



FRIENDS

OF THE UNIVERSITY
OF MONTANA

HERBARIUM

Spring 2012

....Bruce McCune

MORE THAN VASCULAR AT MONTU

By Andrea Pipp

While perusing the vascular plant, moss, and lichen specimens at MONTU you might see the name of Bruce McCune. During his years at UM (1971-1979) Bruce contributed mounts of 62 vascular plant species and a larger number of moss and lichen vouchers to the herbarium.

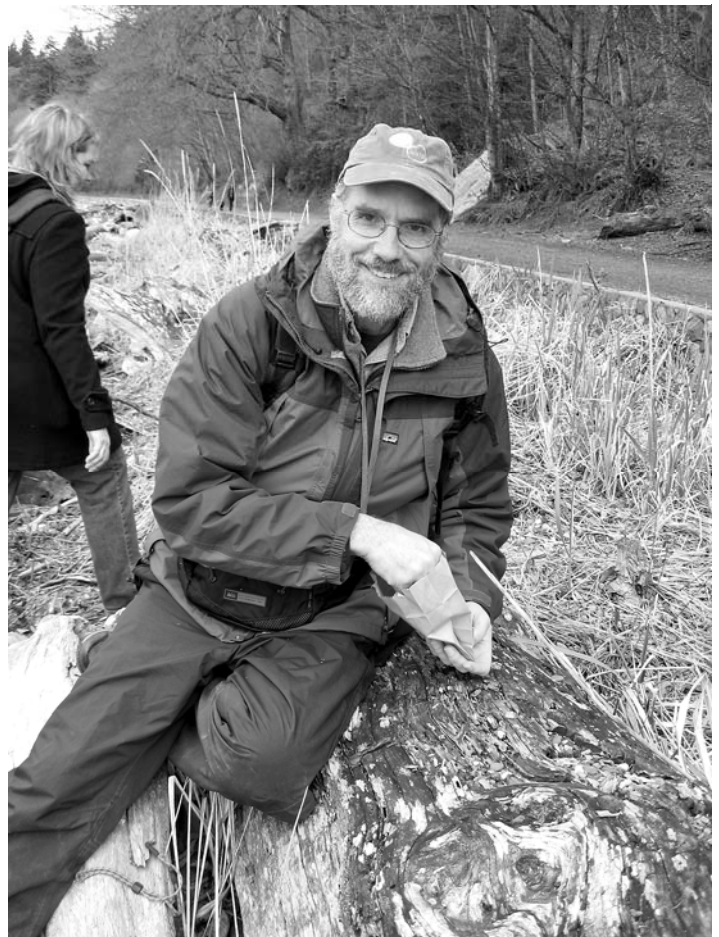
Bruce came to Missoula from the Midwest. Having grown up in Cincinnati and after completing his freshman year at Lawrence University in Appleton, Wisconsin, Bruce attended a wilderness botany class in northern Minnesota. There in the moss-carpeted forests he became quite interested in mosses and, in his words, was swept away by a remarkable young lady (Patricia Muir). Eager to escape the industrial winter of Appleton, Bruce followed Patricia to the University of Montana. That was 1971. The 'new' library was under construction, Hitchcock and Cronquist, as a book, did not exist, and Botany stood on its own – a vibrant, active department, firmly ensconced in its own building. His advisor was Dr. Sherm Preece who provided Bruce with straightforward, simple advice...take the classes required for a botany major. Period. Goodbye.

During his undergraduate years of 1971-1974, he and Pat explored Missoula and spent a lot of time on University Mountain, now known as Mount Sentinel. Bruce was fascinated by Mount Sentinel – especially by the communities of lichens and mosses growing on the north slope. He was intrigued that his botany professors could not name the species and didn't seem to know much about them. He and Pat often escaped the dorms by taking their sleeping bags up the trail that runs between the north and west slopes, finding a level spot, and laying down for the night. They spent many hours in the spring botanizing on the west slope amidst the amazing display of wildflowers, mainly relying on keys in the *Flora of Alberta* by E. H. Moss.

In his senior year Bruce took research credits to conduct a study on the succession of mosses on the north slope of Mt. Sentinel. It was then that Bruce realized that lichens

were the ecological relatives of mosses and incorporated them into his work. He relied on Mason Hale's first edition of *How to Know the Lichens* and a long paper with keys titled "Lichens of the State of Washington" by Grace Howard. He soon realized Hale's book was very biased toward eastern species, for even the most conspicuous lichens found on Mt. Sentinel weren't in the book. Later he discovered that Howard's key contained as much mis-

(Continued on page 7)



Bruce McCune collecting lichen specimens in Seattle in 2009.

Notes from the Board

The herbarium at the University of Montana is well known for its collection of 140,000 vascular plants that highlight the Northern Rocky Mountain flora. But are you aware that the herbarium has collections of the “other” Northern Rocky Mountain flora? You might ask “What other flora could there possibly be?” and I would answer, “Lichens, mosses, liverworts, algae, and diatoms (see page 2 for an article about the diatom collection), of course.” What really comes to my mind is that Montana has five collection centers for non-vascular species: The University of Montana herbarium (MONTU), Montana State University herbarium (MONT), University of Montana at Great Falls (Won Shic Hong’s liverwort collection), Yellowstone National Park, and Glacier National Park. However, only the first two herbaria are really *active and accessible* to the public.

