GEO friend's NEWSLETTER

Emory University Herbarium
Supporting Botanical Research and Education

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EMORY HERBARIUM NEWLY ADDED LICHEN COLLECTION BY SANNE GLASTRA

This semester, I had the opportunity to be a part of a new project at the Emory University Herbarium: the lichen collection! Though initially having very little knowledge about lichens, I have over time acquired increased knowledge and interest in the uniqueness of lichens. Despite seeming plant-like, lichens are "mini ecosystems" comprising of two separate organisms (a fungus and a photosynthetic partner) and are commonly found on trees, rocks, and walls.

Before this semester, the herbarium did not possess any lichen specimens. As a result, Ann (a fellow Herbarium volunteer) and I started the collection from scratch. To begin, we joined forces with Sean Beeching, a local lichen expert, and collected specimens on the Emory campus and Lullwater Reserve. While collecting, we recorded geographical coordinates, habitat information, and identifying features. We placed all collected specimens into paper bags and labeled them.

When we returned to the herbarium after our collection trip, we identified/named them to the best of our ability using books and taxonomical keys and consulted Sean afterwards to check our work.

We have currently databased all of our collected lichens and the specimens that Sean had previously collected in Cumberland Island. We hope to continue to expand the lichen project in the future, as it has been a fun and fulfilling experience! All of this data will be available soon in the North America Lichen Portal. https://lichenportal.org/cnalh/collections/index.php

INSIDE THIS ISSUE

WHAT ARE LICHENS?

Lichens are thallophytic plantlike organisms that consist of a symbiotic association of photosynthetic partners and a fungal partner. In a lichen, the fungal partner can be mostly ascomycetes and basidiomycetes and produces a thallus which houses the photosynthetic partner. The photosynthetic partner is generally green algae or cyanobacteria and provides food for the fungus . In this symbiotic relationship, the dominant partner is the fungus, which gives the lichen the majority of its characteristics, from its thallus shape to its fruiting bodies. Lichens are found worldwide and occur in a variety of environmental conditions. They can colonize a wide range of surfaces and are frequently found on tree bark, exposed rock, and on soil. Lichens are found all across North America and all over the world. They are found in a vast diversity of habitats and climates. There are approximately 3,600 species of lichens in North America. Lichens can survive severe conditions as they can deal with ecological conditions together that neither part would be able to handle on its own.

"Volunteering in the Herbarium introduced me to how methodical research organizations operate"

Simone Meyer

(10th grade, Summer of 2019 volunteer)

My experience over the summer at the Emory Herbarium taught me so much about the day-to-day operations of a research lab and the wonders of plants. I got to help with the digital aspects of the herbarium, like updating the database, and in-lab procedures, such as filing specimens. Volunteering in the Herbarium introduced me to how methodical research organizations are: each person is a moving part in an intricate preservation process. It is satisfying to know that the work I did in the lab is contributing to a larger cause.

More importantly, my experience instilled in me an awe and appreciation for the specimens in the Herbarium and the countless plants I pass in day-to-day life. The specimens in the herbarium have a lot of history and information embedded in them. There is something incredible about holding a specimen that was preserved decades (or days) ago but can still contribute to research today.

Thank you to Our Summer and Fall 2019 Herbarium Volunteers:

Ocean, Emily, Ann, Sanne and Denver, helping in various herbarium tasks.

FALL 2019 VOLUNTEERS

From left to right: Tanika Deuskar, Burhan Mubeen, Emily Edwards, Daisy Li, Denver Roberts, Ann Felicia Sinsuan, and Sanne Glastra.

Lullwater Preserve: Immense Treasure For The Emory Students to Connect With The Natural World

By Tanika Deuskar

"I don't need scientific literature to convince me that spending time in green spaces can lift your mood. I can feel it just a few steps into the preserve."

I spotted them as I puffed along the road: three fawns grazing on the expanse of grass next to the Lullwater House. I had seen a doe at Lullwater before, but she had been much farther away. I had expected the fawns to gallop away as I approached them, but they just stood there, staring at me. They were so adorable, with their tiny antlers and their small tails and their perfect coats.

Going for a run in Lullwater is one of my favorite things to do, especially in the fall. I love the crisp air, the smell of the wood, and the sound of the leaves crunching beneath my feet. But most of all I love to soak up the scene, because Lullwater is simply stunning during the fall. All around you see bright yellow leaves and some remaining green ones. There are hints of orange and red, patches of the brilliant blue sky, and beams of sunlight shining through the gaps in the foliage. I think I often do a lot more photo-clicking than running when I am at Lullwater.

I don't need scientific literature to convince me that spending time in green spaces can lift your mood. I can feel it just a few steps into the preserve. Between a silence that is broken by only birds and crickets, and the tall trees and serene lake, I leave Lullwater calmer and happier and dazzled by its beauty.

EVOLUTION, CORN AND THE CORN BORER

By Daisy Li

The interaction between plants and insects has gone on for millions of years. Fossils of prehistoric plants bear borings and frass that indicate insect activity in plant tissue from eons ago. Today, we see specialized ecological relationships such as that of the European corn borer and the corn plants that reflect archaic roots that have been perfected by generations of natural selection.

