



FRIENDS

OF THE UNIVERSITY
OF MONTANA

HERBARIUM

Spring 2005

MONTU Awarded National Science Foundation Grant

By Peter Lesica and Elizabeth Crone

Bioinformatics. It's a word that not many of us know or use, and yet it was the promise of Montana bioinformatics that won MONTU over one-third of a million dollars from the National Science Foundation (NSF). Last spring Lila Fishman, the new director of MONTU and professor in the Division of Biological Sciences, Elizabeth Crone, professor in the College of Forestry and Peter Lesica wrote a proposal to review the determinations and update taxonomic nomenclature of all 72,000 MONTU Montana collections and then digitize the label information to form the basis for an interactive on-line database available to anyone with internet access. Photographs and county dot maps for each species will also be available as part of this database. In December Lila was informed that MONTU had been awarded a competitive grant by NSF's Biological Research Collections Panel. The Montana Flora On-line Project is projected to take three years beginning this spring.

Museums have taken on a new importance because they are the primary source of information on the earth's biological diversity. They contain a huge amount of data that is not easy to access unless you are at that particular museum. Yet this knowledge is urgently needed to help protect and manage biodiversity now. These data provide the baseline for the next generation of biodiversity studies and conservation activities. Enter bioinformatics. Bioinformatics refers to the tools and techniques for sorting, handling and communicating large amounts of biological data in the age of computers and the Internet. Many major western herbaria can already be accessed via the Internet. These include the University of Idaho, Oregon State

University, University of California at Davis, University of Colorado and University of Wyoming. A recent meeting of representatives from scientific societies and agencies as well as museums recognized the need to bring in new technologies to expand access to collections. They proposed creating a "Legacy Infrastructure Network for Natural Environments" to coordinate museums in every state and increased funding for modernizing collection facilities, updating determinations and expanding electronic access. The UM Herbarium is now on the forefront of this movement.



One of MONTU's 72,000+ plant specimens

Accessioning MONTU's collections information is important at this time in order to make it more readily available to the research community. Two ambitious North America plant systematics projects are currently underway: The Flora of North America Project (FNA) and the Biota of North America Program (BNA). Both projects are working towards cataloguing the diversity of plants in North America. Montana plant distribution information is inadequate in both of these projects. BNA relies on county distribution data from Booth and Wright's 1959 flora and Dorn's 1984 manual. Neither of these represent the UM Herbarium collections. As a result, many BNA distribution maps underrepresent species occurrences in the western part of the state. In Volume 23 of the Flora of North America, the genus *Kobresia* is not shown to occur in Montana even though three species are represented among MONTU's collections. This omission might not have occurred if the monographer had easy access to label data housed at the UM Herbarium. The flora of western Montana has not been studied intensively

(Continued on page 5)

2005 FRIENDS OF THE UM HERBARIUM ANNUAL MEETING

The Annual Meeting of the Friends of the UM Herbarium will be held Saturday, November 5 from 10 am to 2 pm. The meeting will be held in Rm 202 of the Natural Sciences (Botany) Building on the UM campus. This is the annual meeting of the Board of Directors and is open to the membership.

FRIENDS

of the University
of Montana

HERBARIUM



**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*

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The *Friends* Newsletter
is edited by
Peter Lesica and David Dyer

Layout by
Drake Barton and Kathy Lloyd

Activities

The Clark Fork Chapter of the Montana Native Plant Society held three meetings in the herbarium in 2004. Peter Stickney gave a reintroduction to the Grass Family, Mike Young taught a session on *Penstemon*, and Peter Lesica presented a class on clovers.

