The Vasculum

The Society of Herbarium Curators Newsletter
Volume 18, Number 2: August 2023

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Message from the President

Dear Colleagues and fellow Society of Herbarium Curators Members,

It is the end of my first year as President and the last year has been a period of learning about the Society of Herbarium Curators (SHC). SHC serves a unique role supporting curators, the collections community, and herbaria by creating a global community of practice that links specimens, curators, and researchers and provides support for critical specimen-based biodiversity science. Critical to this role is continued support for foundational collection-based science as well as digitization; creating sustainable infrastructure (physical, financial, etc.); engaging in best practices in diversity, inclusion, equity, and access; and promoting sustained workforce training. In the last year I have spent time learning about the structure of the Society, committees, and outreach engagement; my focus has been to facilitate effective practice and structure for long-term sustainability of the SHC. As I look to my second year, I see opportunities to engage SHC members in emerging opportunities in collections science and workforce training, as well as opportunities to expand the SHC to the broader audience of herbarium data users. SHC has an opportunity to grow into some new spaces as collections become even more critical to addressing global issues of concern (climate change, social justice, use of natural resources, invasive species, disease, etc.). This has me asking: What role can SHC fill in this landscape of need (skills development, creating inclusive spaces, education, advocacy, etc.)? What role can we serve in supporting our community of scientists, curators, and educators? How can we build a robust society structure that supports growth, fosters innovation, and builds community?

Leadership in SHC
Thank you to all our SHC committee members and elected officials. We are fortunate to have members that have given thoughtful and sustained support to the society. This type of service is critical and we have many to thank for their service. I would like to thank all who have helped me as I learn the Society structure. Thank you to Past-Presidents Erin Manzitto-Tripp and Patrick Sweeney for answering my endless questions. Diana Jolles (Secretary) has been incredibly helpful as I navigate my job and communication. Maribeth Latvis (Treasurer) and Michael Thomas (Webmaster) for perspective and clarification of the Society structure, infrastructure, and endless potential. Tilo Roy has done an excellent job in her first year as Editor for The Vasculum. Thank you to Alina Freire-Fierro for her commitment to the international community (out-going Member-at-Large). I also want to thank Jessica Budke for her work promoting the SHC at the Botany 2023 booth and over the year. This year we see three new elected members and I look forward to working with our President-Elect Mark Fishbein, Secretary Abigail Moore, and Member-at-Large Katya Romoleroux.

In the coming year we will need some additional officers. Annually we elect a Member-at-Large; this year we will also be electing a new Treasurer. This is a critical position for the SHC. Maribeth Latvis has done an excellent job in this position and I en-courage anyone with an interest to reach out to Maribeth with questions. If you are interested in either elected role or wish to nominate members, contact Past-President

Erin Manzitto-Tripp.

We need representatives of SHC to serve as Society Liaisons. The Affiliate Society Liaison Committee is critical to SHC and the integration of SHC into larger efforts with the annual Botany conference, major grants and diversity initiatives with partners, and the overall advancement and inclusion of herbaria in the national and international discussions around specimens, biodiversity data science, and creating inclusive spaces for the 21st century workforce. Our Section 2A of the SHC bylaws states, "The Committee will keep the Executive Board advised on issues and important matters before affiliated organizations." At the 2023 Executive Board (EB) Meeting, the EB recognized our affiliated societies as ASPT, IAPT, BSA, and SPNHC. We need to appoint society liaisons as we look to working across the community to promote herbaria. Please connect with me if you are interested in serving as a liaison to any of these societies.

We are currently looking to fill position on our Grants Committee and our Herbarium Assistance Committee. These individuals will serve in critical roles for the society. As a 100% volunteer society, our members drive the work and outreach of the SHC. Please consider self-nominating or sending suggestions for colleagues to help progress our society.

Two years ago, a decision was made to cost share with the Botany conference; this commitment to the annual Botany conference comes with added responsibility of engaging in the planning of the annual meeting and advocating for inclusive and accessibility for our membership (both national and international). Looking to our opportunities with the Botany conferences, I have approval from the Executive Board to form an ad hoc committee, designated the Conference Planning Committee. Our Bylaws are silent on the larger conference-related tasks and opportunities (publication of the program and SHC activities, scheduling of EB and Membership meetings, Code of Conduct, Financial Decisions, Diversity and Inclusivity programming, non-science programming, etc.). We also have a significant international scope to SHC with our largest-growing members group from developing countries; we need to address this relative to the location of the Botany conference. An ad hoc Conference Planning Committee will review our current conference related planning, define any opportunities or pinch points related to the conference participation and planning process, determine if we need a revision to the Bylaws for clarity or revision of roles, and help establish plans for the future of SHC meetings. We are looking to engage some motivated SHC members to help define the future of SHC Annual Meetings. Please contact me if you are interested in participating in this critical discussion.

Diversity, Inclusion & Workforce Training:
There is a lot of buzz around collections, digital data, and building the biodiversity science workforce. We have an Early Career Section that has been quite active promoting open job postings, collaborating with SPNHC on best-practices, and hosting virtual meetings. Our Grants Committee awarded four research grants to students (from over 30 applications). In addition to committee efforts in 2022/2023, SHC has been involved in several initiatives to create inclusive spaces and build capacity in herbaria.

- Support for the Strategic Planning for Herbaria course taught by Austin Mast and David Jennings.
- Engagement in the American Institute for Biological Sciences' NSF LEAPS proposal BUILD IDEAL to promote inclusive science practice through Natural History Collections and their Societies.
- Support of Society for the Preservation of Natural History Collections (SPNHC) and Biodiversity Literacy in Undergraduate Education (BLUE) 2023 Natural History Education Virtual DemoCamp for college educators.
- Sponsor BLUE and Broadening Diversity in Biodiversity Science (BDBS) Diversity and Identity in Biodive-

rsity Science Careers Workshop at SPNHC 2023.
- Sponsor BLUE, BDBS, and Botany & Beyond Biodiversity Science Careers Workshop at the Smithsonian Institute in April 2023.
- Participating Society in BIOFAIR: Building an Integrated, Open, FAIR data network a BiologicaAradsl Collections Network initiative that includes paid leadership opportunities for emerging professionals in collections-based biodiversity science.
- Support a members-driven initiative for the SISRIS project: Supporting Inclusive and Sustainable Research Infrastructure for Systematics (Weeks, Zeringue-Krosnick, and Majors), including a series of Workshops and Symposia.

It is a priority to bring SHC into these inclusive initiatives and build capacity for all levels of training and all stakeholders. There are ongoing opportunities to engage our international members, build inclusive spaces, and promote equity and inclusion. Looking to 2023 and 2024, I encourage SHC members to reach out to the Executive Board with ideas for future efforts and ways to engage with the community and support herbaria, curators, and those building and using collections.

Plans for 2023/24

I have one year remaining in my role as President of SHC. In the next year I will focus my efforts on working with the elected officers and committees to support stability and security for the SHC and promote the Society, the members, and the diverse community utilizing and caring for herbaria. Specifically:

- Develop and initiate a plan with the Treasurer and the Investment Committee to build the endowment and secure funds. Look for emails on how you can support these efforts.
- Prioritize creating a geographic home for the Society to assure long-term stability with the non-profit status and taxes and decrease costs/time for relocation.
- Work with committees to establish Chairs, populate open positions, and stagger membership. Please consider volunteering in any of our open positions as a Society Liaison to IAPT, BSA, ASPT, or SPNHC or serve on the Grants Committee or the Herbarium Assistance Committee.
- Empower committees and sections to reach goals and promote community efforts.
- Work with committee Chairs and elected officers to develop and/or consolidate transition documents and procedures.
- Facilitate an ad hoc Conference Planning Committee to enable us to optimize our engagement in annual conferences, facilitate communication, promote inclusion of our members, and engage with opportunities when present.
- Work with Webmaster to develop a plan and initiate efforts to address the website and data security.
- Engage the membership in outreach to the broader collections community in promoting SHC and including SHC in ongoing and emerging collections, professional development, and inclusive science initiatives.
- Promote community-led initiatives to advance herbaria, the collections, and the curators and scientists caring for and using biodiversity data.
- Prioritize inclusion of our international community and the diverse community of scientists and potential scientists working with herbarium collections.

Thank you all for your support in the last year. I'm excited to see what the next year holds and look forward to serving the SHC community.

Anna K. Monfils,
Professor, Biology, Director, CMC Herbarium
Central Michigan University
President, Society of Herbarium Curators (2022-2024)

From the Editor's Desk

Greetings to all my fellow herbarium lovers!

I hope everyone's summer was relaxing yet productive! As for me, summer always seems to fly by faster than any other season! Doing research with students, traveling to conferences, sample collection trips; so much to do, so little time! August ushers in a feeling of newness, excitement for the upcoming fall semester, new students, campus buzzing with activity! August every year is also brimming with energy on our Missouri Western campus, as we host the Kansas City Chiefs' summer training camp!

This year, botanists from all over the world, including my fellow SHC members, met (either virtually or in-person) at the end of July for the Botany 2023 conference, in Boise, Idaho, U.S.A. Our current August issue of The Vasculum describes in detail our Society's strong presence at the conference. We've also added an informative section on the annual meeting of the Society for the Preservation of Natural History Collections (SPNHC), which was held in San Francisco, California, U.S.A. in May 2023, and was attended by many SHC members. This issue also boasts of a repertoire of articles, news, views, and perspectives from different places across the globe, both near and far, and I hope we were able to include something that will cater to everyone in our community. Among the regular sections, our 'Featured Herbarium' takes us inside the New Mexico State University Herbarium (NMC), courtesy of Sara Fuentes-Soriano and Zachary Scott Rogers. Eric Roalson, Director of the Marion Ownbey Herbarium (WS) at Washington State University, shares his experiences and expertise in our 'Early Career Advice' section. Manuel Luján, taxonomist at the Royal Botanic Gardens, Kew, describes his experiences coordinating a workshop on plant taxonomy skills for Latin American students in La Paz, Bolivia in our 'SHC Worldwide' section.

We also have a variety of other enlightening contributions from experts across temperate North America, including a lyrical poem by Sara J. De Groot, an informative review of Linda P.J. Lipsen's book Pressed Plants – Making a Herbarium by Michael Thomas, an enriching piece on the global foray of the West Virginia Natural Heritage Program Herbarium (MVHP) by Matthew Sheik, and a thought-provoking note on the popularity of herbaria in the middle ages by Maura Flannery. Contributions from SHC patrons and experts worldwide form an integral part of our current issue, and we have fantastic and insightful articles by Razanamaro Onja Harivelonaina Morilline, Rapanarivo Solo Hery Jean Victor, and colleagues on the Herbier de Tananarive (TAN) in Madagascar, as well as on the need to rejuvenate botanical illustrations for plant identification by eminent Indian taxonomist Subhasis Panda.