At MONTU you’ll find about 6,400 lichen, moss, and liverwort packets housed in cabinets located in the room immediately left of the main herbarium entrance. The moss and lichen collections are a reflection of more than 100 years of botanical exploration, of the botanists who traversed through our state, and of the diversity of species found in Montana and the greater Pacific Northwest (PNW). In a somewhat chronological listing, the contributing botanists include R.S. Williams, LeRoy Harvey, Fred Herman, Roger Anderson, Wilf Schofield, Dave Bilderback, Roger Rosentreter, Ann Debolt, Bruce McCune, Dale Vitt, and Joe Elliott. To our collection Peter Stickney has recently donated his non-vascular collection from the MRC herbarium. And what a wonderful collection it is! While many of the names reflect an earlier time, the quality of the specimens, their display within the packet, and the fine detail to site and habitat information make these contributions invaluable. Peter also donated his lichens mounted on herbarium sheets! While these mounts don’t reflect the standards for preserving non-vascular species they will serve as a nice teaching aid! From time to time our collection gets visited by lichenologists and bryologists and specimens get spot-checked. A more concerted effort to review specimens and update their taxonomic names would do a lot to increase their value and use.

I’ll close this column with a little update on the other important center for non-vascular species, the herbarium at Montana State University. The MONT cabinets include about 8,500 lichen and 1,500 bryophyte packets, dating from the late 1800s to the present. The majority of specimens have been collected by R.S. Williams, A.J. Sharp, and Sharon Eversman. In the Spring 2011 newsletter, Matt Lavin wrote of the *Consortium for Pacific Northwest Herbaria Online Portal*. This is a project in which herbaria in the PNW are centralizing the data from their collections by digitizing labels and photographing specimens with very high resolution. This movement is growing to include lichens! Headed up by Tom Nash, the MONT lichen collections will be digitized and reviewed beginning in Fall 2012. I’m confident that the movement will continue to grow, eventually including the MONTU lichens.

On your next trip to the herbarium my suggestion is this...stroll over to the lichen and bryophyte cabinets. Take a gander at the collections, check out the diversity of species represented, and marvel at the time when people hand-wrote their labels with beautiful penmanship.

Andrea Pipp

FRIENDS

of the University
of Montana

HERBARIUM



**DIVISION OF
BIOLOGICAL SCIENCES
UNIVERSITY OF
MONTANA
MISSOULA, MT 59812**

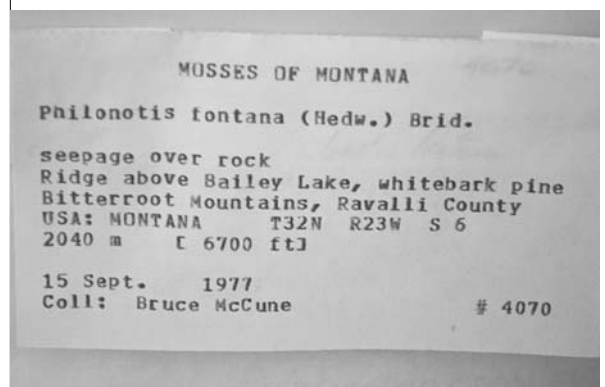
*THE MISSION OF THE
FRIENDS IS TO SECURE
SUPPORT FOR AND TO
ENRICH THE
COLLECTIONS AND
OPERATIONS OF
THE UM HERBARIUM*

BOARD OF DIRECTORS

Drake Barton
Matt Lavin
Dean Pearson
Andrea Pipp
Scott Mincemoyer, president
David Dyer, *ex officio*

The *Friends* Newsletter
Edited by
Peter Lesica and David Dyer

Layout & Copy Editing by
Drake Barton and Kathy Lloyd



Moss specimens at MONTU are enclosed in a paper packet and labeled, as this one from Bruce McCune. See page 8 for a look at the moss. Photo: E. Graslie

MONTU NEWS BRIEFS

New Acquisitions

Peter Lesica: 248 specimens from Montana.
David Hanna: 72 specimens from Montana.
Roger Rosentreter: 64 lichens from western U.S. and Canada.
J.B. Phipps, University of Western Ontario: 108 specimens of *Crataegus*, from MT, WY, and western Canada.
Loren Bahls: Boxes 35 – 40 of the Montana Diatom Collection, consisting of 600 slides of diatoms.
Neil Snow, MNHP: 73 specimens from Lewis & Clark Co, MT.

Exchange Acquisitions

University of Washington: 232 specimens from Montana.
University of Wyoming, Rocky Mountain Herbarium: 488 specimens from Montana.
Boise State University, Snake River Plains Herbarium: 29 specimens from Idaho.

Loans for Research

University of Washington, Peter Zika: 24 sheets of *Juncus* for his continuing research on this genus in western North America.
University of Alaska – Fairbanks, David Murray: 10 sheets of *Eritrichium nanum* for Flora of North America treatment.

Examples of Information Requests

West Virginia Natural Heritage Program: needed locality data for *Artemisia* and *Silene*, for climate change vulnerability study.
Atkins, Helena: information on Wyoming lichen specimens at MONTU.
University of Georgia graduate student: localities for field collections of *Amaranthus*.
Western Illinois University: records of *Opuntia* in Montana.

Visitors to the University of Montana Herbarium in 2011

General Public and Private Consultants

Larry Widener, Tempe Regan, Cedar Brant, Drake Barton,
Kathy Lloyd

UM Researchers and Students

Eva Masin, Scott Mincemoyer, Teal Potter, Neil Snow, Kelly Chadwick, Clare Beelman, Loren Bahls, Ryan Graebner, Victoria Madgwick, Courtney Damren, Michele Disney, Emily Graslie

Federal, State, Tribal, NGO Biologists

Susan Rinehart (USFS), Darlene Lavelle (USFS), Lea Tuttle, Greta Brom-Palkowski, Layla Dumlya (BLM)

Other Academic Researchers

Erik Fredrickson, Thien-Y Le, Tony Jiana, Kim Smith, Elisha Harris, Jeff Berca, Caroline Stromberg (U. Washington), Selena Smith (U. Michigan), Mark Egger (U. Washington)

Activities

The Clark Fork Chapter of the Montana Native Plant Society held three meetings in the herbarium during the winter of 2011. In January, Peter Stickney told us about Montana's Honeysuckle Family. Scott Mincemoyer came over from Helena and provided a primer on Montana's asters in February. In March, Peter Lesica provided tips for learning the common plant families.

