

# PETAL PUSHER

January—February 2019 Newsletter of the Missouri Native Plant Society Volume 34 No.1

“... to promote the enjoyment, preservation, conservation, restoration, and study of the flora native to Missouri.”

## In this issue

Bryophyte Spring  
Ephemerals. ....1

The Interior Highlands  
Liverwort & Hornwort  
Exsiccatae.....3

Stanton Hudson Research  
Awards–2019.....5

From the Editor.....5

Chapter Events.....6

2019 Meetings & Field Trips...6

AmazonSmile Donates  
When You Shop! .....7

A Tribute to Paul L.  
Redfearn.....8

Lichens: Delightful Diversity  
Writ Small ..... 10

Chapter Updates..... 11

Poetry Corner..... 14

Finding the Sword Moss.....  
.....14

Join Us! Become a New  
Member or Renew ..... 15



Yellow-stalked moss (*Ditrichum pallidum*) from Don Robinson State Park. Photo by Nels Holmberg

## Bryophyte Spring Ephemerals

By Nels Holmberg

While anticipating the flowering spring ephemerals this winter, we might also consider some bryophytes that could be considered spring ephemerals. Especially interesting are four that might be identified in the field even without the help of a magnification loop.

**Urn moss** (*Physcomitrium pyriforme*) is known from most counties, and most yards. It quickly colonizes bare soil, and sends up abundant capsules in the spring. The capsules are distinctively pear-shaped, turning yellow/orange as they mature, then brown when their caps (opercula) fall off and



*Asterella tenella* from Whiskey Creek Farm, Franklin County. Photo by Nels Holmberg

their spores disperse. This plant may get its name from the urn-shaped capsule, but it and other species in the same family (Funariaceae) send up their fruiting stalk (seta) out of an urn-shaped cluster of leaves on the stem. Look for this moss in your yard, garden, pasture, or any patch of soil left bare over the winter. It is distinctive looking and may only be confused with its relative, *P. collenchymatum*, which has only been found on mudflats of rivers and lakes at five Missouri locations, including Shaw Nature Reserve. Urn moss may be identified by its stiff cap-less capsule while *P. collenchymatum*'s is lax and crumpled when mature.

**Yellow stalk moss** (*Ditrichum pallidum*) is so widespread and distinctive it has picked up several other common names: pale ditrichum moss, golden thread moss and pale cow hair moss. When this low moss sends up its capsules in late April or May, it becomes very distinctive. Its tall thin seta is bright yellow to golden-yellow. While the leaves and capsules become cryptic with age, the setae turn straw colored and persist as a messy thatch. This moss is common in dry woods, especially dry-chert woodlands, and also in lawns, pastures and the root-balls of toppled trees. It does have a rare similar looking relative, "red-stemmed" moss (*D. rhynchostegium*). The red-stemmed moss was not known from Missouri until

John Atwood looked through over 300 herbarium specimens of yellow stalk moss and found one. It was collected at Floyd Fire Tower near Potosi in 1968 by Paul Redfean (former MSU biology professor, former mayor of Springfield, former editor of *Missouriensis* and collector of over 44,000 specimens). The two species are separated by capsule and leaf characters that are more easily seen with a microscope.

***Asterella tenella*** is a thalloid liverwort without a common name, but is recognizable because it is so small and often grows on dirt trails through wooded MDC

conservation areas. It is also found on both sandstone and dolomite glades, growing on thin soil over bare rock. It has a narrow, flat thalloid form, usually about 2 mm wide. In late winter a small light green bulge starts forming in the notch at the tip of the thallus, then in April it expands to an umbrella-like fruiting body, with spores falling out. As this grows, the thallus dries up and almost disappears, leaving a forest of little umbrellas.

**Hornworts** look like flat liverworts with horns sticking up. Most often seen is *Phaeoceros mohrii*, which is also known as (or confused with) *Phaeoceros oregonus*, *Phaeoceros laevis*, *Anthoceros laevis* var. *carolinianus*, and *Phaeoceros carolinianus* (and you thought vascular plant names are confusing). It is an exciting find in the spring, even though it luckily doesn't seem to have a common name other than 'hornwort'. Although not rare, this hornwort is seldom noticed. Hornworts are named for their long thin reproductive structure which looks more like a thread, but a horn sounds more exciting than a thread. When mature it splits lengthwise and releases spores. Hornworts are annuals and like to colonize bare disturbed soil.

Now you are ready to go out this spring and call off four bryophyte names (of the more than 450 species

in Missouri) along with the spring beauties (*Claytonia virginica*).

