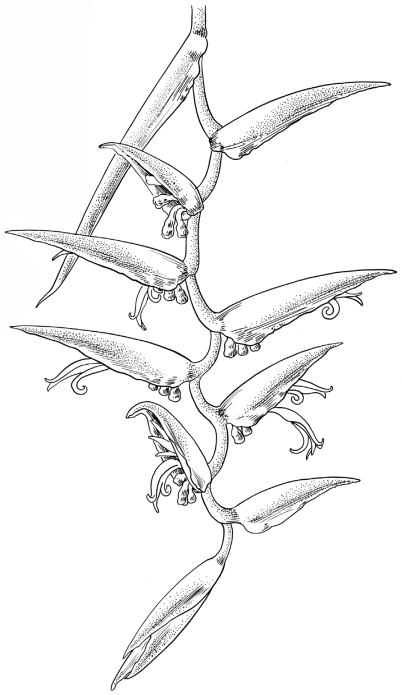
Although "30×30" is a key target of the international framework, Vermont is out in the lead to get this target accomplished thanks to our state representatives, many Vermont conservation organizations, the Agency for Natural Resources, and the Vermont Housing and Conservation Board.

Equally important was that in Cali we met American citizens from other states dedicated to conserving biodiversity. A delegation from California included state representatives such as the secretary of the natural resources agency, non-governmental organizations, academicians, and private conservation groups, all of whom have formed a coalition similar to the Vermont Biodiversity Alliance. We also met and shared ideas on the Convention on Biological Diversity with an alliance from San Francisco and a subnational delegation from Québec, Canada, Vermont's neighbor to the north.

It was immensely encouraging to meet and discuss with these fellow COP16 attendees how state, regional and local entities can advance biodiversity conservation in the absence of leadership at the federal level. The importance of such subnational efforts on biodiversity conservation was emphasized at COP16 as being vital to success. Such efforts become even more important in this country, given the results of the recent presidential election.

The international issues surrounding nature protection are complex but not insurmountable. Our collective efforts could not come at a more important time as biodiversity across the globe sharply declines and leads to cascading, detrimental effects on human health and well-being.

Vermont — although we are a small state — has much to contribute, and we are determined to have an impact. We encourage all Vermonters to get involved in the conservation of biodiversity and especially to support the implementation of Act 59 in our state.



Researchers call for better coordination of the rules for benefit sharing for the use of digital sequence information

- Adapted from EINPresswire.com

The 16th United Nations Biodiversity Conference (COP16) was held in Cali, Colombia, in October. At the conference researchers and international partners elucidated a message on the management for the global harmonization of the different regulations on digital sequence information, as its negotiations are already well advanced. The importance of having freely accessible digital sequence information globally has been demonstrated in the fight against COVID. International cooperation and the sharing of the virus' genetic sequence information were prerequisites for the rapid development of diagnostic procedures and vaccines.

"Various United Nations bodies are simultaneously developing rules for the benefit sharing of digital sequence information. It is extremely important for research to have global harmonization of these rules," informs Amber Hartman Scholz (Leibniz Institute DSMZ-German Collection of Microorganisms and Cell Cultures), the corresponding author of the article, "Harmonize rules for digital sequence information benefit-sharing across UN frameworks," published in *Nature Communications* (https://doi.org/10.1038/s41467-024-52994-z). Smithsonian Institution's **W. John Kress** serves as a co-author on the article.

Open and free access to digital sequence information (DSI) is a basis of life science research. In their article, the authors call for the development of harmonized mechanisms for the use of DSI that are compatible with scientific practices and database structures. At the same time, these mechanisms should maximize shared use to achieve the goals of the legal frameworks. "International policymakers have the mandate to conduct negotiations in their area. But science knows no legal and jurisdictional boundaries. Researchers use genetic data and need open access to the large central public databases around the world. If negotiators develop new rules for use in the commercial sector with UN instruments, these rules clash with the scientific practice," explains Dr. Amber Hartman Scholz.