Notes from the Board

As I sit and ponder what I can write about for this column, the same thought keeps coming to me; yes, I believe the herbarium is an invaluable resource, but what can I say about its value that hasn't been covered by previous board members in this column. My predecessor at the Montana Natural Heritage Program, Bonnie Heidel, previously talked about the close ties between the program and the University of Montana Herbarium in this column (Spring 2001). Much of what was written then remains true today. While I'm happy to report that *Primula alcalina*, thought to be extirpated from the state, is now known from a single location with a voucher specimen deposited at MONTU the figure quoted by Bonnie, "close to 10% of all records in the MTNHP database are based strictly on specimens at the UM herbarium" is probably still in the ballpark. Beyond the general realm of species conservation, this column has also touched on the important functions that the UM herbarium and all herbaria play in the broad fields of ecology, natural history and taxonomy, to name just a few. So what more can I say that hasn't been covered in previous columns?

As the herbarium embarks on the task of verifying specimen identifications and computerizing the specimen label information over the next several years, its importance to the Heritage Program, taxonomic research and many other areas of natural resources will reach new heights. This new technology will enable us to search the specimen data on-line and perhaps more importantly, the increased activity in the herbarium will result in correcting many mis-identifications, mis-filings and other related problems. Completing this task of databasing all the Montana specimens at MONTU will truly be one of the greatest achievements in the realm of botany to-date in the state.

Yet, even after all the Montana collections have been entered into an electronic database, there will still be a need to see and use the specimens in person. These uses range from directly viewing and measuring morphological features for identification purposes and systematic studies, to direct sampling of specimen material for genetic research. There is no substitute to having a specimen sheet in hand and being able to view the various morphological features of the plant specimen at the angle and magnification needed. As experienced botanists become fewer and fewer, the herbarium becomes more and more valuable. What do I mean by this? Herbarium collections are a great resource for being able to quickly familiarize oneself with taxa when a description or key in a flora just isn't enough. As busy as we all seem to be these days, there is sometimes no substitute for a quick visit to the herbarium to compare a plant collected in the field to a specimen in the herbarium verified by an expert.

Once the Montana specimen data are available on-line there will be many times when the information needed will now be at my fingertips. What a great time and energy savings! As with all advancements though there is always a cost and a savings. Lets take a quick look:

Cost of one trip to Missoula and back from Helena in my 1994 Toyota 4-Runner at today's gas prices: »\$21.90

Couple of beers and a bowl of gumbo at Charley B's: »\$9.00

OK, I'd probably have to check out the Iron Horse Brewpub and Old Post: »\$20.00

Cost of computerizing the herbarium: »\$300,000

Trip to Missoula: PRICELESS

Scott Mincemoyer

MONTU People

...David V. Clark

P*enstemon* (beartongue) is the largest genus of plants endemic to North America. They are also one of the showiest groups in the west, so it is not surprising that several western botanists have focused their attention on *Penstemon*. One of them was right here in Missoula. MONTU's cabinets of Scrophulariaceae are filled with David Clark's *Penstemon* collections.

David Clark grew up in Connecticut. He attended Haverford College in Pennsylvania and received his undergraduate degree in Mathematics in 1953. After graduation he was drafted into the Army for two years and then went to work for General Electric. He was one of the first computer programmers to use FORTRAN, at that time a brand new language that revolutionized computing. He worked as a programmer for three years, but then decided it was time for a change. He got married, took a three-month honeymoon, and then accepted a job teaching high school math and science in Dolores, Colorado. Teaching seemed to be what he liked, so in the early 60's he attended Oregon State University to work on a Masters degree in Science Education. Part of the curriculum was field courses, and this is where he developed his interest in botany and evolutionary biology. He received his advanced degree in 1965 and returned to Dolores for one last year of teaching high school. The following year he and his family moved north to Montana.

David Clark collected *Penstemons* from throughout the western U.S. from 1968 through 1970. His research was supported by a trainee grant from the National Aeronautics and Space Administration. David also assisted Billie Lee Turner, a leading taxonomist from the University of Texas, teaching a taxonomy course at the Yellow Bay Biological Station in the summer. A large proportion of Clark's collections are from Montana and Idaho, and many of these are annotated with the chromosome number determined from pollen mother cells or root tips from germinated seeds. These specimens are very valuable because of the information they contain and the extra effort they represent.

