Spring 2011

2011 Friends of The University of Montana Herbarium Newsletter

Peter Lesica

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FRIENDS
OF THE UNIVERSITY OF MONTANA
HERBARIUM

Spring 2011

Consortium for Pacific Northwest Herbaria Online Portal

By Matt Lavin

Montana State University (MONT) and the University of Montana (MONTU) Herbaria are now thoroughly involved with the database project, "Consortium for Pacific Northwest Herbaria Online Portal" (http://www.pnwherbaria.org). The National Science Foundation is funding this project, which involves many herbaria from the Pacific Northwest states of Washington, Oregon, Idaho, and Montana. The University of Washington Herbarium (WTU) is leading this project, which began during June 2010, with an organizational meeting in Seattle at the WTU Herbarium. Peter Lesica, Scott Mincemoyer, and Matt Lavin attended and represented Montana. The overall project has accumulated about 94,000 images of herbarium specimens, which is nearly one third of the goal of 300,000 images. Another component of this database project has been the databasing of bryophytes, lichens, and fungi collections at WTU and the herbarium at Oregon State University (OSC), for which information for over 100,000 specimens has been entered.

MONTU has digitized the label information from all of their 70,000 Montana herbarium specimens, and this information is soon to be integrated into the Consortium database. MONT has imaged about 30,000 Montana

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Graduate student Ryan Quire is assisting with specimen imaging at MONT. Approximately 30,000 Montana specimens have been digitized so far.

Notes from the Board

Herbaria: Crypts for the Dead or Gardens of Eden?

It cannot be denied that herbaria are crypts of sorts. They provide long-term housing for plants of yore that, though gently collected and carefully prepared, are…well...quite dead. However, herbaria are also gardens of Eden budding with new life in both individuals and species. It seems that not all that is collected, cataloged, and stored away is, in fact, dead, particularly in the age of modern genetics. Indeed, as noted by Bebber and colleagues in a recent study published in the Proceedings of the National Academy of Sciences, herbaria are turning out to be the latest hot spots for discovering new plant diversity (Bebber et al. 2010).

The ledgers clearly show that herbaria have given rise to a variety of new life over the years. Perhaps the most famous story of botanical resurrection is that of the Bitterroot (*Lewisia rediviva*). This species received its Latin epithet of *rediviva*, meaning "restored life," from the botanist Frederick Pursh. Pursh was able to resurrect plants from roots given to him by Meriwether Lewis that had been deprived of water and soil for two years. Of course, the designated strategy for prolonged dormancy and rebirth in the plant kingdom is seeds and spores, both of which are often intentionally and unintentionally collected with other plant materials—sometimes with remarkable results. For example, David Johnson (1985) successfully produced plants from sporocarps of the fern *Marsilea oligospora* Gooding, from a herbarium specimen that had been collected 100 years earlier in 1883-1884 by W. N. Suksdorf. Likewise, Charles Lipman (1941) successfully reconstituted to "luxuriant growth," as he put it, the cyanobacteria *Nostoc commune* after 87 years of herbarium sleep. It would seem that Prince Charming also makes frequent visits to the herbarium cabinets.

Of course, the Holy Grail for every botanist is the discovery, description, and naming of a species completely new to science. Though this was an almost casual undertaking 200 years ago, it is no small task today in the heavily-trodden forests and grasslands of North America. While the idea of donning your favorite hiking boots and field-worn pack and trekking to the top of Kilimanjaro may conjure a delightfully nostalgic way to score some new species, you might want to consider instead grabbing your slippers and Mr. Rogers sweater and heading for the herbarium, at least if you really want to rack up some credits in the annals of botany. Bebber and colleagues (2010) recently found that 84 percent of new plant species described since 1970 had been collected and filed away in herbaria over 50 years earlier. From these results, they calculated that of the estimated 70,000 species remaining to be described, more than half of them are already resting in herbaria cabinets waiting patiently to be discovered. So while Colin Congdon and the Kew expedition spend their Christmas trudging for weeks on end though rain, muck, and mosquitoes up Mount Mabu in Mozambique just to unveil a single new endemic mistletoe (*Helixanthera schzocalyx*), you could be snuggled up with a hot chocolate in the warm, dry herbarium casually describing 10 new species of plants.

So the next time you step into a herbarium and are struck by that musty smell you have always attributed to dead air too-long locked up in spaces devoid of light; close your eyes for just a moment, take another whiff, and decide if perhaps what you are really smelling is that mustiness of spring that comes right after snowmelt and just before the world wakes to renewed life. Then role up your sleeves and launch your own expedition into new discovery.

