



The Vasculum

The Society of Herbarium Curators
Newsletter

Volume 13, Number 1: January 2018

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The Society of Herbarium Curators (SHC) is an international organization for discussion, action, and support of herbaria.

Created in 2005 in the southeastern United States, the SHC mission is to unite herbaria across the nation and around the world. For more information, please join us online:

— www.herbariumcurators.org —



Become a member by visiting:
www.herbariumcurators.org/membership

Annual Dues

Student	\$5
Regular	\$10
Sustaining	\$25
Life	\$200

Join us online



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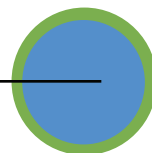
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Message from the President



It is my pleasure to begin by welcoming John Schenk (Georgia Southern University Herbarium) as the new Editor of *The Vasculum*, and Abby Moore (University of Oklahoma's Robert Bebb Herbarium) and Melanie Link-Perez (Oregon State University's Herbarium) as the new Associate Editors. I know that they have great plans for this publication and look forward to watching things roll out over the next issues.

I also thank the Society of Herbarium Curators' Executive Board and Committee Members. It has been a pleasure to work with this hardworking, creative cross-section of the Society's membership in the last year-and-a-half. The group has taken a number of positive steps since the last President's Column, and I will highlight a few of them here.

Perhaps the biggest news has been the approval of the governance documents for an Early Career Section of the Society by the Executive Board on November 22, 2017. According to the Section's Constitution, its purpose is "to support the mission of the Society by empowering students, postdoctoral researchers, and early career professionals for success in herbarium settings." Membership in the Section is open to all who wish to further its purpose, and you can become a member when renewing your membership for 2018. Thank you, Katelin Pearson (Florida State University's Robert K. Godfrey Herbarium), for providing leadership in the creation of the Section's governance documents. Erica Krimmel (Membership Committee Chair; Chicago Academy of Sciences

Herbarium) has agreed to chair the Section's nominating committee to produce the Section's ballot for its four initial officers: Section President (one-year term), Section President-Elect (one-year term), Section Secretary (two-year term), and Section Professional Development Officer (two-year term). If you would like to be considered for one of these positions, please contact Erica Krimmel soon at: ekrimmel@naturemuseum.org. This is an exciting and formative time to serve in those roles.

A second potentially transformative change for the Society is the Executive Board's approval to take the following proposal to the membership for a vote in Spring 2018: Beginning with calendar year 2019, SHC will offer a new "Developing Country" membership category that is complimentary to applicants residing in countries that the SHC Executive Board identifies as eligible based on economic data (e.g., from the World Bank). The SHC Executive Board will annually adopt a list of qualifying countries for the following year. The proposal was made by the Society's Membership Committee, and I personally think that it is an excellent way for the SHC to use its low overhead as a strength, rather than our small annual income simply serving as a constraint. At the end of 2017, the Society's 290 members represented 20 countries. This step would remove a barrier to engaging prospective members with limited resources elsewhere while circumventing some of the limitations introduced because PayPal only accepts 20 or so currencies. The proposal needs to be voted on by the membership because Article 1,

Section 1, of our Bylaws states that “Annual dues shall be set by the membership on recommendation by the Executive Board.”

Here, I will single out our webmaster, Michael Thomas, for special thanks. Michael’s hard work to transition the Society over to a more robust and scalable membership payment and data management infrastructure is making membership growth reasonable for our all-volunteer organization. Expect to see changes to the protocol for membership renewal in 2018 that should make the process more straightforward. These changes incorporate PayPal and, for the first time, CiviCRM.



If you are reading this at a time prior to the February 1 deadline, please help the society advertise its Student Research Grants program. The website for the program has the following description of in-scope research: “Research on any taxa typically accessioned in herbaria including all plant, fungal, lichen, and algal lineages is eligible. Supported activities could include, but are not limited to, fieldwork to generate vouchers for revisionary or floristic work, collecting morphological data from specimens, traveling to herbaria, or making and distributing physical specimens.” The Society awards two \$500 grants to graduate students and one \$250 grant to an undergraduate student. If you have questions, I encourage you to contact Kathy Mathews (Grants Committee Chair; Western Carolina University Herbarium) at kmathews@email.wcu.edu.

I am also pleased to announce that David Jennings (iDigBio, Florida Museum of Natural History) and I

will again offer the short online course “Strategic Planning for Herbaria” to the Society’s members this spring. This year’s course will be on Fridays from 3–4 (Eastern Time Zone) during the eight weeks from April 6 to May 25. A somewhat lengthy description of the 2017 course’s activities can be found in the previous Message from the President column of *The Vasculum*. If you have not already done so, I encourage you to do strategic planning for your herbarium in the context of the course or otherwise. Let’s make it clear to our administrators that our herbaria are context-aware and stakeholder-relevant. Watch for a Society e-mail with additional information on how to apply for the course in the coming weeks.

We will be electing a new Member-at-Large for the Executive Board this spring. If you would like to volunteer to be considered or would like to nominate someone, please send an e-mail to Lucinda McDade (Nominations Committee Acting Chair; Rancho Santa Anna Botanic Garden) at lmcdade@rsabg.org, or me (amast@bio.fsu.edu). The Society values the participation of members from all regions of the world, all institutional contexts, and all career stages.

Thank you for your past and ongoing support of the Society of Herbarium Curators. If you have any thoughts on how to make the society even more successful, please don’t hesitate to e-mail me.

Austin Mast

Robert K. Godfrey Herbarium Director, FSU



From the Editor

moved into after being the Curator of the Armstrong State University Herbarium (AASU). Both Associate Editors bring with them a creative and critical eye, along with their passion for herbarium curation and botanical science. We look forward to their continued input in the upcoming issues.

There is no better way to start this issue of *The Vasculum* than to thank Conley McMullen and his Associate Editors Bryan Dutton and Melinda Peters for the amazing job they did in bringing us *The Vasculum* over the last 12 years. *The Vasculum* has been much more than a newsletter. It has documented everything that makes the Society of Herbarium Curators great, including the events that have promoted herbaria and the officers who have worked diligently to strengthen the Society and its mission. *The Vasculum* has been a platform to better know your fellow curators, their collections, and their exciting work. As stated on the SHC website, *The Vasculum* was established to advance and publicize the Society's mission "to promote and expand the role of herbaria in botanical research, teaching, and service to the community at large; to provide a forum for discussion and action on all issues confronting herbaria; and to extend its efforts and interject its influence toward the protection and preservation of endangered herbaria." There is no doubt that Conley and his team did just that over the last 12 years and we are indebted to them for their service. Thank you Conley, Bryan, and Melinda!