The European corn borer originally arrived in America in the early 1900s where it was first observed in Boston in 1917. Adult borers are small, beige-colored moths but it is their larvae that quickly ravaged the corn belt of the American Midwest. Females will lay their eggs on the leaves of young corn plants in late spring, and the larvae that emerge all summer will chew their way through ripening corn plants.

Scientists have found that there are three important characteristics that guide the behavior of corn borers. First, they have an aversion to light, and will burrow down into the deepest part of the plant to avoid the sun. They also have a tendency known as thigmotaxis, meaning an affinity for narrow spaces where their body is in continuous contact with their surroundings. From an evolutionary standpoint, these two characteristics increase the fitness of the larvae since it ensures that they stay within the dark recesses of the corn plants, which offers them both food and protection from predators and the elements. But most importantly, corn borer larvae have a fondness for sugar, choosing to feed on the parts of the plant with the highest sugar content. This is because sugar is an antidote to 6-methoxybenzoxazolinone, a toxin found in young corn plants that can poison larvae that fail to consume enough sugar. With these three characteristics, it is clear that the European corn borer has evolved a specific relationship with the corn plants it preys upon.

References

Beck, S. D. (1958). An Insect and a Plant. *Scientific American, 198*(5), 87–94. doi: 10.1038/scientificamerican0558-87

Field Expedition to Ichauway

By Emily Edwards

I wasn't entirely sure what I had gotten myself into when I volunteered to join the Quave Lab group in a collection expedition to the Jones Center at Ichauway in Newton, GA. Although I had seen thousands of voucher specimen during my time volunteering in the herbarium, I didn't know anything about the process of collecting plants to create new vouchers. I was the only undergraduate student going on the expedition, and I was nervous that I wouldn't be much help. However, despite my initial nerves, I was excited for the opportunity to learn more about the collection process.

"This field trip helped make my work in the herbarium feel more meaningful, since I gained a better understanding of the importance of herbarium vouchers in research"

We loaded down our cars with shovels, buckets, gloves, and (most importantly) snake gaiters. When we made it to the nature preserve in south Georgia, we regrouped and made a plan for collections. Dr. Samarakoon, the collections manager for the herbarium, taught us how to identify *Lachnanthes caroliniana.* This plant is known in traditional medicine to be effective against gingivitis, a common gum disease caused by a buildup of bacteria (Loesche 1996). The *L. caroliniana* was easily identifiable by its distinctive red roots. However, its aerial parts (the visible portion of the plant exposed to the air) were much more difficult to identify. The plant was not flowering when we collected, so we could not identify it by its distinctive white flower. Instead, it had tall, green stems and leaves that blended in with many of the grasses in the field where we were searching. Finding a needle in a haystack seemed easy compared to finding a green plant in a field. After hours of searching and digging, we finally filled our collection bags.

Once our bags were full, we headed to the prep room. Here, we prepared most of the plants for analysis by separating the roots from the aerial parts and cutting the plant into one inch segments. We moved the prepared plants to a dryer where they stayed overnight. These dried plant samples were now ready to be returned to the labs at Emory, where extracts and compounds would be evaluated for antibacterial activity in the phytochemistry and microbiology labs.

Not all of the plant samples were prepared for analysis, though. Several model specimen were saved intact to be used for voucher specimens. These herbarium vouchers are used to confirm the identity of plant species used in research. Without this identification, it is not possible to verify the validity of the research conducted. Although it is easy to overlook the "materials" section of a research article, proper plant collection and identification are an imperative part of the research that is done in the Quave Lab.

This trip was an incredible opportunity to see drug discovery research from the very beginning. It helped make my work in the herbarium feel more meaningful, since I gained a better understanding of the importance of herbarium vouchers in research. I was proud to see the plants we collected at Ichauway added to the herbarium collection.

Works Cited

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Carolina blood root (*Lachnanthes caroliniana)* used in traditional medicine against gingivitis.

Photo: plants.ifas.ufl.edu

BUILDING THE CHEMICAL HISTORY OF PLANTS USING HERBARIUM SPECIMENS

By Burhan Mubeen

Herbarium samples have typically been used for taxonomic confirmation of plant species, and as records of morphological data. However, due to concerns of chemical degradation in the samples, a less prevalent function of these specimens is as a record of the chemical profile of a plant species at the time of collection. If these specimens were confirmed to maintain a constant chemical profile over time, it would allow for the use of herbarium samples as valid records of plant chemistry, and they could then be appropriately used in the chemical analyses of plants otherwise unattainable. So, this semester, the plant species *Baccharis halimifolia*, also known as Sea Myrtle, was used to begin experimentation to determine the extent of this chemical degradation.