MONTU hosted a group of researchers and students from the University of Washington and University of Michigan for 2 days while they sampled specimens for phytoliths. The research was funded by a large grant titled "A combined phytolith-isotope geochemistry approach to Cenozoic paleo-vegetation reconstruction in Montana."

Thanks to new members of the Friends!

Your continued interest and support is what makes us effective. Thanks, and welcome to these members, new since the last newsletter.

Lowell Anderson, Helena
Ann Fleischli, Missoula
Bruce McCune, Corvallis, OR

Don't Forget to Pay Your Dues!

If you haven't already done so, send in your membership renewal. You won't want to miss a single issue of the newsletter or miss out on what is happening at the herbarium. Use the membership renewal insert included in this newsletter, or the membership form on page 12. Gift memberships are also available and are a great idea for friends

2012 FRIENDS OF THE HERBARIUM ANNUAL MEETING

The Annual Meeting of the Friends of the UM Herbarium will be held Saturday, October 20 from 10 AM to 2 PM. The meeting will be held in Rm. 202 of the Natural Sciences Building on the UM Campus. This is the annual meeting of the Board of Directors and is open to the membership.

MONTANA'S ARCTIC FLORA

The first time I came to Montana I went hiking above treeline in Glacier National Park. The views were spectacular, but just as exciting to me were the plants, many of which had “arctic-alpine” distributions — plants of the frozen north right here in Montana. Over 100 of the nearly 2,100 native plants in Montana (ca. 5%) belong to the Arctic Flora, a group of species that has evolved under an arctic climate and soils over long periods of time. The Arctic Flora dominates the vegetation north of the Arctic Circle (ca. 67° N latitude). A strict botanical definition of arctic pertains to those lands north of the limit of well-formed trees (i.e., full crown, straight, erect bole). In Canada this includes Baffin Island, all of the area around Hudson's Bay, as well as that north of Great Slave Lake. It also includes the northern one-third of Alaska. Plant species belonging to the Arctic Flora are obviously adapted to a cold, often cloudy climate. However, the growing season, during which the upper layers of soil have thawed and temperature is above freezing during the day, can be surprisingly long compared to many alpine environments. North American arctic soils are either derived from acidic Precambrian bedrock (Canadian Shield) or from calcareous Paleozoic, sedimentary rock.

North American arctic vegetation has been classified into many types, but here I will use a simple, dichotomous classification: (1) polar desert/fellfield with well-drained, poorly-developed soil and (2) tundra with relatively poor drainage (often due to permafrost) and well-developed, moist to wet soils. Arctic plants occur in similar habitats above treeline in alpine settings south of the arctic.

Nearly half of Montana's 108 arctic plants occur in only four families: Cyperaceae (15), Asteraceae (12), Saxifragaceae (12), and Rosaceae (9). Three of our arctic species are annuals, three are dwarf shrubs, five are shrubs, and the rest are herbaceous perennials. Thirty-four of the 108

arctic-alpine species that occur in Montana are considered rare here because they are on the southern margin of their range or have a disjunct or fragmented distribution in the state. The majority (71%) of these rare-in-Montana arctic plants occur in only one or both of two areas of the state: (1) Glacier National Park and the adjacent Flathead and Front ranges in the northwest and (2) the Beartooth Range and nearby Crazy Mountains in south-central Montana (Table 1, page 5).

The Lewis Range of Glacier National Park receives more snow than anywhere else in Montana due to the prevailing Jet Stream. As a result it can support wet tundra, although this habitat is limited due to steep topography and deep snow. The geology of the Glacier-Front region also provides limestone fellfields. These habitats with poorly-developed soil apparently simulate the polar desert/fellfield habitats of the arctic. Rare arctic species found in this habitat include *Saussurea nuda*, *Carex petricosa*, *Carex glacialis*, *Arnica angustifolia*, *Braya humilis*, *Dryas integrifolia*, and *Senecio cymbalaria*. The former three are confined to the Glacier-Front region, while the latter four occur elsewhere. Although most of these species are associated with both acidic and calcareous parent materials in the Arctic, they are confined to limestone-derived soils in Montana.

William Weber, who has studied the arctic-alpine flora of Colorado extensively, pointed out that many arctic disjuncts occur in east-west trending mountain ranges. The north slopes of these exceptional ranges (most Rocky Mountain ranges trend north-south) are thought to have acted as refugia from the exceptionally warm climate approximately 8,000 years ago during the altithermal period. This pattern holds true for Montana as well, because the east-west-trending Beartooth Range is the premier refugium for arctic disjunct species in the state; 16 of our rare arctic species are found there, and all but one of these are found in seeps or moist to wet tundra (Table 1, page 5).

A more restrictive habitat association I have noticed is that many of our rare arctic tundra species are found not on north-facing slopes but rather on gentle, south- or west-facing slopes below permanent snow fields. Such species include *Draba macounii*, *Eriophorum callitrix*, *Kobresia simpliciuscula*, *Kobresia sibirica*, *Ranunculus sulphureus*, and *Tofieldia pusilla*. It is my hypothesis that the south exposure provides a long growing season, and the meltwater from permanent snow assures that the soil remains wet and cold, similar to arctic tundra during the summer.

The presence of arctic species in Montana suggests that the arctic flora “migrated” down the Rocky Mountain chain during the cooler Pleistocene epoch. These plants are a window on the past and may provide clues to how our vegetation may respond to future climate changes. Nearly one-quarter of our 34 rare arctic species was first discovered in Montana in the past 25 years. There are undoubtedly more to be found, so keep your eyes open.