Dean E. Pearson

FRIENDS
of the University of Montana
HERBARIUM

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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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References:

Bebber, D.P., M.A. Carine, J.R.I. Wood, A.H. Wortley, D.J. Harris, G.T. Prance, G. Davidse, J. Page, T.D. Pennington, N.K.B. Robson, and R.W. Scotland. 2011. Herbaria are a major frontier for species discovery. Proceedings of the National Academy of Sciences, Early Edition http://www.pnas.org/content/early/2010/12/01/1011841108.short

Johnson, D. A. 1985. New records for longevity of *Marsilea* sporocarps. American Fern Journal 75:30-31.

Lipman, C. 1941. The successful revival of *Nostoc commune* from a herbarium specimen eighty-seven years old. Torrey Botanical Society 68:664-666.

Plant Talk. December 22, 2010. Mozambique: Kew find new mistletoe from slopes of Mount Mabu. http://www.plant-talk.org/mozambique-kew-new-mistletoe-mabu.htm

MONTU People
….Wilfred W. White

Some of Montana's best botanists of the last century were U.S. Forest Service personnel. One of these was Wilfred W. White. Forest Service presence in Montana began a little more than 100 years ago, and it was not long afterward that White came west to work for the agency. W.W. White was born July 11, 1877; he grew up in Iowa in a Quaker family. He attended Penn College, Haverford College, and eventually Cornell University in upstate New York where he obtained a degree in forestry. He went on to obtain a Master's Degree from the University of Michigan. By 1905, White was working for U.S. Forest Service Region One (then District One) in Missoula, Montana as assistant to Elers Koch, then Regional Supervisor and eventual author of *Forty Years a Forester* (1998, Mountain Press, Missoula). Koch described White as a "tower of strength" and "one of my oldest friends." During his five years at the Regional Office White did a number of jobs, including marking timber sales. In 1907, Gifford Pinchot, then head of the U.S. Forest Service, helped White and Koch mark the Lick Creek timber sale near Lake Como northwest of Darby, the first large timber sale offered by the USFS.

W.W. White (left) and K.D. Swan, April 1938, Lick Creek Timber Sale.

Wilfred White became the second supervisor of Bitterroot National Forest in 1909, and remained at this post until 1921. He traveled extensively throughout what is now the Frank Church River of No Return Wilderness and the Selway-Bitterroot Wilderness. He and his crews mapped the area, built trails, and installed telephone lines. White retired from the Forest Service in 1929. He acquired farmland and an orchard on Willoughby Creek near Stevensville in the Bitterroot Valley and a city block with three large rental houses in Missoula. White, his wife, and four children managed these properties and did farm work after his retirement from the Forest Service. But W.W. White was doing something else during this time as well.

White made some plant collections from his first days with the Forest Service, mainly in Ravalli and Missoula counties. He collected *Ceanothus velutinus* in Deer Lodge County in 1906, serviceberry in 1907 and camas in 1908. He collected in southwest Montana (Beaverhead and Carbon counties) in 1928. In that same year he collected his first willow specimens from Montana, thus beginning his 30-year study of the genus *Salix* in the state. White reported that he first began to study willows in Idaho in 1926, but this "hobby" was soon extended to Montana and began in earnest in 1933 (White 1956), although he did collect Montana willows in 1932. In fact, he collected willows at his orchard near Stevensville in 1931-1934, including *Salix bebbiana, S. discolor, S. eriocephala, S. exigua, S. geyeriana, S. lasiandra* and *S. scouleriana*.

He collected entirely in western Montana until 1936, when he collected willows in Cascade and Powder River counties as well as southwest counties. Over the next two years he collected in western Montana. White made his first big collecting trip to eastern Montana in 1939, when he visited Glacier, Cascade, Meagher, Petroleum, Valley, Blaine, Park, and Hill counties. White collected in Yellowstone County in both 1941 and 1942, but then ceased collecting at all during the war years of 1943-45. In 1946 he collected only in northwest Montana. W.W. White's final year of plant collecting in Montana was 1947, when he again collected in eastern, south-central, and southwest counties, including most of those he visited in 1939, as well as Rosebud, Roosevelt, Sheridan, and Wheatland counties. White's collecting emphasis was on willows, but he collected specimens of many other species during this time as well.

Most of White's willow specimens were sent to the well-known willow expert, Carleton R. Ball, for determination. Duplicates were deposited in the Forest Service herbarium in Missoula and in his private collection which was donated to the herbarium at the University of Montana after his death in 1958.

Wilfred White published the first checklist of Montana willows in 1956, nearly ten years after he stopped his field collecting. The report contains state distribution maps for 18 species with vouchered counties apparently filled in by hand. He lists 28 species, some of which are no longer considered good, but he collected specimens of the vast majority of the 32 species known today for Montana. The next willow treatment for Montana was by Edwin Booth in his 1959, *Flora of Montana* and then by Robert Dorn in his 1970, monograph published by Montana State University. Montana is lucky to have had these diligent willow aficionados working in our state.

White, W. W. 1956. Native willows found in Montana. Proceedings of the Montana Academy of Sciences 16: 21-35.