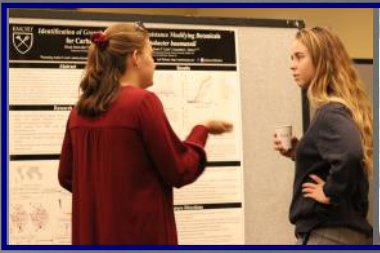
Emory Herbarium samples of this species that were collected at approximately 10 year intervals from the mid 20th century to present were gathered in order to assess the effects of aging on herbarium voucher chemical composition. With this analysis, we will be able to see changes in the chemical profiles that occur over time in *Baccharis halimifolia* in order to determine if herbarium specimens are a viable source of plant material for other types of analysis.

Sea Myrtle *(Baccharis halimifolia)* **top:** herbarium specimen collected in 1917 **middle:** rhomboidal shaped leaves with dentate margins.

> *"Baccharis halimifolia*, also known as Sea Myrtle, was used to begin experimentation to determine the extent of the chemical degradation. ……."

VOLUNTEER SPOTLIGHT: ANN SINSUAN

Ann is a second-year student from Stone Mountain, GA who is double majoring in chemistry and music with a concentration in composition. She began volunteering at the herbarium over the summer to learn more about the various shades of green that surround us. "In about three months, I've been able to view and handle plants from all over the world," says Ann. "You can essentially tour an entire country by looking at its plants, and you can do so all from the comfort of the herbarium!"



Biodiversity research symposium organized by French and American researchers addressing planetary health, disease ecology, drug discovery.

Plant Taxonomy workshop for Atlanta Botanical Garden summer volunteers




Herbarium student volunteers at the Fernbank Natural History Museum on Adventures in Science Day.

Emory Herbarium at Sustainable Food Fair featuring wild edible foods.




Research teams who participated in the Ichauway summer plant expedition (below) and Fall expedition (above)

Mushrooms are the new plastic

By Denver Roberts

The climate is the worst that it's ever been. We are losing biodiversity rapidly, deforestation is at an all-time high, natural disasters hit harder than ever before, and our pollution increases by the day. At such a critical point in human history, we must make changes to our lifestyles in order to keep the end of the world at bay, and decreasing our carbon footprint by cutting pollution is one of the first things that comes to mind.

We have been reducing, reusing and recycling since my time in primary school, but that still is not enough. Eben Bayer, the CEO of a small company called Ecovative is showing us that perhaps we've been approaching it in the wrong way; plants could be the answer to our problems.

Ecovative is a company that develops eco-friendly materials that act like plastics but are made from mushrooms, specifically the mycelium. "You're used to seeing the mushroom above the ground. Mycelium is like the roots beneath it," Bayer explains. The company uses live mycelium and feeds it agricultural waste. The mycelium acts as a natural glue by growing throughout the waste and binding it all together. The resulting material behaves like a sustainable version of plastic and Styrofoam.

Currently, Ecovative grows the materials into specific shapes and sizes to use as packaging materials in place of Styrofoam. When you've opened that long-awaited package, with Ecovative's product, you can break up the Styrofoam-like plant material and throw it into your garden as compost.

Bayer is looking to move past just packaging materials however. The company claims that mycelium has huge potential to be used in construction, regenerative medicine, as a faux leather and even as a meat replacement. Anyone down to try mycelium bacon? "It really has boundless possibilities, and it comes from its ability to move from the microscale, to the macroscale," Bayer says enthusiastically in an interview.

Nowadays, the future often looks bleak and uncertain, but people like Bayer are developing solutions, through the power of plants.

Bibliography

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Mycelium based packaging materials in place of Styrofoam (Photo: drupa.com)

A: Chanterelle (*Cantharellus cibarius*), B: Red morning glory (*Ipomoea coccinea*), C: Butter fly bush (*Buddleia sp.*), D: Sweet goldenrod (*Solidago odora*), E: Sun hemp (*Crotalaria juncea*), F: Purple Coneflower (*Echinacea purpurea*)

SUPPORT STUDENT RESEARCH WITH AN HERBARIUM T-SHIRT

Our students make such important contributions to the research underway at the Emory University Herbarium. Under the leadership of Curator/Director Dr. Quave and Collections Manager Dr. Samarakoon, Emory undergraduates and graduate students have become involved in plant science research at Emory in myriad ways! In addition to working with specimens in the herbarium, many students dream of opportunities to undertake field research. Such experiences can determine the career trajectories for future scientists! Help us give them those opportunities through support of student research projects while also enjoying a lovely t-shirt featuring native medicinal plants of the SE USA!

Order your shirts online HERE by 2/11 (delivery 2/28). All proceeds (after expense of printing) go directly to Emory as a non-profit donation for direct use in our student research program.

Don't want a shirt? You can still contribute with a direct donation to Emory Herbarium through the secure Emory Giving website HERE.

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OUR MISSION

The mission of the Emory University Herbarium (GEO) is to serve as a botanical research and educational resource for the Emory University and global community. GEO aims to foster understanding of the human-nature interface by collecting, preserving, researching and exhibiting botanical specimens and ethnobotanical objects.

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Schedule a visit or tour! We are open 9 a.m.-5 p.m. Monday-Friday.

Support our research and outreach activities with a tax-deductible donation. Information on how to give is available HERE or on our website.

Learn more on our website:

https://scholarblogs.emory.edu/emoryherbarium/