As always, The Vasculum is an epitome of collaboration and teamwork! My efforts at assembling and publishing this issue have been strongly supported by numerous colleagues, friends, and family! I'd like to take the liberty of dedicating this issue to my mother, Deepti Dutt, who has always remained my pillar of support, forever inspiring and enthralling me with her indomitable spirit, positivity, and energy. . Even while recovering from a major surgery, this summer, she kept on encouraging me towards working on this endeavor. Many thanks to all our contributors, who have spent tireless hours composing the various fascinating articles. Special thanks to our SHC

President, Anna Monfils, for her incredible support towards this initiative. My heartfelt thanks to our amazing editorial board members, Abigail Moore and Harlan Svoboda, whose kind help is much appreciated, each time, every time!

I cannot emphasize enough on how important and valuable all our writers are! Please keep supporting us and sending me your contributions. Here's wishing everyone a wonderful start to a brand-new fall semester!

Now, what are you waiting for? Take another sip of your favorite beverage and continue reading!

Figure 1: Voucher specimen of *Juncus repens* Michx (Juncaceae), from the Leo A. Galloway Herbarium at Missouri Western State University (Photo credit: Tilottama Roy)

Tilottama Roy
Editor, *The Vasculum*
Associate Professor, Department of Biology
Missouri Western State University

Cover Photos (Top: A portion of an image of *Gaultheria codonantha* Airy Shaw (S.Panda 30885, CAL): Walong, Arunachal Pradesh, 28/04/2003, deposited at CAL (Central National Herbarium)-Ericaceae; Photo Credit: Subhasis Panda; Please see page 37 for complete image); Bottom: Participants during fieldwork in the Yungas. Left to right: Giovanni Paton, Maira Martinez, Iris Sandoval, Cherry Rojas, Dr. Gwilym P Lewis (Kew). (Photo credit: Manuel Luján); Please see SHC Worldwide on page 38 for details).

News from the Society

SHC at Botany 2023

The Society was involved in a number of events at Botany 2023- One World, held in Boise, Idaho, USA, from July 22-26. These are outlined below:

- SISRIS (Supporting Inclusive and Sustainable (collections-based) Research Infrastructure for Systematics) workshop, held on Sunday, July 23, moderated by Andrea Weeks (George Mason Univesity, USA) and presented by Deborah Paul (University of Illinois Urbana, Champaign, USA)
- Executive board Meeting held on Sunday, July 23 (members attended both in person, as well as via zoom)
- SHC booth, managed by SHC members as well as student volunteer Sierra Hubbard
- SHC members annual meeting held on Monday, July 24 (members attended both in person, as well as via zoom)
- SISRIS (Supporting Inclusive and Sustainable (collections-based) Research Infrastructure for Systematics) symposium, held on Wednesday, July 23, moderated by Andrea Weeks (George Mason Univesity, USA) and presented by Deborah Paul (University of Illinois Urbana, Champaign, USA)
- SISRIS (Supporting Inclusive and Sustainable (collections-based) Research Infrastructure for Systematics) symposium, held on Sunday, July 23, moderated by Erin Manzito-Tripp (University of Colorado, Boulder, USA), Andrea Weeks (George Mason Univesity, USA) and Shawn Krosnick (Tennessee Tech University, USA)

Figure 1: SHC Executive board meeting
(Photo credit: Tilottama Roy)

Figure 2: SISRIS symposium
(Photo credit: Tilottama Roy)

Figure 3: SHC Membership meeting
(Photo credit: Tilottama Roy)

Figure 4: SHC student member Sierra Hubbard volunteering at the booth
(Photo credit: Tilottama Roy)

SHC New Appointments

President Elect (2023-2024): Mark Fishbein (Oklahoma State University, USA)
Secretary (2023-2025): Abigail Moore (Univerisity of Oklahoma, USA)
Member-at-Large (2023-2026): Katya Romoleroux (Pontificia Universidad Católica del Ecuador, Ecuador)
Affiliate Society Liaison Committee Chair (incoming 3rd year MAL) (2023-2024): Socorro Gonzalez-Elizondo (Instituto Politécnico Nacional, Mexico)
Auditing Committee Chair (2023-2024): Mark Mayfield (Kansas State University, USA)
Auditing Committee (2023-204): George Yatskievych (University of Texas at Austin, USA), Deborah Lewis (Iowa State University, USA)
Membership Committee (2023-2025): Jessica Budke (University of Tennessee at Knoxville, USA)
Early Career Section President- Elect (2023-2024): Jacob Suissa (University of Tennessee at Knoxville, USA)
Early Career Section President (2023-2024): Nina House (California Botanic Garden- Claremont Graduate University, USA)

The Society of Herbarium Curators (SHC) unites the world's herbarium professionals in discussion, training, action, and support for the benefit of herbaria, science, and society. SHC envisions a network of innovative, well-trained herbarium professionals, empowered to recognize and address local and global stakeholder needs with organizationally sustainable strategies that advance the well-being of herbaria, science, and society. For more information, please join us online:

— www.herbariumcurators.org —

SPNHC 38th Annual Meeting

The 38th annual meeting of the Society for the Preservation of Natural History Collections (SPNHC) was held in San Francisco, California, May 28 to June 2, 2023. Hosted by the California Academy of Sciences, the event spanned 7 days, with field trips to local institutions and landmarks, workshops covering an array of museum-related themes, evening social events, a virtual poster gallery and an in-person exhibition hall. It also featured over 220 talks given to packed rooms and live streamed, with all presentations recorded for additional viewing. Nearly 420 people joined the meeting in person and over 120 attended virtually, with representatives from 31 countries, 41 US states, and most Canadian provinces. The attendees included many long-time and even founding SPNHC members, established museum professionals, and a large contingent of students and emerging professionals. The week was a great success and a lot of fun, and attendees equally enjoyed the extensive opportunities for professional growth and the time to catch up with old friends and make new ones. Thanks to everyone who joined us for SPNHC 2023!

Figure 1: SPNHC logo (Credit: Rachel Diaz-Bastin, California Academy of Sciences)

Figure 2: A presentation (State of the "ZooMu Nation": progress toward bridging the gap between zoos and museums) by SPNHC President-Elect Greg Watkins-Colwell (Photo credit: Greg Watkins-Colwell and Laura Eklund)

Figure 3: Always-a-crowd-favorite behind-the-scenes collections tours, in this case the Ichthyology collection at the host institution California Academy of Sciences (Photo credit: Laura Eklund)

Laura Eklund
Senior Collection Manager, Anthropology
Chair of Science Collections
Co-Chair, SPNHC 2023 Local Organizing Committee
California Academy of Sciences

My Press is Full of Treasures

The weather is sunny and pleasant this morn.
The plants in the woods are with flowers adorned.

I shoulder my backpack and pick up my press.
There's just a light breeze; one small cloud in the west.

The shrubs are quite dense, and the hills somewhat steep.
I sometimes must hop on smooth rocks 'cross the creek.

But I find a rare lily and saxifrage too;
A beautiful mint with small flowers light blue.

The clouds are now building some more in the west,
But on I continue, plant-finding with zest.

A horsetail, reeds, rushes, in soil quite wet.
A sword fern and loosestrife not on my list yet.

The sky's clouded over, a thunderclap booms,
And moving toward me, the haze of rain looms.

What begins pitter-patter becomes pouring streams.
I can feel the rain running inside of my sleeves.

The rain tapers off and the clouds drift away.
So, I could do more of my survey today.

My plant press was bagged, and I covered my pack,
But my shirt is so soaked that it's stuck to my back.

Another rare lily, and locoweed too.
A stonecrop, a buckwheat—all to my list new.

I cross slopes of talus, climb over a log,
Forge on between willows, and wade through a bog.

A few hours later, at last I emerge.
Discover I've picked up some things I should purge:

Small sticks in my hair, on my shoulder, an ant.
Some leaves down my shirt, and a tick on my pants.

My boots are quite muddy, and also my shirt,
And sweat makes the scrape on one shin start to hurt.

Some sap on my sleeve, a bug bite on my ear.
My hand is still tingling, from nettles, I fear.

A bruise on my knee, but at least it's not broke.
My arm might have brushed against live poison oak (I'll know tomorrow)

There's gritty dirt stuck in the sweat on my chin.
Crab spider rappels from off my hat brim.

But my press filled with treasures, I hiked a long way.
My shirt is half dry; so it was a good day.

Sarah J. De Groot
Botanist
Center for the Environmental Management of Military Lands
Colorado State University

The West Virginia Natural Heritage Program Herbarium is Going Global!

Since the publication of the status, updates, and plans for herbaria across West Virginia in The Vasculum's January 2022 issue, the West Virginia Natural Heritage Program Herbarium (WVHP) has been hard at work. WVHP has begun the process of digitizing the entire collection. This effort includes processing backlogged specimens, transferring data from an in situ database to the SERNEC portal, and developing an imaging action plan.

WVHP has served as the reference collection for West Virginia state botanists and ecologists since its establishment in 1988. It is housed at the West Virginia Division of Natural Resources' Elkins Operation Center in Elkins, WV, U.S.A. WVHP has accessioned 3803 vascular plant specimens and 455 bryophyte specimens to date, with more to be incorporated from the backlog. Historical collaborations with institutions have broadened both the geographical and temporal scale of specimens to span 18 states and two centuries. The oldest specimen is a Euphorbia vermiculata Raf. collected by Charles F. Millspaugh in 1891 in Point Pleasant, WV. Over 13% of the collection consists of species tracked as rare by the Heritage Program. All this speaks to the value of this regional herbarium and the data WVHP holds, particularly for plants across central Appalachia.

Digitization began with the transfer of data from the local in situ database to the SERNEC portal. The database was known as the Curatorial Database System (CDS). The CDS, originally developed by Paul J. Harmon (now retired WV DNR botanist) using dBase in the 1990s, was last reiterated in Microsoft Visual FoxPro 6 in 1998. The database was adopted by Dr. Donna Ford-Werntz at the West Virginia University Herbarium (WVA) and served as the central database used to produce the Checklist and Atlas of the Vascular Flora of West Virginia (Harmon et al. 2006). Data was extracted from the CDS and copied into an Excel spreadsheet where columns were assessed and matched to their respective Darwin Core equivalent. The transfer of this data into the SERNEC portal was substantially simplified with the help of the Symbiota Support Hub. WVHP is the second Heritage Program to utilize the SERNEC data portal, the first being the Arkansas Natural Heritage Commission Herbarium (ANHC). The initial data transfer into SERNEC used specimen accession numbers as unique identifiers. Barcodes were purchased in May 2023, and, by June 2023, all accessioned specimens were barcoded and had their Catalog Numbers updated in the SERNEC portal. These barcodes will be essential for imaging, the next step in digitization.

WVHP is currently working with WVA to create an efficient imaging action plan using their photo box imaging station purchased by the 'Keys to the Cabinet' National Science Foundation grant in 2014 (award #1410069). These plans include transporting specimens to WVA throughout the Winter of 2023–2024 for imaging. These images will be stored on a local hard drive until they can be processed in Adobe Lightroom and incorporated into the SERNEC portal.

