



Search for the So-Called Fern Allies

“Hot dog, I found it!”

There it was—*Selaginella*, a small spikemoss, luxuriating on the soggy substrate. What a sweet find!

We had already documented more than 1,100 different plant species on the Domain before I came upon this one. So why had it eluded us?

Did I make this discovery on a remote rock outcrop? At the edge of a forest pool? Behind a secluded waterfall? Hardly! I was bottoms-up in the heart of campus, peering into the enclosure surrounding a subterranean air vent of one of the University’s oldest academic buildings.

You see, a person who’s usually got her eye out for flowers has to revise her search image *and* her posture when looking for spikemosses. It’s down-on-your-knees, nose-to-the-soil work, distinguishing among various tiny non-flowering plants covered in scale-like leaves.

Resembling a moss or liverwort, *Selaginella* is one of the “fern allies,” an intriguing group of plants that share some characteristics with ferns: they reproduce asexually with spores and contain vascular tissue (xylem and phloem). And if you remember Alternation of Generations (that nemesis of introductory botany students), you may recall that only in ferns and fern allies do both generations of the life cycle live on their own.

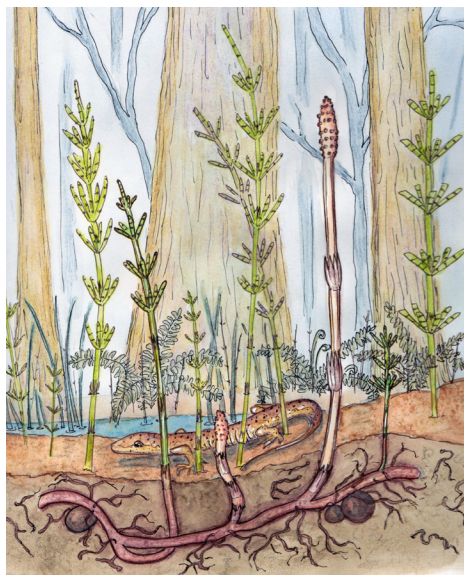
Fern allies form a curious assembly. Besides spikemosses, the group consists of clubmosses, quillworts, horsetails, and whisk ferns. If you haven’t been introduced, allow me to do the honors:

- Clubmosses include ground pine, creeping-cedar, shining clubmoss, and the like. They do look a bit like robust mosses, and many have club-like structures that produce spores. *Diphasiastrum* (also known as *Lycopodium*) is a familiar one.

Fun fact: Some clubmosses produce spores that contain so much oil that they can ignite. These spores are harvested and sold as “*Lycopodium* powder,” a flash powder that was used in early flash photography, among other things.

- Spikemosses, sometimes called “lesser clubmosses,” are today limited to the one genus, *Selaginella*, which includes meadow spikemoss, the one that I recently went head over heels for. Distinguishing it from mosses is no picnic.

Fun fact: Spikemosses make lovely additions to terrariums. Look for them where nursery-propagated plants are sold.



- Quillworts bring to mind another “I found it!” moment, this one by Herbarium Director Jon Evans. Checking out the upper reaches of a Domain reservoir, he came upon a population of quillworts, genus *Isoetes*, growing in the mud flats. The plants look a bit like tufts of grass, but if you look closely, as Jon did, you will see that the leaf blades resemble porcupine spines, and you may discover telltale spores clumped at their bases.

Fun fact: Quillworts actually exchange gases (absorb carbon dioxide and give off oxygen) through their roots. The expelled oxygen sometimes reacts with iron in the soil to produce a rusty red ring around the plant.

- Horsetails are some of the oddest-looking plants around. Their hollow, jointed stems

are unmistakable. The plants come in two types: unbranched and branched. The latter, also called scouring rushes, really do look a little like a horse’s tail. In our search for plants on the Domain, Yolande Gottfried and I had been told by several people that scouring rushes could be found along some woodland stream or other. Empty-handed and nearing the last of these so-called horsetail haunts, we went tramping down to the creek, straight through a thriving horsetail population. (“Found it!”) We made our collection and carried a stem segment to each of those who had set us on what had almost become a wild goose chase.

Fun facts: Scouring rushes served the pioneers as a sort of “steel wool,” because horsetail stems contain abrasive silicate crystals. The stem segments break apart easily, a neat thing to show kids.