As we transition to a new editorial team, we continue *The Vasculum* with the same mission in mind. As you have likely noticed, we have changed the look of *The Vasculum*, but you will find the great content that Conley and his team developed over the years to be familiar. We welcome two new Associate Editors to *The Vasculum*, Abby Moore and Melanie Link-Pérez. Abby is an Assistant Professor and Curator of the Robert Bebb Herbarium (OKL) at the University of Oklahoma. Melanie is the Curator of the Oregon State University Herbarium (OSC), a position she recently

It has been the contributions submitted by our members that have made *The Vasculum* so enjoyable over the years. We want to take this opportunity to again solicit articles for future issues. Our members have been conducting amazing projects that incorporate herbaria in teaching, research, public outreach, and advocating plant biodiversity. We want to hear more about what you are doing and be inspired. Please see our call for papers on page 4 for more information.

We continue in the tradition of previous *Vasculum* issues to include the Featured Herbarium series. This issue highlights the collections at the Universidad Nacional Autónoma de México (UNAM). The herbarium at UNAM (MEXU) has a deep and rich history that made it one of the most impressive collections in the world. You will also find an invited article by University of Vermont's Dave Barrington, who updates us on how the Pringle Herbarium (VT) has recovered from the August 3rd fire. As a Society, we all breathed a sigh of relief that the damage was not as severe as we first feared, and reading through Dave's account will provide invaluable information to all of us on how to mitigate damage and recover quickly from such a devastating event. In addition to our featured articles, you will find sections that include a message from President Austin Mast, News from our Society, and News from our Members.

We hope you enjoy this issue of *The Vasculum* and look forward to bringing you future issues.

John J. Schenk, Editor

Georgia Southern Univ. Herbarium Curator

News from the Society

■ SHC Student Research Grants

Scope: Research that contributes to or uses herbarium resources in ways that augment the collections. Research on any taxa typically accessioned in herbaria including all plant, fungal, lichen, and algal lineages is eligible. Supported activities could include, but are not limited to, fieldwork to generate vouchers for revisionary or floristic work, collecting morphological data from specimens, traveling to herbaria, or making and distributing physical specimens. Thus, students' overarching research could include molecular approaches, but the merit of the proposal would be based on the ability of the work to contribute to building or improving herbarium resources. Additionally, meta-analysis of herbarium data would also be eligible, provided that a component of the research includes direct study of specimens.

Eligibility: Undergraduate and graduate student SHC members may apply. It is expected that only student research projects with the clear potential to lead to publication will be competitive. Both the student and the student's research advisor, who should provide a letter of recommendation, must be members of SHC at the time of application. Deadline is 1 February 2018.

Please see www.herbariumcurators.org/grants for more information. 🌿

■ Call for papers

Herbaria play a vital role in plant research, while serving as the basis for teaching plant structure and diversity. Two common goals that our members share are advocating for the preservation and growth of our collections, and integrating collections in research and teaching. Many of us have developed creative ways to accomplish

these goals, but our ideas are shared infrequently. Our community, however, could benefit greatly from disseminating creative ideas as we work towards the common goal of realizing the value that herbaria hold. In addition, despite the amount of time we invest integrating herbaria into teaching and research, we seldom receive recognition for our efforts in tangible ways that department chairs, deans, or directors can use to evaluate our contributions.

We would like to formally invite you to publish your efforts in *The Vasculum*. Doing so would not only enrich your community by sharing ideas that inspire your peers, but also directly benefit you in the form of publications. We are interested particularly in articles that highlight how collections are being directly applied in research and teaching, how you are advocating for your collection to college and museum administrators, and how collections are being used for public outreach, as well as field notes and articles on plants of interest and botanical history. Please contact the Editor with your ideas and questions. We look forward to reading your contributions.

The Vasculum Editorial Committee





■ Introducing the Society of Herbarium Curators Early Career Section

The Society of Herbarium Curators is excited to announce its first official section: The Early Career Section (ECS).

Herbaria worldwide continue to attract students and early career professionals, and these newest members of the herbarium community join us with novel ideas, unique skills, and particular needs. The purpose of this Section is “to support the mission of the Society by empowering students, postdoctoral researchers, and early career professionals for success in herbarium settings” (ECS Constitution available at <http://www.herbariumcurators.org/early-career>). In practice, this could mean, for example, addressing training and professional development needs of early career professionals and leveraging new ideas to find innovative research and outreach methods.

All members of SHC interested in furthering the purpose of the Section are encouraged to become a member of the Early Career Section at no additional cost to regular SHC membership. Students, postdocs, and early career professionals are especially

encouraged to run for one of the five officer positions: President (one-year term, followed by one year term of past President), President-elect (one-year term, followed by one-year term of President and one-year term of past President), Secretary (two-year term), and Professional Development Officer (two-year term). If you would like to nominate yourself or someone else, please send an email to membership@herbariumcurators.org for consideration by the interim nominating committee.

Early career professionals have much to learn and much to offer. We believe that providing a dedicated Section to focus on this audience will strengthen the future of herbaria, and we look forward to the good work this Section will produce with strong support from the existing SHC membership. Please look out for more details about the Early Career Section throughout 2018!

Katie Pearson

Graduate Curator, FSU R.K. Godfrey Herbarium

Please join us for the 13th Annual Meeting of the Society of Herbarium Curators in Rochester, Minnesota



Haven't renewed your membership for 2018?

Renewing is fast, affordable, and easy.

Visit www.herbariumcurators.org/membership today



Who are The Society of Herbarium Curators?

The Society of Herbarium Curators (SHC) was founded in 2005 by a group of American herbarium curators who met regularly in conjunction with the annual Association of Southeastern Biologists conference. Since then, the Society has expanded from its nucleus in the southeastern United States as herbarium affiliates elsewhere recognized the value of an organization devoted to promoting the importance of herbaria and building resources within the community.

Today, SHC members live all over the United States, representing 48 states and territories, and membership is increasing all around the globe. Within the U.S., membership is largest in the east but somewhat reflects the geographic distribution of U.S. herbaria, as shown in Figure 1. Globally, our 2017 active membership consisted of 225 members from 26 countries, broken down into 147 regular, 40 life and 38 student members. Membership signups have ebbed and flowed over time, and 2017 was our greatest sign up year to date

with 70 new members! The retention rate in SHC is impressive: 28% of our members have belonged to the Society for five or more years. As of mid-December 2017, we have nearly 100 members paid in full for 2018, half of whom are either new to the Society or had previously let their membership lapse.

In 2017, SHC members represented 108 herbaria out of the Index Herbariorum's estimate of 3,000 worldwide (<http://sweetgum.nybg.org/science/ih/>). Although this percent is small, the effect of having over 100 institutions united in speaking for herbaria is not. Figure 2 maps where the Society is representing herbaria listed on the Index (yellow dots), and also illustrates herbaria from which we would love to see new members (black dots).