The backlog of specimens spanned three cabinets and seven decades. The backlog can be broken down as follows: one cabinet of unprocessed specimens from previous WV Natural Heritage botanists and ecologists; one cabinet of unidentified specimens; half a cabinet of Dr. Eugene E. Hutton, Jr. specimens; and half a cabinet of teaching-quality specimens. Dr. Hutton of Huttonsville, WV, U.S.A., in addition to being a practicing physician, was also a WV plant enthusiast. The curation of his collection is particularly time consuming as specimens were mounted on an array of materials including cardboard acquired from his dress shirts while labels were written directly on the cardboard or on the back of his prescription pad. The newly obtained filtering tools provided by the SERNEC portal allowed for quick assessment of the research quality of Hutton specimens. Those destined to be incorporated into WVHP were remounted on archival quality materials. Overall, over 200 specimens have

been accessioned into WVHP from the backlog, with many more destined for donation to other institutions. So, what's next? The top priority for WVHP is to identify unknown collections and distribute specimens. Collaborative projects are in motion between WVHP and local Davis & Elkins College (D&E) researchers. This includes supporting a new Sustainable Resource Management program at D&E through donations of dendrological specimens. Previous work by Dr. Pamela Puppo of Marshall University in Huntington, WV, U.S.A. inspired collaboration between D&E librarian Mary Jo DeJoice and WVHP to systematically organize legacy documentation following the WV Division of Natural Resources document retention policies. WVHP also plans on utilizing BioNomia (bionomia.net), a platform aimed at connecting biodiversity data to people who generate this information, following methods taught at the recent Supporting Inclusive and Sustainable Research Infrastructure for Systematics (SISRIS) workshops at the Association of Southeastern Biologists and Botany 2023 conferences. Specifically, WVHP is interested in quantifying, for the first time, the botanical legacies of Elizabeth Ann Bartholomew and Dr. Eugene E. Hutton, both well-respected West Virginia botanists.

With the backlog processed, the data now publicly accessible on the SERNEC portal, and an action plan to image the specimens, WVHP is well on its way to being a 21st century herbarium. We are excited to see what science is facilitated with the aid of WVHP data!

Literature Cited

Harmon, P. J., D. Ford-Werntz, W. Grafton. 2066. Checklist and Atlas of the Vascular Flora of West Virginia. West Virginia Division of Natural Resources, Wildlife Resources Section, Elkins, WV. 381 p. https://researchrepository.wvu.edu/herbarium-datasets/1/

From left to right: WV Division of Natural Resources (WV DNR) Ecologist and WVHP Curator Jim Vanderhorst, Associate Ecologist & Data Manager Brian Streets, Associate Botanist Matthew Sheik, and State Botanist John Burkhart in the herbarium. (Photo credit: Matthew Sheik)

Matthew Sheik
Associate Botanist
West Virginia Division of Natural Resources | West Virginia Natural Heritage Program Herbarium (WVHP)

Look Who Had an Herbarium

Those who work in herbaria know that when someone asks them what they do, they usually end up having to explain what an herbarium is. This hasn't always been the case. When she was in school, the poet Emily Dickinson wrote to a friend, "Have you made an herbarium yet? I hope you will if you have not, it would be such a treasure to you; 'most all the girls are making one" (Sewall, 2006, p. 16). Even teenagers knew about herbaria in the 19th century, which can be considered the heyday not only of amateur plant collecting, but of natural history in general. However, individuals in many fields outside of botany were preserving plants almost from the beginning of the practice.

Capuchins, a branch of the Franciscan religious order, were early proponents. Fr. Gregorio de Reggio created one in 1606 that is now in the Oxford University Herbarium (OXF). He is an example of someone who collected with skill since he was knowledgeable in both botany and horticulture, serving as a consultant to the wealthy Italian Farnese family (Egmond, 2010). Some clergymen who traveled far from home as missionaries were also avid plant collectors. Hendrik van Rheede, a Dutch government official in India and author of the 12-twelve volume Hortus Indicus Malabaricus (1678-1703), learned much from an Italian priest Matteo di San Giuseppe who had been there for many years and had collected specimens and drawings. Clergy found botany a pleasant way to spend time in their often isolated posts. Also, as in Fr. Matteo's case, learning about medicinal plants from indigenous peoples was a way into the culture while also providing remedies when medicines from home were scarce or ineffective against tropical maladies (Sargent, 2019). This tie-in continued with both Catholic and Protestant missionaries often encouraged to report on their findings by their superiors and sometimes by botanists. In the 19th century when the French priest Armand David was on his way to China, he was tapped to collect plants for the National Museum of Natural History in Paris (P), which holds a large number of his specimens including many types.

Philosophers also seemed to have a bent for plant collecting. John Locke was interested less in specimens than in seeds. He sought interesting plants and traded lists with botanists who could supply seeds of exotic species, much sought after at the time. Seeds were easier to send than specimens and provided the possibility of creating many plants for future study. Taking up botany relatively late in his life, Jean-Jacques Rousseau can be considered an amateur, but he studied botany and collected plants seriously. He created a number of herbaria, both for himself and his friends. Some were presentation volumes for his patrons, who included the wealthy Madeleine Delessert, to whom he wrote a series of eight letters outlining how to teach botany to her daughter. The last letter is on creating an herbarium (Cook, 2012).

Johann Wolfgang von Goethe wrote a book on plant form and also collected specimens, as did John Stuart Mill, who studied plants throughout his life, to the point where his daughter-in-law had a room created to store his collection. He saw botany as informing his thinking on hierarchical classification systems including those for the law. The writer John Ruskin was not as dedicated a collector, but he did spend a summer gathering plants in Chamonix, France. His album has been preserved and a two-volume set just published on the collection, one with photographs of the specimens, the other with commentaries on Ruskin and on the plants (Ruskin, 2023). What makes these specimens notable now is that they document what was growing in a particular location at a particular point in time, June 1844. This data hadn't previously been available to biodiversity researchers.

As Emily Dickinson's case suggests, herbaria weren't just the purview of males. This was evident even in the 16th century when the Dutch botanist Carolus Clusius corresponded with many women, most of them wealthy, who had extensive gardens and sought seeds and bulbs of interesting species (Egmond, 2010). Some sent specimens

of the plants they had, often including drawings, and Clusius, whose connections enabled him to access plants from the Americas to the Far East, responded in kind. Many of these women were adept at growing difficult to cultivate species, and there is a considerable list of women gardeners who worked wonders with plants including Agnes Block in the Netherlands and Mary Somerset in England. Somerset's 12-volume herbarium still exists as part of the Hans Sloane collection at the Natural History Museum, London (BM). It documents not only the many exotic species she grew but also such garden favorites as anemones; she carefully preserved the flowers from many different varieties (Fig. 1). This trend in collecting continued into the 18th and 19th centuries when a number of women seriously studied botany, often allowing men to published their work because they didn't feel comfortable having their names in print (LeBouff, 2020).

Fig. 1: Specimen of an anemone from Mary Somerset's herbarium. (Herbarium of the Natural History Museum, London) (Photocredit: C. V. Starr Virtual Herbarium (http://sweetgum.nybg.org/science/vh/)

Women's interest in botany even extended to royalty. There is a suggestion that Queen Victoria was given a seaweed album, but I can't find evidence for this. However, Queen Charlotte, wife of George III, was an avid gardener and amateur botanist, having her own herbarium. She was even set to receive the French plant collector Jacques Labillardière's specimens that had been confiscated by the British; they were to be given to her by the French royalty in exile in Britain. However, Joseph Banks, botanical advisor to the British king, intervened and had them returned to Labillardière in France. Banks had been in some of the areas where the Frenchman had visited and knew what was involved in amassing such a collection (Williams, 2003). Another queen with botanical interests was Louisa Ulrika of Sweden, a patron of Carl Linnaeus for whom he created an herbarium. While most of his specimens are now at the Linnean Society (LINN) in London, these are still in Sweden. I'm not sure this counts as having an herbarium, but Princess Grace (Kelly) of Monaco pressed many plants, not for scientific purposes but for making colorful arrangements that she framed. At the other end of the political spectrum is the Marxist philosopher and activist Rosa Luxemburg who was fascinated by plants and kept notebooks with pressed specimens and her comments on them. She even did this during times she was imprisoned. She asked her friends to bring her books so she could identify specimens she had collected or received from others. She considered this practice important for maintaining her emotional balance during difficult times (Wittich, 2016).

Committed capitalists also loved plants. The French banker Benjamin Delessert was a passionate collector of specimens and botanical literature, and had a curator to manage both. Delessert was the son of Rousseau's patron, Madeleine Delessert. He probably read the letters intended for his sister, though we don't know what if any influence they had on her. Manchester businessmen Charles Bailey and James Cosmo Melvill both collected widely, butcame to a gentleman's agreement to divide up the world. This way they wouldn't have too many duplicates, since they both planned to give their specimens to the Manchester Museum (MANCH): 600,000 in all, 300,000 from each. (What a coincidence!) But it wasn't just the wealthy who collected. In the 19th century, all classes were in the plant gathering game. Richard Dick, a baker in Thurso in the very north of Scotland, collected passionately and like many others corresponded and traded information and specimens with professional botanists. Also, there is now much work being done on women, sometimes colonists in the remote places, who did the same. I could go on with this litany of people we associate with other fields who also botanized: Thomas Edison co llecting specimens

for his work on finding a rubber substitute, the artist Paul Klee feeding his botanical imagination, the experimental music composer John Cage collecting mushrooms and even teaching a course about them (Fig. 2), and the Swedish ambassador to Thailand, Gunnar Seidenfaden, using his posting to collect and publish on orchids. Herbaria are everywhere!