A harmonized multilateral system for Open DSI must have clear and simple standardized terms of use for all publicly available data. The authors of the *Nature Communications* publication call for international and uniform legal certainty in the interest of scientific progress. Harmonizing the existing frameworks is challenging because they each serve a different purpose: conservation and sustainable use of biological diversity (Convention on Biological Diversity/Nagoya Protocol/Biodiversity Beyond National Jurisdiction), detection, prevention and eradication of diseases (Pandemic Influenza Preparedness, World Health Organization's Pandemic Agreement) and food security (International Treaty on Plant Genetic Resources for Food and Agriculture). Each set of rules has different decision-making processes, compliance measures and designated national negotiators (often from different governmental departments) with mandates that don't overlap or even compete for budgets and political priorities. If benefit-sharing from DSI is designed in isolation for each of these forums rather than in an interconnected global context, there is a real risk that legal uncertainty and red tape will reduce the value of the data.

22nd National Botanical Symposium to explore the future of collections-based plant science

The Smithsonian's National Museum of Natural History Department of Botany, the United States Botanic Garden, and Smithsonian Gardens will hold the 22nd National Botanical Symposium (formerly Smithsonian Botanical Symposium), "**The Future of Collections-Based Plant Science**," on May 16, 2025.

What does the future hold for herbaria and botanic gardens as the goals, visions, and objectives of these institutions adapt to a modern era while stewarding important preserved and living collections? Collections-based science, whether it is based on preserved plant specimens, living collections, or both, has entered a new age as novel tools, such as artificial intelligence (AI), machine-learning, and genomics are being used more broadly by botanists. Contemporary plant science now involves big data and is highly interdisciplinary. International networks and collaborations with a diversity of people and organizations have expanded the reach, breadth, and depth of botanical research. Botanists, horticulturists, conservation biologists, social scientists, community members, and artists are collaborating to advance our understanding of plants and the application of this knowledge in their respective fields. This symposium will bring fresh thought into a new vision for collections-based plant science.

In addition, the 22nd José Cuatrecasas Medal for Excellence in Tropical Botany will be awarded at the Symposium 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 and taxonomy in tropical South America.

The Symposium will feature invited speakers giving afternoon presentations in Baird Auditorium of the National Museum of Natural History (NMNH) in Washington, D.C., for both in-person and virtual guests. The talks will be followed by a poster session and evening reception for in-person guests at the Conservatory of the U.S. Botanic Garden.

The event is free, but all attendees, both in-person and virtual, must register in advance. Registration and poster abstract submission will begin in February 2024.