# The Interior Highlands Liverwort and Hornwort Exsiccatae

By John J. Atwood, Missouri Botanical Garden



Hornwort from Babler State Park. Photo by Nels Holmberg

Liverworts and hornworts are related to mosses in a group collectively known as bryophytes. Bryophytes lack roots and share similarities in their reproductive structures and life cycle. Compared to mosses, liverworts and hornworts are generally smaller plants. This makes them an inconspicuous component of the flora, unless numerous plants are discovered growing in clumps or mats. There are two major liverwort groups: leafy and thalloid. Leafy liverworts superficially look like mosses due to their leafy shoots. They differ, however, in that their leaves are arranged in two flat rows on the stem. Often, leafy liverworts also have a third row of much smaller leaves attached underneath the stem. In contrast, mosses have leaves evenly arranged around the stem. Thalloid liverworts



Leafy liverwort, *Frullania stylifera*. Photo by Rick Gray.

lack leaves and have the appearance of ribbons or rosettes that can be fleshy or thin. Hornworts mostly resemble thalloid liverworts, but they have a persistent, cylindrical spore-bearing structure. The spore-bearing structures on liverworts, by comparison, are attached to an ephemeral stalk.

The liverworts and hornworts of the Interior Highlands of southern Missouri, northwestern Arkansas, and portions of southern Illinois, southeastern Kansas, and eastern Oklahoma, are generally the same species that occur in eastern North America. Some of these species are at their western-most distribution in the Interior Highlands. Interestingly, a few western North American species also occur in the Interior Highlands at their eastern-most distribution. Lastly, a few species occur in the region as disjunct relicts of a once widespread Pleistocene era flora. These species have their primary distribution in boreal and sub-boreal regions, but at one time occurred in the Interior Highlands under colder climatic conditions. Their ability to persist in the region is tied to the specific microhabitats that they inhabit.

There has been a considerable amount of study on the liverworts and hornworts of the Interior Highlands. The first floristic account, although unpublished, was by Patricia Thomas. Her treatment lists 139 species and is based on fieldwork, herbarium studies, and a summation of the relevant literature. A similar number of species from the Interior Highlands is cited in Rudolph Schuster's six volume manual *The Hepaticae and Anthocerotae of North America*, indicating that the total taxonomic diversity for the region is reasonably well known. Although new species

undoubtedly can still be found, only a handful of new state or regional distribution records have been added over the last thirty years. Unfortunately, the regional distribution and ecology for most species remains fragmentary. Liverwort and hornwort checklists for the Interior Highlands by Steve Timme and Paul Redfearn show that over 60% of the species are known from five or fewer localities. Searches for representative specimens in the herbarium of the Missouri Botanical Garden corroborate this finding. Additionally, most of these specimens were collected more than forty years ago, leaving questions about their present-day status in those localities. In Missouri, the lack of distribution data for liverworts and hornworts is reflected in the recent Missouri Department of Conservation's Species and Communities of Conservation Concern Checklist. Of the 41 liverworts and hornworts cited, 26 species are considered to be critically imperiled.

To promote the floristic, taxonomic, and ecological study of the liverworts and hornworts of the Interior Highlands, I have directed some of my fieldwork towards the study of these organisms and have begun distributing specimens as an *exsiccatae* /eksə'kätē/. An *exsiccatae* is a set of duplicate dried specimens that are distributed for use as a reference collection to academic institutions and herbaria. The term comes from the Latin verb *exsiccare*: to dry out. The set of specimens are accompanied with a booklet or printed labels that give information about where and when the specimens were collected, who collected them, and who named them. *Exsiccatae* are typically made for a particular geographic area, but they can also be made up of a particular group of plants. For this *exsiccatae*, duplicate sets of 10 specimens are distributed to herbaria with bryological programs. In the United States these herbaria included the California Academy of Science, Duke University, the Field Museum of Natural History, the Missouri Botanical Garden, and the New York Botanical Garden. The international herbaria include the Hattori Botanical Laboratory in Nichinan, Japan; the Main Botanical Garden in Moscow, Russia; the Polar-Alpine Botanical Garden in Kirovsk, Russia; the Royal Botanic Garden in Edinburgh, Scotland; and the University of Göttingen in Germany. Additional duplicate specimens are sent to the American Bryological and Lichenological Society's hepatic exchange for use in private herbaria.

Since 2013, there have been four published fascicles of specimens. These specimens have added new state distribution records for several species and have been cited in three bryological publications.