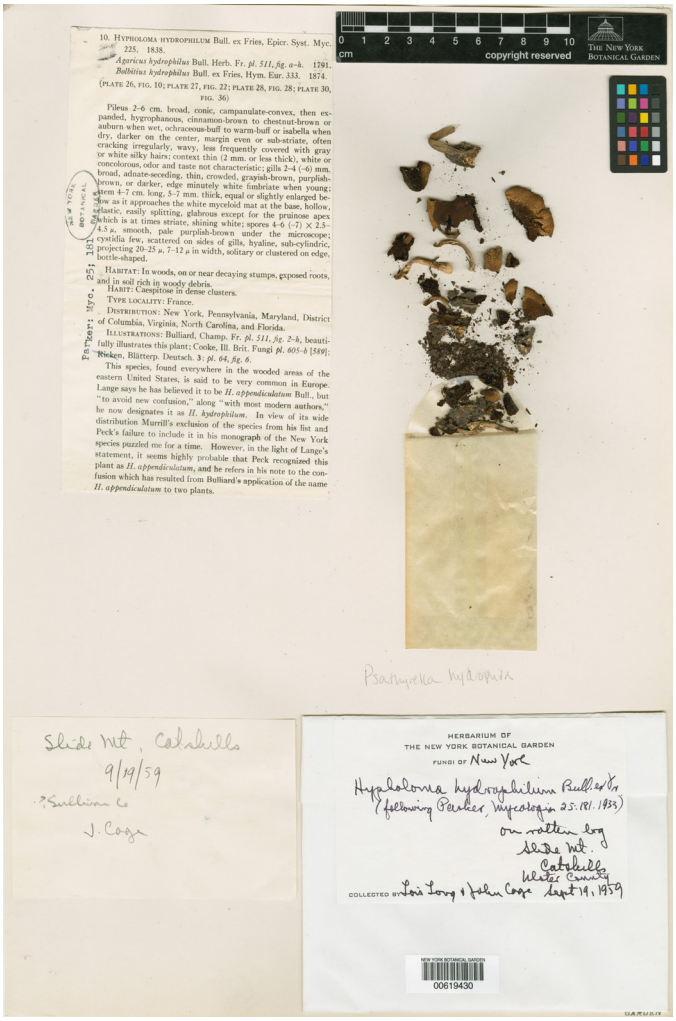

Fig. 2: Specimen of *Psathyrella hydrophila* (Bull.) R.D. Orton collected by Lois Long and John Cage. (New York Botanical Garden Herbarium) (Photo credit: C. V. Starr Virtual Herbarium (http://sweetgum.nybg.org/science/vh/)

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Book Review:
Pressed Plants–Making a Herbarium

Author: Linda P.J. Lipsen; Illustrations: Derek Tan. 2023. The Royal British Columbia Museum, 675 Belleville Street, Victoria, British Columbia, V8W 9W2, Canada. 92 pp. (softcover) US$19.95. ISBN 978-0772680563

Pressed Plants (Fig. 1) is a descriptive guide that will serve as an easy-to-understand introduction to students and newcomers as well as a refresher to seasoned plant specimen collectors. It is the long-awaited update to Dr. Christopher Brayshaw's beloved Plant Collecting for the Amateur. The author Linda P.J. Lipsen, Curator of the University of British Columbia Herbarium, along with illustrator and colleague Derek Tan, have published a concise and well-illustrated publication for those interested in learning and beginning to press plants for both art and science. Linda brings more than 30 years' experience in specimen collecting and has an established sense of the value of a well-preserved plant specimen and its importance to understanding the plant biodiversity all around us. Rich in illustrations, the condensed and contemporary guide presents six chapters including topics such as 1) Plant collection and preparation including safety, responsible and ethical collecting; 2) specimen pressing and drying; 3) mounting; 4) preservation (Fig. 2); and 5) plant identification. Key features of eight of the largest plant families and distinctive groups such as ferns and conifers are briefly described. The margins are often filled with useful tips and tricks based on the author's extensive personal experience.

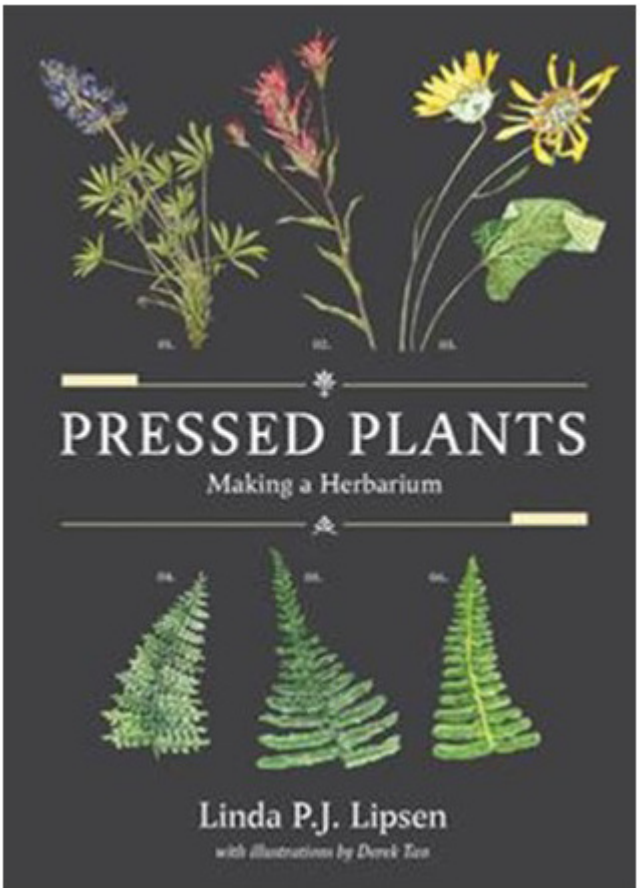

Figure 1: Cover of the book (Photo credit: Derek Tan)

The author includes not only information on the why, what, when and how of plant collecting, but also important suggestions for specialized tools and supplies, personal safety tips, and some guidelines for responsible and ethical collecting. Pressed Plants also includes the latest updates to best practices, such as how to preserve plant material for DNA extraction. It is important to note that Pressed Plants focuses only on vascular plants; those interested in algae, lichens, fungi, and bryophytes will need to utilize other resources for these more specialized groups.

The only shortcomings are a lack of specific detail regarding plant dryer design, which can be a bottleneck regarding the quality of specimen preservation. Lipsen leaves it up to the creativity of the reader for finding or making a plant dryer. There is a lack of citing specific online resources which would help the reader to source standard herbarium tools, equipment, and supplies. Also omitted is a detailed discussion of the increased use of new digital applications developed to aid botanists in the collection of data for voucher specimens using smart

phones increasingly being used by many Gen Z students. Such emerging tools are accelerating the process of data capture in situ and its subsequent organization.

Nonetheless, *Pressed Plants* provides a well-developed introduction to plant collecting and will teach the reader how to properly press plants to help document plant biodiversity so it is better understood, valued and protected. Available for less than $20, this contemporary publication should be an essential resource in every botany student's resource library.

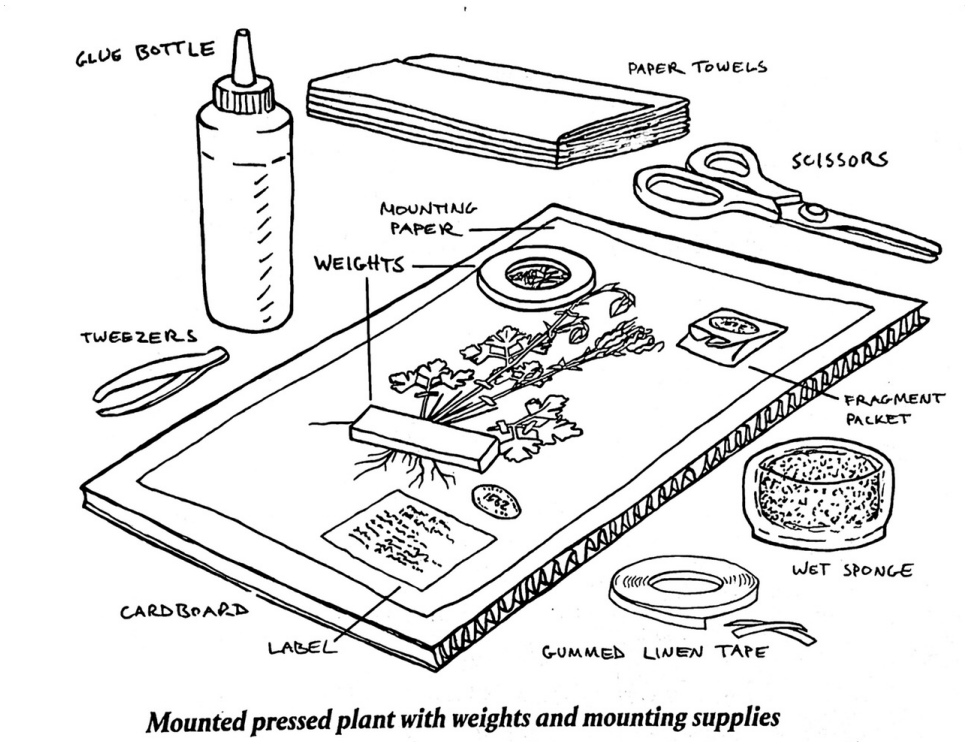

Figure 2: An image from the book (Photo credit: Derek Tan)

Michael B. Thomas
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Madagascar Herbarium TAN: Preserving Endangered Plant Species and Biodiversity

Introduction: Madagascar, a global biodiversity hotspot, is home to a remarkable array of plant species, with an endemism rate reaching up to 84%. As the second-highest island in terms of biodiversity, Madagascar presents excellent scientific opportunities for research and exploration. One crucial institution contributing to the preservation and study of Madagascar's plant heritage is the Herbier de Tananarive (TAN), Antananarivo, Madagascar.

The Significance of Herbarium TAN: The Herbarium TAN, housed within the Parc Botanique et Zoologique de Tsimbazaza (PBZT), is internationally recognized as the largest herbarium in the western Indian Ocean islands. Based on 2019 data, TAN contains around 350,000 specimens, from 280 families, 1885 Genera and 8745 species (Fig. 1). The TAN Herbarium specifically focuses on plants from Madagascar, East Africa, and the Indian Ocean islands.

Preserving Endangered Specimens: The Herbarium TAN plays a crucial role in conserving endangered plant species. As Madagascar's rich biodiversity faces increasing threats, such as habitat loss and climate change, preserving these specimens becomes paramount. At least 80% of the specimens in the TAN herbarium are endemic and endangered, making it an invaluable resource for research, species identification, and conservation efforts (Fig. 2).

Expansion and Challenges: To accommodate the growing collection of specimens, the PBZT needs to expand its herbarium facilities. At present, the herbarium struggles to make space for newly arrived specimens, making expansion imperative. The unavailability of sufficient room and cabinets has resulted in some mounted specimens being stored in cardboard boxes, which poses challenges for proper utilization and accessibility. At least 120,000 specimens are unclassified and unmounted as of 2019 (Fig. 3).

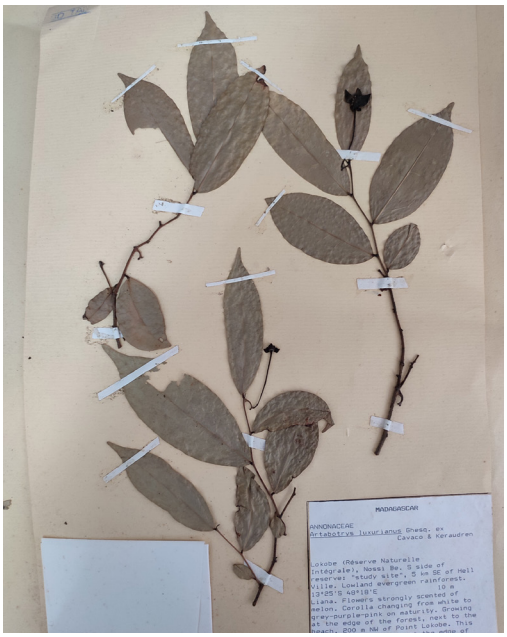

Figure 1 (left): Herbarium cabinets at the Herbarium TAN (Photo credit: Onja Razanamaro);
Figure 2 (right): Specimens of *Artabotrys luxurians* Ghesq. ex Cavaco & Keraudren (Photo credit: Onja Razanamaro)

Collaborative Efforts and International Partnerships: The Herbarium TAN collaborates with esteemed institutions such as national institutions (the herbaria TEF, Herbarium of the University of Antananarivo DBEV and ENS) and international organizations (Missouri Botanical Garden; Royal Botanic Gardens, Kew; California Academy of Sciences; the Botanical Garden of the University of Vienna called Hortus Botanicus vindobonensis- HBV and Institut de Recherche pour le développement). These partnerships enhance the herbarium's capacity for research, species identification, and preservation efforts. Together, they work towards safeguarding Madagascar's botanical heritage and promoting global understanding of its unique flora.