(Continued on page 5)



photo: Peter Lesica

Gentiana glauca

Table 1. Habitat and distribution of rare arctic species in Montana.

<u>Species</u>	<u>Family</u>	<u>Soil</u>	<u>Habitat</u>	<u>Rarity</u>	<u>MT distribution</u>
Antennaria monocephala	ASTERACEAE	all	moist/wet turf	peripheral	widespread
Arnica angustifolia	ASTERACEAE	calcareous	fellfield	peripheral	widespread
Braya humilis	BRASSICACEAE	calcareous	fellfield	disjunct	Beaverhead
Carex capitata	CYPERACEAE	acidic	moist/wet turf	disjunct	Beartooth
Carex glacialis	CYPERACEAE	calcareous	fellfield	peripheral	Glacier/Front
Carex norvegica	CYPERACEAE	acidic	moist/wet turf	disjunct	Beartooth
Carex petricosa	CYPERACEAE	calcareous	fellfield	peripheral	Glacier/Front
Cassiope tetragona	ERICACEAE	all	moist/wet turf	peripheral	Northwest
Diphasiastrum alpinum	LYCOPODIACEAE:	all	moist/wet turf	peripheral	Glacier/Front
Draba macounii	BRASSICACEAE	all	moist/wet turf	peripheral	Glacier/Front
Draba porsildii	BRASSICACEAE	acidic	moist/wet turf	disjunct	Beartooth
Dryas integrifolia	ROSACEAE	calcareous	fellfield	disjunct	Big Snowy
Eriophorum callitrix	CYPERACEAE	acidic	moist/wet turf	disjunct	Beartooth
Gentiana glauca	GENTIANACEAE	all	moist/wet turf	peripheral	Glacier/Front
Kobresia sibirica	CYPERACEAE	acidic	moist/wet turf	disjunct	Beartooth
Koenigia islandica	POLYGONACEAE	acidic	seeps	disjunct	Beartooth
Luzula arcuata	JUNCACEAE	all	moist/wet turf	peripheral	widespread
Micranthes lyallii	SAXIFRAGACEAE	all	stream banks	peripheral	Northwest
Micranthes nivalis	SAXIFRAGACEAE	all	moist/wet turf	disjunct	Glacier/Front
Papaver radicum	PAPAVERACEAE	acidic	fellfield	disjunct	Beartooth
Pedicularis oederi	OROBANCHACEAE	acidic	moist/wet turf	disjunct	Beartooth
Phippsia algida	POACEAE	acidic	seeps	disjunct	Beartooth
Potentilla hyparctica	ROSACEAE	acidic	moist/wet turf	disjunct	Beartooth
Ranunculus gelidus	RANUNCULACEAE	all	moist/wet turf	peripheral	widespread
Ranunculus sulphureus	RANUNCULACEAE	acidic	moist/wet turf	disjunct	Beartooth
Sagina nivalis	CARYOPHYLLACEAE	all	moist/wet turf	disjunct	Glacier/Front
Salix barrattiana	SALICACEAE	all	moist/wet turf	peripheral	Glacier/Beartooth
Saussurea nuda	ASTERACEAE	calcareous	fellfield	peripheral	Glacier/Front
Saxifraga flagellaris	SAXIFRAGACEAE	acidic	moist/wet turf	disjunct	Beartooth
Saxifraga hirculus	SAXIFRAGACEAE	acidic	moist/wet turf	disjunct	Beartooth
Saxifraga serpyllifolia	SAXIFRAGACEAE	acidic	moist/wet turf	disjunct	Beartooth
Senecio cymbalaria	ASTERACEAE	calcareous	fellfield	peripheral	widespread
Senecio fuscatus	ASTERACEAE	acidic	moist/wet turf	disjunct	Beartooth
Tofieldia pusilla	LILIACEAE	calcareous	moist/wet turf	peripheral	Glacier/Front

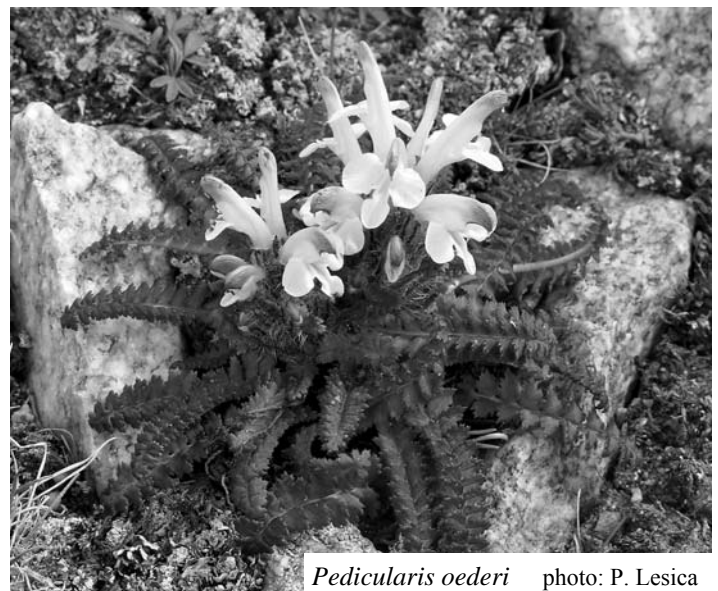
...Arctic (Continued from page 4)

References

Aiken, S.G., Dallwitz, M.J., Consaul, L.L., McJannet, C.L., Boles, R.L., Argus, G.W., Gillett, J.M., Scott, P.J., Elven, R., LeBlanc, M.C., Gillespie, L.J., Brysting, A.K., Solstad, H., and Harris, J.G. 2007. Flora of the Canadian Arctic Archipelago: Descriptions, Illustrations, Identification, and Information Retrieval. NRC Research Press, National Research Council of Canada, Ottawa. <http://nature.ca/aafloora/data>, accessed on 5 March 2012

Panarctic Flora Project Steering Committee. Undated. Annotated Checklist of the Panarctic Flora (PAF) Vascular plants. <http://nhm2.uio.no/paf/>, accessed on 5 March 2012.