The process of speciation can be effectively studied in rapidly evolving groups such as *Penstemon* because several stages of the process can often be found in a single group of closely related taxa. Clark's dissertation was clearly aimed at understanding the evolutionary process. He and his advisor, Robert Irving, chose the *Penstemon attenuatus* complex which includes many Montana species such as *P. albertinus*, *P. attenuatus*, *P. confertus*, *P. flavescens*, *P. procerus*, *P. pseudoprocerus*, *P. rydbergii*, and *P. wilcoxii*. Clark used morphological, cytological, palynological and chemical methods to identify hybrids between *P. procerus* and *P. globosus* occurring in meadows east of Lost Trail Pass and to show that they were similar to *P. rydbergii*. He suggested that *P. rydbergii* is a hybrid that spread during post-glacial times. Clark also documented tetraploid plants associated with most diploid species such as *P. globosus*, *P. procerus*, *P. albertinus* and *P. wilcoxii*. In addition there are several species that are hexaploid, including *P. attenuatus*, *P. pseudoprocerus* and *P. flavescens*. He concluded that hybridization and chromosome doubling have played a large role in

speciation in this group. Clark also did a minor study on the *P. wilcoxii* - *P. albertinus* group. Many of us in western Montana have difficulty distinguishing these two species consistently. Francis Pennell described *P. caelestinus*, a third species in this group, from near Garrison Junction, Montana. *Penstemon caelestinus* is intermediate between *P. wilcoxii* and *P. albertinus* and may be the reason the latter two are difficult to distinguish. Clark's morphological studies suggest that all three species should be recognized, although Cronquist's treatment in *Vascular Plants of the Pacific Northwest* combines *P. caelestinus* under *P. albertinus*. Future studies will be necessary to really understand this group.

After completing his dissertation in 1971, David Clark and his wife Rosemary moved back to Colorado where he accepted a teaching position at Colorado Mountain College on the east slope of the mountains. He taught all the sciences, including botany, mathematics, chemistry and physics until his retirement in 1987. Since then he has continued to teach astronomy and geology part-time at the college. He also does plant identification for resource managers on White River National Forest. In his spare time he works on mastering 16th Century musical instruments such as the recorder, krummhorn and hand bells. David is also active in the local Audubon chapter. David and his wife have chosen to live near what is probably the global center of diversity for the genus *Penstemon*. One has to wonder whether this was just a coincidence.

Peter Lesica



David Clark and his wife Rosemary



MONT NEWS BRIEFS

New Acquisitions

Peter Rice (1 specimen *Euphorbia agraria*, 1st record for Montana)

Andrea Pipp (70 lichens from Montana and Colorado)

Loren Bahls (500 diatom slides from Pacific Northwest)

John Pierce (1 specimen of *Scirpus pumilus*)

Darlene Lavelle (1 specimen of *Allium acuminatum*)

Loans for Research

Jeanette Oliver from Flathead Valley Community College received 5 sheets of *Polygonum cuspidatum*, a serious weed in parts of North America and Europe.

Peter Zika at the University of Washington received 33 sheets for his research on *Impatiens* hybridization in the Pacific Northwest.

Steve O'Kane at the University of Northern Iowa obtained 71 sheets for his monographic treatment of *Physaria* and *Lesquerella*.

John Strother at the University of California received 53 sheets of *Grindelia howellii* for his work on the Flora of North America (FNA) project.

Ron Hartman from the University of Wyoming requested 45 sheets of *Arenaria*, *Stellaria* and *Moehringia* for his studies on *S. oxyphylla*.

John Semple at the University of Waterloo received 17 sheets of *Aster junciformis* for his continuing work on North American *Aster (sensu lato)*.

Sarah Spalding at the U.S. Geological Survey obtained 150 diatom slides for use in a project to use rare diatoms for monitoring wetlands on the Northern Great Plains.