Peter Lesica

MONTU NEWS BRIEFS

New Acquisitions

Linda Pietarinen: 6 specimens of *Arctostaphylos* and 1 of *Clarkia* from the Bitterroot National Forest.

University of Michigan Herbarium: 3 sheets of *Botrychium*, originally collected by Klaus Lackschewitz in Deer Lodge Co.

Scott Mincemoyer: one specimen of *Senecio elmeri* from Montana.

Peter Lesica: 240 specimens from Montana.

Virginia Vincent: 3 specimens of *Mutinus caninus*, a fungus, from Missoula.

Dept. of Native American Studies, UM: 160 sheets of plants collected in 1974 and 1975 as part of the Ethnobotany Program, from reservations across Montana.

Craig Odegard: 17 specimens from Sanders Co., MT.

Exchange Acquisitions

Oregon State University: 33 specimens from OR and WA.

Snake River Plains Herbarium: 129 specimens from Idaho.

University of Washington Herbarium: 23 specimens from Washington.

University of New Hampshire: 51 specimens from the Mission Mountains of Montana, collected by G.E. Crow in 1969.

Loans for Research

Duke University, Michael Windham: 422 sheets of *Boechera* and 195 sheets of *Arabis,* for NSF-funded taxonomic research project among 4 universities.

University of Kansas, Craig Freeman: 682 sheets of *Penstemon* for Flora of North America treatment.

University of Washington Herbarium: 18 sheets of *Petrophytum* and *Huperzia*.

Franklin and Marshall College, North Museum of Natural History: 11 sheets of *Solanum carolinense* for study of the invasion of the common horsenettle throughout the U.S.

Rhithron Associates, Missoula: one slide from the Montana Diatom Collection, from Ruby River drainage, for a taxonomic study.

Examples of Information Requests

MT Natural Heritage Program: label data on mosses and lichens at MONTU for MTNHP Species of Concern list.

Lee Metcalf National Wildlife Refuge: information on equipment, techniques, procedures used at MONTU to help start a herbarium at LMNWR.

Northern Kentucky University: information on *Nicandra* from Montana.

Cheryl Beyer, Forest Botanist, California: information on manufacturers of herbarium cabinets, for new herbarium at Lake Tahoe Basin Management Unit., and how to use freezing for pest control.

Visitors to the University of Montana Herbarium in 2010

General Public and Private Consultants

Nancy Seiler, Carl Brown, Leslie Parker

UM Researchers and Students

Marilyn Marler, Scott Mincemoyer, Peter Rice, Ashley Lehman, Emily Kern, Teal Potter

Federal, State, Tribal, NGO Biologists

Peter Stickney U.S. Forest Service
Jennifer Whipple National Park Service
Heidi Anderson National Park Service
Erin Holmes U.S. Fish & Wildlife Service
Deborah Goslin U.S. Fish & Wildlife Service
Susan Rinehart U.S. Forest Service

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.

Matt Lavin, Bozeman
Jessie Salix, Dillon
Catriona Simms, Missoula

Activities

The Clark Fork Chapter of the Montana Native Plant Society held three meetings in the herbarium during the winter of 2010. In January, Peter Stickney told us about Montana's Waterleaf Family. Scott Mincemoyer came over from Helena and refreshed our memories on Montana's Rushes, the genus *Juncus* in February. In March, Peter Lesica led the group in trying to grasp the genus *Potentilla*.

2011 Friends of the UM Herbarium Annual Meeting

The Annual Meeting of the Friends of the UM Herbarium will be held Saturday, October 22 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.

Farewell to the Aceraceae: Changes in the Angiosperm Family Tree

By Walter Fertig

from the September 2010 issue of *Sego Lily*, the newsletter of the Utah Native Plant Society

The Maple family is dead. For sure there are still plenty of species of maples (*Acer*) across North America and Asia, but the maple family (Aceraceae) is gone — cut down by a new generation of taxonomists wielding DNA datasets and modern phylogenetic theory. The maples and their close cousins the horse-chestnuts (Hippocastanaceae) are now part of an expanded Soapberry family (Sapindaceae).

The milkweed family (Asclepiadaceae) is also no more – absorbed by the Dogbanes (Apocynaceae). Gone too are the Goosefoots (Chenopodiaceae), Duckweeds (Lemnaceae), Pyrolas (Pyrolaceae), and Waterleafs (Hydrophyllaceae). Some familiar groups like the Lilies (Liliaceae) and Figworts (Scrophulariaceae) have received extreme makeovers and while still alive, are barely recognizable. Meanwhile, several formerly obscure families, like the Lopseeds (Phrymaceae), Broomrapes (Orobanchaceae), and Plantains (Plantaginaceae) have attained prominence thanks to an influx of new species transferred from elsewhere.

So what is going on?