Weber, W. A. 2003. The Middle Asian element in the Southern Rocky Mountain flora of the western United States: a critical biogeographical review. *Journal of Biogeography* 30: 649–685.



Pedicularis oederi photo: P. Lesica

Peter Lesica

The Herbarium Students – From New York City to Brazil!

At the herbarium we usually hire students with a work-study award from Financial Aid to work in the collections. However, we sometimes come across a student who is extremely interested in the herbarium but has no work-study funding. For these students we will set up the herbarium experience as an internship that becomes part of their academic program. The student then gains valuable experience in botany and in the operation of a herbarium, and the herbarium benefits from their previous knowledge and eagerness.

This year we are fortunate to have Annalisa Ingegno as our intern. She is originally from Queens, New York and is a senior at UM majoring in Biology and with a minor in Computer Science. She has a strong interest in botany and in bioinformatics, reflected in her minor in computer science. Annalisa brings a wealth of both lab and field experience, and has worked two years in faculty member Ray Callaway's lab. While attending high school in New York City, Annalisa had the great opportunity to do an internship at the American Museum of Natural History. Her first interest was in Astrophysics but then she decided that living at high altitude – where the big telescopes are – but with very few plants around wasn't too appealing. So she chose the more down-to-earth study of botany. In addition to being bright and motivated, Annalisa is an amazing fiddle player! She has the honor this June of playing in the prestigious Telluride Bluegrass Festival in Colorado. Good luck, Annalisa!

The other parameter that we usually follow in hiring students for the herbarium is selecting upper-level undergraduate students. These students have several advantages, such as relevant course background, prior work experience, and a more focused academic path. However, this year we broke from the normal course and hired freshman Kyla Crisp. She is one of the few freshmen that we've ever hired, but with her interest in the herbarium, great academic success in high school, and top references she was ideal for the job. Kyla is from Helena and is a Biology major. Due to her life-long interest in biology, it's no wonder that her favorite course so far at UM has been Diversity of Life. Even at this stage in her career she has a goal of studying climate change in graduate school, and has her eyes on doing a junior year abroad in New Zealand.

We also welcome Sarah Luiza Costa, an exchange student from Brazil who is working this semester in the herbarium. She has taken many courses in botany in Brazil and has interesting comparisons between the very diverse floras! We are also fortunate this year to have two great volunteers, John Csoka (page 7) and Greta Brom-Palkowski. They are working with Virginia Vincent to

catch up with our backload of mounting specimens, and are entering data into our database. Please say "Hi" to our great staff on your next trip to the herbarium!



Annalisa Ingegno, an intern at the herbarium.



Kyla Crisp is a work study student at the herbarium.

Photo: Dave Dyer



John Csoka, one of several volunteers in the herbarium.

...Bruce (Continued from page 1)

information as information. So he struggled. Progress came when he found C. D. Bird's (University of Calgary) comprehensive, but unpublished keys to the lichens of west-central Canada. Later, Bruce was able to give Dr. Bird a box of Mt. Sentinel specimens for him to check and correct.

In my interview with Bruce, he recalled the time when Klaus Lackschewitz showed him a lichen and asked Bruce to tell him about it. Bruce replied that it was a *Cladonia*. Klaus responded with, "This much I know." What Klaus wanted to know was something about its distribution and ecology, which at the time Bruce doubts he could have satisfactorily answered.

After graduating in 1974 with Botany and Biology degrees, Bruce worked two summers for the Bureau of Land Management in Montana. With his new (but already worn) copy of Hitchcock and Cronquist (*Flora of the Pacific Northwest*), his own microscope, a beater car, and canoe Bruce botanized around Montana. On the side he managed to publish his research project on Mt. Sentinel (*Northwest Science* 51: 198-207). The years of 1974-1976 motivated him to pursue graduate studies. Cleaning outhouses inspired a higher calling within him and through his travels he learned what he wanted and what it would take to achieve it.

Bruce returned to UM to work on a master's degree in Botany from 1976 to 1979 under the guidance of Dr. Jim Habeck. He studied whether lichen and bryophyte communities vary in parallel with vascular plants. He did this

by piggybacking moss layer and epiphyte sampling on Joe Antos' vascular plant plots in the Swan Valley. Joe lived and breathed botany and became an important mentor for Bruce. From Joe he learned the habit of staying current with published papers. Together they published many scientific papers, including a study that sampled the recovery of the 1977 burn on the west slope of Mt. Sentinel (*American Midland Naturalist* 110: 354-364).

During this time Mason Hale was the pre-eminent lichenologist in the USA. Being stationed at the Smithsonian Institution, his career was completely devoted to lichen research and he wrote many papers, books, and monographs. Bruce asked Dr. John Tibbs (Zoology) about the possibility of being a teacher's assistant (TA) at the Flathead Biological Station. Being receptive, Bruce floated the idea of having a lichenology class. He was a bit taken back when Dr. Tibbs said, "Sure, who should teach it?" Bruce replied with the most famous lichenologist he could think of, Mason Hale. Soon after, Dr. Tibbs informed Bruce that Dr. Hale agreed to teach the class and that Bruce would be the TA. In recalling this time Bruce remains amazed at how it all came to be.

