

Plant Science Says



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Governor Visits Seed Lab By Faye Jorgensen

President Cruzado, Dean Charles Boyer, Department Head John Sherwood, Bob Hodgskiss and Ryan Holt (members of the Seed Lab Advisory Board) and Heather Rimel, Manager of the Montana Seed Growers Association, all helped the Seed Lab staff welcome Governor Steve Bullock to the Montana State Seed Lab. Dr. Sherwood and Mr. Hodgskiss briefed the Governor on the importance of the Seed Lab to Montana Ag Industry. They also expressed their appreciation for the funding in this year's State budget, funding that is enabling the Seed Lab to increase staff and equipment in addition to allowing the Seed lab to provide additional services.



Clockwise- Governor Steve Bullock, Faye Jorgensen, Richelle O'Leary, Ryan Holt, Bob Hodgskiss, John Sherwood, Tracy Stone-Manning - the Governor's Chief of Staff, , Dean Charles Boyer, Seed Lab Manger Bridget Westfall, and President Cruzado.



Bob Hodgkiss, Chairman of the Seed Lab Advisory Board, Bridget Westfall, newly hired Seed Lab Manager, and Governor Steve Bullock.



Faye Jorgensen showing Governor Bullock a TZ test that the Seed Lab runs for Montana growers.

Governor Bullock took a tour of the Seed Lab, observing first hand some of the tests provided. Bridget demonstrated the process of obtaining a purity analysis of a Pubescent Wheatgrass and Faye demonstrated Pea Germinations and the testing of the BASF Clearfield Trait in wheat. The discussion of the impacts of

quality assurance, cost effective testing services, economic and environmental issues generated many questions and comments from Governor Bullock.

Gordon Research Conferences: Science at the Cutting Edge

By Mark Young

For more than 80 years, the Gordon Research Conferences (GRCs) have been one of the most leading and most influential set of scientific meetings in the world. From a humble start as an informal gathering of scientists in the summer (mostly at prep schools in the New England area), to a year-round series of meetings held around the world that covers hundreds of research areas, the GRCs have become some of the best scientific meetings you will ever attend. Why are the GRCs so successful? The formula is simple; the meetings are small (typically <150), the meetings bring together the best in world in a particular field, the meetings are intense (early morning to late in the evening, with a long break in the afternoons); to promote interactions among participants the meetings are informal (few ties are ever seen), the meetings are long (typically a week and all participants are expected to stay the entire time), the meetings are mostly in remote areas, (no where to hide) and after most evening sessions there is a open bar (where the real science gets done). I encourage all students and faculty to actively participate in their field's respective GRC. It is hard to imagine a more important meeting to participate in for graduate students, postdocs, and faculty. In over 30 years of participating in GRCs, I can absolutely say they have been some of the most important and influential meetings with respect to my research program. To students, go to the GRC in your field, engage with the best, enjoy the scientific excitement and get ready to drink!

International Conference on Mycorrhizae By Cathy Cripps

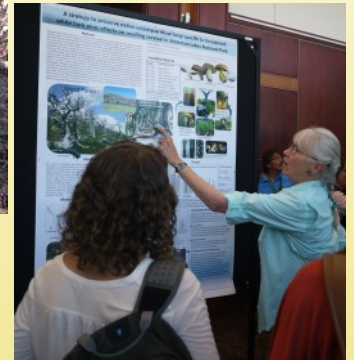
In August, we traveled to the 8th International Conference on Mycorrhizae in Flagstaff, Arizona. This conference has been ongoing for many years and was attended by around 500 researchers from numerous countries. The surrounding landscape of "naked geology" consisting of red sandstone walls, white cliffs, hoodoos (eroded sandstone pillars), canyons, deep arroyos and volcanic cones set the stage. Flagstaff is a beautiful city set in the midst of this desert scene, but the traffic was heavy and constant. There is a long history of humans in the area from Native Americans to the Spanish which is reflected in the architecture, monuments, and food. It was a once in a lifetime chance to collect rare desert fungi since unusual torrents of rain had pelted the area even causing floods. We had one special 'Inocybe' foray in the big ponderosa pines with experts: Brandon Matheny from Tennessee, Thomas Kuyper from The Netherlands, and



Cathy under giant ponderosa pine holding mycorrhizal mushroom



Desert landscape outside of Flagstaff



Cathy presenting her poster on whitebark pine and fungi

Steve Trudell from University of Washington, and myself; this was in addition to the primary foray. The Lowell Observatory where Pluto was discovered was another interesting side attraction.