Indeed, most liverwort and hornwort species in the region appear to have wider distributions than what is currently reported in the literature. By accumulating habitat and distribution data from voucher specimens, the species that are truly rare are slowly being differentiated from those that are understudied. A fourth set of specimens is nearly complete, with an anticipated distribution in 2019.



John Atwood at Terre Bleue Creek. Photo by Nels Holmberg

# Stanton Hudson Memorial Fund Student Research Awards–2019

The Missouri Native Plant Society announces the availability of funding for research projects conducted by college or university students under the supervision of a faculty member. This award honors the late H. Stanton Hudson (1921–2002), a longtime member of the Missouri Native Plant Society whose passion for the flora of Missouri and its conservation inspired his friends and family to create a small grant program in his memory.

To qualify for the Hudson Fund, research must involve Missouri native plants in some way but may have as its primary focus any pertinent subject area in plant biology, including conservation, ecology, physiology, systematics, and evolution, etc. The grant may be used for any non-salary expenses relating to the proposed research, including travel, equipment, and supplies. For 2019, we anticipate awarding two grants in the amount of \$1,000.00 each. At the conclusion of the project, grant recipients will be expected to prepare research results for publication in a scientific journal and will be asked to present their research at the annual Missouri Botanical Symposium.

Proposals should not exceed five single-spaced typed pages and should include:

1. Description of the project;
2. How the project relates to native Missouri plants;
3. Estimated completion date;
4. Overall budget for the research;
5. How an award from the Hudson Fund would be used;
6. A list of other funding received or applied for toward the project.

Applicants should also include a current curriculum vitae. In addition, two letters of reference must be included, one of these being from the student's faculty advisor.

Materials may be submitted by mail (in triplicate) or, preferably, electronically as e-mail attachments in Microsoft Word or Adobe Acrobat (PDF). Letters from the applicant's references may be submitted as e-mail messages. Proposals will be reviewed by the MONPS grants committee.

Application materials may be sent to:

Missouri Native Plant Society  
c/o Dr. Paul M. McKenzie  
2311 Grandview Circle  
Columbia, MO 65203

Email: [paul\\_mckenzie@fws.gov](mailto:paul_mckenzie@fws.gov) [in case of a prolonged government shut down, e-mail to [mbowe@missouristate.edu](mailto:mbowe@missouristate.edu)]

For questions, contact Dr. McKenzie by phone at (573) 445-3019 or by email.

The deadline for submissions is January 31, 2019, and announcement of winners will be made by February 28, 2019, with funds to be awarded by June 1, 2019.

## From the Editor

This issue was borne via collaboration through a troubled time. Erin Skornia, Dana Thomas, and I were able to put it together with the help of much technology (especially instant texting). That being said, the Society also suffered the loss of one of our Charter members and early Presidents, Paul Redfearn.

In a strange way, this became the perfect storm. The issue was already going to have a bryophyte and lichen theme, and Paul was a world-renowned bryologist. Also, as you'll see in our tribute to him, my first publication was bryological.

Thank you to our proofreading team, including Malissa Briggler (who also put together all of the Chapter Reports and Events), John Oliver, and board members. Thank you to our authors, chapter representatives, and other contributors. Thank you for your time, dedication, collaboration and support.

When you get a chance, go out barefoot on a sunny day and feel the softness of a moss on your toes. Or wear some boots and crunch on some reindeer lichens. But please leave them all in place when you're done.

Sincerely,

**Michelle Bowe, editor temporaire**

# Save the Dates for MONPS 2019 Meetings and Field Trips!

Dates have been selected for our 2019 field trips! Mark your calendars now, and keep an eye on upcoming issues of the Petal Pusher for full itineraries and details closer to each field trip. Information will also be posted on the MONPS website and Facebook page.

For each trip, we will explore field sites on a Friday, Saturday and Sunday. An invited speaker will provide a presentation during one evening (usually Friday) and we will hold a board meeting one evening as well. Don't miss these opportunities to see beautiful locations and to learn from other botanists and plant enthusiasts in the state! You're welcome to attend all of the field trips or to just pop in for a day or two. Tentative site possibilities are shown below. Details subject to change!

Spring - Sullivan, MO - May 3-5 Meremec S.P., Hamilton Branch Cave, Huzzah C.A., Onondaga S.P., Vilander Bluff S.P.

Summer - Fulton, MO - June 21-23 (MONPS 40th anniversary) Auxvasse N.A., Grand Bluffs C.A., Prairie Garden Trust, Tucker Prairie N.A., Graham Cave S.P., Danville C.A.