A new grass family phylogeny is published

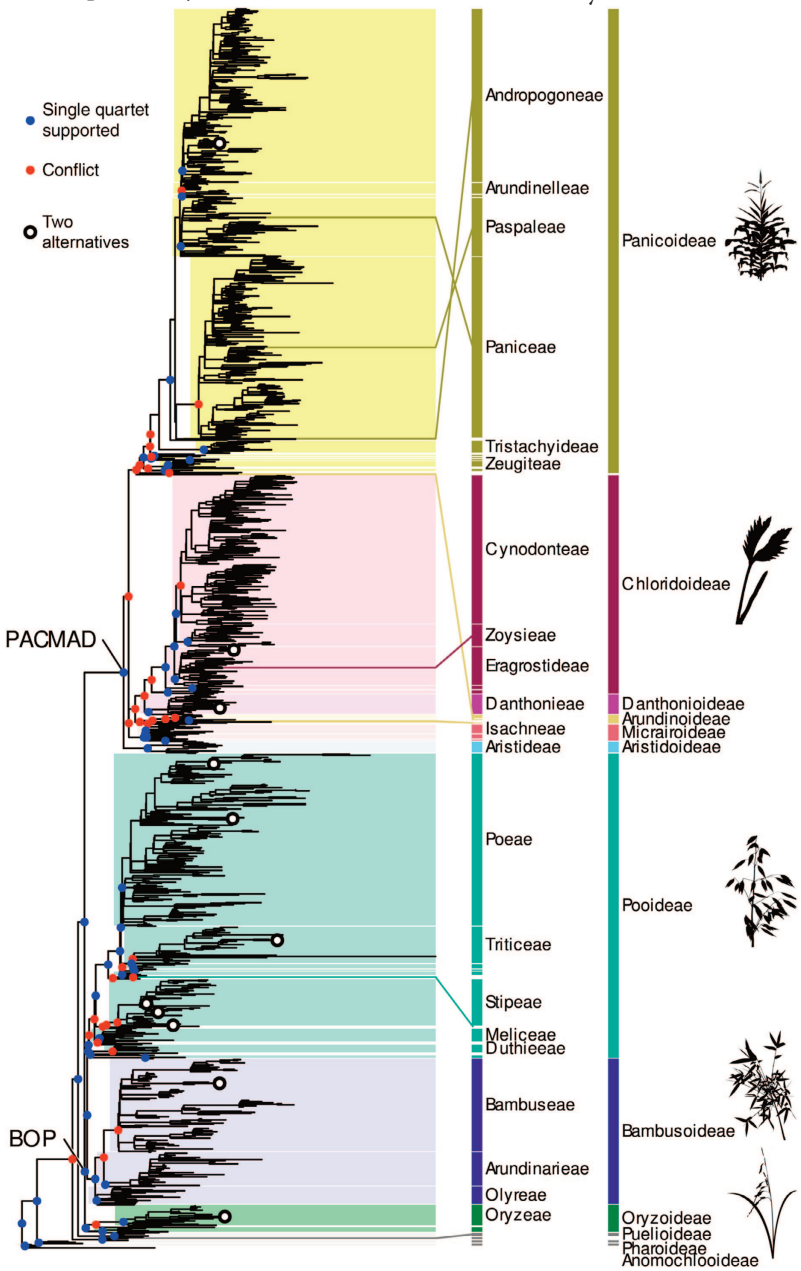
A collaborative effort from the Grass Phylogeny Working Group III has resulted in the publication of a new grass phylogeny inferred from 331 nuclear genes for more than 1,100 grass species entitled, "A nuclear phylogenomic tree of grasses (Poaceae) recovers current classification despite gene tree incongruence" (*New Phytologist*, https://doi.org/10.1111/nph.20263). The international team of 74 scientists, including the Smithsonian Institution's **Paul Peterson** and **Rob Soreng**, provide a corrected framework for revising the grass tree of life, which will support further research into grass evolution.

The grass family has nearly 11,800 species in 791 genera, 109 subtribes, 54 tribes, 7 supertribes, and 12 subfamilies (Soreng et al., 2022; https://doi.org/10.1111/jse.12847; classification posted on TROPICOS). Poaceae is among the largest plant families of the world and is widely used by humans for food (rice, corn, wheat), building materials (reed, bamboo), and biofuels (sugarcane, switchgrass). Knowing the evolutionary history of this important plant family and how the taxa are related will help advance comparative biological research, the impact of hybridization, studies in crop breeding, understanding biodiversity and ecosystem conservation, and improve our classification among the subfamilies, tribes, subtribes, and genera.

The newly published nuclear DNA tree covers 79% of grass genera. Herbarium specimens were used to sequence 21 rare genera and one hybrid for the first time (Pharoideae: *Scrotochoa*. Bambusoideae: *Ekmanochloa*, *Fimbribambusa*, *Miniochloa*, *Parabambusa*, *Pinga*, *Ruhooglandia*, *Widjagachloa*. Pooideae: *Agropyropsis*. Panicoideae: *Asthenochloa*, *Bhidia*, *Dilophotriche*, *Hydrothauma*, *Oryzidium*, *Pogonachne*, *Pseudodichanthium*, *Thedachloa*, *Thyridachne*, *Trilobachne*. Chloridoideae: *Kampochloa*, *Pommeruella*, × *Cynochloris*), confirming or fine-tuning their classifications.