The main question at these conferences is usually: Are you AM or ECTO? Actually, it is easy to tell who studies Arbuscular mycorrhizae (AM) and who studies ectomycorrhizal (ECTO) fungi. The AM folks are usually well dressed, probably reflecting sufficient funding from agriculture for research on crops. The ECTO people, on the other hand, typically have come fresh out of the forests where they study ectomycorrhizal ecology and they are attired in field clothes. And, the two groups rarely mix.

The main speakers were Tom Bruns of Berkeley who is examining big scale soil ecology with new molecular methods that tell us the full diversity of fungi in the soil and Jim Trappe of the USDA Forest Service who has had a long career studying hypogeous fungi (which do not fruit above ground). The Rytas Vilgalys lab at Duke presented new research showing the large number of genes (250-350) turned on in the fungi and in the trees when mycorrhizal colonization takes place. There was a lot of interest in my poster on the restoration of whitebark pine; similar research in Arizona is focused on pinyon pines but has not reached the applied stage yet. There were also 'lightening talks' of five minutes each which were quite effective and mostly went off

without a hitch except that presenters had to move quickly on and off stage.

Joe Morton, who is a big name in AM fungi, was touting his Montana roots - his mentor was our own Don Mathre. Some of you might remember Bob Antibus who took his sabbatical in my lab. He attended with his wife Joanne and we conspired on writing up our research using isotope signatures to determine nitrogen sources for various ectomycorrhizal fungi associated with whitebark pine. My husband Don was able to attend and passed the time discovering the area. It was interesting to see mycologists attempting to line dance in a 'cowboy' bar one night---here, AM and ECTO folks were finally united in symbiosis!

From there it was on to the high alpine country of Colorado.

Intercultural Experience in Québec, Canada- Summer 2015 **Jennifer Britton**

You know what's nice about Montréal? Not only is it a beautiful city, but you have Cuban cigars.
-Jamie Farr

We travel abroad to explore different places and people. It is a wonderful feeling to experience the world's diversity and see the commonalities interweaving humanity. Through travel, students gain global perspective, independence, tolerance, self-sufficiency, and resourcefulness- skills invaluable personally, academically and professionally.

The Québec Summer 2015 course served as a study/travel and exploration into our northern neighbors' unique Anglo-French culture, landscape design and horticulture. Our group included Elizabeth Ritchie, Marisa White, Nellie Reid and Christian Black (my fearless TA), and myself. We travelled with the intent to see, hear, and taste the culture. To walk, bike, bus and metro our way through gardens, parks, and markets.

Our accommodation included two youth hostels - HI-Montréal & HI-Québec City. Both are very convenient and comfortable. Our explorations included some old favorites in Montréal such as Old Montréal, Chateau Ramazay, Marche Atwater & Parc du Mont-Royal and of course the Montreal Botanical

Garden, always a favorite for students and professor alike. We arrived at the garden



Christian dressed in period clothes at the Civilization Museum



Elizabeth dressed up and juggling



Quebec Water Show



Random Street Sculpture

when it opened and were amongst the last to leave when it closed. For nine hours regardless of the weather (rain deluge!) we browsed the thematic gardens and greenhouses. **Just look at those hostas!**

To add some new experiences, I included some fresh excursions, a show of recent graduates from Cirque de Soleil performance school. The troupe originated in Québec and their entertainment center, TOHU, is the gem in the cap of the amazing brownfield redevelopment park Complexe Environnemental De St-Michel. True inspiration in sustainability. We also used Via Rail Canada to travel to charming Quebec City. Why rail? In part due to the absolute ease and convince of VIA and to show students that an efficient alternative can and does exist in North America (if not in the U.S.)! The enchanting Francophone capital of Quebec province is the oldest city in North America and a UNESCO World Heritage Site- a small taste of Europe on our side of the puddle.

Class curriculum included five projects with various learning outcomes and durations.