In the last year alone, SHC provided letters of support in response to herbarium closures and threats of funding cuts, public commentary on customs protocols for plant specimens, and community support in the face of natural disasters. We also worked to build resources within the herbarium community, for example, by piloting an online short-course in Strategic Planning (continue on page 8)

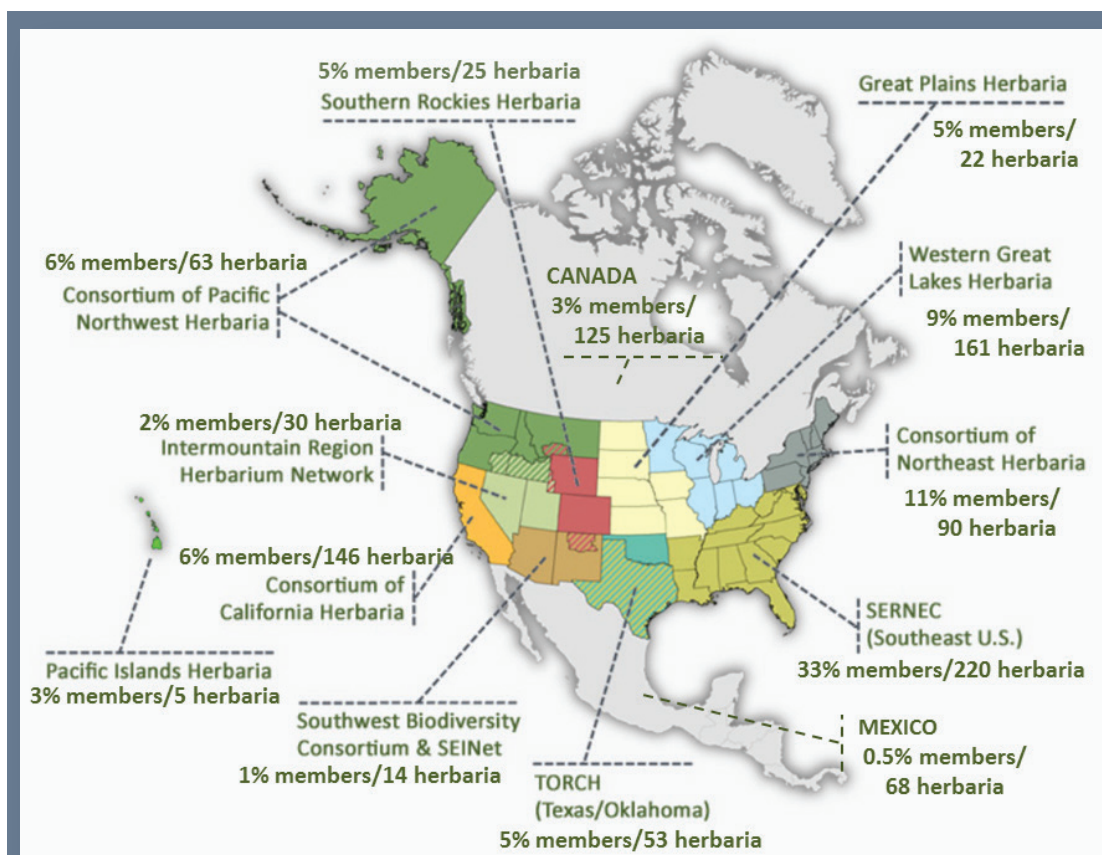


Figure 1. Map of North American-based members in the Society of Herbarium Curators and the numbers of herbaria by geographic region. Created by Ben Legler (University of Washington) and Rick Williams (Idaho State University).

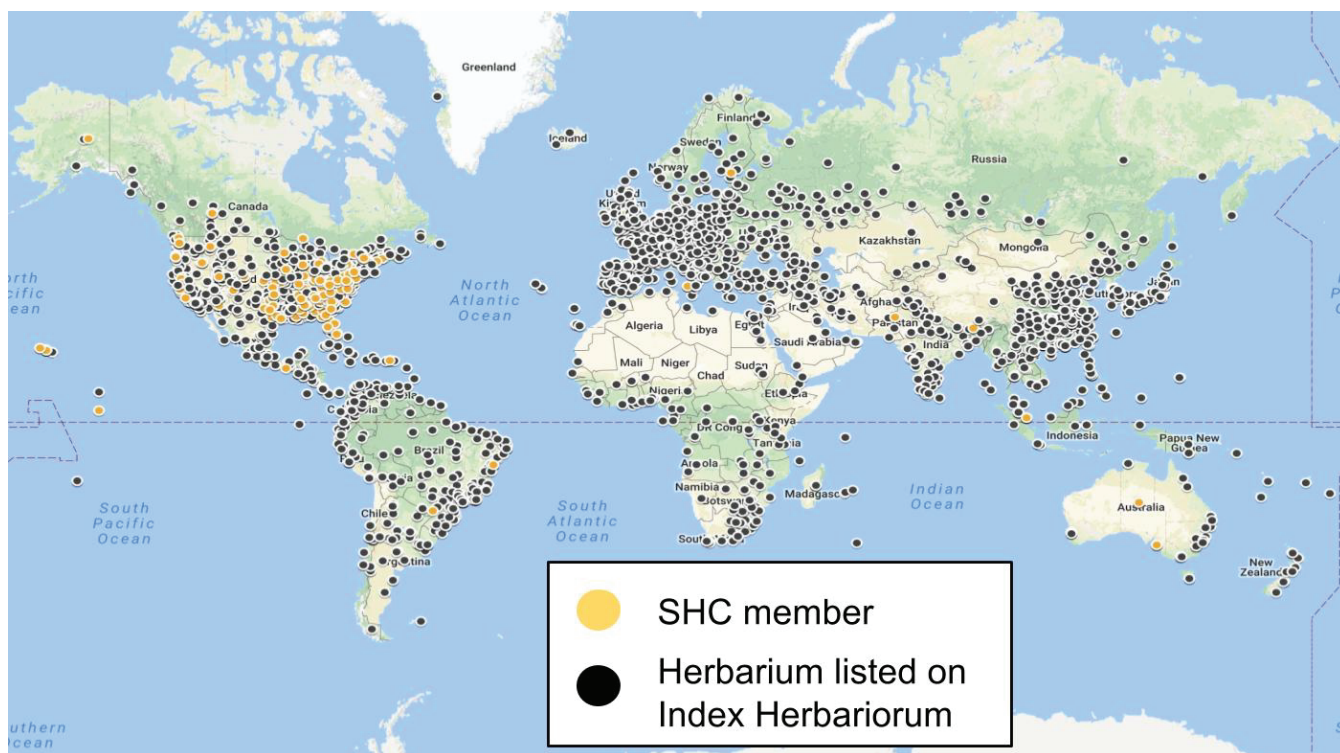


Figure 2. Global map of herbaria listed in the Index Herbariorum overlaid with locations of SHC members. Data accessed Oct 2017. Created with Google MyMaps by Katie Pearson (Florida State University).

for Herbaria, which was so popular we will offer it again in 2018.

One of the driving questions for this Membership Committee is how to increase the diversity of our membership, especially in terms of geography, herbarium size, and career stage. Regarding the latter, we are excited about the launch of a new Early Career Section, and we look forward to working closely with Section leadership in 2018 and beyond. We also have introduced gift memberships this year, which we hope will be a mechanism for established professionals to invite their students or other young colleagues into the Society.