The gene set was leveraged from five diverse sets of genomic data: (1) 450 Illumina target capture read accessions enriched with the Angiosperm353 probe set; (2) 295 Illumina shotgun whole-genome sequencing accessions; (3) 17 Illumina target capture read accessions enriched with 122 nuclear loci; (4) 343 assembled transcriptomes assembled from two recent studies; and (5) 48 whole genome sequences from PHYTOZOME v.13. The nuclear gene tree topology was compared to plastome regions by a 910-tip tree using the sequences of 70 coding plastome regions and the *trnL-trnF* intergenic region. Evidence for reticulations (hybridization, introgression, and lateral transfers) was investigated using gene tree-species tree reconciliation methods. Supported conflicts at the tribal level were detected for five genera; plastome data was not included for three other genera that resolved in different tribes than previously classified in Soreng et al. (2022). These conflicts need further study.

The timeline of grass evolution continues to be a hot topic among agrostologists, and this new phylogeny supports earlier biogeography studies (Gallaher et al., 2022; https://doi.org/10.1111/jse.12857) suggesting the Poaceae began to diversify in the early–late Cretaceous (crown age of 98.54 Ma) on West Gondwana before the complete split between Africa and South America. Africa clearly served as the center of origin for much of the early diversification of the lineages within the family.



Phylogeny of 1153 Poaceae accessions inferred from 331 nuclear genes. (Image from *New Phytologist*, https://doi.org/10.1111/nph.20263)

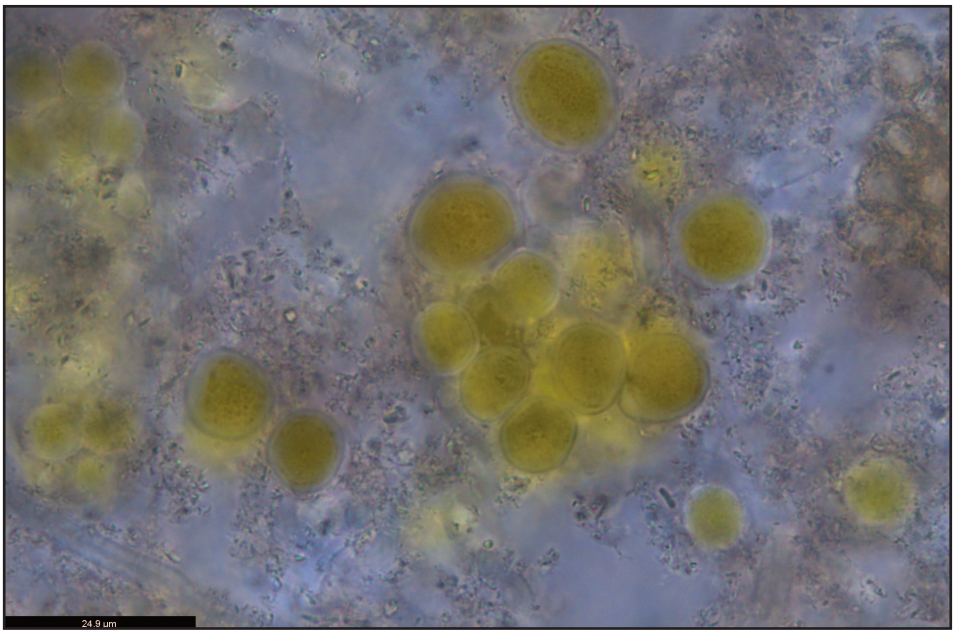
Untangling *Trebouxia*, a green algal lichen photobiont in southern Africa

By Ian Medeiros

A recent study in the *American Journal of Botany* (2024; https://doi.org/10.1002/ajb2.16441) provides a first view of the southern African biodiversity of the green algal genus *Trebouxia* (Chlorophyta), the most common photosynthetic partner in lichens.

Southern Africa, particularly the Greater Cape Floristic Region, is a biodiversity hotspot for vascular plants and hosts a unique biota of lichen-forming fungi (mycobionts). However, the region's lichen-forming algae (photobionts) had hardly been studied with molecular data or put into a global phylogenetic context. In the unicellular green alga *Trebouxia*, as with other lichen photobiont lineages, genomic variation far exceeds the limited morphological variation, and thus molecular data are essential for recognizing species.