During the trip students were encouraged to seek a new experience beyond our time in-class and to describe it through written exposition. Suggestions included seeking out new food, music, shopping, museums, or events. Students also blogged the day's events complete with photos, sketches or any items that share the class's experience (<https://msulandscape.design.wordpress.com>).

They kept an ongoing travel sketchbook with the aid of a travel-sized camera *obscura*, a historically popular artistic device for plein air art. To deepen their experience of plant material and design students worked on a series of questions and descriptive narratives of the Montreal Botanical Garden and a "leave no trace" earth art with documentation of Parc du Mount-Royal, Montreal's significant park design by Frederick Law Olmsted. Their final assignment "retired" their worn and torn camera *obscura* in an in-situ photo record.

Like any study-abroad people, energy, and moods had some up-and-downs. Everyone is entitled to a few travel weary moments. It can be an intense experience to be outside one's comfort zone of people, place and space! But is that not the point? To grow, to learn, and in the end to experience differences and similarities in the human condition. Hopefully students saw their lives reflected in the Quebecois landscape as well. À la prochaine Québec.

Berry Workshop By Durc Setzer

The 2015 Cold Hardy Berry Workshop started with coffee, pastries and light conversation. Zach Miller, coordinator of the Montana Cold Hardy Fruit Project, introduced speakers Kathy Wiederholt of NDSU and Bob Thaden of Tongue River Winery.

Kathy Wiederholt began the workshop with an introduction to the Northern Hardy Fruit Evaluation Project initiated in 2006 at the North Dakota State University Research Center in Carrington, N.D. Kathy is the leader of that project and has managed the project from inception. The fruit trialed there that she spoke of included; apples, aronia, black, red and white currants, dwarf sour cherries, grapes, haskap/honeyberries and juneberries. She covered management topics about the plants including hardiness, pest and disease issues, pollination requirements, and fruit quality. One of her most surprising details was the absence of bumble bees in Carrington and the consequently poor fruit set during cold springs.



Bob Thaden's talk was on northern shrub fruit applications for wine. Kathy Wiederholt (foreground) spoke about fruit research at NDSU Research Center in Carrington, North Dakota.

After Kathy's presentation, Bob Thaden of Tongue River Winery took the stage to present about winemaking and orchard management in an arid environment in Montana. Bob and his wife Marilyn have been making wine for 40 years, and started their grape vineyard in Miles City in 2004. Since then they have been expanding their vineyard and planting other fruit plants like aronia, pears, dwarf sour cherries, apples, honeyberries, currants, and raspberries that they also utilize in their wines. Bob manages his vineyard and orchard with an iron fist, as he has learned he must in Montana where complete crop failures are common and every fruit or berry counts when your business depends on them. One of his innovative management techniques includes protecting the plants from both rodents and herbicide with large PVC collars. With the collars he can use glyphosate with almost total row coverage to manage weeds, use of drip irrigation and wood mulch also keep weeds at bay. Bob observed early on that birds can strip a vineyard bare in a short time. Frustrated by the birds' ability to circumnavigate conventional bird netting, Tongue River Winery adopted a method used by Asian orchards; complete netting of the vineyard. The entire 250' by 250' vineyard is netted with a high ceiling and side panels every year, to be removed before snowfall. Bob claims this is the best management decision he has made as losses to birds are now zero, and he has freedom to manage the plants without having to fight bird net on every row.

Following Bob's presentations, the workshop took a break for fruit tastings. The tastings consisted of frozen currant, aronia, juneberry and haskap berries, aronia and haskap fruit snacks, aronia and haskap

juices and haskap jam. Haskapa.com of Nova Scotia, Canada generously donated some of their products.

After the tastings, Kathy gave a presentation about pruning practices for the different types of plants involved in the workshop. Kathy's typical mantra concerning pruning is spreading and open, so that the plant receives air flow and weak growth is removed. Her parting advice was that when pruning you are going to make mistakes at first that will probably make you cuss, but the plant will regrow and you will both be better for it the next year.

After this final presentation concluded the audience broke for the wine tastings from Tongue River Winery. The wines tasted included White Raspberry, Apple Ice, Haskap, Cherry Pie, Chokecherry, Black Currant, Aronia and others. The Thadens were very generous, sharing some of the last bottles of their highly demanded, low production specialty wines.