These changes are the result of studies by the Angiosperm Phylogeny Group (APG), an international consortium of research institutes and professional taxonomists. The APG has been at work for nearly two decades applying modern research methods and theory to several centuries-old riddles. What is the most primitive group of angiosperms? How natural are existing orders and families? What does the family tree (phylogeny) of flowering plants look like (see page 7)? Through sharing datasets and findings, the APG is attempting to forge an elusive consensus among taxonomists. The work of APG (originally published in 1999, updated in 2003, and most recently revised in 2009) has corroborated many hypotheses of species relationships among the angiosperms but has also challenged long-held assumptions, much to the consternation of some botanists.

***Acer glabrum*, our Rocky Mountain maple, is no longer *Acer glabrum*.**

Taxonomy has two main purposes: to provide standardized names for distinct species and subspecies/varieties and to organize these taxa into a logical sequence. The rules for naming species were largely developed by Carolus Linnaeus in the mid 1700s and since formalized and periodically updated in the International Code of Botanical Nomenclature. Hundreds of classification systems have been proposed over the last three millennia, beginning with the simple growth form approach (tree, shrub, perennial herb) of Theophrastus in ancient Greece. Linnaeus's own "sexual system," based primarily on the number and degree of fusion of stamens per flower, was an early attempt to apply repeatable criteria to the problem of organizing the chaotic jumble of plant species.

Since Linnaeus's time, plant taxonomists have been striving to create ever more natural combinations of species by including information from many sources, such as floral and fruit morphology, embryology, wood anatomy, leaf architecture, cytology, genetics, and the fossil record. Starting in the 1860s with the acceptance of Darwin's theory of evolution, the primary emphasis of taxonomy has shifted from creating mere order to identifying the underlying genealogical relationships among species and families.

Over the last 40 years the dominant angiosperm classification system has been that of the late Arthur Cronquist of the New York Botanical Garden*. Cronquist split the flowering plants into six subclasses of dicots and five subclasses of monocots, with each subunit representing a major evolutionary line. Of these, the Magnolia group (Magnoliidae) is thought to be the most primitive and closest to the putative ancestral flowering plant. Typical Magnoliids, such as the magnolias (Magnoliaceae), buttercups (Ranunculaceae), and water-lilies (Nymphaeaceae) have numerous, separate sepals and petals, numerous stamens, many unfused pistils, and pollen opening by a single germination pore. Other dicot lines include the mostly wind-pollinated and petal-less Hamameliidae (oaks, elms, birches, and sycamores), chemically-unique Caryophyllidae (carnations, buckwheats, and cacti), the large and somewhat amorphous Rosidae (roses, peas, maples, euphorbs, and parsleys), and Dilleniidae (mustards, heaths, violets, and willows), and the Asteridae (asters, mints, phloxes, gentians) considered to be the

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...Changes *(Continued from page 5)*

most advanced group because of the pronounced reduction and fusion of floral parts.

The monocots are believed to derive from the magnoliids through the primitive Alismatidae (mostly aquatic species with numerous stamens and separate pistils, such as the arrowheads and pondweeds). Additional monocot lines include the Arecidae (palms and arums), Commelinidae (bromeliads, sedges, and grasses), Zingiberidae (bananas and gingers), and Liliidae (lilies, iris, and orchids). Like the Asteridae, the Liliidae are considered the most evolutionarily advanced group within their class.

The systems advocated by Cronquist, Takhtajan, and Thorne were derived from their authors' encyclopedic knowledge of flowering plant diversity and the taxonomic literature. By contrast, the Angiosperm Phylogeny Group's taxonomy is derived from pooling datasets and experiences of numerous individual researchers, augmented by breakthroughs in analyzing DNA that were unavailable even two decades ago. In addition, the APG

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Family Changes Based on Recent Taxonomic Research by the Angiosperm Phylogeny Group

Old Family	New Family
Aceraceae (maples)	Sapindaceae (soapberries)
Asclepiadaceae (milkweeds)	Apocynaceae (dogbanes)
Buddlejaceae (butterfly-bushes)	Scrophulariaceae (figworts)
Callitrichaceae (water-starworts)	Plantaginaceae (plantains)
Chenopodiaceae (goosefoots)	Amaranthaceae (amaranths) & Sarcobataceae (greasewood)
Cuscutaceae (dodders)	Convolvulaceae (morning-glories)
Fumariaceae (fumitories)	Papaveraceae (poppies)
Hippuridaceae (mares'-tails)	Plantaginaceae (plantains)
Hippocastanaceae (horse-chestnuts)	Sapindaceae (soapberries)
Hydrophyllaceae (waterleafs)	Boraginaceae (borages)
Lemnaceae (duckweeds)	Araceae (arums)
Liliaceae (lilies, in part: still includes *Erythronium, Fritillaria, Lilium, Lloydia*)	Alliaceae (onions) Amaryllidaceae (daffodils) Asparagaceae (asparagus) Colchicaceae (crocus) Melanthiaceae (bunchflowers) Ruscaceae (butcher's brooms) Themidaceae (funnel-lilies)
Monotropaceae (pinesaps)	Ericaceae (heaths)
Najadaceae (naiads)	Hydrocharitaceae (frogbits)
Pyrolaceae (pyrolas)	Ericaceae (heaths)
Scrophulariaceae (figworts, in part, still includes *Scrophularia Verbascum, Buddleja*)	Orobanchaceae (broomrapes: includes *Castilleja, Cordylanthus, Orthocarpus, & Pedicularis*) Phrymaceae (lopseeds: includes *Mimulus & Mimetanthe*) Plantaginaceae (plantains: includes *Collinsia, Penstemon, & Veronica*)
Tiliaceae (basswoods)	Malvaceae (mallows)
Viscaceae (mistletoes)	Santalaceae (sandalwoods)
Zannichelliaceae (horned pondweed)	Potamogetonaceae (pondweeds)