In our efforts to expand the geographic diversity of the Society, we send annual membership appeals to anyone listed as a contact for a collection on Index Herbariorum. Furthermore, because we see connecting online as a valuable means to build a global community, we are working on maintaining active social media accounts on Facebook and Twitter, as well as on improving content on the SHC website.

As we continue to work on improving sustainability,

community resources, and the membership experience, help us help you by participating in the conversation on the Herbaria-L listserv, on social media (Twitter: @socherbcurators), and at professional meetings. If you have an idea or comment that you would like to share with the Membership Committee directly, please email us at: membership@herbariumcurators.org. We encourage members to get involved by attending the annual SHC meeting at Botany 2018, nominating students for our research grant program (deadline February 1st), joining our Early Career Section, and spreading the word to your colleagues and students.

Thanks to all our 2018 members for their continued support as we look forward to a great year ahead!

Erica Krimmel
Assistant Collections Manager at the Chicago
Academy of Sciences

Rick Williams
Ray J. Davis Herbarium Curator

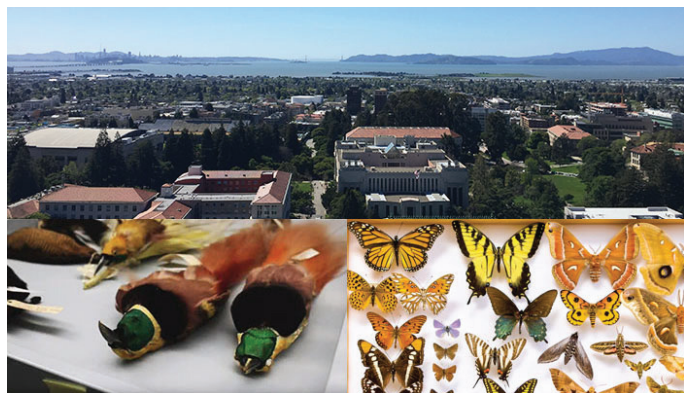
Katie Pearson
Graduate Curator, FSU R.K. Godfrey Herbarium

News from our Members

■ Second Annual Digital Data in Biodiversity Research Conference

The Berkeley Natural History Museums, the Berkeley Initiative for Global Change Biology, and iDigBio are pleased to announce the second annual Digital Data in Biodiversity Research Conference, to be held in Berkeley, CA, 4–6 June 2018. The rapid mobilization of digitized biodiversity data, led largely in the United States by the National Science Foundation's Advancing Digitization of Biodiversity Collections program, has resulted in a substantial increase in available data for research and related activities. The 2018 conference will again encompass the uses of digitized data across all biodiversity disciplines, with special emphasis on digitized specimen data and the potential for “big data” analytics in organismal biology. Planning is in progress and further details will be released in several successive mailings later this autumn and in early 2018. A call for papers will be circulated in January. Please save the date and watch for further announcements via several listservs and on the iDigBio website (<http://www.idigbio.org>). This conference will provide an important opportunity to explore digital data tools, techniques, discoveries, and outcomes across the biodiversity sciences. For further information or to ensure that you are on the email list, please contact Gil Nelson at iDigBio (gnelson@bio.fsu.edu).

Registration: Registration fees are a modest \$100.00 for professionals, \$50.00 for students.



■ New Position Announcement

Scott LaGreca, who previously served as the Curator of the Plant Pathology Herbarium at Cornell University, will be stepping into a new role at Duke University as the Lichens Collections Manager. Please see his new contact information below:

Lichen Herbarium
Department of Biology
Box 90338
Duke University
Durham, NC 27705-0338 USA
Phone: 919-613-6112
E-mail: scott.lagreca@duke.edu

■ University Products' Storage of Natural History Collections Catalog Now Available

University Products, the leading supplier of archival quality storage products and conservation tools and equipment, has created a new catalog of supplies specific to natural history museum collections. The company offers a wide variety of materials including several weights of herbarium specimen papers, Resistall© paper for wet collections, bryophyte packets, fragment folders, genus folders and dozens of additional products. The company also offers imprinting and custom enclosures, and has created items for The Smithsonian National Museum of Natural History, The Field Museum of Natural History, and the Bishop Museum of Natural History, among many others. In addition, University Products is the official distributor of the Society for the Preservation of Natural History Collections (SPNHC) publications including titles such as *Managing the Modern Herbarium* and *Storage of Natural History Collections: Ideas and Practical Solutions*.

For additional information, or to receive a copy of the catalog, call John Dunphy at 413-493-2304, or email jadunpy@universityproducts.com. To see the company's complete line of materials for conservation, preservation, restoration and exhibition, visit www.universityproducts.com.

The Fire at the Pringle Herbarium: A Disaster Averted



Torrey Hall at the height of the blaze.

Just after eight o'clock on the morning of August 3, 2017, the firefighters in Station 3 of the Burlington Fire Department responded to a fire alarm that came in from the University of Vermont's Torrey Hall, just 600 feet south of the firehouse. As the crew loaded up the fire truck, one firefighter said, "probably just another false alarm, like the one we responded to three weeks ago." Indeed, the crew had recently been in Torrey

Hall, gone from cellar to the fourth level, all through the natural-history collections that are in the building, finally deciding that someone working on the exterior renovation of the building, then in progress, had tripped the alarm accidentally. However, when the firehouse door was opened and they had launched the pumper into the street, they saw the huge plume of black smoke rising from the roof of Torrey Hall—this alarm was for real.

The roof interior of Torrey Hall, the University of Vermont Building housing the Pringle Herbarium as well as the University's vertebrate and invertebrate collections, had indeed caught fire—apparently related to braising work on the new roof. Anyone on the scene in the first half hour witnessed the entire top of the building in 30-foot-high flames, and a plume of black smoke rose over Burlington that made it clear to the entire University that a major blaze was in progress. Prospects for saving anything in the interior seemed dismal. The firemen from Station 3 went to work, with the assistance of crews from surrounding communities responding to four alarms. Aware of the value of the collections from their recent visit, the firefighters first spread waterproof tarps over the most vulnerable collection cabinets on the uppermost level, just under the roof, before they turned on the hoses. Within the hour, the fire was completely under control, thanks to the remarkable efforts of these firefighters.

The Natural History Museum in Torrey Hall brings together three of the most important natural history collections in Vermont: the flora represented by the plants in the Cyrus Pringle Herbarium and the fauna as documented for both the invertebrate and vertebrate animals in the Zadock Thompson Zoological Collections. The size of the combined collection is about 700,000 accessions (330,000 plants and fungi; 350,000 invertebrates; 20,000 vertebrates). All-told, the UVM Natural History Museum provides the State of Vermont at large and the University of Vermont with a working Museum that promotes the exploration of biodiversity through both original research and the teaching of natural history.