Fall - Dexter, MO - Sept 6-8 Big Cane C.A., Morris S.P., Mingo N.W.R., various private sand prairies, Holly Ridge C.A.

Winter - Columbia, MO - Board Meeting Dec. 7 (no field trips)

## Chapter Events

### Hawthorn

**01-17; 02-21: Chapter Lunches, 11:30 a.m.**

Chapter lunches are held on the third Thursday of each month just south of Broadway Street in downtown Columbia at Uprise Bakery inside the lobby of the RagTag Theatre, 10 Hitt Street, Columbia, Missouri.

**01-14; 03-11: Bimonthly Chapter Meeting, 6:30 p.m.**

Chapter meetings are held on odd-numbered months on the second Monday at the Unitarian Church, 2615 Shepard Boulevard, Columbia, Missouri. Newcomers and friends are welcome to attend.

See [www.columbianativeplants.org](http://www.columbianativeplants.org) for updated postings of newsletters and activity details.

### Kansas City

**01-08; 03-05: Chapter Meeting, 7:00 P.M.**

Our chapter meetings are held on the first Tuesday of odd-numbered months except July at the Anita B. Gorman Conservation Discovery Center, 4750 Troost Ave., Kansas City, Missouri. For more information, please contact John Richer, RichterJC@BV.com.

### Osage Plains

**02-25: Chapter Field trip**

Trip co-ordinators: Bernie Henehan [berniehenehan@yahoo.com](mailto:berniehenehan@yahoo.com), Dan Henehan [henehandan0@gmail.com](mailto:henehandan0@gmail.com), and Chapter Rep: Casey Burks [mobugwoman@gmail.com](mailto:mobugwoman@gmail.com). Feel Free to contact any of us for further information or to be added to the Osage Plains distribution list.

### Ozarks

**No meetings in January or February.**

### Paradoxa

**No meetings January—February. See you in the Spring!**

Paradoxa schedules meetings and walkabouts at a variety of locations in the Rolla area. Watch our chapter page on the [monativeplants.org](http://monativeplants.org) website for updates, or email us at [paradoxarolla@gmail.com](mailto:paradoxarolla@gmail.com), and ask to be added to our email list, as dates and

locations may change.

Workdays for the Bray CA Botanical Collection and Herbarium Project are generally held on the first and third Thursdays of the month. Please contact us at the above email if you would like to join the crew.

## Perennis

Watch for announcements by e-mail, the MONPS Facebook page, and the MONPS website.

## Saint Louis

### 01-23: Guest Speaker Ted McRae, 7:30 P.M.

You may recognize Ted McRae's name as the author of a recent article in the *Petal Pusher* on pollination in Ozark witch hazel. Ted is an agricultural entomologist who specializes in several families of beetles and also has a keen interest in plant-insect relationships. You can learn a lot more about Ted and his interests by looking at his comprehensive and informative blog, *Beetles in the Bush* (<https://beetlesinthebush.wordpress.com/>).

### 02-27: Rick Gray and Steve Turner, 7:30 P.M.

Our program will be “Two Roads to Colorado,” the botanical and photographic highlights of two separate trips to the Centennial, Mile-High, but mostly Columbine State. Our speakers will be Chapter President Rick Gray, and one of our favorite photographers, Steve Turner. You'll enjoy this one, don't miss it! Chapter meetings are held on the fourth Wednesday of the month at the Sunset Hills Community Center, 3915 South Lindbergh Boulevard, Sunset Hills, Missouri.

## Southwest

### 01-29: Winter Plant Identification, 6:00 p.m.

Michelle Bowe will present a workshop on winter plant identification at the Midtown Library in Springfield. Please contact Michelle Bowe at [mbowe@missouristate.edu](mailto:mbowe@missouristate.edu) if you would like to speak at our meetings or have ideas. Thanks!



## AmazonSmile Donates to MONPS When You Shop!

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Simply visit [smile.amazon.com](https://smile.amazon.com) and search for Missouri Native Plant Society Inc. After you finish shopping, Amazon will automatically donate to MONPS. You may also click the AmazonSmile link on [monativeplants.org](https://monativeplants.org).

Make sure to navigate to [smile.amazon.com](https://smile.amazon.com) each time you shop. The default [amazon.com](https://amazon.com) will not result in a donation, and your smart phone application may not support AmazonSmile.

Visit [About AmazonSmile](#) to read more about the AmazonSmile Foundation.