- And finally, the whisk ferns. These rootless, leafless plants are tropical and sub-tropical. Many are epiphytes, living on other plants as supports, not as parasites. They are often found growing in the root mantles of tree ferns or in the axils of palm leaves. Whisk ferns resemble the earliest land plants, but actually they evolved more recently than flowering plants, losing their leaves and roots along the way. There are none in the Tennessee flora.

Fun facts: Whisk ferns are favored by gardeners in mild climates for their unusual growth form. I hope to see one in the wild sometime. It’s on my bucket list.

So there they are, the five types of fern “allies.” But why the quotation marks? Are they not that close to ferns after all? For the answer, we need to delve into a bit of botanical history.

The great 18th-century taxonomist Carolus Linnaeus, not the first to scratch his head over these plants, classified some of them with mosses and others with ferns. Then, in the early 19th century, it was looking

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The Beginnings of a New Tradition—Reunion Open Hours

Reunion/Homecoming weekend was very exciting this year. The Webb Greenhouse was open for a couple of hours on both Friday and Saturday, and on those two days we had upwards of 40–50 people come by. For the first time having the greenhouse open as part of this special weekend's schedule, this was a great number of people. They ranged from alumni from the mid-late 1970s to much more recent graduates who just realized that they'd never been in the greenhouse (including a few who were biology majors) and just wanted to stop by and see what all the fuss was about. No one who came left disappointed.

To be honest, there were two aspects to this idea—one was that the greenhouse really does have a lot to show off at this point, and it will only get better as more activities happen around it and in it with the large collection of plants. But the second aspect was that I had, having recently attended my 50th high school reunion, realized that I am REALLY not much of a reunion kind of guy. So I figured that if the open greenhouse hours were put on the

schedule, with my name being included as one who would be there to show folks around and answer questions, then people who saw my name and wanted to see me or were simply curious would also come by. And both aspects were covered in the folks who came by. It was a win/win.

The most interesting and perhaps

interest or adaptations, in short, their reason for being in the collection. We got around the greenhouse once, and at that point I suggested that we could go around again and I could do the same thing but with different plants this time, but then suggesting that what we had done in that circuit was to take a quick tour of



the rest of the planet, exploring at least half a dozen other ecosystems from at least four other continents, and that this snapshot glimpsing of the rest of the planet was the advantage of having the greenhouse on this campus.

I can't tell you if this alumna was convinced or not, but she definitely had something to think about. Not a bad outcome, in my book.

challenging question came on the second day, if I'm remembering correctly: surrounded by thousands of acres of wonderful diversity what was the point of having the greenhouse—isn't there enough in the ecology and plant diversity already present on the Domain? I walked with this alumna through the house, pointing out this plant and that and explaining their

So, next time you're on the Domain, especially for Reunion/Homecoming weekend, check on the schedule when the Webb Greenhouse open hours will be, and come on by. I'll be glad to show you around, answer questions, even take you around the world in 40 or 50 steps.

YSR!

—Jonathan Ertelt

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as though all of them had more in common with the ferns. So the term "fern ally" was coined, and these categories of plants were established:

- Bryophytes (mosses, liverworts, and hornworts).
- Pteridophytes (ferns and fern allies).
- Spermatophytes (seed plants).

For about 100 years that scheme seemed to fit, until scientists began noticing similarities in leaf structure and formation between ferns, seed plants, and some of the fern allies, separating them from the other fern allies and from Bryophytes. (Maybe Linnaeus was on to something?) The dissolution of the "alliance" had begun.

But the blow, the coup de grace, was to come in the 1990s when DNA and fossil evidence, along with computer algorithms and advances in theory, set "fern ally" classification

on its ear. It turns out that horsetails and whisk ferns, the strangest-looking of the bunch, really are ferns. And the rest of the "allies" (clubmosses, spikemosses, and quillworts) are much more closely related to Bryophytes than they are to ferns. Those three are now grouped together as Lycophytes. In fact (Are you still with me?) ferns are so much more closely related to seed plants than to Lycophytes that if ferns were to have allies at all, the alliance would be with the seed plants: pine trees, corn

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Coming Next Spring

Yolande Gottfried has been walking the Turkey Hollow Trail at St. Mary's Sewanee in preparation for a forthcoming trail guide. She plans to include information on the trees and forest type as well as the wildflowers through the seasons. This guide should be useful to both local folks who enjoy the trail as well as participants in the programs at St. Mary's Sewanee.