Geographically, the Natural History Museum lies in a region of unusual floristic and faunistic diversity for a recently glaciated region. Remnants of the early Holocene biota persist in the shifting sands at the edge of the



UVM Plant Biology major Sami Connolly in the wet-plant tent, day 2.

Champlain Sea (ca. 12,000–10,000 ybp) and in the alpine notches and summits of the state. Northeastern-most limits for species widespread on the North American craton to the south and west are common in communities on calcium-rich Paleozoic sedimentary rocks

and soils derived from them in the milder climate of the Champlain Basin. All of these elements are superimposed on the inherent diversity to be found across northeastern North America. The diverse flora and fauna of the Champlain Valley have for two centuries engendered a culture of deep interest in the biodiversity of the region, now epitomized in the Museum.

Torrey Hall, the building housing the University's Natural History Museum, was opened as the new University library and location for the burgeoning natural history collections for the University of Vermont in the summer of 1863, at the turning point in the Civil War—when the very future of the institution

was in doubt because so many young men had answered the call to service. The Reverend Joseph Torrey, ninth President of the University and a botanist himself, dedicated the building. The Burlington Free Press, in its account of the opening, reported that “It is felt that the building erected is a safe and solid structure. It affords room not only for the library and [collections] already belonging to the University, but for those additions which it is confidently hoped will be made in the future as they have been in the past, by individual donations.”

Listed on the National Register of Historic Places in 1973, Torrey Hall was extensively renovated and the building rededicated in honor of President Torrey in 1974. Working with Biology Professors Ingi Agnarsson and Bill Kilpatrick, curators of the Zadock Thompson Collections, I won a \$470,000 National Science Foundation Award in 2014 under the Collections in Support of Biological Research Program (CSBR) to provide housing for all of the University's collections in modern metal cabinets for the first time, reducing the chance of damage from fire and flood and enhancing pest control. While the specimens were being secured, curators and students systematically reorganized them to reflect current classifications. At the same time, the ongoing plant and arthropod digitization and imaging program was expanded to fully represent the collections and make specimen images and related data available online to researchers and educators.

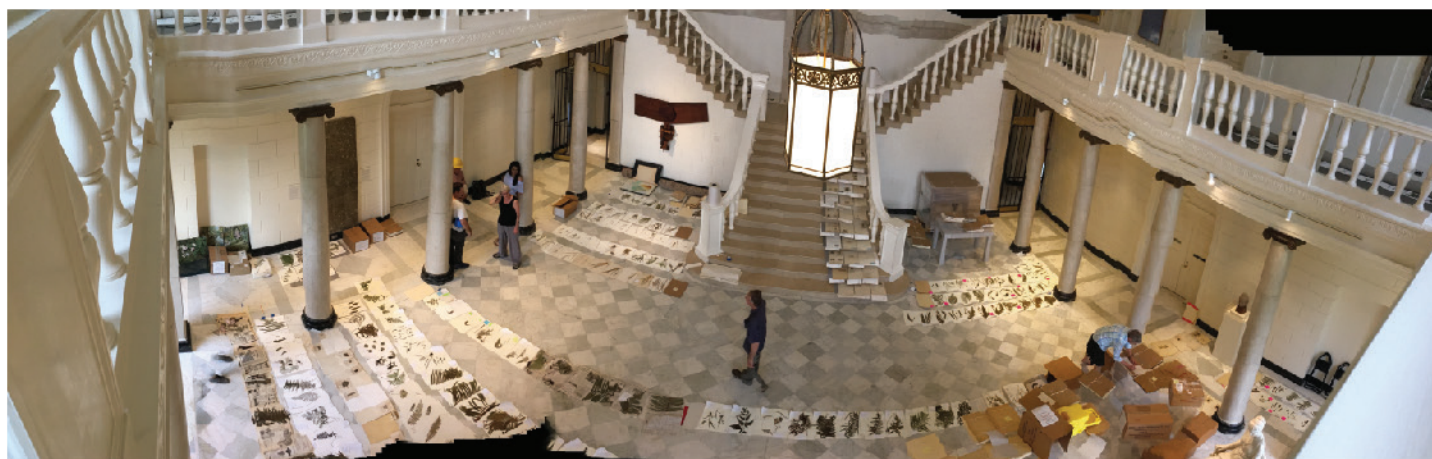


The moist specimens drying on the floor of the Marble Court, Fleming Museum, day 3 (photo, David Barrington).

Beginning in 2016, the University invested in an architecturally informed exterior renovation of historic Torrey Hall, including restoration of its original multi-colored slate roof as well as return of the chimneys, window decorations, doors, and windows to their original 19th-century condition. It was the work on this restoration that was abruptly interrupted on August 3rd of 2017 by the fire, which destroyed the roof and roof infrastructure. To put out the fire in the roof, about 500,000 gallons of water were delivered to the main section of the building, creating what amounted to an internal rainstorm in the building.

I entered Torrey Hall with the first group to survey the interior following the quenching of the flames. There was standing water on the floors on all levels. We discovered that, thanks to NSF, all of the collections in

about 36 hours to stabilize the wet collections before fungal attack would compromise them. Two days of herculean effort by almost 100 volunteers resulted in the salvaging of much of our wet material. We triaged the exposed materials into "only damp," "wet but important and salvageable," and "wet and lowest priority or unsalvageable." The damp specimens were spread out in the Marble Court of the adjacent Fleming Museum of Art, thanks to the kindness of Fleming Director Janie Cohen; they dried completely within a day. At any one time over those first two days, we had 15 or 20 people working together on the wet specimens on tables set up for the purpose under a tent. Following our University Library colleagues' instructions for recovering wet books, we separated the specimens by interleaving them with waxed paper, then bagged them in plastic bags, boxed the bags, and froze



Panorama, the Marble Court, day 3. (photo, Catherine Paris).

metal cabinets were unimpacted by the water—including virtually all of the accessioned collections of plants and all of the animal collections. The impact of this water on unsheltered materials was random, even capricious. In some places, plants out in the open, simply held in folders, were dry. In other places, hundreds of specimens were soaked. The water used to extinguish the fire compromised the electrical system, the floor coverings, and all of the plaster in the building (including, unfortunately, a set of fine student murals done over the last 40 years). Fortunately, we found that the herbarium's library and archives, as well as the vertebrate collection, were completely untouched by the massive influx of water—they were housed in a free-standing late nineteenth-century addition to the building.

We quickly learned from our University Library colleagues Scott Miller and Chris Burns, better versed than we were in emergency response, that we had

them in a rented freezer truck on site. We decided to discard the lowest-priority collections as the mold bloomed across the remaining wet specimens. At the end of that 36-hour marathon, we saw the freezer truck on its way to the Belfor Company, a Massachusetts firm that specializes in recovering wet books and archival materials.