American Phytopathological Society Meeting By Carmen Pol

The National American Phytopathological Society (APS) annual meeting was held in Pasadena, California from August 1-5. Dr. Barry Jacobsen, Alan Dyer, Carmen Pol, Erin Gunnink Troth and Nar Ranabhat had the privilege of attending.

Erin presented in the Epidemiology and Disease Management technical session, discussing the population dynamics of coexistence between *Cochliobolus sativus* and *Fusarium*. Erin also competed in the Pacific Division Student Oral Presentation competition and was selected as the third place winner for her technical session "The Population Dynamics of Coexistence between *Cochliobolus sativus* and *Fusarium pseudograminearum* in Wheat."

Nar presented in the Impact of Cultural Management on Disease Technical Session, discussing the impact of cover crop termination methods on diseases of wheat and lentil. Carmen presented her research on the control of wheat curl mite, vector to *Wheat streak mosaic virus*, with pesticide applications on wheat in the Chemical Management of Plant Disease Technical Session. She also presented the work of



Carmen Pol with her poster entitled, "Plant Virus Biology for Advancing STEM Teaching" at the APS meeting.



APS members are given a tour of one of the humid sub-tropical greenhouses at Huntington Gardens.



A Kishu Shimpaku Juniper bonsai, part of the Huntington Gardens Japanese bonsai collection.

Irene Grimberg and colleagues on "Plant Virus Biology for Advancing STEM Teaching" in a poster session.

Sixteen hundred people, both national and international guests, attended the numerous special sessions, technical sessions, poster huddles, dinners and ceremonies. The conference kicked off with an awards ceremony recognizing distinguished APS members and their achievements.

Plenary sessions included Crossroads in Science, California's drought and drought response and connecting four generations of scientists with communication.

Erin and Nar attended a field trip to Huntington Gardens and were taken on a tour of the conservatory and greenhouses, as well as the tissue culture lab and gardens. The Gardens hopes to achieve a major organizational shift - instead of keeping plants (an endeavor which requires significant greenhouse space and runs the risk of losing unique cultivars to disease), they would like to store seed banks and, eventually, use frozen plant tissue for clonal species propagation if the technology becomes available.

According to the tour guide, the most common sources of new diseases are from the transportation of firewood and the import of plants from other countries, which often accompany families that immigrate to the United States through Los Angeles. Management of the gardens generates substantial plant waste, which is mulched and reused by the gardens to avoid importing insect pests in bark from other locations both within and outside of California. The tour guide mentioned that diseases typically don't persist in the plant matter after they have been shredded, and recycling the plant material hasn't presented problems with regards to disease control. The group toured the Japanese Gardens, which featured a fantastic collection of bonsai, the Cactus Gardens and Palm Grove, and several others that Erin missed after wandering off. It will be exciting to see what next year has to offer in Tampa!

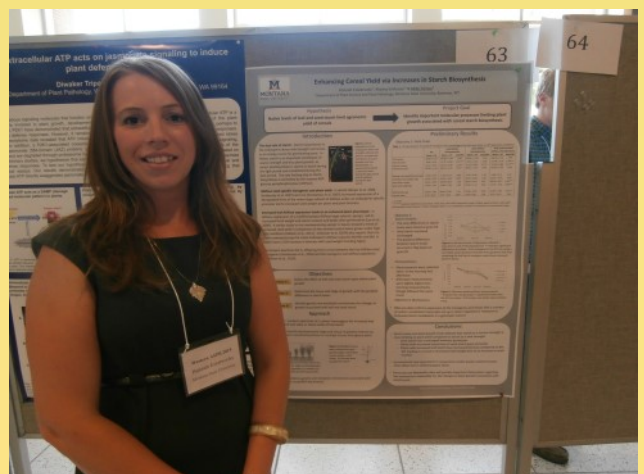
American Society of Plant Biologists Conference