To begin the process of applying a modern classification scheme to *Trebouxia* in South Africa and Namibia, an international team of scientists from the United States, Belgium, Chile, Hungary, Malaysia, Namibia, Panama, Poland, and South Africa sequenced the internal transcribed spacer (ITS) and *rbcL* from ca. 150 lichen thalli representing diverse mycobionts and biomes, from desert and fynbos to Afrotemperate forest and montane grassland.



***Trebouxia* in a squash preparation of lichen thallus. Hale 78605 (US).**

These sequences were incorporated into curated, global datasets; putative species were delimited with both phylogeny and operational taxonomic unit (OTU) clustering approaches as a way of ensuring that conclusions were robust to uncertain species boundaries.

We found that the *Trebouxia* biota of this region contains an estimated 43 species, representing 20–30% of global *Trebouxia* biodiversity. This is comparable to other well-sampled regions of the Southern Hemisphere (i.e., Bolivia and Kenya). On one hand, the results exemplify an "everything is everywhere" approach to microbial biogeography, with a majority of the southern African *Trebouxia* species shared with Bolivia, Kenya, or the Mediterranean basin. Conversely, seven species were only found in southern Africa, although further sampling will be required to assess whether they are truly southern African endemics.

Patterns in species distribution and the mycobiont–photobiont association echoed what has been found elsewhere in the world. For example, the foggy Namib desert coast was dominated by species of *Trebouxia* clade A, something also seen in the Atacama Desert of Chile. The mycobiont genus *Parmotrema* was strictly associated with species from *Trebouxia* clade C, as has been observed in the Neotropics and Northern Hemisphere. Mean annual precipitation, but not mean annual temperature or precipitation seasonality, was found to have a significant effect on the composition of *Trebouxia* communities.

Only five of the species-level lineages recognized in this study have been formally described, highlighting the substantial Linnean shortfall in *Trebouxia*, but also providing a blueprint for future efforts to recollect, culture, and formally describe these species.