Michael Vincent at Miami University received one sheet of *Fatona villosa* for his study on the spread of this exotic in North America.

Mark Bierner at the University of Texas obtained 2 sheets of *Hymenoxys* for his FNA treatment

Rick McNeill at the University of Idaho received 23 sheets of *Lomatium bicolor* for his systematics research.

Exchange Acquisitions

Boise State University (204 vascular plants from Idaho)

Royal British Columbia Museum (88 vascular plants)

New York Botanical Garden (176 vascular plants including 6 isotypes)

Publications Based on MONTU Specimens

Alberta Sustainable Resource Development. 2004. Status of the tiny cryptanthe (*Cryptantha minima*) in Alberta. Alberta Sustainable Resource Development, Fish and Wildlife Division, and Alberta Conservation Association Wildlife Status Report No. 54. Edmonton, Alberta.

Alderman, S. C., R. R. Halse and J. F. White. 2004. A reevaluation of the host range and geographical distribution of *Claviceps* species in the United States. *Plant Disease* 88: 63-81.

Mechanda, S. M., B. R. Baum, D. A. Johnson and J. T. Arnason. 2004. Analysis of diversity of natural populations and commercial lines of *Echinacea* using AFLP. *Canadian Journal of Botany* 82: 461-484.

Potapova, M. G., K. C. Ponader, R. L. Lowe, T. A. Clason and L. L. Bahls. 2003. Small-celled *Nupela neglecta* from North America. *Diatom Research* 18: 293-306.

The UM Herbarium received 13 requests for information in 2004, including:

Label data from 125 *Dryopteris*, *Cystopteris*, *Selaginella* and *Listera* to Terri Hildebrand at University of Kansas

Label data for 12 specimens of *Cryptantha minima* to Cheryl Bradley in Alberta

Label data for 16 specimens of *Lesquerella ludoviciana* to Janice Coons at Eastern Illinois University

Label data for 3 specimens of *Dalea ornata* to Douglas Johnson, Utah State University

Other Online Atlas Projects

As was mentioned on page one of this newsletter, other states have been working on digitizing their herbaria data and producing online access to distribution atlases for each taxon. In the latest newsletter from the Virginia Native Plant Society, the *Bulletin*, they announced the *Digital Atlas of the Virginia Flora*. Going to http://www.biol.vt.edu/digital_atlas/ will take you to the homepage where you can search the database by scientific name or browse by family or genus, or jump into major groups such as Fern and Fern Allies, Gymnosperms, Monocots, or Dicots. Click on any one of those categories and you are directed to a list of families, genera and species represented in the state. Click on any species and a simple line map of Virginia is populated with a dot in each county where the species has been recorded. The map loads pretty quickly as it does not contain much in the way of graphics. The site has a nice clean look, and is a work in progress that can be added to as new data become available.

Another project that has a much different look is the atlas developed from the Oregon Flora Project (<http://www.oregonflora.org>). From that page you can access the Oregon Vascular Plant Atlas. Once there you click on the "map options form" where you choose the family, then the genus and finally the species which may be further sub-divided into sub-species or variety. Once you add the taxon you can create a distribution map in one of several views of the state: shaded relief map, precipitation map (very useful) eco-region map or county line map. This is all pretty slick but the more intense graphical interface does take a bit more time to load. If you don't have a fairly fast Internet connection you may want to stick with the county line maps as they are less detailed. However, it is interesting to explore where plants occur across a precipitation gradient or see how Oregon has divided the state by eco-region. Anyway, a couple of things to amuse ourselves with while the hard work of devolving our own atlas begins!

Drake Barton

...Bioinformatics (Continued from page 1)

for many decades. However, undescribed species have often been discovered among MONTU collections when experts have examined them. At least 12 new taxa have been described from MONTU collections in the past 20 years. A systematic examination of the Montana collections is likely to bring other novelties to light and promote a more thorough understanding of the flora of the Northern Rocky Mountains.