By Hannah Estabrooks and Darby Kammeraad

Recently, both Hannah Estabrooks and me (Darby Kammeraad) attended the 2015 Western Section American Society of Plant Biologists conference in Pullman, Washington. My experience with conferences in the past have been solely focused on cereal quality, but this conference provided an opportunity to gain a more broad understanding of plant biology and see what specific areas are being studied in our region of the U.S. Not only did Hannah and I hear about a wide variety of topics in both the poster session and presentations, we also participated. Hannah showed her poster entitled "Enhancing Cereal Yield via Increases in Starch Biosynthesis", which was a summary of her work with transgenic rice. I



Darby Kammeraad giving his PP presentation entitled, "Mutagenesis Derived Puroindoline Alleles in *Triticum aestivum* and Their Impacts Upon End-Product Quality"



Hannah Estabrooks with her poster "Enhancing Cereal Yield via Increases in Starch Biosynthesis"

gave a presentation entitled "Mutagenesis Derived Puroindoline Alleles in *Triticum aestivum* and Their Impacts Upon End-Product Quality," summarizing my work with new grain hardness alleles. Hannah and I both won travel awards, having been two of the furthest traveled students at the conference. We like to think the conference was well worth the seven hour drive, especially when we picked up some delicious cherries in St. Regis, Montana! Hannah and I also agree that one of the most interesting presentations at the conference involved the cold treatment of pears to induce ripening. We were amazed to find out that pears require many weeks of cold treatment before they are able to ripen, and that some of the pears you are able to buy at the grocery store are not always cold treated.

Aquatic Meeting By Danielle Grimm and Jeff Pashnik

In July, Jeff Pashnik and I, along with our advisor Dr. Ryan Thum, attended the Aquatic Plant Management Society conference in Myrtle Beach, South Carolina. This annual conference focuses on advances in methods and technology for aquatic plant management.

We were thoroughly impressed by the numerous professional development opportunities for graduate students at the conference. The organizers clearly put thought into how to maximize the learning opportunities for students within the structure of the conference. One way in particular was through several luncheons designed specifically to facilitate interaction with people of all levels within the aquatic plant management industry, including employees of the EPA, researchers, regulators, and herbicide manufacturers.

All attending students were encouraged to present on their research topics in order to both present research relevant to aquatic plant management, and also as an opportunity to present and be critiqued in a professional setting. The society sponsored a student paper contest, which provided feedback on the organization, content, and professionalism of the talks presented at the conference. Jeff and I both presented, and we both received valuable experience and feedback, both formally through the presentation, and through conversations after the talk with people from both an academic and industry background.

My paper presentation focused on the role of parental species on specific invasive characteristics such as growth rate and reproductive rate. I was able to relate my experiment to management practices through reinforcing the need to limit introduction of new

plants into lakes already invaded by watermilfoil. I obtained valuable feedback on my presentation, and on how to improve my project for greater relevance. Jeff's presentation focused on a genetic study of the evolution of herbicide resistance and the need for more molecular genetic studies within the industry. He was able to identify an unfilled niche which would provide excellent opportunities for providing new knowledge to the group.

The conference concluded with a tour of the beautiful South Carolina wetlands for the students who attended. We were provided with the opportunity to observe a pristine aquatic plant community, complete with a wealth of native wildlife. This tour provided us with examples of how herbicide applicators evaluate and treat lakes and waterbodies, along with a view of what a balanced southern aquatic ecosystem looks like. Considering that the majority of our experiences have been in northern waterbodies, it was informative to compare the composition of waterbodies in the two very different climates, and to see some of the factors that are of importance to a key audience for our research.

In conclusion, the conference was an excellent experience. The group was exceptionally welcoming to students, with several sessions dedicated to informing students of professional development opportunities within and outside of the industry. Additionally, numerous events were designed specifically to help students form professional connections. All in all, the conference was a fun and informative experience, and we look forward to attending again next summer.

Advanced Plant Disease Workshop By Eva Grimme

On July 23 and 24, 16 agricultural consultants, county agents, and private applicators attended the Advanced Plant Disease Diagnostics Training Workshop put on by the Mary Burrows and Alan Dyer. Those who attended the workshop earned Certified Crop Advisor and Montana Department of Agriculture Pesticide Applicator credits. Included in the workshop was instruction on the use of microscopes to identify pathogen structures and field trips to learn how to look for and recognize diseases in wheat and barley.



Alan Dyer demonstrating a method for identifying take-all of wheat.