## **A Tribute to Paul L. Redfearn, Jr., Ph.D.**

**by Michelle Bowe, Missouri State University with Doug Ladd, The Nature Conservancy**

Paul Redfearn taught me “How to know the Mosses and Liverworts” (Conard and Redfearn, 1979) as I worked on my very first publication thirteen years before I met him in person (Bowe and Rayner, 1993). I first met Paul when I joined the faculty of Missouri State University in 2002. Needless to say, I was thrilled to find that he was a faculty member here. Despite being retired, he was at school almost every day and he continued to serve MSU as the herbarium curator (Ozarks Regional Herbarium, SMS) and consultant for anyone in the world who was studying mosses and liverworts (bryophytes) until he moved to Kansas City in 2012. It is fitting that we include this tribute in the Mosses, Liverworts and Lichens edition of the Petal Pusher.

During his years in Springfield, Paul was many things to many people—an excellent professor and mentor, a charter member and the second president of the Missouri Native Plant Society, Springfield Mayor, and City Councilperson. He was also a member of The Nature Conservancy’s Missouri board of trustees, and was instrumental in establishing the Springfield Botanical Center. In fact, if you visit the native plant gardens there, you will find a bench that was placed in his honor.

Paul Redfearn is a person who has impacted many more lives than can be measured or described and the innovations he made at MSU are ongoing—he developed and curated the herbarium and developed an on-line

searchable photographic database of plants (**Vascular plant photographs**). In addition, he was one of the first curators to add their entire collection to a computer database (currently with approximately 65,000 specimens). He was a great mentor for me here, was one of the state's leading conservation biologists and continued to publish papers in the Missouri Conservationist throughout his life. He and I published several papers together (Bowe and Redfearn, 2002; King et al. 2012) and had many discussions about plants, field trip sites, Florida, politics, and life in general. Paul is survived by his loving wife and botanical companion, Alice—Paul collected many many plants for the herbarium, and most of them read “Collected by P.L. Redfearn, Jr. with Alice Redfearn.” On his herbarium website, Paul included a bibliography of publications by faculty, staff, and students of the Ozarks Regional Herbarium (**SMS publications**). And while he didn't talk much about it, Paul was a Korean war veteran with Bob Kral, another mentor of sorts while I was a student at Vanderbilt University. I do remember a discussion about Paul just wanting to look for mosses and liverworts while on duty in Japan.

**From Doug Ladd:** This is sad news and the end of an era. Paul was extremely helpful to me when I first came to Missouri in 1980. His herbarium (SMS) was only 40 miles away and I used it extensively as I worked with the local flora. Paul always went out of his way to facilitate access, provide encouragement, and share his thoughts on just about anything, even inviting me to his home for meals. As I started working with lichens, he suggested I work through and revise their collection, readily providing support and materials, and joking that I was his off-budget lichen herbarium curator. Paul was also extremely helpful in identifying bryophyte specimens for me through the years. His contributions to our knowledge of Ozark bryophytes put the region on the map from a cryptogam perspective, and his 1972 Mosses of the Interior Highlands remains a key reference for the region. I have several fond memories of field time with him, including one Arkansas excursion Paul, Bill Buck (NY) and I made circa 2002 to recollect a moss Paul had collected years ago that turned out to be a new species. Paul was in his mid-70's then, and still readily climbing the steep slopes of the Ozarks. Paul was instrumental in the early days of MONPS, and also served a term as president and played a major role in editing and keeping Missouriensis going during a difficult period in the early 1980's.

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# Lichens: Delightful Diversity Writ Small

by Doug Ladd

With more than 15,000 different types known, lichens are a prominent and ubiquitous, if overlooked, part of the beautiful and complex fabric of life that envelops and sustains the planet. Although most people are not aware of it, much of the small-scale variation in colors we see in nature is caused by lichens, which contribute patterns of yellow, orange, green, brown, and gray over trees, rocks, soil, and even old concrete and stonework.

From early childhood classes onward, many of us learn that lichens are a harmonious partnership between two different organisms (“Alice Alga married Freddy Fungus and they lived together happily ever after”). Lichens are indeed a combination of a fungus and a photosynthetic organism, called the photobiont — typically either a green alga or a cyanobacterium (formerly called blue-green algae). The photobiont provides nutrients to the fungus, while the fungus provides structure, moisture retention and essential minerals to the algae, allowing the combination to survive in environments where neither could survive alone.