A Dedicated Team of Experts: TAN is staffed by a dedicated team of botanists, researchers, and conservationists passionate about preserving Madagascar's botanical heritage. Their expertise and commitment contribute significantly to the success of TAN and its invaluable contributions to scientific research and conservation efforts.

Figure 3: Temporary storage of specimens in boxes due to lack of cabinets (Photo credit: Onja Razanamaro)

Conclusion: The Herbarium TAN stands as a testament to the country's dedication to preserving its extraordinary plant diversity. With its extensive collection of specimens and ongoing research collaborations, the herbarium contributes significantly to scientific knowledge, conservation efforts, and the sustainable management of Madagascar's invaluable botanical resources. By nurturing and expanding the herbarium's facilities, we can ensure the continued study and protection of Madagascar's plant species for generations to come.

Rapanarivo Solo Hery Jean Victor, Head of Department, Department of Botany, Herbarium TAN
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The Need to Rejuvenate Botanical Illustrations to Correctly Identify Plant Taxa

Introduction:
Present day botanists rely mostly on images of living plant material consisting mainly of dissected floral parts, including floral or fruiting twigs or both, for identification of plant taxa. However, in the past it has been a norm to send scientific illustrations of plants to experts, for them to be identified, termed as 'image-based identification'. Unfortunately, most plant taxonomists nowadays are not interested in using botanical illustrations for the purpose of plant identification processes; rather they are much more reliant on digital cameras, and computer software like Adobe Photoshop, and computer-based plant images, especially dissected floral parts and their sequential arrangement for plant identification. Botanical illustrations create a scientific and innovative art in one's mind, as has happened in the past, for example, in the cases of eminent plant taxonomists like William Roxburgh (1832; Fig. 1), Charles Baron Clarke (Ref. Cibachrome images procured from Kew Herbarium), Sir J. D. Hooker (1849), and many others, which in turn helped in the process of correct identification of plant taxa. Sir J. D. Hooker (1849) mentioned in the title page of his *The Rhododendron of Sikkim-Himalaya* "from drawings and descriptions made on the spot", meaning he described all *Rhododendron* taxa contained in his book based on field drawings (Fig. 2). C. B. Clarke (in the reprinted 2nd edition of Roxburgh's *Flora Indica*, preface page v, 1874) mentioned that Roxburgh "left at the Calcutta Botanic Garden a set of life-sized coloured drawings, with botanical dissections, of plants 2542 in number, among which nearly all the Indian species described in his *Flora Indica* are depicted" (Fig. 1). Noltie et al. (2021) mentioned that William Roxburgh "seems not to have kept a 'top set' of herbarium specimens for himself and for his own reference purposes relied on the drawings and descriptions…" (Fig. 1). Botanical illustrations of different stages of the life-cycle of a living plant, show all characters and character-states of a particular taxon, thus enabling the correct identification of plant taxa, owing to the said botanists' or plant taxonomists' sound and acquired knowledge of a particular taxon.

Figure 1 (top right): Botanical illustration by a local artist under the direction of William Roxburgh: *Berberis asiatica* Roxb. (Berberidaceae) (Source: W. Roxburgh, Flora Indica vol. 2: 1832, plate no. 6, Icone no. 1962 from the website www.biodiversitylibrary.org>Roxburgh_Icones BHL); Figure 2 (bottom right): Botanical coloured illustration of *Rhododendron barbatum* Wall. ex G. Don by Sir J. D. Hooker (Source: The *Rhododendrons* of Sikkim-Himalaya, 1849 from website www.biodiversitylibrary.org>The-Rhododendrons-of-Sikkim_Himalaya BHL)

Without this in-depth knowledge, one cannot create a scientific illustration. On the other hand, digital camera and computer-based sequential arrangement of images of a particular taxon may help identify the plant, but one cannot acquire an in-depth knowledge of a particular taxon simply by taking photographs of it. Therefore, there is an urgent need to rejuvenate botanical illustrations for plant identification, especially among present day young researchers engaged in plant taxonomy research.

Role of botanical illustrations in the process of plant identification:

While working as a Research Fellow in Central National Herbarium (CAL) during 1999-2003, I was interested to see pencil sketches and line drawings by Charles Baron Clarke on Ericaceous herbarium sheets (Fig. 3). Clarke probably got his idea from Roxburgh's 2nd edition of his book, Flora Indica vol. 1 in 1832 (actually published by William Carey on behalf of the late William Roxburgh). These line drawings are key factors in the determination of species and varietal level identification. One does not need to dissect flowers of the herbarium specimens, rather these pencil sketches themselves contribute to the process of plant identification. Sometimes several confusing data are gathered due to 'range of variations' studies based on consultation of several herbarium specimens of a particular plant taxon. These 'range of variations' can be confusing to a taxonomist, especially young researchers engaged in plant taxonomy research, who may come to the conclusion that one of the specimens is a new taxon. But these pencil sketches on herbarium sheets, sometimes a range sketches show that in reality they are the same and there is no variation at all!

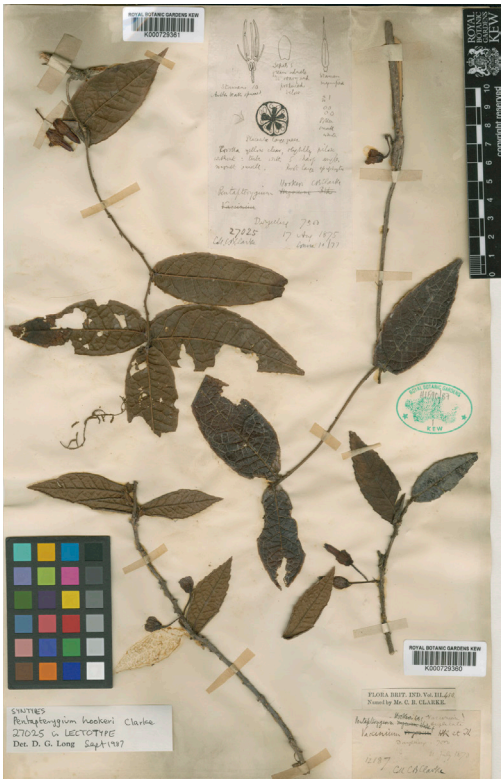


Figure 3: C. B. Clarke's pencil and ink sketches on an Ericaceous herbarium sheet, Agapetes hookeri (C. B. Clarke) Sleumer (above two plant specimens with Barcode no. K000729361, coll no. 27025, drawn by himself on 17th August, 1875 at Darjeeling town) (Source: procured from Cibachrome type images from K Herbarium website https://apps.kew.org>herbcat).

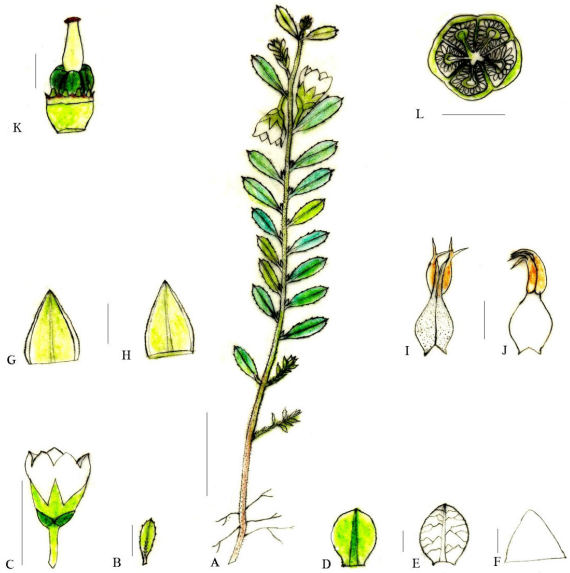
During taxonomic revisionary work on some selected genera of Indian Ericaceae, under 'Flora of India Project' (1999-2003), I made several Rotring sketches using Indian ink and colour wood pencil-based field line drawings on Indian Ericaceous plants, mostly of Eastern Himalayan taxa. The following is an example of how botanical illustrations helped in the case of *Gaultheria sinensis* J. Anthony (Figs. 4-6) identification through the following steps (S. Panda 2005):

a. Field drawings with the help of good quality microtip pencil, followed by coloured wood pencils, on the spot itself (Kibek in West Sikkim, Fig. 5, Map 1).
b. Neatly labelled line drawings with the help of Rotring pen using Indian ink at the CAL Herbarium after returning from the field (Fig. 6).
c. Detailed descriptions based on botanical drawing and field data
d. Highlighted unique characters.
e. Consultations of relevant taxonomic literature if available.
f. Matching this plant (Fig. 4A) with identified herbarium specimens of *Gaultheria* L. in CAL (Fig. 4B) and other Indian Herbaria (e.g., ASSAM, BSHC, BSIS, DD).
g. Field data and field drawings used as key factors leading to correct identification as *Gaultheria sinensis* J. Anthony (Ericaceae)

Conclusion

During the process of plant identification, one important key factor is botanical illustration. One should not avoid botanical illustrations. Young researchers in the field of plant taxonomy should be oriented towards understanding botanical illustrations from the beginning of their career along with other existing techniques. One may follow Keith West's book, *How to draw plants: The Techniques of Botanical Illustration* (2004) for correct scientific drawing.