Other changes:
Celtis goes from Ulmaceae (Celtidaceae) to Cannabaceae (hemps)
Nolina goes from Agavaceae to Ruscaceae (butcher's brooms)
Sambucus & *Viburnum* go from Caprifoliaceae to Adoxaceae (moschatels)

...Changes *(Continued from page 6)*

has applied formal cladistic methodology to the problem of family relationships.

The basic premise of cladistics is that species and families can be organized based on deviations from an original set of shared characteristics. These changes can be depicted visually as branches of a tree (each branch is a "clade") and the distance between branches is analogous to the degree of similarity between taxonomic groups. To be legitimate under the rules of cladistics, families and higher taxonomic groups must include all species above a given fork in the tree (the decision of what fork to choose is left to the taxonomist). Families that are nested within forks comprising another, related family cannot stand alone, regardless of how distinct they might appear otherwise. Thus, the maple and horse-chestnut branches nest within that of the soapberries and must be included within an expanded family concept of Sapindaceae. Likewise, the milkweed clade falls within the dogbanes, duckweeds within the arums, and so forth (see chart page 6).

Other situations are more complex, such as the old Scrophulariaceae where genera once included in the Figwort family were scattered among numerous branches and intertwined with Orobanchaceae, Phrymaceae, and Plantaginaceae. Either all of these families had to be merged into one very amorphous family, or they had to be reconstituted into more evolutionarily coherent subgroups. Unfortunately, due to the naming rules set down under the International Code, the family names Orobanchaceae, Phrymaceae, and Plantaginaceae had to be retained, even though they are named for relatively unfamiliar genera.

Another family that has been split up considerably is the Liliaceae. For years, specialists have recognized that the group was unnatural and served as a catch-all for a diverse assemblage of monocots with six tepals and six stamens. Based on recent genetic and morphological studies, several lily genera have been relocated to other monocot families and orders. The false asphodels (*Tofieldia*) turn out to be more closely related to the arrowheads and are now placed in their own family (Tofieldiaceae). Likewise, camas (*Camassia*) is better placed with the yuccas and agaves (Agavaceae). Other lily genera have been split into two main clades based on seed and nectary features. One, the asparagus line, includes the onions (*Allium*), funnel-lilies (*Androstephium*), and false Solomon's seal (*Maianthemum*), which turn out to be more related to the irises, orchids, and agaves than the true lilies. While the lily family remains, it is much reduced and retains mostly the true lilies (*Lilium*), tulips (*Tulipa*), checker-lilies (*Fritillaria*), and trout lilies (*Erythronium*). There is still disagreement as to whether the sego lilies and mariposas (*Calochortus*) belong here or in their own family, Calochortaceae. Other former lily family members have been segregated, including the catbriers (Smilacaceae), Trilliums (Trilliaceae), and death-camas (Melanthiaceae).

Some of the changes proposed by the APG remain controversial. The borages (Boraginaceae) traditionally have been allied with the mints (Lamiaceae) on the basis of similar fruit structures: four 1-seeded nutlets. DNA evidence suggests these two groups are only distantly related within the Asterid clade and that the borages should contain the waterleafs (Hydrophyllaceae), despite the lat-