The elegance of this combination is that the combined entity transforms both components and functions as a distinct organism, with a unique structure, chemistry, appearance, and ecological behavior



British Soldiers (*Cladonia cristatella*), a common lichen on lightly shaded logs in the Ozarks. ©Louise K. Broman (courtesy Indiana Dunes National Lakeshore) - [http://www.epa.gov/glnpo/image/viz\\_nat2.html](http://www.epa.gov/glnpo/image/viz_nat2.html), Public Domain, <https://commons.wikimedia.org/w/index.php?curid=3899384censes/by-sa/4.0>], from Wikimedia Commons

unlike that of either the alga or fungus. Each type of lichen almost always has a unique fungus species, whereas relatively few species of algae and cyanobacteria occur throughout the lichen world, and multiple photobionts are sometimes associated with the same species of lichen-forming fungus. Many lichen algae are thought to also occur as free-living organisms, while lichen-forming fungi very rarely occur on their own.

For more than a century, this paradigm of a classic symbiosis seemed clear-cut and provided a view of nature that accorded well with human concepts of the benefits of cooperation and mutual support. Alas, as in most things in nature, the actual situation is far more complex and nuanced than a simple harmonious partnership. What was thought to be a happy monogamous union turns out to be a bit darker and more sordid, involving threesomes and exploitation!

The lichen world was rocked in 2016 with the discovery that two very different-appearing horsehair lichens (*Bryoria* sp.) with identical fungal and algal components, were associated with different species of yeasts — microscopic fungi related to mushrooms. These yeasts play a major role in the structure of these lichens. Additionally, lichen fungi produce filaments that envelop and remove nutrients from the algal cells, so the actual situation in lichens may be more of a controlled parasitism. Indeed, James Crombie, a nineteenth century Scottish lichenologist, described lichens as the union of “...a captive algal damsel and tyrant fungal master”!

Regardless of whether it is a true mutualism or controlled parasitism, the evolutionary advantages of the symbiosis are clear, as evidenced by the fact that lichenization has evolved independently at least 20 separate times in the past 400 million years — lichens are not a cohesive organismal group, but a nutritional strategy sometimes described as fungi that discovered agriculture. Most lichen-forming fungi are Ascomycetes, called sac fungi, referring to the sac that contain the fungal spores. Nearly half of the ca. 30,000 known species of Ascomycetes are lichenized; there are also some lichen-forming fungi in the Basidiomycetes, the fungal group that includes mushrooms.

**Continued on p. 12...**



*Notiantha grandensis*, a fossil from Patagonia. Photo by Nathan Jud

## Chapter Updates

### Hawthorn

**By Cindy Squire, Chapter President**

Our Holiday Party was held December 1 at the Guitar Mansion in Columbia. Elena Vega was the gracious host for the potluck holiday celebration. The Guitar Mansion was built in 1859-1862 in an Italianate Style by David Guitar. This mansion escaped destruction during the Civil War and is on the National Register of Historic Homes. This was a wonderful experience. Thank you, Elena, for your hospitality!!!

We are looking forward to a holiday wreath workshop on Sunday December 16th at Hillcreek Fiber Studio. Carol Leigh Brack-Kaiser is hosting this event. We will be using native plant materials to craft our wreaths.

The November 16th meeting was rescheduled due to a snow/ice storm. On December 4th we enjoyed

a presentation from one of our grant recipients Emily Roberts. We exchanged native seeds just in time for planting and we exchanged cookies and treats also. Our meeting times will now be at 6:30 year round. The January 14, meeting will be a planning only meeting with no presentations.

Monthly lunches at the Uprise Bakery on 10 Hitt Street in Columbia are fun. The food at the Uprise Bakery is hearty and filling. Conversation is focused on native plants and seeds are exchanged during winter months. Please join us!!

### Kansas City

**By Cécile Lagandré, Chapter Representative**

In September 2018, we were lucky to welcome MONPS new member Nathan Jud in our midst. Despite his heavy work load as a brand-new professor at William Jewell College in Liberty, MO, he prepared for us a presentation of his research work in paleobotany and paleoecology. On his web site, [nathanajud.wixsite.com/paleobotany](http://nathanajud.wixsite.com/paleobotany), Nathan says “plant fossils reveal

the surprising history of plant evolution, biogeography, and (previous) climate change.”

Nathan holds a B.S. in Environmental & Plant Biology from Ohio University, and a Ph.D. in Biological Sciences from the University of Maryland. While he was patiently waiting for a teaching appointment, he completed a 2-year postdoc with the University of Florida and, for good measure, a second one with Cornell University. What a patient dude!

In 2015, Nathan was asked to evaluate a 11+ meters fossilized trunk found by a team while digging for dinosaur bones in the Cretaceous of Utah. This find confirms that "angiosperms were large trees and part of the forest canopy by the Late Cretaceous."