Figure 4A (left): *Gaultheria sinensis* J. Anthony (Ericaceae) Herbarium specimen at CAL. Collected for the first time from Kibek of West Sikkim on 14th May, 2002 by the author; Figure 4B (top): Central National Herbarium (CAL) (Photo credits: S. Panda)



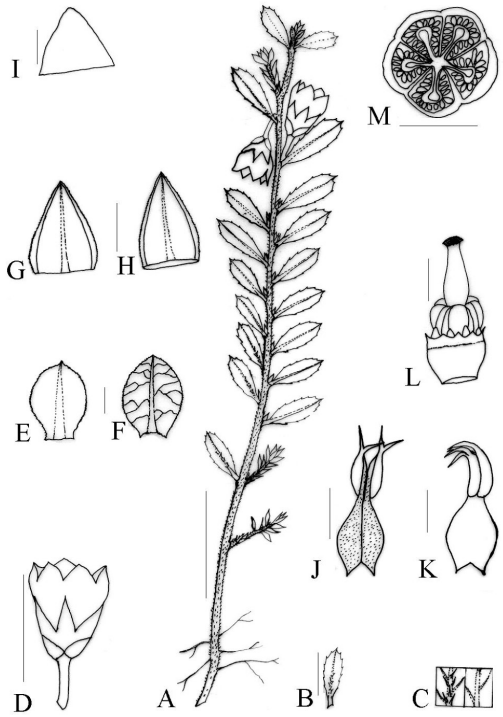
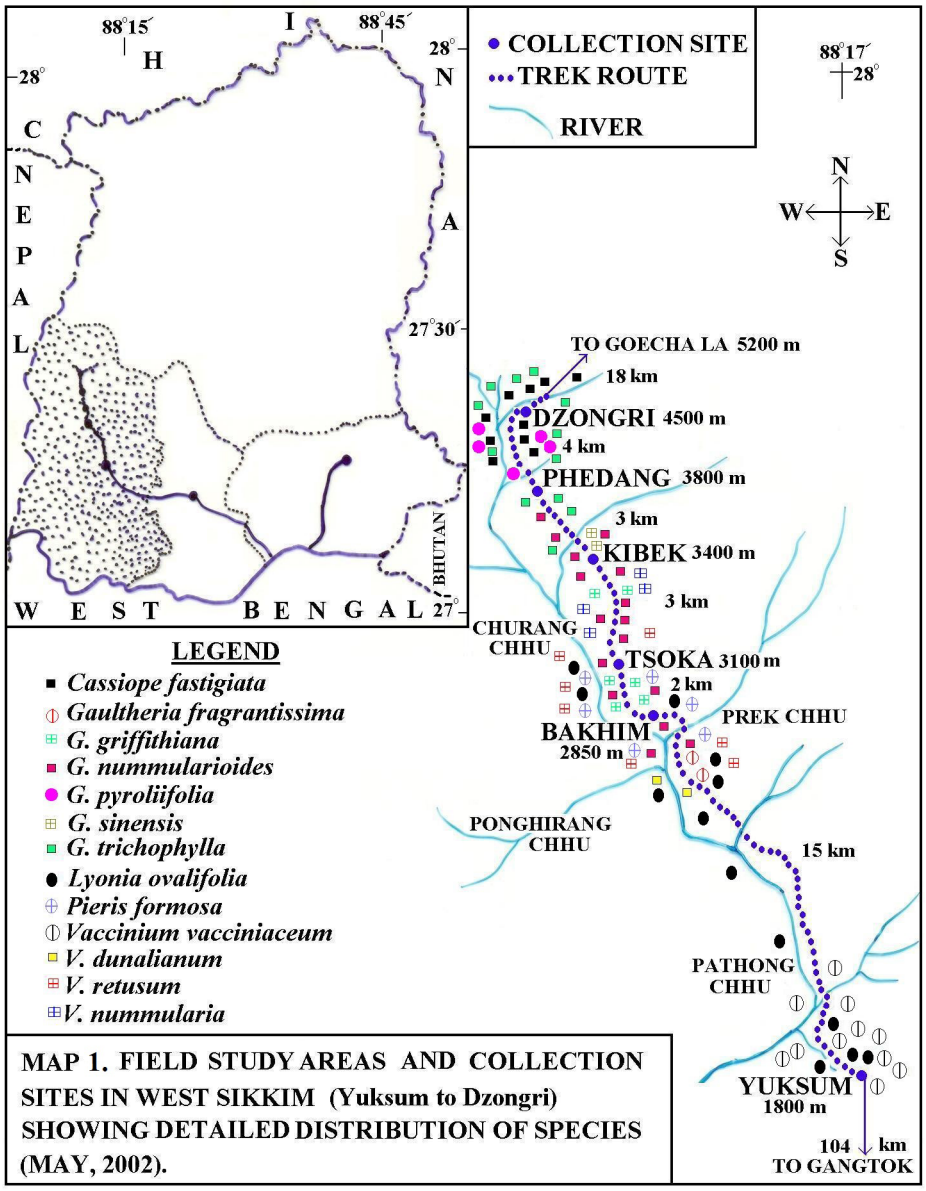


Figure 5A (top): *Gaultheria sinensis* field drawing at Kibek in West Sikkim; Figure 5B (right): *Gaultheria sinensis* line drawing (Photo credits: S. Panda)



Map 1. Showing Natural distribution of *Gaultheria sinensis* J. Anthony at Kibek in Sikkim Himalaya (India).

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The author would like to acknowledge his mentor, Dr. M. Sanjappa, former Director of the Botanical Survey of India for his untiring guidance at CAL during the 'Flora of India Project' work on taxonomic revision of some selected genera of Indian Ericaceae. The author also wishes to express his thanks to Dr. A. A. Mao, present Director of BSI for his continuous support and inspiration, and to Dr. R. K. Gupta, In-Charge, CAL Herbarium, for his permission to consult herbarium specimens.

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Early Career Advice

Eric H. Roalson (Fig. 1) is a Professor and the Director of the Marion Ownbey Herbarium (WS) at Washington State University, Pullman, USA.

How have herbaria enriched your research?
The vast majority of my research over the past 30 years has been based on herbarium collections. This includes everything from vouchering collections from my own fieldwork to using historical and contemporary collections for systematic and phylogenetic research, describing new species, studying geographic distributions, and so on. Really, herbarium collections form the core underlying data for everything I have done.

How have herbaria enriched your teaching?
I think students really respond to having the tactile interaction with real plants, and so using the herbarium collections in teaching plant diversity, plants and people-focused courses, and even introductory botany greatly enhances those course. I find students are often very interested in the history and geography information found on herbarium specimens, in addition to learning about the plants.

Figure 1: Eric H. Roalson

What types of outreach activities do you do for the general public?
The Marion Ownbey Herbarium (WS) typically does tours for WSU classes, but it has otherwise not done a lot of other public outreach, at least in recent years. We are starting to do more public outreach across all of the museums at WSU, including hosting special events for groups like the WSU SACNAS (Society for Advancing Hispanics/Chicanos & Native Americans in Science) chapter, behind the scenes tours for the local Girl Scout troop, tours for the WSU Botany Club, tours for WSU International Programs, etc. We have had some discussions on possible collaborations with the local science museum, but those have not borne fruit yet.

What made you first interested in herbaria?
My first systematic botany class. It was my first exposure to plant natural history collections, and it definitely made me more interested in learning more. The professor who taught the systematics courses at Texas A&M University, Dr. Stephan Hatch, did an excellent job of cultivating an interest in plant taxonomy and herbaria while I was an undergraduate student.

What was your first herbarium-related job?
I would consider my first herbarium-related job to be my Master's degree position at New Mexico State University. I was a student with Dr. Kelly Allred doing a floristic project, helping with the New Mexico Range Science Herbarium, and TAing the plant diversity classes. While not officially herbarium employment, it was the first position I was in where I was spending a large amount of time working in the herbarium.

What was the species of your first herbarium collection and where did you collect it? My first collection was *Oxalis dillenii* Jacq., collected in a park next to the house I lived in in Round Rock, Texas. It was for the required plant collection for my first plant diversity class at Texas A&M.

What are some herbarium-specific challenges you have faced during your career and how were you able to overcome them?
The biggest challenge I have faced is quite recent: after being director of the WS Herbarium for two years, the decision was made that we needed to move the herbarium to a new location as the building it was in was slated to be torn down in the near future. The logistical complexity of moving a collection of 400,000 specimens and the aged compactor system (installed in 1983!), as well as sorting through all of the material that had accumulated over the previous 50+ years in that location was complex to say the least. However, we were able to go from plan formulation to being completely moved and reopened and functional in about 13 months. They were a complicated 13 months, but we are now ready to reinvigorate the herbarium work here at WSU. While, to many, the idea of moving an herbarium might sound like a really negative thing, it has allowed us to create a much more functional space, in a much better location, and create a much more organized arrangement of the material outside of the main collection.

What challenges do you see early career curators and collection managers facing and how do you think they could be met?
Biology is an aways-expanding field and resources are always spread more thinly than optimal. Continuing to advocate for the relevance and importance of collections is never ending.

What was the best herbarium/career advice that you received?
I think the best advice I received, or at least the lesson I learned from mentors, is to do what is necessary to be successful where you find yourself. Every position is different, and everyone's situation is different, and there is not one approach that will always work best. Find what will allow you to be successful where you are – you can't advocate for herbaria, change in priorities, diversity, etc. if you aren't in the job. How does that apply? Well, in my case, what was clear to me (or the lesson I learned, rightly or wrongly), was that I needed to emphasize particular research approaches early in my career and that has then allowed me to come back to other areas later in my career when I had more agency to determine my own path.

What advice could you give for early career members to be successful?
Find things that you are excited about and that motivate you to do your work! There will always be aspects of a I have spent most of my career not in herbarium positions, so in many ways I am only just recently back to herbarium work, which make this question seem much closer to what I am experiencing now. I do think that there has been a reinvigoration of natural history collections work, and renewed appreciation for the value of collections, particularly where you can demonstrate connection to broader questions about biodiversity and challenges of big biological questions, like climate change.

How is being an early career curator/collections manager nowadays better than when you began your career?
I think the breadth of skills and experiences that can be applied to herbarium work adds some challenges as one person cannot be an expert in all things, and so figuring out what aspects of herbarium work you want to focus on and how best to engage with the diverse fields of biology that touch upon natural history collections can be a real challenge.

How can early career members better leverage herbarium sciences into the future?
There are numerous technological advances that allow us to leverage collections in new ways. Find ways of applying those to your collection, either through your own research or through collaborations with other scien

tists. This can better integrate the collection into the research community, as well as demonstrate the relevance of collections to other fields of biology.

What are the important ways herbarium staff can promote and advocate for their collections?
I think every collection might have its own challenges or opportunities depending on their location and history, but I think there are a large number of herbaria that do not have public outreach space associated with their collection, and this limits their opportunity for public outreach and funding opportunities for public outreach. This is often despite there being local natural history museum spaces that include public displays. In my opinion, better integrating herbaria with other natural history collections so plants can be more directly integrated into public displays is an excellent opportunity to promote and advocate for herbarium collections, and is an approach underutilized by many collections.

What are some future challenges you see early career members facing, and how can they rise to meet those challenges?
Natural history collections, including herbaria, often have a relatively small staff, and there is more to be done than working hours available. The challenge of advocating for staff support of collections, replacing retirees, etc. is one of the more challenging problems faced by collections. Where collections are able to demonstrate their value to the community, university, etc., the likelihood of continued support increases.

What is the best thing about managing a herbarium collection?
It is a very concrete way of engaging with students and the general public on plant diversity and its importance. When you can show someone a physical specimen and talk about what it is, where it is from, who collected it, who was that person, etc. it really engages people's interests.