However, our ordeal was not over. The engineers who surveyed the building in the wake of the fire were concerned that the weight of the collections, in combination with the weight of the water saturating the walls and floors, would compromise the integrity of the whole building, ending in its collapse. It was decided to move all of the natural-history collection from Torrey Hall to prevent this outcome. In four short days, we saw every last collection cabinet out of Torrey Hall to new quarters—the herbarium cabinets alone numbered 185; they were located on all four levels of the building. The animal collections were

housed in over 80 additional cabinets. Booska's, the local family-owned movers, were there for us; they moved cabinets out through a hole in the roof via crane, through window casements via forklift, or through the building's doors. In less than a day, we came up with space for all the cabinets: the plants were housed in Jeffords Hall (the University's Plant Science Building) and the animal collections in Blundell House, an unoccupied building on the University's south campus. The installation of the herbarium on two levels of Jeffords involved yet another crane—and an amazing amount of good work by the moving crew. As you might imagine, the collection is not in a very logical order in its new home, because we had so little control over the sequence in which cabinets came out of Torrey, into trucks, and into Jeffords.

The response of the international community of natural-history collections curators and especially herbarium curators was deeply important to us. Within a day of the fire, we had e-mails from over sixty colleagues, including from the major North American herbaria as well as herbaria in Europe and Asia. The offers of support were generous and sincere; we will be ever grateful to the community for their amazing response. Fortunately, we had such a massive number of volunteers show up outside Torrey Hall that we had all the help we could put to work right here in Burlington. At the same time, we had wise advice on recovery provided by the informal group of people who call themselves the Cultural Heritage Emergency Response Network, a group of Vermonters working with cultural heritage collections (Libraries, Museums, Historical Societies, Town Offices) that provides mutual aid in preparedness for, and response to emergencies. Soon after, the American Society of Plant Taxonomists provided funding for a larger-capacity freezer to cope with increased vulnerability to insect pests. With this abundance of help and expertise, we were able to



One of the new metal cabinets coming out of the roof of Torrey Hall, day 6 (photo, Sid Bosworth).

respond quickly enough to keep the Torrey Hall emergency from becoming a disaster.

Thanks to Scott O'Brien, Contract Coordinator with the University's Physical Plant Department, we were able to reinvent functional herbarium facilities in Jeffords Hall, allowing us to restore our routine collection functions within a few weeks of the fire. The improvements included constructing an enclosed space to house the Pringle's communications and mounting facilities as well as dedicating space for our digitization facility, now nearing its goal of digitizing the entire vascular plant collection.

Back at Torrey Hall, exterior renovation contractor J.A. Morrissey has resumed restoration work on the windows and brickwork; they have also removed the fire-damaged roof components and begun again to

restore the nineteenth-century slate mansard roof. In the first weeks after the fire, G.W. Savage Co., the local emergency restoration specialists, removed the compromised portions of the building interior, leaving the rich nineteenth-century architectural features intact but opening up the possibility of an innovative redesign and reconstruction of the building interior to suit our vision for the University of Vermont's Natural History Museum. At a November meeting of UVM's senior leadership convened by President Tom Sullivan, the decision was made to support the continued dedication of Torrey Hall to the Pringle Herbarium and the University of Vermont's Natural History Museum. Planning the restoration of the building's interior is now underway. We look forward to our return to Torrey Hall sometime in 2020.

David S. Barrington, Director
Pringle Herbarium, University of Vermont

Featured Herbarium

A Brief History of MEXU

The National Autonomous University of Mexico (Universidad Nacional Autónoma de México; UNAM) is the largest university in Mexico. Its main campus is called University City, located in the Delegation of Coyoacán in southern Mexico City. UNAM has 350,000 enrolled students, including 112,000 at the preparatory level, 205,000 at the undergraduate level, and 30,000 graduate students. Professors and researchers number 40,000, of which 12,000 are full-time.

UNAM traces its history to the Royal and Pontifical University of Mexico (Real y Pontificia Universidad de México), founded by royal decree in 1551 by Charles I of Spain. It was inaugurated as the National University of Mexico (Universidad Nacional de México) on September 22, 1910, thanks in great part to the efforts of the intellectual Justo Sierra Méndez (García Stahl, 1975). In the aftermath of the Mexican Revolution in 1929, the university was given its autonomy from the Secretary of Public Education, resulting in the addition

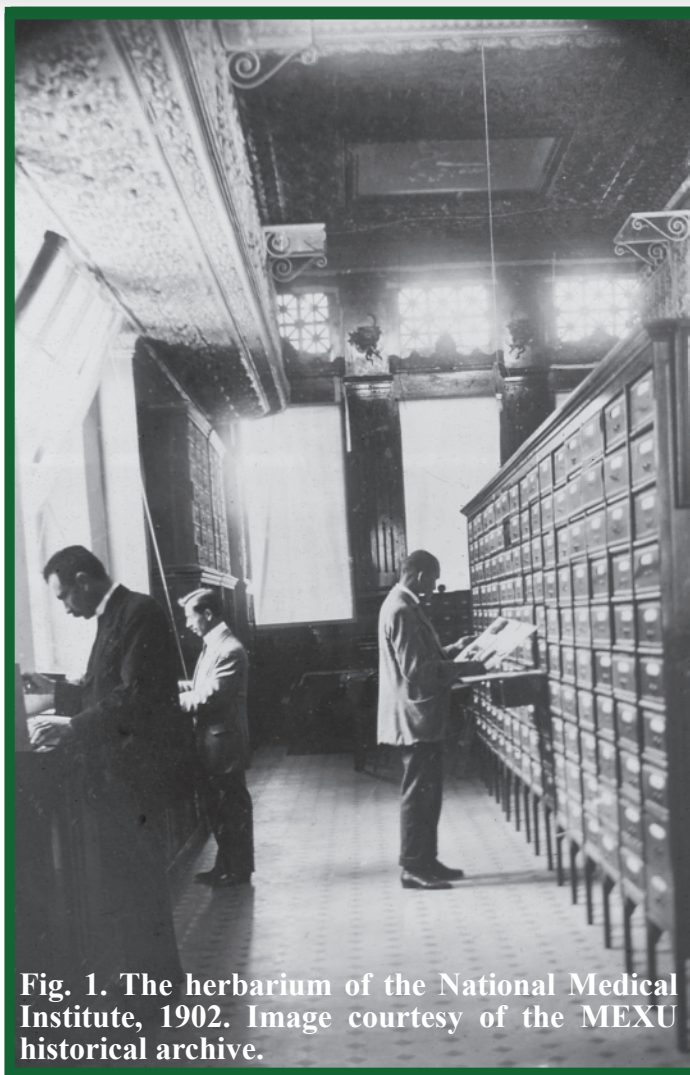


Fig. 1. The herbarium of the National Medical Institute, 1902. Image courtesy of the MEXU historical archive.

of “Autónoma” to its former name.