Nathan told us about arriving in the Argentinian part of Patagonia in 2017, wondering what he could do for the team digging in an early Danian layer (just following the mass extinction marking the end of the Cretaceous.) On his first day, he was handed a very-fine sandstone to siltstone fossil of "delicate flowers with well-preserved features"—pictured on p. 11—and with a sigh of relief he understood how he could help: he had recognized a plant of the buckthorn family (Rhamnaceae) by the way the sepals attached to the hypanthium rim. “I can do this” was his thought.

## Osage Plains

**By Casey Burks, Chapter Representative**

November 18th The Osage Plains group held a special Sunday meeting to say a fond farewell to our fearless leader, Elizabeth Middleton. Working for MDC as a grasslands botanist, Elizabeth taught us so much about grasses, and forbs on glades and prairies and knew of hidden jewel areas for us to visit.

Elizabeth become our Osage Plains leader in 2014 and during that time her daughter was born so we enjoyed getting to see her older son and baby daughter grow. On some Saturday field trips, her husband would join us. The call of their Indiana roots (grandparents) were calling which we certainly understand but we sure will miss them all.

When Osage Plains starts meetings in February 2019, we'll have voted in our next President.

## Paradoxa

**By Pam Barnabee, Chapter President**

The Botanical Collection & Herbarium Project crew for Bray Conservation Area is done collecting specimens for 2018 and plans to get them mounted and tucked away in the herbarium cabinet before blooming season begins in earnest next March. To date, we've collected 227 plants, almost 200 unique species. The project is a great way to get acquainted with the plants in our area; interested persons are always welcome to join the group - no prior knowledge or skills required.

## Perennis

**By Andrew Braun, Chapter Representative**

Members of the Perennis chapter met at Big Oak Tree State Park on November 11. The group walked along the boardwalk and noted characteristic swamp tree species such as pumpkin ash (*Fraxinus profunda*), bald cypress (*Taxodium distichum*), water elm (*Planera aquatica*) and several species of bottomland oaks (*Quercus macrocarpa*, *Q. michauxii*, *Q. shumardii*, and others). The group also circled around the levee of Big Oak Lake, noting several bottomland herbaceous species such as southern dewberry (*Rubus trivialis*) and annual salt marsh aster (*Symphotrichum subulatum*) still hanging on late in the season..

## Saint Louis

The St. Louis Chapter does not hold meetings in November and December since the meetings are too close to the holidays, but will resume in January (see Chapter Events).

## Lichens, continued

While initially appearing unique, the organismal duality (or triality) of lichens is not unusual, and the more we learn about the complexities of what constitutes an organism, the more we find similar associations. Some marine animals are associated with internal algae, and many flowering plants have intricate interrelationships and dependencies with mycorrhizal fungi. Legumes rely on nitrogen-fixing bacteria incorporated in their structure, and the ancestors of

the mitochondria in our cells were originally separate free-living microorganisms.

Regardless of their nature, each lichen ‘species’ (for taxonomic purposes lichens are classified as fungi) has distinct proclivities, just as do simpler single organisms such as birds and flowering plants. Ongoing work in the Ozarks and Great Plains has revealed that the region is not the lichen-poor expanse it was once thought to be. Nearly 850 species of lichens and lichen-associated fungi are known from the Ozarks, with a lower diversity occurring in other parts of Missouri. These range from ubiquitous weedy lichens that occur even in downtown Kansas City and St. Louis, to lichens restricted to specific microhabitats in high quality natural areas. More than fifty of these are new species to science and were discovered during recent work in the region.

While lichens occur on a broad range of substrates, most occur on trees and rocks. While there are some generalists, most lichens that occur on trees are not found on rocks, and vice versa. Some lichens only occur on tree branches, others on trunks or bases, and some throughout. Some lichens are restricted to specific types of trees, or even individual tree species – there is a rare lichen (*Graphis sophisticascens*) that only occurs on older river birches (*Betula nigra*) in natural habitats in Missouri and bordering states! Similarly, some lichens occur on many different rock types, but many are restricted to siliceous (chert, sandstone, igneous) or carbonate (dolomite, limestone) rocks, and usually require specific narrow ranges of moisture conditions, shading, and rock size to survive.

Because they are often slow-growing and restricted to specific habitats and environmental conditions, a knowledge of lichens can enhance understanding of habitat quality and landscape history. Lichen identification can be technical, often relying on microscopic characteristics such as spores. Many lichens produce unique and diagnostic chemicals not found in either component organism, and chemical methods ranging from simple spot tests to chromatography are sometimes necessary for identification. However, just as with any group of organisms, with practice and field experience most lichens can be identified in the field once a deep familiarity with their characteristics and local ecological pattern is acquired.