What is the one most important thing that a herbarium does?
While herbaria are important in numerous ways, my opinion is that the most important thing a herbarium does is provide a long-term permanent record of plant diversity on the planet.

What is the future of herbarium science?
Herbarium science is poised to continue to be a core resource for understanding fundamental questions in biology. Our ability to use herbarium material to answer numerous questions about plant diversity and a changing planet only continues to increase, and so herbaria can play a fundamental role in these works.

Do you have any closing advice for early career members?
Be an enthusiastic advocate whenever you can! You never know who might be moved by learning about herbarium collections, whether students, members of the public, or the construction workers renovating your space!

Early Career Advice is a regular feature of *The Vasculum*. If you have questions you would like to ask or if there is someone you would like to see interviewed, please contact us (earlycareer@herbariumcuratorsorg).

Featured Herbarium

Overview and administration

New Mexico State University (NMSU) is a public land-grant research university located within the Chihuahuan Desert in Southern New Mexico, U.S.A. About 20,000 students are enrolled across five campuses. The surrounding region is known as The Borderlands due to its close proximity to Mexico. Local communities are particularly diverse, both socioeconomically and culturally, with a large portion of the population Latino and Spanish-speaking. As such, the University's student body is around two-thirds Hispanic and NMSU is designated as an official Hispanic-serving institution (HSI).

Founded in 1890, the New Mexico State University Herbarium (NMC) is the oldest herbarium in New Mexico and holds an international collection of 103,000 specimens (https://herbarium.nmsu.edu/index.html). The NMC Herbarium, recently 100% digitized, includes a diverse group of naturally occurring and cultivated plants that document variation and geographic distributions of more than 13,000 species of vascular plants, bryophytes, algae, and fungi.

Over the 130-year history of the NMC Herbarium, the collections have been under the care of ten part-time faculty curators associated with several different colleges and departments. The primary responsibilities of curators have generally focused on education, research, and outreach (Fig. 1). Currently, the NMC Herbarium is managed by Director Sara Fuentes-Soriano and Curator Zachary S. Rogers. Prior to 2017, NMSU actually had two separate herbarium collections on campus, the Biology Herbarium (NMC) and the smaller Range Science Herbarium (NMCR). Recently the two have been unified, physically and digitally, into a single herbarium under the umbrella code NMC. Routine operations in the herbarium are carried out with the help of student workers, interns, and an enthusiastic group of volunteers coming from the local community.

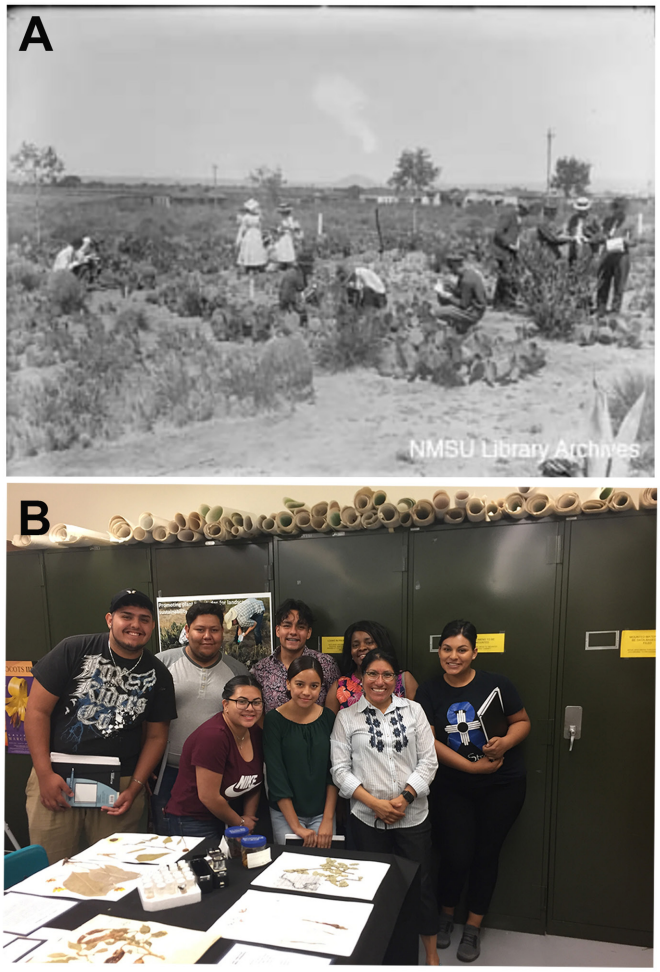


Figure 1: The NMC Herbarium has more than 130 years of history conducting plant education and research activities in Southern New Mexico. A. Class sketching plants in the late 1890s on the NMSU campus in Las Cruces, New Mexico (Photo: E.O. Wooton, courtesy of the Hobson-Huntsinger New Mexico State University Archives). B. Tour and workshop offered at the NMC herbarium in 2018 to students in the College Assistance Migrant Program (CAMP) STEM program (Photo credit: Z.S. Rogers).

The herbarium is open to the public, without appointment, and currently receives about 1,000 in-person visitors annually. NMC is housed in the Biology Annex building on the University's main campus in Las Cruces, New Mexico, U.S.A.

History and strengths of the two recently-unified collections

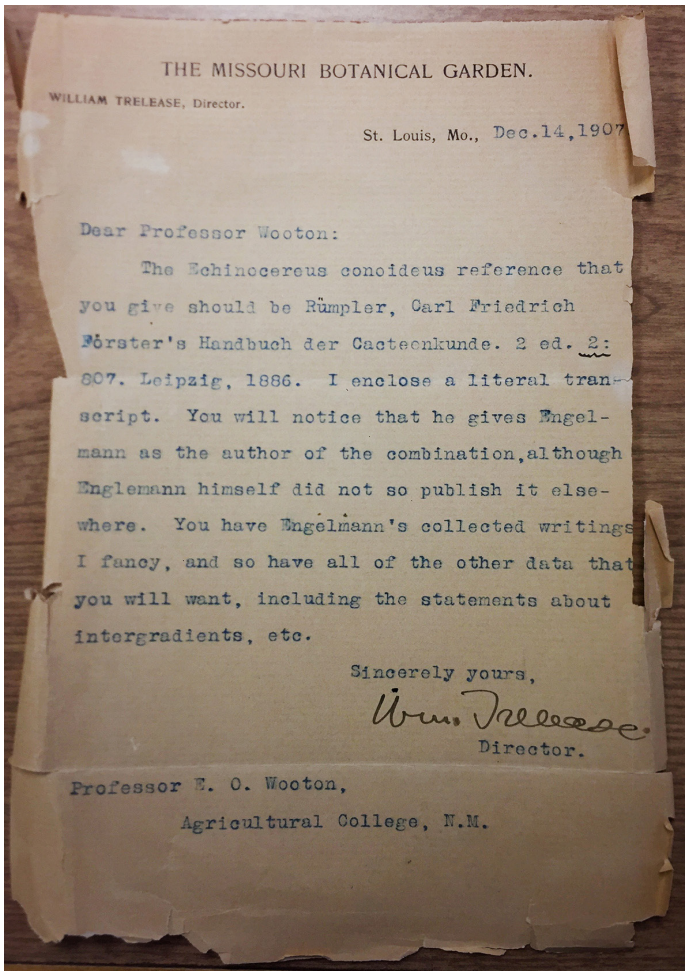
The NMC Collection. In 1890, Elmer Ottis Wooton (1865–1945) took a teaching position at the newly formed New Mexico College of Agriculture and Mechanic Arts in Las Cruces and became the first botanist to reside in what was then still known as the New Mexico Territory (Fig. 2; Allred, 2008). Professor Wooton, along with his student Paul C. Standley, immediately started building his herbarium to document plants of the region; a large portion of the species he collected proved to be completely new to science. Wooton also developed long-distance collaborations and specimen exchanges with prominent botanists working at institutions located in the Midwestern U.S. and along the Atlantic Coast (Fig. 3). By the time Wooton permanently left the Territory in 1911 (one year before statehood), the collection had grown to a respectable 6,500 specimens and more than 600 nomenclatural types. For the next 60 years, the NMC Herbarium grew slowly with numerous extended periods of inactivity. Then, in 1968, Dr. Richard W. Spellenberg joined NMSU and served as herbarium curator until his retirement in 2002. As an avid collector, Spellenberg diversified NMC by collecting and incorporating plants occurring throughout the American Southwest and Mexico. Spellenberg has contributed more than 10,000 specimens to NMC and continues to add interesting taxa to the collection each year.

Figure 2: A. Professor Elmer Ottis Wooton in 1896, age 31, just a few years after he started the NMC Herbarium at New Mexico State University (Photo: Thomas Studio; Mae Gilmore Miller Photograph Collection, housed at the Hobson-Huntsinger New Mexico State University Archives). B. The title page of one of Wooton's field notebook from a 1909 trip to the High Plains in southeastern New Mexico. C. Wooton's field notes from a 1906 trip to Silver City, New Mexico, showing an elevational transect sketch of the landscape near the Rio Grande (Photo credit: B and C: S. Fuentes-Soriano, taken from original resources in the Hobson-Huntsinger New Mexico State University Archives).

Historical highlights from NMC are thousands of specimen vouchers that were used to produce the first Flora of New Mexico (Wooton and Standley, 1915) and the legacy plant collections and observations made by renowned botanists such as Wooton, Standley, and O.B. Metcalfe. The herbarium currently holds about 850 nomenclatural types (excluding paratypes) of New Mexico plants, more than any other institution worldwide. About 20% of those priceless types were collected by Wooton himself. Taxonomic strengths of NMC have developed over the years to include Asteraceae, Brassicaceae, Fabaceae, Fagaceae, Nyctaginaceae, and Poaceae.

The NMCR Collection. Founded in 1956, the Range Science Herbarium (NMCR) remained very small until the hiring of Dr. Kelly W. Allred in 1979. Allred quickly became the foremost agrostologist and bryologist in the state and focused specifically on collecting and documenting the diverse plant communities of New Mexico. By his retirement in 2012, Allred had grown the collection to more than 20,000 specimens mainly through his own collecting efforts and those of his students. Although NMCR is much smaller than NMC, its specimens document a great deal of the state's flora, especially for those taxa occurring in southern New Mexico. Many of the NMCR specimens are unique because duplicates were rarely made and were not distributed to other herbaria.

A decision was made in 2017 to unify the smaller, younger NMCR with NMC as part of a larger effort to revitalize and modernize both collections through integrated management, curation, and digitization. That decision has already paid off through 10-fold increases in visitation and usage of the collections. NMCR specimens provide data used for many research projects including regional and local guides to the plants of New Mexico, an updated state flora (Allred 2020; Allred and Jercinovic, 2020), and numerous articles about the state's 4000 species of plants (Rogers and Spellenberg, 2023; Rogers et al., 2023).



THE MISSOURI BOTANICAL GARDEN.

WILLIAM TRELEASE, Director.