The lichenology class at the Flathead Biological Station turned out to be a significant class for UM. Many of the students went on to study lichens and some, such as Dr. Roger Rosentreter and Dr. Paula DePriest, even made a career in lichenology. It was also significant for Mason Hale, who was a massive collector focused on the eastern U.S. and far away lands like Africa. This class shifted his attention to the western U.S. Bruce even fixed a few bad habits, such as collecting too small a sample and handwriting his labels, and he learned a lot in secondary chemistry. With no fume hoods the students learned the basics of thin-layer chromatography by running their plates outside in glass tanks set up on a picnic table.

Bruce had other botanical experiences while at the Flathead Biological Station. As a TA for an aquatic vascular plant class taught by Ernie Schuyler in 1978, Bruce spent one of his days off looking for aquatic and wetland mosses in the Swan Valley. He found a strange aquatic plant with irregular white flowers. Realizing he hadn't seen it before, he scooped it up and later floated it in a pan for Ernie to check out. Normally calm, Ernie looked at it and became very excited for he knew it was *Howellia*. At the time, people thought the plant was on the brink of extinction. These days the distribution and biology of *Howellia aquatilis*, a Threatened plant, is much better known thanks to work done by Peter Lesica and others.

As graduate students, Roger Rosentreter and he spent many long evenings studying and curating lichens. One of their favorite fuels was boxed macaroni and cheese balanced with carrots dunked in mayonnaise. Bruce still remembers how spectacular the bright orange sauce looked as it cooked in the 4-liter beaker on a hotplate in the lab.

(Continued on page 8)

...Bruce (Continued from page 7)

In 1979, Bruce and Pat married and moved to the University of Wisconsin (UW) in Madison to pursue their doctorate studies. Figuring that job prospects would be greater if he studied the higher plants, Bruce pursued a study in forest ecology. He had observed that the west slope of the Bitterroot Range is cut by a series of strikingly similar canyons, yet the tree composition from one canyon to the next is quite variable. His doctorate tested the notion that tree composition in a given canyon is a result of a series of “accidents” of history, not environmental differences.

After completing their doctorate degrees, moving to Indianapolis for post-doctorate work, Bruce and Pat were

thrilled to move back west – this time with teaching positions at Oregon State University in Corvallis. Since 1987, Bruce has mentored students, published many successful papers and books on lichenology and bryology, and developed software programs for ecological data sets.

While Bruce left Montana, Montana has not left him. Thoughts of developing a list of Montana lichens became a written draft in 1986. Bruce annotated the list – mostly because it originally helped him organize the scattering of information. Over the years he enlisted co-authors, Dr. Roger Rosentreter, Tim Wheeler, Toby Spribille, and Othmar Breuss, spent a sabbatical reviewing MONT and MONTU collections, and visited sites. Bruce hopes to publish it in 2012 as a *Monograph in North American Lichenology*.

MONTU is a repository for much more than vascular plants. Lichen, moss, liverworts, diatoms, and fungus are also represented. Come take a look!



Paper packets of lichen specimens are stored in wooden filing boxes at MONTU. Photos by Emily Graslie



Philonotis fontana, one of many moss specimens at MONTU. See page 2 for a look at the specimen label. MONTU also has fungus specimens (upper right).



NAMING TAXONOMIC NOVELTIES — NEW NOMENCLATRURAL TYPES AT MONTU

“The purpose of giving a name to a taxonomic unit is not to indicate its characters or history, but to supply a means of referring to it and to indicate its taxonomic rank.” —from the Preamble to the Vienna Code

By Loren Bahls

To avoid ambiguity in referring to plant taxa, plant taxonomists have devised a precise and simple system of naming based on nomenclatural types. A nomenclatural type is a specimen or gathering of specimens to which the name of a taxon is *permanently attached*. Think about that for a moment. For most collections in the herbarium there remains the possibility that the material was misidentified or the name on the herbarium sheet is no longer current. But for types, the name and the specimen are linked forever. There's no do-over.

One of the most important functions of a herbarium is to serve as a safe and accessible public repository for nomenclatural types. With plant taxonomy in a perpetual state of flux and new species discovered constantly, types serve as anchors or reference points that can be examined as ideas about how organisms should be grouped or named are changing.

For a species new to science (a “taxonomic novelty”), types are routinely designated when the species is described and the description is published. In addition to types for about 200 vascular plant taxa already deposited in the herbarium, MONTU recently received types for 29 newly found and described species of diatoms (Kingdom Plantae, Division Bacillariophyta) from the Northwest United States.

In the Linnaean system of botanical nomenclature, a species name is a binomial, for example *Drosera anglica*. The first part of the name (*Drosera*) is the genus to which the author (in this case Hudson) assigned the new species. The second part (*anglica*) is the specific epithet given by the author. Subgeneric taxa (subgenus, section) and infraspecific taxa (variety, form) may also be given names. The name of the genus combined with one or two epithets is termed a combination and a type is designated for each novel combination.

Nomenclatural types are used to establish the names of all taxa at and below the rank of family. A hierarchical classification scheme for the new diatom species *Navicula flatheadensis* contains the following ranks:

Kingdom **Plantae**
Division **Bacillariophyta**
Class **Bacillariophyceae** Haeckel 1878 *emend.* Mann 1990
Subclass **Bacillariophycidae** Mann 1990
Order **Naviculales** Bessey 1907
Family **Naviculaceae** Kützing 1844
Genus *Navicula* Bory de Saint-Vincent 1822

Navicula sect. *Navicula* Lange-Bertalot 2001
Navicula flatheadensis Bahls 2011

So, for purposes of illustration, Kützing designated the type for the family Naviculaceae in 1844, Bory de Saint Vincent designated the type for the genus *Navicula* in 1822, Lange-Bertalot designated the type for *Navicula* section *Navicula* in 2001, and Bahls designated the type for the species (combination) *Navicula flatheadensis* in 2011. Although the nomenclatural type is commonly treated as the model or ideal of a taxon, it is not necessarily the most typical or representative element of the taxon.