The book *Lichens of North America* (Brodo et al.,

2001) provides a breath-takingly beautiful and comprehensive introduction to the diversity of lichens including most of the common and prominent lichens in Missouri. If you are interested in learning more about lichens, attending a lichen workshop is a great way to gain field experience and acquire the necessary techniques. Organizations such as NatureCITE here in Missouri and the Eagle Hill Institute in Maine offer field lichen workshops for various experience levels. Once you acquire an eye for the subtle elegance of these amazing tiny creatures, the way you see the world will be forever changed and enriched.

## Reference

Brodo, I.M, S.D. Sharnoff and S. Sharnoff. 2001. *Lichens of North America*. Yale University Press, xiii + 795 pp.



Gold-Eye Lichen (*Teloschistes chrysophthalmus*), found scattered across Missouri, showing the bright orange apothecia, which produce the spores of the lichen fungus. ©Eric Hunt [CC BY-SA 4.0 (<https://creativecommons.org/licenses/by-sa/4.0/>)]

## Poetry Corner

**Papulæ (Order I.)**  
BY SYLVIA LEGRIS

*Genus II. Lichen.*

On a scale of Lustrous to Sockeye,  
Fishscale to Fire-Dot. Not Ichthyosis:  
Lichen. Fruiting bodies in a calcareous  
spot. Goldspeck. Blushing.

O the diffuse eruption of dazzling papulæ!

Usher the Wild Lichen. Usher spring  
and the furfuraceous scurf recurs.  
The Brain-Scaled (the hairline cracked).  
The Blue-Blistered, the Earth-Wrinkled.

Neither Strophulus nor stoppable.  
Like wildfire rash the crustose rush  
of successive crops. Tundra Sulphur,  
circumpolar, the snowy excoriations.

So squats the Dog Lichen, the Freckle Pelt.  
Cobblestoned, chronic, the not contagious.

"Papulæ (Order I.)" By Sylvia Legris, from  
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## Finding the Sword Moss

By Nels Holmberg

Sword Moss (*Bryoxiphium norvegicum*) is very distinctive, easily recognized, and rare (S1) in Missouri. This moss has very flat shiny stems 8-25 mm long with 2 rows of closely overlapping leaves and really looks more like a blade of grass than a sword. It is widespread in range, but not common, and found on the continents of Europe, Asia and North America (including the West Indies). It is found in Russia, Greenland and Iceland, but not in Norway! It has been found in 15 states, mostly in wet gorges in such places as the Dells of Wisconsin and the Hocking Hills of Ohio.

In Missouri it is only known from 2 counties: Ste. Genevieve and St. Claire. In Ste. Genevieve Co., it was first found by Julian A. Steyermark in 1934, probably in what is now Pickle Springs Natural Area. (Many of Steyermark's first collections were bryophytes, but that is a different story.) Paul Redfearn found it in nearby Hickory Canyon Natural area in 1980, and John Atwood has recently found it twice, in the new addition to the area and just over the property line on private property. The largest Missouri population of the sword moss was found when MONPS members Peggy & Ken Lefarth invited John Atwood & Nels to visit their property about 2 miles west of Hickory Canyon. Here it grows along both sides of a moist bryophyte rich sandstone gorge and is well protected.

The St. Claire location was found in 1969 by Canadian bryologist Robert Ireland. He had relatives in Kansas City and spent family visits out roaming the hills. Paul Redfearn visited the site 3 times in the 1970s. A crew of Nels Holmberg, John Atwood, & John Brinda set out to relocate the site in 2013, but the 4 herbarium labels gave the following information: 2 miles NW of Blackjack, 6 miles east and 2 miles north of Cedar Springs, 6 miles south of Roscoe, and 10 miles west of Collins. (Aren't we grateful now for GPS?) MDC Biologist Larry Rizzo (MONPS Plant Stewardship award winner in 2004) was able to track down the likely property owner, the Charles Dean family, and get permission to visit. It didn't take long for the crew to hike through a pasture to a small creek bordered by a sandstone bluff. Patches of sword moss stretched for about 20 yards along the bluff. Success!

**Left: Sword Moss (*Bryoxiphium norvegicum*) on the Peggy & Ken Lefarth property, Ste. Genevieve County (Nels' photo)**

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**“A thing is right when  
it tends to preserve  
the integrity, stability,  
and beauty of the  
biotic community.  
It is wrong when it  
tends otherwise.”**

**—Aldo Leopold**