It is envisioned that the Montana Flora On-line Project will employ Peter Lesica as part-time curatorial specialist, four part-time undergraduates, a part-time graduate student and a part-time computer specialist for three years. The grant also provides money to purchase three new computers, a slide scanner, microscope and a laser printer. In addition to creating an on-line database of Montana's vascular plants, the project will also conduct workshops for agencies, school teachers and Native American land managers to introduce the database and demonstrate its use. MONTU is heading into the 21st Century. Stay tuned, we'll be digital before you know it.

Further reading:

Gropp, R. E. 2004. Expanding access to natural history collections. *BioScience* 54: 392.

Sugden, A. and E. Pennisi. 2000. Diversity digitized (a special series of articles on bioinformatics) *Science* 289: 2305-2314.

The Culture Corner

TO MY HERBARIUM

Ye dry and dead remains!
Poor, wrinkled remnants of a beauteous prime!
Why, from your final doom, should I take pains
To stay the hand of time?

The world would pass you by:
For beauty, grace and fragrance all are gone.
Your age is homeliness to every eye,
And prized by me alone.

Not beautiful, but dear,
Your wrecks recall to me the happy past.
Wand-like, your stems can summon to appear
The days that could not last.

I breathe the summer air!
I wander in the woodland paths once more
Again in the copse, the dell the meadow, wear
The loveliness of yore.

Turned to the God of day,
Your little lips come, prayerfully apart.
With the soft breeze your leaves, reviving, play
Sweet music to my heart.

The friend who in those years
Shared warmly in my rambles far and wide,
Back, with the same old fondness re-appears,
And trudges at my side.

These are your charms to me!
While such dear recollections ye awake,
Your ruins, blackened, crumbling though they may be,
I treasure for their sake.

May I, like you, dry flowers,
When in young life I can no more engage,
A dear memento be of happy hours
To those who tend my age.

From: Putnam's Monthly Magazine of American Literature, Science and Art 4 (24): 632 (December 1854). Author unknown.

Visitors to the University of Montana Herbarium in 2004

General Public and Private Consultants

John Brown, Nancy Anderson, Beth Horn, John Pierce, James Riser, Amanda Tripp, Jessica Rowell, Anita Maxwell, Gabrielle Sivitz, Beth Peluso, Emily Curry, Scott Miles

UM Researchers and Students

James Habeck, Elizabeth Crone, Ashley Parkinson, Mary Bricker, K. Colenso, Motoshi Honda, Becky Douglas

Out-of-town Academic Researchers

Ron Hartman (University of Wyoming), Lauren Bahls (Hannaëa)

Federal, State, Tribal, NGO Biologists

Clint Emerson (Montana Natural Heritage Program), Janet Howard (U.S. Forest Service), Peter Stickney (U.S. Forest Service), Scott Mincemoyer (Montana Natural Heritage Program), Lauren Priestman (U.S. Forest Service), Kirsten Bovee (U.S. Forest Service), Lorna McIntyre (U.S. Forest Service), Darlene Lavelle (U.S. Forest Service), Steve Shelly (U.S. Forest Service), Dierdre Shaw (Glacier National Park), Dennis Longknife (Fort Belknap Indian Reservation)

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.

Tara Carolin
Karen Gray
Montana Natural History Center
Linda Mycek
Bonnie McKee Vaughn

Erica Curry – Herbarium Student Employee

Do you think you're tough enough to mount specimens with the women of the U.M. Herbarium!? Guess again! It almost seems that to be a work-study student in the herbarium you have to first complete a grueling outdoor program! Our newest herbarium employee, Erica Curry, spent three months hiking over 200 miles across the Colorado Plateau in southern Utah as part of a Wild Rockies Field Institute course. Allison Holt, our returning work-study student that we featured in last year's newsletter, completed the rigorous 2-month Outward Bound Instructors' Course after she had finished her undergraduate degree. And of course we all know about the exploits of Virginia Vincent, who was profiled in our 2002 newsletter.