Scouting for disease in the field.



Clark Schmidt from BASF discussing symptoms in wheat with one of the attendees.



Mareike Johnston demonstrating how to use a microscope to identify crop diseases.



Andrea Varella won second place at the 2015 NAPB graduate student poster competition. Seventy-five students presented their posters at the competition.

National Association of Plant Breeders Meeting

By Roshan Acharya, Jamie Smitchger, and Andrea Varella

We attended the 2015 National Association of Plant Breeders (NAPB) meeting in Pullman, Washington, which was hosted by Washington State University (WSU). The meeting was well attended by nearly 200 people from many different backgrounds, which were nearly equally split between professional plant breeders and graduate students. Luckily for the graduate students, the activities and agendas were focused towards lifetime learning, especially for students. Many creative ideas such as collaborative short term (1 week) and long term (2-3 weeks) student training were discussed. Students were allowed to participate in a poster contest, and Andrea won second place (75 entries) in the poster contest for her research with QTL's conferring resistance to wheat stem sawfly. Field visits, demonstration plots, and displays of various instruments allowed us to experience new and existing technologies that could be

incorporated into a future breeding program. This meeting was also a great networking opportunity to meet potential employers and faculty members from different industries and universities. It was also interesting to meet the authors of various papers in our literature reviews. Many successful plant breeders in both academia and industry shared some of the struggles they faced in plant breeding when they were just starting their career, which was very encouraging for the graduate students. By listening to different talks from professors and scientists, we were able to understand the overall progress in plant breeding activities throughout the United States. We would



Attendees of the 2015 National Association of Plant Breeders' meeting.

highly recommend the conference to professional plant breeders and other graduate students in plant genetics.

Finally, after driving through miles and miles of the rather boring Palouse hills around Pullman, we also realized how special Bozeman really is.

MAL! Schedule

September 13 - Emily Glunk, Forage Specialist: "Today's livestock picture in Montana"

September 20 - Russ McElyea, Montana's Chief Water Court Judge: "Droughts, Floods, 1860s water rights!"

September 27 - Bruce Maxwell, MSU Agro Ecologist: "Amazing advances in precision farming and the development of producer development of on farm research programs"

Course Focus

BIOB375 "General Genetics"

By Bob Sharrock



In the last few years, BIOB375 "General Genetics" has been taught by Luther Talbert, Li Huang, Michele Flenniken, Jaime Sherman, Ryan Thum, or me. It is now offered in both the Fall and Spring semesters, when class sizes are in the 100-

200 students range, and also in the summer, when the class size is 20-30. It is a 3 credit course, entirely lecture in format (no lab), and is either a required class or an elective in a wide range of undergraduate majors. An alternative upper-division genetics course, BIOB377 "Practical Genetics", is taught in Spring by Norm Weeden or Phil Bruckner. There is also a human disease-focused course for the pre-meds called BIOH320 "Biomedical Genetics", which is taught by Cell Biology and Neurosciences faculty. Every instructor has their own individual take on how this very large and important subject is taught but we all cover essentially the same material and use the same or similar texts.

Most areas of science are advancing in interesting new directions these days and the resulting discoveries and innovations will have enormous effects on our lives and those of generations to come. One could argue that, in the last 100 years or so, the science of genetics has changed how we think of ourselves as humans and how we deal with

challenges such as feeding ourselves, keeping ourselves healthy, and understanding our environment as much as any field of endeavor. So, I think of BIOB375 as an important cornerstone class for all majors related to biology and for anyone who would like to understand how living things work on a "biological information processing" level. Students come into the class with a background of having seen some of the concepts and material in high school and in popular writing (in many cases this isn't very much) and having taken a one semester course of 100-level or 200-level introductory cell and molecular biology. From that starting point, we address a standard set of topics in basic genetics and, with each concept or structure or mechanism, we try to build connections to other ideas we've already covered or will cover and, hopefully, to the big picture in biology. Cell division – you can't understand biology unless you know where it comes from. Sex – yea! Mendelian genetics – such a simple model to start from. Chromosomes and genes and how genetic information becomes our 3-dimensional biological world. The origins of new gene alleles and the flow of alleles over generations in populations. Breeding, genetic engineering, and new things like RNA-mediated gene control and epigenetics. There are a lot of topics and concepts to cover and we move along at a fairly brisk pace.