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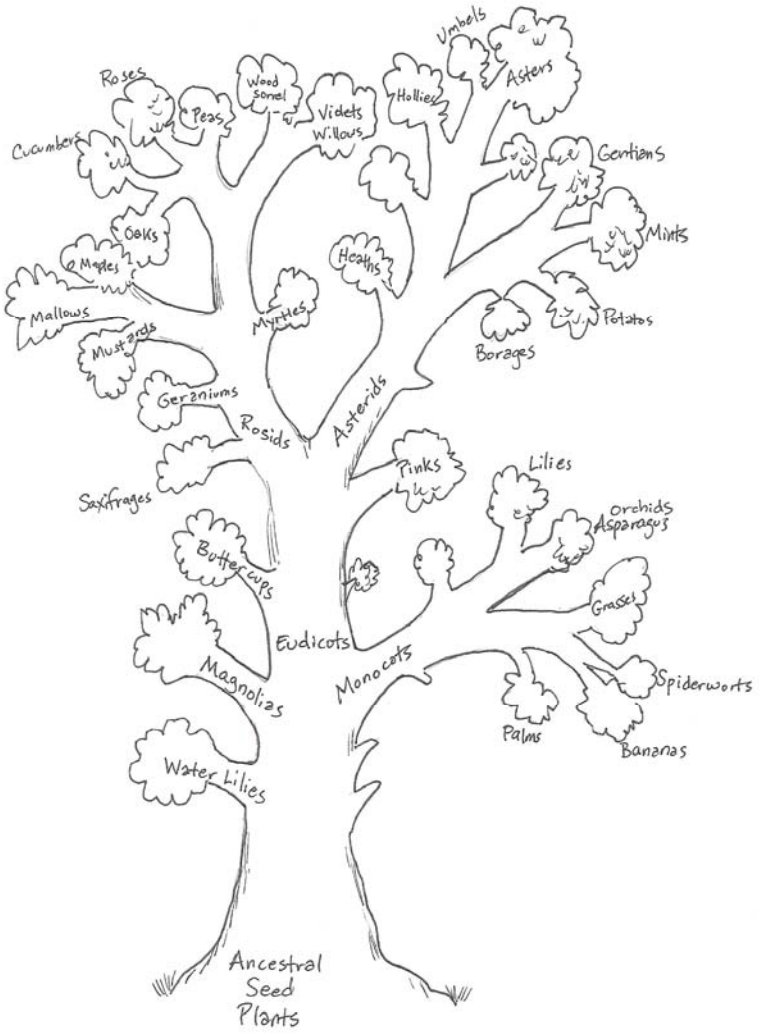

Arborus angiospermus, an evolutionary or phylogenetic family tree of the flowering plants or angiosperms, based on recent taxonomic revisions of the Angiosperm Phylogeny Group (APG). ***Cartoon by W. Fertig.***

...Changes *(Continued from page 7)*

ter group (*Phacelia, Hydrophyllum* and relatives) having capsule fruits with numerous seeds.

Besides re-arranging plant families, the APG has altered Cronquist's long-standing family tree. The most primitive flowering plants are now thought to be a group of herbs and shrubs that includes the water-lilies and several small orders found mostly in the south Pacific and Australia. From this basal group, the angiosperms split into the magnoliid line (analogous to Cronquist's concept with a few of the most primitive forms and the buttercups removed), the monocots, and the "true dicots" or eudicots. Among the eudicots, the buttercups diverged early, as did the Caryophyllidae. Two main branches later arose: the Rosids (which include most of Cronquist's Rosidae, Hamamelidae, and Dilleniidae) and the Asterids (expanded from the original Asteridae to include the umbels (Apiaceae), hollies (Aquifoliales), dogwoods (Cornales), and heaths (Ericales).

Of course no classification is ever complete or universally accepted. Numerous refinements were made in the third edition of the APG system published in 2009, and more changes will likely arise and be posted on the APG website in the future (www.mobot.org/mobot/research/apweb/). Taxonomists are still free to use systems of their choosing in technical manuals, floras, and species checklists. Users of these products will still need to be fluent in multiple family synonyms and concepts.

We live in an era of unstable taxonomy, and this is not likely to change any time soon. Efforts to create more natural taxonomic systems, like that proposed by APG, are worthwhile, even though they may be upsetting when they impact our favorite families or world view. Taxonomy is, after all, a legitimate science and not merely pasting and re-arranging stamps in a binder. Some of the changes proposed by APG will prove to be wrong in light of new discoveries and changes in theory (cladistics is not without its logical shortcomings, particularly the problems of hybridization and reticulate evolution). The goal of perfect, natural classification will remain elusive, just as it has since Linnaeus's time nearly 250 years ago.

*Russian botanist Armen Takhtajan and American Robert Thorne independently derived comparable, though more complex, systems at about the same time as Cronquist, but their works have not been as widely used in North America.

References:

Angiosperm Phylogeny Group. 2003. An update of the Angiosperm Phylogeny Group classification for the orders and families of flowering plants: APG II. *Botanical Journal of the Linnaean Society* 141:399-436.

Spears, P. 2006. *A Tour of the Flowering Plants Based on the Classification System of the Angiosperm Phylogeny Group.* Missouri Botanical Garden Press, St. Louis, MO. 308 pp.

...Portal *(Continued from page 1)*

specimens out of about 65,000 total, and 2,300 of these have had the label data digitized so far. Digitization of label data for MONT images is occurring at WTU where optical character recognition and other technologies are being used to speed acquisition of these sorts of data.