The Institute of Biology (Instituto de Biología; IBUNAM) is a research center dedicated to conducting research into the origins, interactions, distribution, present composition, use, and conservation of Mexico’s biological diversity. It is one of 33 research institutes at UNAM. The IBUNAM is the custodian of the greater part of Mexico’s National Biological Collections (Colecciones Biológicas Nacionales; CBNs). The Department of Zoology houses ten collections:

insects, arachnids, mollusks, crustaceans, fish, reptiles and amphibians, helminths, birds, and mammals. The Department of Botany houses the National Herbarium of Mexico (Herbario Nacional de México; MEXU). Currently, the CBNs have more than 3 million catalogued specimens.

MEXU houses 1.5 million catalogued specimens (<http://www.ib.unam.mx/botanica/herbario/>). The vascular plant collection has 1.4 million specimens,

including more than 1,200 holotypes and 6,200 isotypes. It is divided into nine halls that are curated by nine academic technicians. MEXU has another four main collections: bryophytes (48,000 specimens), curated by Claudio Delgadillo Moya; fungi (>11,000 specimens), curated by Elvira Aguirre Acosta; lichens (10,000 specimens), curated by Marusa Herrera Campos and Elvira Aguirre Acosta; and algae (5,500 specimens), curated by José Luis Godínez Ortega. MEXU also includes an ethnobotanical collection (>3,600 specimens), curated by Cristina Mapes Sánchez, and a xylarium (3,500 blocks of wood), curated by Josefina Barajas Morales.

The National Herbarium (Herbario Nacional) was created in 1929 as part of the Department of Botany of IBUNAM, but it houses specimens from earlier

institutions, most importantly the National Medical Institute (Instituto Médico Nacional; IMN) and the National Museum (Museo Nacional). The IMN was founded in 1888 during the rule of Porfirio Díaz. It occupied temporary sites

near the center of Mexico City before it moved to a newly constructed building on the corner of Ayuntamiento and Balderas. The herbarium of the IMN (Fig. 1) held the collections of the Mexican Scientific Commission (Comisión Científica Mexicana, 1883) and the Commission of the Valley of Mexico (Comisión del Valle de México, 1856).

Among its principal activities, it documented medically useful plants and developed vegetation and other maps for the country. An important work from this time was “Datos para la Materia Médica Mexicana,” published by the founding director, Fernando Altamirano, and José Ramírez in four volumes from 1894 to 1908. In 1904, the IMN reported 8,000 exsiccata (Alcocer, 1904).

In 1915, in the midst the Mexican Revolution, the IMN became the Directorate of Biological Studies (Dirección de Estudios Biológicos). Its founding director was the evolutionary biologist, Alfonso Luis Herrera. The Directorate absorbed the collections of the IMN, the National Natural History Museum (previously named the National Museum, founded in 1825), the Geographic Exploratory Commission

(Comisión Geográfica Exploradora, 1876), the Museum of Tacubaya (Museo de Tacubaya, 1893), and the Exploratory Commission for Natural Flora and Fauna (Comisión Exploradora de la Flora y Fauna



Fig. 2. Casa del Lago, 1908. Image courtesy of the Cantú-Souvade collection.

Naturales, 1907; Ortega et al., 1996).

The first director of the Botanical Section of the Directorate of Biological Studies was Miguel Cordero. Years later the post was held by Maximino Martínez, who adopted the classification of Engler as organized by Dalla Torre y Harms (Cuevas Cardona and López



Fig. 3. The atrium of IBUNAM, 2017.

Ramírez, 2009), which is still followed today for flowering plants. In 1925 the herbarium was reported to have 24,387 catalogued specimens comprising almost 8,000 species, and another 40,000 uncatalogued specimens (Herrera, 1925). The Directorate moved to the Casa del Lago, Chapultepec in 1927 (Herrera et al., 1998; Fig. 2). In 1929, the Directorate of Biological Studies, together with its collections, were transferred to the newly established IBUNAM. In 1956, it moved to new installations in University City (Ciudad Universitaria). The IBUNAM has occupied its current building in University City, west of Insurgentes Sur and next to the IBUNAM Botanical Garden since 1999 (Fig. 3).

Documenting the Biological Diversity of Mexico and the Americas

MEXU's earliest collections predate the Mexican War of Independence (1810–1821) when its territory comprised part of New Spain. Most notable are collections from the Royal Scientific Expedition (Real

Expedición Científica) sent by King Carlos III of Spain and lasting from 1787 to 1803. MEXU houses specimens from this expedition collected from Puebla in 1787 by Martín Sessé y Lacasta and José Mariano Mociño. MEXU's oldest specimen is of *Roldana ehrenbergiana* (Klatt) H. Rob & Bretell, originally labelled as "*Senecio canicida* Sp. N." by Sessé (Fig. 4). MEXU houses bound herbaria (1789 and 1800) from Vicente Cervantes, another participant in the expedition. These specimens are principally of Asteraceae collected around Mexico City. Several hundred specimens in the herbarium were collected prior to the Mexican War of Independence in 1810. Important collectors after the war and up until the beginning of the Mexican Revolution in 1910 included Fernando Altamirano, Gustave Joseph Brouard Arsène, Eugène Bourgeau, Cassiano Conzatti, Eugene Langlassè, Ferdinand J. Lindheimer, Rafael Montes de Oca, Edward Palmer, Antonio Peñafiel, Cyrus G. Pringle, Johann G. Schaffner, and José J. Triana.

A high proportion of MEXU's earliest collections document the floristic diversity of Mexico City and the surrounding states that make up the Valle de México. This basin has undergone profound changes in its land use, even before Tenochtitlan's conquest by Hernán Cortés in 1521, when, as the capital of the Aztec's vast Mesoamerican empire, it was a city of several hundred thousand people surrounded by Lake Texcoco. Today Mexico City is a megalopolis of 21 million people. A recent example of land use change brought on by urbanization is that suffered by the Pedregal de San Ángel, a vast expanse of lava rock preserving a xeric shrubland characterized by *Senecio praecox* in southern Mexico City. In the first half of the 20th Century, UNAM's main campus was built on the Pedregal. One of its most laudable floristic treatments was Jerzy Rzedowski's 1954 publication "Vegetación del Pedregal de San Ángel (Distrito Federal, México)". Today, 90% of the Pedregal has been developed into neighborhoods, businesses, roads, and even institutions of the UNAM. Much of what is left forms a designated Ecological Reserve of 237 hectares inside University City.

MEXU Today

Among the most specimen-intensive projects currently conducted at MEXU are the determinations of botanical collections for the National Inventory of Forests and Soils (Inventario Nacional Forestal y de Suelos), DNA barcoding, and large-scale digitalization of the National Biological Collections. Martin Ricker of the Department of Botany has led several projects to verify determinations of Mexico's National Inventory of Forests and Soils. The inventories are carried out by the National Forestry

Commission (Comisión Nacional Forestal; CONAFOR) in order to document forest distribution, composition, and demography, and to plan for the sustainable use of forest resources. Approximately 10,000 collections per year enter the herbarium for determination, of which 10–20% are selected for accession. The determinations are made by MEXU personnel, mainly Esteban Martínez Salas, and botanists paid from the projects. The sampling design requires collections to include remote localities, and also include tissue samples in silica gel for future DNA barcoding studies (tissue and DNA collections are currently maintained by individual researchers) and wood cores for dendrochronological analyses.