St. Louis, Mo., Dec.14,1907

Dear Professor Wooton:

The Echinocereus conoideus reference that you give should be Rümpler, Carl Friedrich Förster's Handbuch der Cacteenkunde. 2 ed. 2: 807. Leipzig, 1886. I enclose a literal transcript. You will notice that he gives Engelmann as the author of the combination, although Englemann himself did not so publish it elsewhere. You have Engelmann's collected writings I fancy, and so have all of the other data that you will want, including the statements about intergradients, etc.

Sincerely yours,

Wm. Trelease.

Director.

Professor E. O. Wooton,

Agricultural College, N.M.

Figure 3: A 1907 correspondence from Missouri Botanical Garden Director and Cactaceae specialist William Trelease to E.O. Wooton regarding a species of *Echinocereus* Engelm. (Photo credit: S. Fuentes-Soriano, taken from original resources in the Hobson-Huntsinger New Mexico State University Archives).

Recent Expansion and Modernization

Through funding received from the National Science-Foundation, PIs Fuentes-Soriano and Rogers recently completed a four-year project to digitize and merge the two NMSU herbaria (NMC/NMCR) that were stored previously in different buildings on campus. As part of this process, all 103,000 specimens received a complete curatorial evaluation prior to digitization. The herbarium was reorganized to match the most recent phylogenetic taxonomic classifications of major plant lineages and families. Five thousand specimens in newspaper were recovered from a sizable backlog and accessioned into the collection. Ten thousand damaged specimen were repaired, while another 10,000 were assigned mappable coordinates post-facto. A total of 2000 duplicates and poor-quality specimens were removed permanently from the herbarium. The unification included the laborious task of combining two disparate, incomplete, insecure, offline databases into a single, modern, online specimen database. Every specimen was photographed with a high resolution imaging system. Specimen data records and associated images are now available more broadly via Specify, the new herbarium database and unified management system (https://specify.nmsu.edu/specify/). Copies of our complete, cleaned dataset will be refreshed on public biodiversity portals like SEINet and GBIF later in 2023.

The consolidated NMC (NMC plus NMCR) has been a stalwart component serving the international botanical community and a great resource that complements the University's scientific, educational, and outreach goals.

The NMSU herbarium over the years has: 1) generated and integrated plant taxonomic, phenotypic, and genetic data and knowledge; 2) enabled easy and equitable access to data to accelerate research, innovation, and application of plants to globally relevant societal problems; and 3) used historical herbarium specimen data to produce newly generated taxonomic, ecological, and genetic information to better serve future generations of plant scholars.

Digitization, Preservation, and Accessibility

Preservation of the plant specimens is crucial for their long-term value. The NMC Herbarium follows standard herbarium practices, including careful specimen preparation, label digitization, imaging, and storage. The specimens are organized according to a classification system, and their data, such as collection location, date, and collector information, are meticulously documented.

The herbarium serves as a research facility and plays an important role in education and outreach. It offers opportunities for students and the public to learn about plants, their identification, and their importance to ecosystems (Fig. 4). The herbarium staff conducts workshops, provides plant identification services, and collaborates with other institutions to promote botanical knowledge and conservation.

Opportunities for Research and Education

NMC Herbarium collections represent the harmonization and coordination of existing Southwestern New Mexico plant biodiversity resources and their joint mission to promote, support, and enable the use of plant herbarium specimens for research, education, innovation, and workforce development. The NMC Herbarium's unique knowledge base and infrastructure offer opportunities to generate diverse educational materials and develop new internship and professional development opportunities for underserved students. NMC is actively engaged with training undergraduates, graduate students, and postdoctoral scholars. The NMSU Herbarium serves as an important resource for botanical research, providing a wealth of information on plant taxonomy, distribution, ecology, and conservation. It also supports the work of NMSU faculty and visiting scientists, as well as researchers from other institutions. The herbarium's collections and associated data contribute to studies on plant diversity, vegetation mapping, invasive species, and climate change. The NMC Herbarium regularly collaborates with agencies such as the U.S. Department of Agriculture (USDA), the

Figure 4. A. NMC Herbarium Director Sara Fuentes-Soriano and Curator Zachary Scott Rogers studying a New Mexico species of Brassicaceae in 2019. B. A field trip to Bishop's Cap Peak in the Organ Mountains Desert Peaks National Monument, near Las Cruces, New Mexico. The group consisted of NMC Herbarium students and curators, volunteers from New Mexico State University, and members of the New Mexico Native Plant Society-Las Cruces Chapter. Many herbarium specimens were collected as part of a project focusing on inventorying plant communities of the park (Photo credit: Alexander Abair).

National Park Service (NPS), and the Bureau of Land Management (BLM), and also with international researchers conducting scientific research and conservation.

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Society of Herbarium Curators Worldwide

Fostering Plant Taxonomy Skills: Empowering Latin American Botanists through Herbarium Research

Welcome to the column where we highlight individual members from across the globe! For this edition, SHC member Manuel Luján (Fig. 1) Taxonomist at the Royal Botanic Gardens, Kew, Richmond, UK, shares his experiences in moderating a workshop on plant taxonomy skills for conservation in La Paz, Bolivia in 2023, to empower latin american botanists.

In the Neotropics, a region that boasts unparalleled biodiversity, efforts to better understand and document the flora ought to be implemented and expanded. Recognizing the importance of equipping young botanists with plant taxonomy skills, the Royal Botanic Gardens, Kew organized a workshop on Plant Taxonomy Skills for Conservation, Latin America 2023. This initiative focused on supporting Latin American students in acquiring knowledge on plant species classification and delimitation, nomenclature, conservation assessments, as well as notions on phylogenetic systematics, morphometrics, and species distribution. The workshop started with a three-week online module where Kew's specialists offered a series of lectures on the principles of plant taxonomy, emphasizing the significance of natural history collections as invaluable resources for taxonomic research. The students had the opportunity to interact live with over 30 specialists from Kew, as well as work independently to complete short exercises on specific subjects.

During the first days of March 2023, and after a great deal of logistics and travel coordination, 16 students from eight different countries in Latin America gathered in La Paz, Bolivia to begin the in-person module of the workshop. Our wonderful colleagues from the Bolivian National Herbarium (LPB) and Universidad Mayor de San Andrés (UMSA)

Fig 1. Plant collecting in Yungas forest near Santiago de Chirca biological station in Bolivia. Left to right: Maira Martinez, Giovanni Paton, Sara Núñez-Meza, Cherry Rojas, Manuel Luján.

were instrumental in supporting the participants during the course. LPB Herbarium's Director, Dr. Carla Maldonado, and staff kindly provided access to the collections, workspaces, and critical logistics to accommodate and support students. LPB staff and associated researchers also participated as lecturers and instructors, providing first-hand knowledge about Bolivian plant diversity and botanical research in the country.

The workshop embraced an interactive approach, immersing participants in hands-on activities. Students were introduced to the LPB Herbarium, where they learned about the process of plant specimen preservation, mounting, and cataloguing (Fig. 2). During the workshop, participants used LPB collections to undertake short research projects. They focused on specific plant genera, delving deep into taxonomic research. With the guidance of Kew specialists Bente Klitgård, Gwilym P. Lewis, Anna Haigh, and Manuel Luján, the students conducted species delimitation exercises, generated species identification keys, distribution maps, and species conservation assessments for plant groups native to Bolivia. In collaboration with Dr. Silvia Gallegos, the course went on a three-day field trip to Santiago de Chirca Biological Station (fig. 1), where we were able to observe part of Bolivia's extraordinary biodiversity and learn about restoration projects in the Yungas ecosystem. This hands-on approach allowed students to learn from practitioners at the forefront of conservation science, bridging the gap between theoretical knowledge and practical application. They also acquired field research experience by collecting plant specimens and their associated data (Fig. 3 and 4).

Fig 2. Pressing plants and processing field notes in Santiago de Chirca biological station. Sitting up front Luis Torres (F) standing on the right Dr. Bente B Klitgård (Kew). (Photo credit: Manuel Luján)

The participants had the opportunity to share their research projects during a final presentation at the University's auditorium, followed by a closing ceremony with high-profile guests including Oscar Arnaldo Heredia Vargas, rector of the University, and Jeff Glekin, United Kingdon Ambassador to Bolivia (Fig 5). The successful workshop delivered a transformative learning experience, enabling early-career Latin American researchers to acquire essential skills in plant taxonomy. By engaging with the extensive natural history collections, students gained a comprehensive understanding of the rich Bolivian flora and developed the capacity to contribute to its documentation. This initiative was generously supported by Schroder Trust and Mallinckrodt Pharmaceuticals. Below are some testimials from participants:

"This workshop allowed me to update my knowledge about some botanical families important in tropical dry ecosystems such as legumes, and to acquire new knowledge of the flora of Andean ecosystems. The human aspect of meeting colleagues from other countries and finding the similarities and motivations that push us to continue carrying out botanical research from our countries was important. Overall, the workshop was scientifically and personally very motivating." Iris Saldivar Gomez (Herbario Nacional de Nicaragua, Nicaragua)

"This was an amazing opportunity. After the workshop, I returned to my country with new perspectives and more

confidence, and I am now working to publish some of my taxonomic work. This experience changed my professional and personal life for the better." Ernesto Campos-Pineda (Smithsonian Tropical Research Institute, Panama).

Fig. 3. Participants during fieldwork in the Yungas. Left to right: Giovanni Paton, Maira Martinez, Iris Sandoval, Cherry Rojas, Dr. Gwilym P Lewis (Kew). (Photo credit: Manuel Luján)

Fig. 4. Plant identification in the field, left to right: Ernesto Campos (SCZ), Alfredo Fuentes (LPB), Dr. Gwilym P Lewis (Kew), Dr. Bente B Klitgård (Kew). (Photo credit: Manuel Luján)

Figure 5. Participants of the Plant Taxonomy Skills for Conservation 2023. Standing left to right: Cinthia Soliz, Michel Palencia, Stephanie Núñez, Emma Mendieta, Cherry Rojas (crouching), Maira Martinez, Alejandra Huaman, Rosember Hurtado, Claudia Miguez, Sara Nuñez, sitting left to right: Arhtur La Rosa, Ernesto Campos, Giovanni Paton, Luis Torres, Gustavo Miranda. (Photo credit: Manuel Luján)

If you would like to be interviewed for a future column, please get in touch with us via membership@herbariumcurators.org.

SHC MEMBERSHIP DRIVE & ANNUAL RENEWAL

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We also encourage our members to donate to The Society to support our General Fund, our Student Research Grant Fund, or our nascent Endowment. As we grow our student research funding, it is our goal to increase award amounts, the number of awards granted, and to diversify grantees, all while supporting innovative research that benefits herbaria.

Cover Photo: (Top: *Gaultheria codonantha* Airy Shaw (S.Panda 30885, CAL): Walong, Arunachal Pradesh, 28/04/2003, deposited at CAL (Central National Herbarium)-Ericaceae; Photo Credit: Subhasis Panda)

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