The equipment setup at MONT includes an Ortery light box that easily holds and aligns a 12" x 17" herbarium specimen, a Canon EOS 5D digital camera with a 50 mm macro lens capable of taking high quality images in RAW format, and a Dell Vostro 17" laptop computer with 8 GB Ram and running the 64-bit version of Windows 7 along with all of the necessary graphics software. The laptop interfaces with and drives the camera (see picture page 1). One graduate student, Ryan Quire, and one undergraduate student, Robin Anderson, are assisting with the MONT imaging. Before imaging herbarium specimens, we verify the identity and geographic locality of each in order to improve the quality of the information going into the Consortium database. For example, Peter Lesica made several visits to MONT over the past year to study specimens in the MONT herbarium. Peter thereby assisted greatly in sorting out many misidentifications. Also, I spent over one month going through all of the specimens of grasses (Poaceae) at MONT (as I had done at MONTU during several sessions from previous years). Each specimen was scrutinized for correct identity, taxonomic names were brought into alignment with the treatments in the grass volumes of the Flora of North America, and specimens were sorted into state and county occurrences if indeed they had not already been.

With specimens so organized, we find we can photograph about 50-100 per hour. Speed depends on many things, such as opening packets to expose the contents, or taking two photographs: one with the packet closed and the other with the contents displayed in as neat and orderly a fashion as possible. Going through specimens one by one during a photo session inevitably results in the identification of curation issues, such as specimens that need to be repaired or checked for proper county assignment or species identification. While photographing a set of specimens, we tag them with basic information such as family, genus, species, and general geographic identity so at least some information (metadata) is associated with each image before they are shipped to WTU. Shipment of specimens occurs via mailing by regular post an external hard drive containing anywhere from 4,000 to 10,000 high quality photos (or up to about half a pterobyte of data). With about 30,000 images completed to date, we are well on our way to having the MONT image project completed no later than the end of January 2012. MONT specimen images and associated label information should soon be available when searching the Consortium Portal for Pacific Northwest plant information.

The Mission and Geographic Scope of the MONTU Herbarium

At the 2010 FOH Annual Meeting, the Board of Directors discussed the need to amend the mission statement of the herbarium to limit the geographic extent from which the herbarium would accept specimens. A more restrictive limit on the acceptance of specimens is necessary to conserve the limited amount of storage space available at the current herbarium facility. By one estimate, the herbarium still has room for between 4,000 and 8,000 sheets, which should be sufficient for the next decade or more given the recent number of accessions each year. Part of this space was made available in the recent past by de-accessioning tropical specimens and sending them to herbaria where they are more likely to be of benefit to those studying tropical plants. It is foreseeable and perhaps even desirable for additional plants in the collection from outside the geographic scope of the herbarium to be de-accessioned and sent to other herbaria, but that is a discussion topic for another time. For now, the priority needs to be refining the mission of the herbarium, particularly as it pertains to the geographic scope of the specimens it is accessioning. As such, the Board is looking to provide guidance to herbarium staff on the specimens that should be incorporated into the collections. One significant impact of such a change would be to limit specimens coming in via exchange agreements with other herbaria.

After discussion during the November meeting, the Board initially voted to recommend limiting the acceptance of new specimens to Montana and neighboring states. In the intervening months and as a result of additional dialog, it became clear that further discussion of the issue was warranted before the Board made a final recommendation. For the last few years, the herbarium's mission has been defined as follows: "The primary focus of the herbarium is to continue to assemble and maintain a collection of the flora of the western cordillera and Great Plains, including those circumboreal genera with representatives in this region." There is general agreement by the Board that this focus is overly broad given the space and resource limitations of the herbarium. However, it should be noted that out-of-state specimens are also a valuable part of the collection and at times are essential to the work being conducted by Montana botanists and researchers. For example, while recently researching the identity of a particular species of *Senecio* from northwest Montana, specimens of *Senecio elmeri* from Washington were crucial for making a correct taxonomic determination. Often times it is necessary to study plants from beyond the boundary of Montana to understand what we have within the state and how our plants fit within this larger context. It is true that specimens can often be borrowed from another herbarium or one can travel to the respective herbarium, but sometimes that is not feasible. So a decision about the geographic scope and mission of the herbarium should not be made hastily, nor should it be made without considering the needs of the users; the goal being to find a balance between utility and finite resources.

A few options discussed thus far include, limiting the acceptance of new specimens and the mission of the herbarium to:

1. Montana, or
2. Montana and neighboring states/provinces, or
3. The northwestern Great Plains (western North Dakota, western South Dakota, southern Saskatchewan), the Pacific Northwest as defined by Hitchcock and Cronquist (1973) (i.e. Washington, northern Oregon, Idaho north of the Snake River Plain, southern B.C.), and the Northern Rocky Mountains (northern Wyoming, Montana, and southern Alberta).