MEXU has participated in a number of floristic studies over the years. The IBUNAM supports institutional projects such as the Flora Mesoamericana in collaboration with the Missouri Botanical Garden and the Natural History Museum of London. This project was coordinated at IBUNAM for 35 years by Mario Sousa Sánchez (Fig. 5), and was taken over in 2017 by Héctor Hernández Macías. Other recent and ongoing studies include the Flora del Valle de Tehuacán-Cuicatlán, and floras of the states of Veracruz and Oaxaca, the municipality of Guadalcázar, San Luis Potosí, and along the overwintering and migration routes of the Monarch butterfly.

A significant proportion of MEXU's collections are recent. Mexico's government funded much exploration of biological resources in the 1980's. Collection activity for MEXU peaked at approximately 60,000



Fig. 4. The holotype of *Senecio canicidus* Sessé & Mociño (a synonym of *Roldana ehrenbergiana* [Klatt] H. Rob. & Brettell). Collected in Puebla by Sessé and Mociño between 1787 and 1803 and thought to be the oldest specimen in MEXU.

specimens in 1985 under the direction of Mario Sousa Sánchez. These collections are an important resource for destructive sampling, most commonly for anatomical and DNA studies. We permit limited tissue sampling in recognition that some species are confined to remote regions that are often difficult to access. Unfortunately, several taxonomic groups, such as those protected by CITES (for example, Cactaceae and Cycadaceae), are becoming intensively sampled in the collection. In other cases, fairly easy-to-collect species

are being sampled by researchers wishing to save time and effort, even though the herbarium's representation of these species is limited.

Ten academic technicians curate MEXU's collection and oversee its daily operations, including loan and access to type specimens (Maru García Peña), exchange (Gilda Ortiz Calderón), donation (Alberto Reyes García), mounting (Laura Calvillo Canadell), plant identification (Verónica Juárez Jaimes), special collections and catalogues (Martha Olvera García), and digitization programs (Angélica Ramírez Roa). The academic technicians also participate in floristic studies (Alberto Reyes García, Esteban Martínez Salas, and Rafael Torres Colín), conduct original research in plant systematics, and teach courses in plant mounting and identification.

MEXU also has 12 full-time technicians whose main responsibility is to mount plants. These technicians also prepare new specimen folders, pack and ship specimens for other herbaria, and type and print collection labels. Thanks to their efforts, the number of vascular plants mounted and accessioned per year has ranged from 20,000 to 30,000 in the last decade. In 2017, the technicians began taking digital photographs of newly mounted and recently annotated specimens.

Approximately one-third of MEXU's specimens have come from exchange with other herbaria and one-tenth from donations. Our main exchange partners are the Missouri Botanical Garden (MO), Royal Botanic Gardens (K), the New York Botanical Garden (NY), Universidad de Guadalajara (IBUG), Instituto de Ecología, A.C. at Xalapa (XAL), and Instituto de Ecología, A.C. at Pátzcuaro (IEB). The remainder of MEXU's collection has been made by researchers and students at UNAM, principally from the IBUNAM's Department of Botany and Botanical Garden.



Fig. 5 (upper): Mario Sousa, Herbarium Chief from 1975–1985 and 1994–2003. Photo by Carmen Loyola, 2014.
Fig. 6 (lower): Specimens used for guided tours, Sala Bletia.

MEXU receives visitors from diverse fields, including plant taxonomy, ecology, agriculture, ethnobotany, paleobotany, plant anatomy, medicine, architecture, art, and history. MEXU is consulted by government

scientists, such as those from the National Institute of Statistics and Geography (Instituto Nacional de Estadística y Geografía; INEGI). MEXU also opens its doors to the public, offering guided tours both by appointment and during special events to more than

1,000 people per year, mainly students of high schools and undergraduate programs from Mexico City and surrounding states (Fig. 6).

Digitization of MEXU

In 2012, IBUNAM began an ambitious four-year project funded by CONABIO to digitize the National Biological Collections. IBUNAM has been steadily digitizing its collections for decades, mainly focusing on taxonomic groups of interest to its researchers. The accumulated data for that effort, including 288,347 specimens from MEXU, are available on the UNIBIO bioinformatics unit website (Unidad de Informática para la Biodiversidad; <http://unibio.unam.mx/>). The 2012 project as envisioned by our director, Víctor Sánchez Cordero, was grander than its predecessor, involving centralized data capture for all biological collections with 18 computer terminals, a new database platform, and extensive cleaning of captured specimen data. In June of 2012 digitization began on four collections, including MEXU.

MEXU adopted the system used by the Consortium of Pacific Northwest Herbaria for taking photographs of mounted vascular plants (Legler, 2011). Digital images are taken in Ortery light boxes with a Canon EOS 5D Mark II fitted with a Sigma 50 mm f/2.8 EX DG macro lens. During the four-year project, two to three taxonomic specialists worked full-time selecting, reviewing, stamping, and photographing specimens. The images are saved in jpg format at 3744 by 5616 pixels (21 megapixels) on the internal hard drives of computers connected to the cameras, and backups are made on external 2-3 TB hard drives and then copied to a UNIBIO server.

Workers manually capture label data for the botanical and zoological collections at 18 computer terminals in UNIBIO. The capture screen allows verbatim entry of

vascular plant specimen data. The vascular plants are captured from digital images, whereas most other collections, including MEXU's collections of fruits, seeds, fungi, and lichens, which are in envelopes and boxes, are captured directly from specimen labels rather than from photographs. Digitization of the bryophyte label data was continued independently by Claudio Delgadillo, who has maintained that collection for years.

The specimen database is managed with PostgreSQL and other open source software developed at IBUNAM. After initial data capture, automated data quality protocols are used to verify geographic data, match determinations to taxonomic catalogs, and homogenize names of collectors. UNAM's rector decided to adopt the system for all of its collections, forming the Coordination of University Digital Collections (CCUD) in 2013. The CCUD database is being steadily made available online at their open data portal (<https://datosabiertos.unam.mx/>). Currently, 1,195,079 (75%) of the digital objects available online are MEXU specimens.

Based on the 1,195,000 MEXU specimens available on the open data portal, 80.8% are from Mexico, followed by 3.8% from the United States, 1.9% from Guatemala, and 1.4% from Costa Rica. Outside of Mexico our collections come mainly from the United States, followed by Central America, and then South America. Approximately 30% of MEXU's collections are from Mexico's three most floristically-diverse states: Oaxaca, Chiapas, and Veracruz. Approximately 37% of the specimens have geographic coordinates.

In 2017, the director of the Instituto de Biología was awarded a one-year project to continue with the digitization of the National Biological Collections. We foresee that this will allow us to complete photography

of all vascular plants in the herbarium except those that were sent out on loan before 2012. We invite those who are interested to follow the digitization effort on UNAM's open data portal.

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