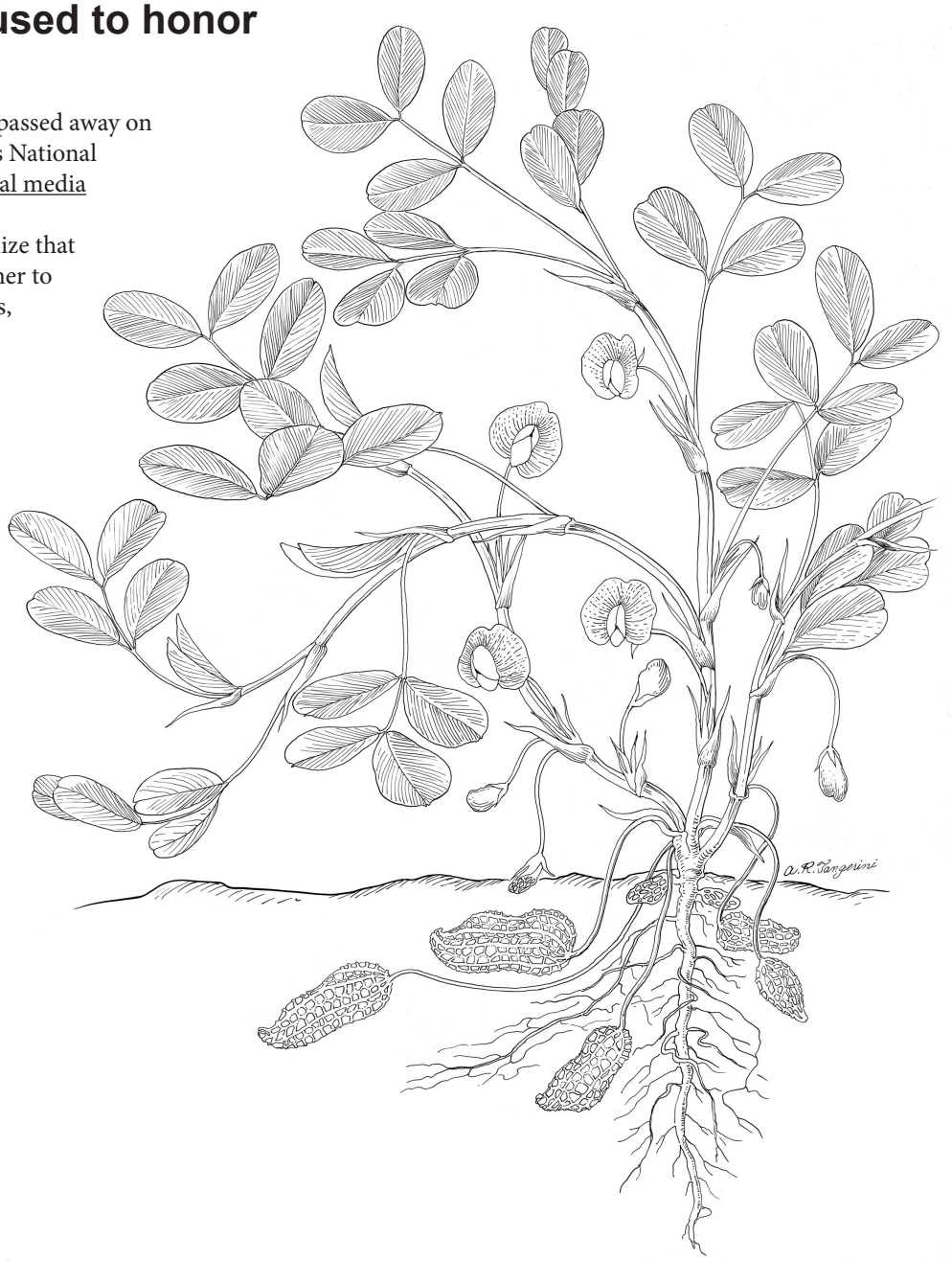
Sampling for lichen photobionts in the northern mistbelt forest of the Buffelskloof Nature Reserve, South Africa. (photo by József Geml)

Peanut illustration used to honor President Carter

When Jimmy Carter (1924-2024) passed away on December 29, 2024, the Smithsonian's National Museum of Natural History used social media to honor him.

To mark his passing and to recognize that Carter rose from Georgia peanut farmer to the 39th president of the United States, the museum used an illustration of a peanut plant (*Arachis hypogaea*), which was drawn by Department of Botany illustrator **Alice Tangerini**.

The illustration was drawn in 1975 at the request of Edward Ayensu who included it in his article, "Africa in the American Presence," a paper from the international conference The United States in the World held in 1976 in Washington, DC.



TRAVEL

Alberto Coello traveled to Madrid, Spain (12/19) to give a lecture about the application of phylogenies in conservation at the European University of Madrid.

Stuart Davies traveled to Cali, Colombia (10/24–10/29) to attend the 16th Conference of the Parties to the United Nations Convention on Biological Diversity (COP16); and to Brazil and Argentina (11/7–11/19) to meet with plot principal investigators of the ForestGEO sites Ilha do Cardoso and Misiones.

Laurence Dorr traveled to Villa de Leyva, Colombia (12/8–12/17) to visit and curate the Malvaceae specimens and other plants found in the northern Andes that are in the Herbarium Federico Medem Bogotá (FMB).

W. John Kress traveled to Cali, Colombia (10/20–10/29) to attend the 16th Conference of the Parties to the United Nations Convention on Biological Diversity (COP16), as a member of the Vermont Biodiversity Alliance and representing the global scientific and museum community on the issue of Digital Sequence Information (DSI) to promote the open access of DNA for benefit sharing.

John Wiersema traveled to Berlin, Germany (11/24–11/30) on behalf of the International Association for Plant Taxonomy to participate in the Editorial Committee Meeting, as its Secretary, for the preparation and editing of the 2025 edition of the *International Code of Nomenclature for algae, fungi, and plants*, the *Madrid Code* held at the Botanischer Garten und Botanisches Museum.