Since 2010, I have helped to name and describe 34 new-to-science species of diatoms from the Northwest United States. Types for these species have been deposited in the Montana Diatom Collection, either at MONTU or in my working collection in Helena. A list of the new species and their types is available at the MONTU website: <http://herbarium.dbs.umt.edu/diatoms.asp>

Types for most of these species have also been deposited in diatom herbaria at the Academy of Natural Sciences of Philadelphia and the California Academy of Sciences in San Francisco. ANSP and CAS have the largest diatom herbaria and the most important repositories of diatom types in the United States.

Two of the new diatom species—*Navicula piercei* and *Navicula caroliniae*—are named for Montana botanists and Friends of the Herbarium John Pierce and Tara Carolin, who have greatly assisted with diatom research in the state (see page 11). Other new species are named for prominent diatomists, field workers who collected samples, the Blackfeet, Crow, and Kootenai Indian Tribes, and for various collection sites in western Montana, such as Beeskove Lake in the Rattlesnake Wilderness near Missoula. Several are named for features of the Waterton-Glacier International Peace Park. These and other species from the Northwest are being posted to the new on-line flora Diatoms of the United States (see page 10).

Diatom types at MONTU are of three different kinds. A **holotype** is the one specimen used by the author or designated by the author as the nomenclatural type. As long as a holotype exists, it fixes the application of the name. An **isotype** is any duplicate of the holotype. A **paratype** is a specimen cited in the scientific publication describing the species (protologue) that is neither the holotype nor an isotype, but from a different collection. For diatoms,

(Continued on page 10)

...Diatoms (Continued from page 9)

which are typically mounted on microscope slides in associations of multiple species, the holotype specimen is circled on the cover glass with a diamond marker.

References

Knapp, S., J. McNeill and N.J. Turland. 2011. Changes to publication requirements made at the XVIII International Botanical Congress in Melbourne—what does e-publication mean for you? *Cladistics* 27:653-656.

McNeill, J., F.R. Barrie, H.M. Burdet, V. Demoulin, D.L. Hawksworth, K. Marhold, D.H. Nicolson, J. Prado, P.C. Silva, J.E. Skog, J.H. Wiersema and N.J. Turland. 2006. International Code of Botanical Nomenclature (Vienna Code). Adopted by the Seventeenth International Botanical Congress, Vienna, Austria, July 2005. A.R.G. Gantner Verlag KG, Ruggell, Liechtenstein. 568 pp.

Spaulding, S.A., D.J. Lubinski and M. Potapova. 2010. Diatoms of the United States. <http://westerndiatoms.colorado.edu>. Accessed on 02 March, 2012.

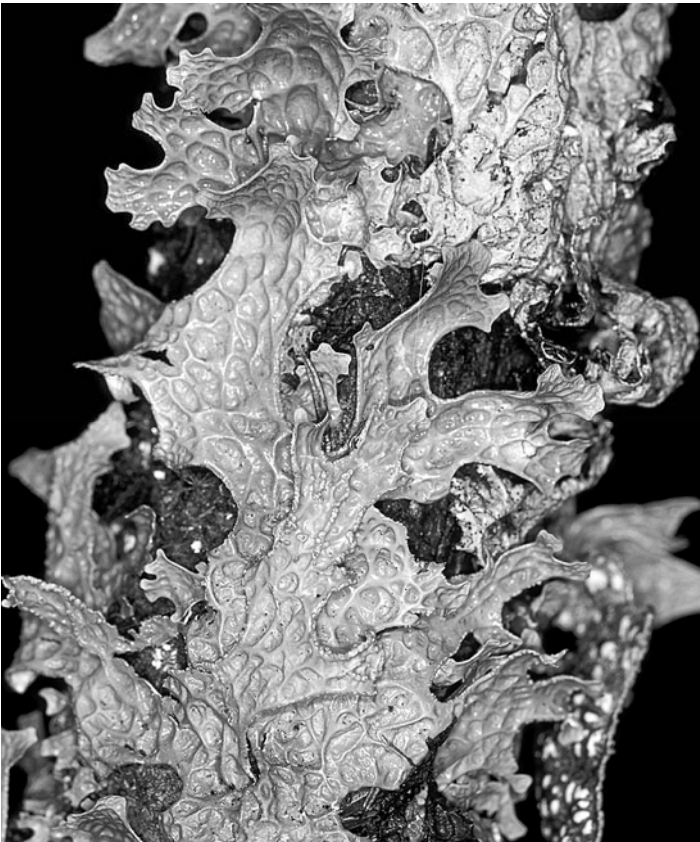
Loren Bahls is curator of the Montana Diatom Collection and a contributor to the on-line flora *Diatoms of the United States*.

NEW ON-LINE DIATOM FLORA LAUNCHED

To assist in diatom identification for environmental assessment, paleoecology, biogeography, and biodiversity research, a team of experts is assembling the first on-line diatom flora for the United States:

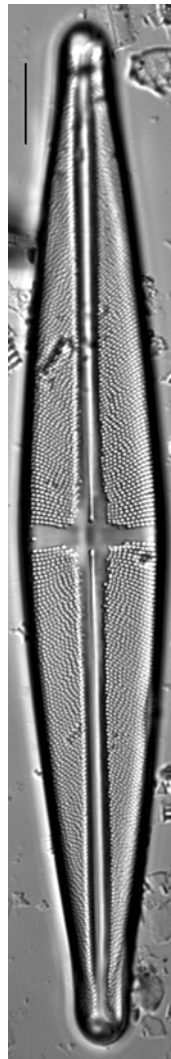
<http://westerndiatoms.colorado.edu/>

The flora is funded by the U. S. Geological Survey and housed at the University of Colorado in Boulder. When completed, it will be the first comprehensive and up-to-date diatom flora of the United States. New and existing species from Montana and the Northwest are being posted there. A project to survey diatom biodiversity in the Crown of the Continent ecoregion of Montana, British Columbia, and Alberta is also featured: http://westerndiatoms.colorado.edu/about/project/1826/diatoms_from_the_crown_of_the_continent