Erica was an undergraduate student at The Evergreen State College in Olympia, WA when she took the Utah course. Fortunately for us, the course was taught by instructors from U. M.'s Environmental Studies Program, and they inspired Erica to come to the University of Montana. Erica grew up on Bainbridge Island and enrolled in Evergreen College to study forest

ecology. She then returned to Bainbridge Island and was a graduate intern at Islandwood Environmental Learning Center. There she took classes in environmental education and natural history and also had the opportunity to teach a variety of natural history courses. Thus Erica has extensive experience in plant identification in the Pacific Northwest and is a valuable addition to our herbarium.

But Erica's interests don't stop there! She also studied tropical ecology in Costa Rica and Hawaii, has done stream ecology fieldwork in the steamy forests of Georgia, studied trumpeter swan habitat in the Blackfoot Valley, and has traveled frequently to Alaska. She is currently a graduate student in the Environmental Studies Program at U.M. and was just honored with a Doris Duke Fellowship. This will take her to Shelburne, Vermont this summer to study. No doubt this will spark her interest in the flora of New England, and next she'll probably take up ferns!

We're glad to have her enthusiasm, energy and skill here at the herbarium. Please introduce yourself to Erica the next time you're in the herbarium (and if you know where to spot a wolverine in Montana, let her know).

Dave Dyer



Erica Curry (left) and Allison Holt at the Herbarium



Debbie McNiel

Joseph Edward Kirkwood: Early Day MONTU Collector

by James Habeck

Professor Joseph E. Kirkwood was well advanced in his career as a professional botanist before joining the University of Montana's biology faculty. Born in Iowa in 1872, just a few years before Fort Missoula was established, Dr. Kirkwood completed his undergraduate training at Pacific University in Oregon (AB 1898); then later, his PhD at Columbia University on the East Coast (1903). He taught botany in several eastern colleges and traveled and worked in Mexico and Arizona deserts before coming to Montana. Morton Elrod invited Kirkwood to the Missoula campus to launch a new department of botany. He started in 1909 when he was 37 years old.

Dr. Kirkwood was broadly trained in classical botany, and exhibited interest and ability in all phases of plant biology. Upon his arrival at UM, Kirkwood started up a short course program for forest rangers housed in a room below the University's bell tower. This training program led to the creation of UM's School of Forestry, mostly through the efforts of Dr. Kirkwood. Training forest rangers seems to have gotten Kirkwood more narrowly focused and interested in plant ecology and plant systematics. In the summer of 1910, his first field season in Montana, he traveled by train through many of the national forests; in doing so he witnessed the great fires that raged across northern Idaho and western Montana that year. He prepared a lengthy paper that graphically described his daily experiences during that trip. The 1910 manuscript is available at the Mansfield Library archives.

In 1922 he published a small volume, *Forest Distribution in the Northern Rocky Mountains*. This book reveals that Kirkwood had become well acquainted with Montana's phytogeography. In one chapter Kirkwood describes the region's fossil flora and geographic origins of the modern flora, as understood at that time. He was strongly influenced by the published works of P.A. Rydberg and John B. Leiberger, among others, who had earlier studied and published on the plant geography of Montana. Kirkwood applied many of the ecological concepts promulgated by Clements and Weaver, as well as C. Hart Merriam.

Specimens with Kirkwood's label are frequently encountered in UM's Herbarium; his distinctive Spencerian handwriting is easy to spot. We don't have a full record of his plant collections, but he was a regular contributor to the UM Herbarium between 1910 and 1928. Perhaps Kirkwood's greatest contributions to the development and expansion of MONTU were the result of several botanical explorations he made into three remote (at that time) parts of western Montana and northern Idaho. These botanical explorations were undertaken during the summers of 1923, 1924 and 1925, each lasting one to two weeks. Kirkwood was in his early 50's when he made these trips that involved extensive horse travel and trail hiking, cover-

ing many miles of wilderness. During his trip into the upper Selway River one member of his party contracted Rocky Mountain spotted fever and died. Kirkwood provided detailed descriptions of these explorations in three issues of *Science Monthly* in 1927 and 1928.