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Spring Calendar of Events

Springtime is busy for wildflower lovers! Herbarium staffers will be teaching classes and leading hikes for Trails and Trilliums and the Spring Wildflower Pilgrimage in the Smokies. We are offering two hikes of our own:

SHAKERAG HOLLOW

Sunday, April 7, 1:30 p.m., Mary Priestley

A walk among the abundant and diverse spring wildflowers of this partly old-growth forest area. Meet at the Green's View parking lot (past the golf course). 2 miles, moderate to strenuous, with one fairly challenging incline.

TURKEY HOLLOW TRAIL at St. Mary's Sewanee Conference Center

Sunday, April 14, 1:30 p.m., Yolande Gottfried

There should be a wide variety of spring wildflowers to enjoy. There is a short, somewhat steep section going down below the bluff and another coming back up plus a rocky section, but this is still an easier trail than Shakerag Hollow. Facilities will be available in the conference center. Meet in the parking lot in front of the main building for this moderate one-hour walk below the bluff.

The Herbarium sponsors a **NATURE JOURNALING GROUP** that meets Thursdays, 9-11 a.m. All are welcome. Email Mary Priestley at mpriestley0150@gmail.com for more information.

Times are CDT.

Wear appropriate shoes on these walks. Risks involved in hiking include physical exertion, rough terrain, forces of nature, and other hazards not present in everyday life. Picking flowers and digging plants are prohibited in the above-mentioned natural areas.



THE SEWANEE PLANT PRESS

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Drawings are by Mary Priestley

Fern allies are: clubmoss, horsetails, quillwort, whisk fern, and spikemoss.

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plants, rosebushes, and the like. But let's not go there.

I will, however, go out on a limb and say that most plant taxonomists today would recognize the following as distinct groups of plants:

- Bryophytes (mosses, liverworts, and hornworts).
- Lycophytes (clubmosses, spikemosses, and quillworts).
- Polypodiophytes (ferns, including horsetails and whisk ferns).
- Spermatophytes (seed plants).

Plant classification is a moving target, isn't it? And botanists seem loath to abandon terminology. So although "fern ally" and "pteridophyte" no longer mean what they did, the terms are still very much in use.

OK, then, is this all inconsequential "botany speak"? Much ado about nothing? After all, our landscape is dominated by the seed plants, flowering plants especially. Lycophytes, largely a verdant curiosity, comprise less than 1% of vascular plants. They are generally relegated to the fringe habitats—a few on harsh cliff faces or other extreme

environments, but mostly in isolated patches of wetland—creeks, pools, and ditches.

However, if we could travel back in time 300 million years, give or take, the scene would be totally different. During the Carboniferous Period, we'd see swampland covering vast expanses of what are now North America, Europe, and China. The dominant vegetation, towering like trees above us, would be the ancestors of today's humble Lycophytes. Because of the scale-like patterns on their trunks, scientists named these giants *Lepidodendron*, scale trees. They ruled for about 40 million years—80 million in China—until the swamps dried up and these titans became extinct.

What caused the desiccation and their demise? Scientists suggest that glaciation bound water in ice, lowered the sea level and increased its salinity, making coastlines and estuaries uninhabitable by these plants. Continental drift created Pangaea, trapping swamplands in the drier interior of the new mega-continent. Mountain ranges, formed by colliding continents, intercepted moisture-laden air from the ocean, and created sediments that filled the drying swamps. *Lepidodendron* was no more.

But fast-forward to our era, when the

fossilized remains of those behemoths, now compacted into coal, are fueling our industry and commerce and, according to atmospheric scientists, having a catastrophic effect on the climate. Seemingly insignificant plants in today's flora are the descendants of ancient ones that are having a huge impact on our lives and those of our children.

Happily, Lycophytes can also fuel our imagination. Just for fun, try this the next time you find a nice patch of clubmoss: Kneel down and lean way over. Get your head into that Lilliputian canopy, open your eyes, and pretend. Are you a tiny salamander making its way through the forest? A snail looking for a tasty bit of greens? Or are you a time traveler visiting the long-ago era when swamplands stretched for miles, insects were monstrously big, and "fern allies" ruled the day?

—Mary Priestley

This article first appeared in 2018 in the *Tennessee Conservationist* magazine.