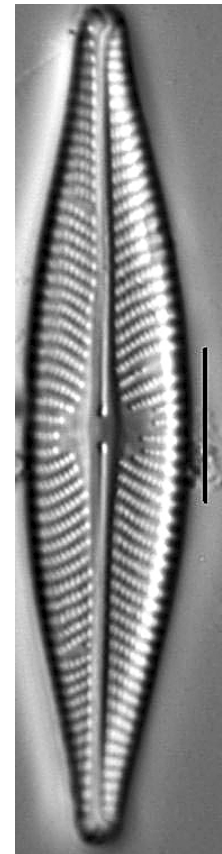


Lobaria pulmonaria, not a diatom but a lichen, is found in moist woods.

Photo: Drake Barton



Stauroneis beeskovae



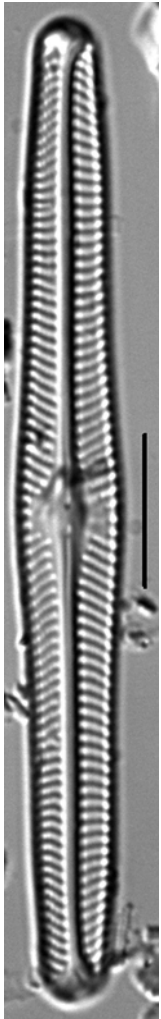
Navicula flatheadensis

NEW DIATOMS NAMED FOR CAROLIN AND PIERCE

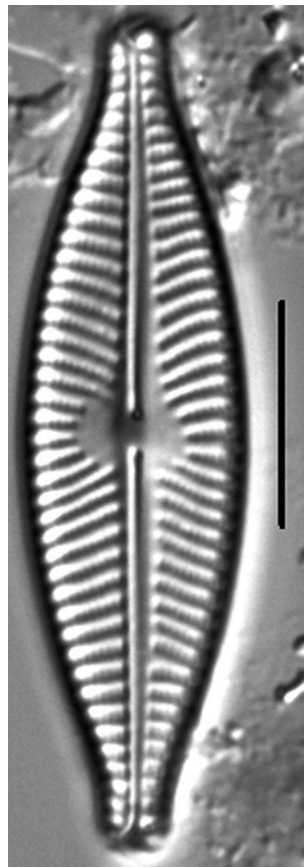
Friends of the Herbarium Tara Carolin and John Pierce were recently recognized for their significant contributions to diatom research in Montana. Two new diatom species—*Navicula caroliniae* and *Navicula piercei*—were named in their honor. Carolin is director of the Crown of the Continent Research Learning Center and was instrumental in securing funding for a survey of diatom biodiversity in Glacier National Park. The type locality for *Navicula caroliniae* is Bowman Lake in Glacier National Park. Pierce, a consulting botanist based in Missoula, personally collected 165 diatom samples from lakes and wetlands in the Northern Rockies. Several of John's samples have become the nomenclatural types of new diatom species, including *Stauroneis beeskoveae* and his namesake diatom. The type locality for *Navicula piercei* is Copper Lake on the Clearwater National Forest in northern Idaho.



John Pierce



Navicula piercei



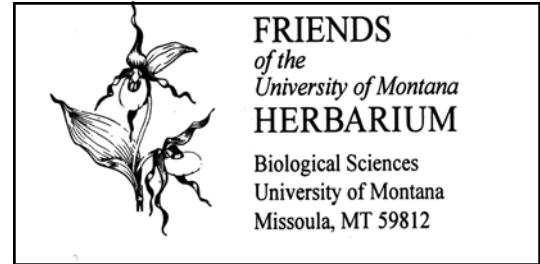
Navicula caroliniae



Tara Carolin

YES! *I want to help protect the irreplaceable collections and enhance the facilities of the University of Montana Herbarium*

- | | | |
|--------------------------|----------------------------|----------------|
| <input type="checkbox"/> | REGULAR MEMBER | \$15 |
| <input type="checkbox"/> | SUSTAINING MEMBER | \$25 |
| <input type="checkbox"/> | CONTRIBUTING MEMBER | \$50 |
| <input type="checkbox"/> | ORGANIZATION | \$50 |
| <input type="checkbox"/> | LIFE MEMBERSHIP | \$300 |
| <input type="checkbox"/> | SPECIAL GIFT | \$_____ |
| <input type="checkbox"/> | HONORARIUM FUND | \$_____ |



Send checks to:

Herbarium-Division of Biological Sciences—
The University of Montana – Missoula, MT
59812

Dues are for a period of **two** years. Dues for current members are payable in even- numbered years. New memberships are accepted at any time. All contributions to the Friends are tax deductible to the full extent provided by law. All checks should be made payable to: U.M. Foundation/Friends of the U.M. Herbarium.

Dues may also be paid online at: <http://umfoundation.onlinemontana.org>

1. Click on “Click here to Submit a Gift”

2. In the list of possible funds to donate to, **uncheck** the first box, scroll down to the last entry “Other”, and type in “Friends of UM Herbarium, Fund #29H”.

3. Under “Comments” indicate “Membership for Friends of UM Herbarium, Fund #29H”



FRIENDS
of the
University of Montana
HERBARIUM

Biological Sciences
University of Montana
Missoula, MT 59812