NEW FACES

Left image: Danielle Remor (center) with Carol Kelloff and Warren Wagner. Right image: Rose Villanueva (left) with Jun Wen, Tina Wang, and Yali Li. (photographers unknown)

Danielle Remor is a Brazilian Ph.D. student in Botany at the State University of Feira de Santana (UEFS) and was awarded the 2024 Harold E. Robinson and Vicki A. Funk Award. Remor has been working with the Asteraceae family since her Master's degree. Her Ph.D. thesis aims to use integrative taxonomy to produce a phylogeny through phylogenomic methods for the genera *Caatinganthus*, *Mattfeldanthus*, *Stilpnopappus*, *Strophopappus*, and *Xiphochaeta*, which compose the *Stilpnopappus* alliance (Asteraceae, Vernonieae). Furthermore, she seeks to provide an updated taxonomic review and investigate, through biogeography, how these genera colonized the dry regions of Brazil. The U.S. National Herbarium houses a large number of collections of this group, including important Venezuelan specimens and type materials. During her one-month visit to the National Herbarium in October, supervised by **Warren Wagner** with assistance from **Carol Kelloff**, Remor was able to analyze and review the morphology of all morphotypes belonging to her study group, including relevant type specimens. The opportunity to visit the herbarium allowed her to access materials she had not yet been able to describe, significantly contributing to and expanding the results of her taxonomic review and updating the taxonomic identity of various materials. She also acquired samples from 10 species for DNA extraction, which will contribute to an overview of the taxonomic and evolutionary relationships of the genera in the *Stilpnopappus* alliance, providing valuable insights for the Vernonieae tribe.

Rosa María Villanueva Espinoza, a Master's student in Botany at the South China Botanical Garden, was awarded a 2024 José Cuatrecasas Award. She visited the National Herbarium from October 7 through November 5, under the supervision of **Jun Wen** to study, "Taxonomy and phylogeny of the genus *Justicia* (Acanthaceae: Justicieae: Justiciinae) in Peru." During her visit, Villanueva determined the species rank of various unidentified and misidentified *Justicia* specimens, some of which represent new taxa. In addition, she examined *Justicia* collections from other countries to help document the occurrence of *Justicia boliviensis* in Peru, constituting a new record for the country. Type collections and additional specimens from closely related species, such as *J. inficiens, J. pilosa, J. lancifolia, and J. obovata*, were revised. The revision of the US collection further elucidated the morphological similarities between *J. wallnoeferi* and *J. cuscoensis*. She also photographed diagnostic features such as stamens, seeds, and fruits of Peruvian species to enhance her Master's project. Furthermore, leaf fragments from 31 *Justicia* species were collected for future phylogenetic studies within this genus. Some of these findings, including new species and nomenclatural novelties, have already been included in a submitted manuscript to *Phytokeys*. A second paper, currently in progress, integrates the additional data obtained from the US and her revisions undertaken from various other herbaria.

VISITORS

Yali Li, South China Botanical Garden; *Firmiana* (Malvaceae) (9/10/24-9/3/25).

Ting Wang, South China Botanical Garden; *Angiopteris* (Marattiaceae) (9/10/2024-9/3/2025).

Priscila Lopez, Smithsonian Tropical Research Institute; *Selaginella* (Selaginellaceae) (9/30-10/4).

John Mitchell, New York Botanical Garden, and **Susan Pell**, United States Botanic Garden; Anacardiaceae (9/30-10/4; 12/9-12/13).

Danielle Remor, State University of Feira de Santana, Brazil; *Stilpnopappus* alliance (Asteraceae, Vernonieae) (10/7-11/5).

Rosa Maria Villanueva Espinoza, South China Botanical Garden; *Justicia* (Acanthaceae)(10/7-11/5).

Michael Dillon, Field Museum; Asteraceae (10/17-10/18).

Vidal Mansano, Rio de Janeiro Botanic Garden, Brazil; Fabaceae (10/17-10/18).