Each of these options has positives and negatives. Option 1 is obviously the most restrictive and may unduly hinder the value of the herbarium to current and future users, though it would be the easiest to implement, as well as being the option most likely to result in the fewest number of specimens being accessioned each year. Option 2 would substantially increase the geographic scope and the potential value to herbarium users, as well as still being easy to implement since it explicitly follows political boundaries. However, it is also likely to result in the incorporation of specimens from outside the primary interest of MONTU users (i.e. specimens from the eastern half of the Dakotas or northern Alberta). Option 3 would also greatly increase the scope and value of the collection beyond Montana, while more accurately following floristic boundaries than option 2. A potential negative aspect of this sort of boundary would be the likely increased examination of specimens needed prior to being accessioned to determine if they fell within the geographic area of interest (ie. western vs. eastern South Dakota). The Board is seeking comments and feedback from FOH members and MONTU herbarium users on the 3 options identified above or other ideas on what the geographic focus of the herbarium should be. The Board anticipates finalizing a recommendation at its next meeting in late October. Please send comments to Scott Mincemoyer, Board President, at smincemoyer@mt.gov or, alternatively, to any other Board member.

Scott Mincemoyer

Virginia Vincent (see article on page 10) helps keep the herbarium in good order.

The Herbarium Staff From A to Z!

The herbarium is fortunate to have a dedicated staff of student and non-student employees. All contribute a great deal in their areas to help keep the herbarium continually moving forward. This year we have the following staff on board.

Adam Shreading, who was featured in the staff article in last year's newsletter, continues to be our main expert in the Specify database system. He trains the students in data entry and keeps an eye out for the accuracy of their results. Adam may leave for occasional interesting wildlife biology field projects, such as working with golden eagles (see page 11), but is dedicated to the Specify project and will often work odd hours to help keep the project flowing smoothly.

Kayla Kaze is our "senior" work-study student, having been with the herbarium for a full year now. She is the driving force behind getting all the specimens in Peter Stickney's MRC Herbarium (see the cover article in 2010 newsletter) cataloged into our system, assigning additional MRC numbers, and having them ready for data entry.

Kayla is from Miles City, Montana, which is about as far away from Missoula as Seattle, and is a senior in Human Biology. She is currently applying to medical schools in the southeastern United States, with the eventual goal of returning to Montana to work as a family practitioner. Towards that end, she has also worked in a cell and molecular biology lab on campus. Since she needs even *more* to do, she also advises Biology students and is a teaching assistant for the human anatomy course. She is an excellent student and is great working with people; she will no doubt be successful in her field!

Zia Maumanee, our on-call Specify expert.

Kahla Louthan has been with the herbarium since January, and is working primarily on data entry of the new MRC material. She is a wildlife biology student from Scappoose, Oregon (know where that is!?) and has an interest in all things in the outdoors, from animals to plants. She more or less randomly moved to Missoula, and quickly fit right in to the perfect niche for her. She began wildlife biology studies at U.M. and also started volunteering for the Wind River Bear Institute in Florence. She was such a perfect complement at Wind River that they drummed up funds to hire her. She now manages the dog day-care facilities, often working nights and weekends, and also works to train the Karelian Bear Dogs. This is a breed from Finland and Russia that the Institute trains to run off problem bears, as an alternative to shooting the bears. This is known as "bear sheparding," and Wind River now has dogs placed all over the world in this capacity. The dogs are also used to find carcasses of poached animals. Kahla would like to eventually work as a wildlife biologist specializing in bears. Kahla is currently a sophomore at U.M., so we hope she's at the herbarium for a long time to come!

Everyone knows **V**irginia Vincent! She has been a dedicated volunteer at the herbarium for 11 years. See the cover story in the 2002 Friends newsletter for a feature article about Virginia. She began her association with the University of Montana when she came here to study in 1956. Virginia also continues her legacy of being a fire lookout on Stark Mountain in the summers and, fortunately for us, works at the herbarium the rest of the year. She continues to monitor the day to day activities of the students and keeps her watchful eye over the myriad of details in the collection. Thanks, Virginia!

And last but not least, **Z**ia Maumanee is our "on-call" expert with the Specify database. When we encounter difficulties that even the DBS technology folks are stumped by, we call in Zia! She began at the herbarium in 2005 working on the NSF grant to help design the Specify database and the related website. In her words "it's her baby," and many times we have been very glad she's still involved with the herbarium and the database. She is now working to connect our database to the Consortium of Pacific Northwest Herbaria so that the data are even more widely available.

Dave Dyer

Kahla Louthan (left) has been with the herbarium since January, and is working primarily on data entry of the new MRC material. She is a wildlife biology student from Scappoose, Oregon.

Adam Shreading (right) also pursues interests in wildlife biology, in addition to training students on Specify database entries and checking for accuracy.

Kayla Kaze (left) is our "senior" work-study student, having been with the herbarium for a full year now. She is the driving force behind getting all the specimens in Peter Stickney's MRC Herbarium cataloged into our system, assigning additional MRC numbers, and having them ready for data entry.

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

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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".
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