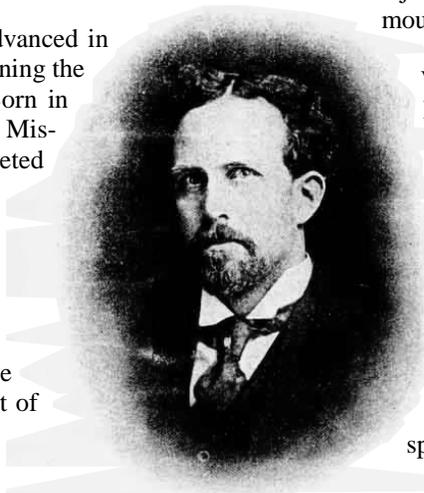
Kirkwood's journal articles provide many photographs of the mountains and forests he traversed; those areas now better known as the Selway-Bitterroot Wilderness, the Lolo Trail in Idaho and the Bob Marshall Wilderness. Kirkwood routinely stopped and collected plants along the trails; these included plants from all elevations and a wide assortment of forest types. Evenings in camp he pressed the specimens. Many of the plant species he collected are listed in his three published reports. It is assumed that Kirkwood did not collect numerous specimens of each species at each site, as was the habit of C. Leo Hitchcock a few years later, whose multiple-specimen collecting style was done with plant exchanges in mind.

Joseph Kirkwood made plant collections in upper Bitterroot River drainages, the Kootenai and Cabinet Mountains in the northwestern corner of Montana, as well as around Missoula itself. The Pacific coastal affinities of some of the Montana flora were noted and described by Kirkwood in the first issue (1927) of *Northwest Science*. He prepared a nearly complete book manuscript on the woody plants of the northern Rockies, but he died in the summer of 1928 before its completion and publication. He was a member of a UM Biological Station research team studying the Flathead Lake ecosystem; Kirkwood was investigating the lake's algal flora when he died. His book, *Northern Rocky Mountain Trees and Shrubs* was published posthumously in 1930 by Stanford Press.

As a closing note, since Dr. Kirkwood was scheduled to be on sabbatical leave during 1928-29, a replacement for his teaching assignments had already been selected. Esther Larsen was a 1925 UM botany graduate and former student of Kirkwood, but in 1928 she was a graduate student in plant systematics at Washington University, St Louis. She agreed to interrupt her PhD studies to assume Kirkwood's duties for one year. She ended up staying on the botany faculty until C. Leo Hitchcock was hired in 1932. While on the botany faculty Esther Larsen collected plants on the Biological Station grounds and elsewhere in western Montana.

Publications:

- Botany of the Montana Rockies. *Torreyia* 26: 105-109 (1926).
- Botanical explorations in the Rocky Mountains. *Science Monthly* 24: 236-250 (1927).
- Botanical explorations in the Rocky Mountains-Selway River. *Science Monthly* 25: 515-528 (1927).
- The Pacific element in the Rocky Mountain flora. *Northwest Science* 1: 14 (1927).
- Botanical explorations in the Rocky Mountains-Lolo Trail. *Science Monthly* 26: 315-328 (1928).
- Northern Rocky Mountains trees and shrubs. Stanford University Press (1930).



JOSEPH EDWARD KIRKWOOD, Ph. D.
Assistant Professor of Botany
and Forestry.

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 | \$_____ |



Dues are for a period of **two** years. All contributions to the Friends are tax deductible to the full extent provided by law. All checks should be made payable to UM Foundation/Friends of the UM Herbarium.

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