Pan Li and **Zhechen Qi**, Zhejiang Sci-Tech University, China; Amaranthaceae, Smilacaceae, Lamiaceae (10/24-10/25).

Fred Barrie, Missouri Botanical Garden; Gesneriaceae and Flora Mesoamericana (10/28-11/8).

Brian Lapointe, Florida Atlantic University-Harbor Branch Oceanographic Institute; Florida algae (11/4-11/5).

Philippe Clerc, Ville de Geneve, Switzerland; Lichens (*Usnea*, Pameliaceae) (11/12-11/19).

Atiles Reis, Universidade Federal do Rio de Janeiro, Brazil; Ferns (*Asplenium* and *Diplazium*) (11/12-12/6).

Byron Javier Villón-Álvarez, **Pedro Jiménez Mejias**, **Paulo Muñoz-Schüler**, **Mónica Míguez Ríos**, Universidad Pablo de Olavide, Spain; Cyperaceae (11/13-11/22).

Sylvia Earle, National Geographic Explorer at Large; Documentary filming (11/14-11/15).

Elizabeth Collins, George Mason University; Independent research (11/15-11/22).

Richard Dunn, Selby Botanical Gardens; Independent research (11/18-11/22).

Linde Wieringa, Ludwig-Maximilians-Universität München, Germany; Melastomataceae (11/20-11/22).

Mkayla Creek, **David Hembry**, **Erica Newman**, and **Chelsea Rodriguez**, James Madison University; Independent research (12/13).

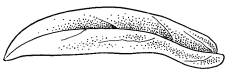
Nathalia Susin Streher, University of Pittsburgh; Asteraceae, Brassicaceae, Iridaceae, Loasaceae, Lythraceae, Malvaceae, Polygonaceae, Primulaceae, Solanaceae, Violaceae (12/16-12/20).

Patrick McKenzie, Harvard University; *Monarda* (Lamiaceae) (12/18-12/20).

STAFF ACTIVITIES

On November 25, **Erika Gardner** gave a presentation titled, "What is a Type Specimen," to the Riderwood Senior Living Community Garden Club in Silver Spring, Maryland. The presentation included historical collecting accounts and the continued preservation of specimens, the use of DNA analysis of herbarium specimens to uncover new species to solve cryptic speciation issues, and how botanical illustrators use their skills to highlight characteristics of a plant to distinguish it from other similar species.

Staff scientists and postdoctoral fellows from ForestGEO, including **Stuart Davies**, **Eugenie Mas**, **Jose Medina**, **Krishna Anujan**, **Helene Muller-Landau**, **Luca Morreale**, and **Kelvin Acebron**, attended the annual AGU (American Geophysical Union) conference in Washington, DC, on December 9-13. The conference is the "largest gathering of Earth and space scientists," where individuals connect and share their research. The goal of the conference is to better understand the planet, environment, and how to address climate change. This year's theme was "What's Next for Science," and it was attended by approximately 27,000 registered guests. ForesGEO post-doc Krishna Anujan presented a poster, "Sensitivity of tree growth to precipitation in seasonally dry tropical forests using long-term dendrometer band measurements".



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ART BY ALICE TANGERINI

Schiedea waiahuluensis W.L.Wagner, Weller, B.Nyberg, & A.K.Sakai

Schiedea waiahuluensis, a newly discovered species from Hawai'i, is likely the first plant to be identified and collected using drone technology. The species is found only on the dry cliffs of Waiahulu on the island of Kaua'i, with an estimated population of around 345 individuals, primarily growing on bare rock surfaces in small pockets of soil. Seeds from the first drone-collected samples were sent to the greenhouses of the University of California Irvine, where nursery-grown plants allowed for detailed measurements and material for the official type specimen. Alice Tangerini used the Holotype cuttings sent from UC Irvine for the inked illustration of the habit and inflorescence. Digital images taken from the cuttings and UC Irvine photos were used for the flower details to show the diversity of the flower types and were drawn digitally in Adobe Photoshop.

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