There are a number of higher-level undergraduate courses at MSU that build on the background provided by BIOB375, BIOB377, or BIOH320. The field of genetics will continue to change very rapidly over the coming years and is increasingly expanding into everyone's lives through new developments in health care, food production, industrial biotech, and environmental science. I look forward to explaining and discussing these changes in BIOB375 along the way.

New Employees

Heather Rimel - Montana Seed Growers Association



Heather Rimel has accepted the position of Manager of the Montana State Seed Growers Association after the retirement of Ron Larson in June. Heather has worked for MSGA for 8 years and is looking forward to being the Manager.

Bridget Westfall - Montana State Seed Testing Laboratory



Bridget Westfall has accepted the position of Manager of the Montana State Seed Testing Laboratory. She has worked in the Seed Lab for 27 years and is eager to take on the challenge of being the Manager.

Bridget says, "Our goal in the Seed lab is to evolve with the agricultural industry. We will be hiring talented staff, up-dating equipment and offering relevant tests to meet our customer needs. I am confident that this will enhance our service by providing accurate, timely and cost effective seed analysis thereby supporting Montana's diverse and ever evolving agricultural industry. Our current employees, Faye Jorgensen and Richelle O'Leary, are very knowledgeable and enthusiastic about seed testing. We have a great team working for the success of all."

Erin Gunnink Troth



Hi all, I'm Erin Gunnink Troth. I'll begin working for Alan Dyer as a research associate this September after wrapping up my Master's degree. You may already know me, as I've earned my Bachelor's and Master's degrees from MSU and am semi-native to Bozeman. If you're not sure which graduate student I am, I'm the one that usually has purple hair.

My Master's work involved the ecology of the wheat pathogens *Fusarium pseudograminearum* and *Cochliobolus sativus*, and other members of the dryland root rot complex of wheat as well. I'll continue working with crown rot pathogens of wheat in Alan's lab and will likely be developing qPCR protocols for other pathogens. I look forward to continuing to work with the Department of Plant Sciences; come find me in 237 Plant Bioscience.

New Graduate Students

Andy Burkhardt (Jamie Sherman)

My name is Andy Burkhardt and I am Jamie Sherman's new doctoral student. Originally from rural southeastern Indiana, I received my B.S. from Purdue University in Soil and Crop



Andy Burkhardt

Management. After completing my degree, I worked in the ag industry for a few years, first conducting research on the *Miscanthus* genus as a candidate feedstock for biofuel production followed by a year as a yield trial manager for a corn breeding program in the Eastern Corn Belt.

Following my time in Indiana, I moved to Wyoming to pursue my M.S. in Agronomy from the University of Wyoming. My thesis was focused on utilizing coalbed natural gas produced water for irrigation on several crop species and what effects produced water had on plant secondary metabolites (essential oils) and their content and composition.

My work with Dr. Sherman will broadly focus on using conservation agriculture and traditional breeding efforts to curb production problems in Montana agriculture. My wife and I relish our time outside. From hiking to snowshoeing to walking our dog Baron, we love being outdoors. So far, it seems like the transition from Wyoming to Montana has been an easy one (although I'm still getting used to having so many people around!) and I'm excited about where the years ahead will lead me.

Megan Getz (Jamie Sherman)



I grew up in a small town named Tremonton, which is located 20 minutes south of the Idaho/Utah border. When I was young, I loved to help my father farm; it didn't matter what the job was, I was there ready to learn. As I grew older I became more involved in our family farm. I love the

lifestyle and I love to learn so after graduating high school, I decided to attend Utah State University, USU. While there, I worked in the Cereals Breeding Program and loved it. I focused my degree towards plant breeding and graduated with a B.S. in Plant Science and minors in Soil Science and Agribusiness. After my time at USU, I knew I wanted to further my education by entering a graduate program under someone with a strong genetics background. I am very excited to start my experience here, at MSU, working with Dr. Jamie Sherman, and her barley team.

Patents

Gary Strobel, Angela Tomcheck, Patent No: US 9,090,921B2, July 28, 2015, "Method of Producing Volatile Organic Compounds from Microorganisms".

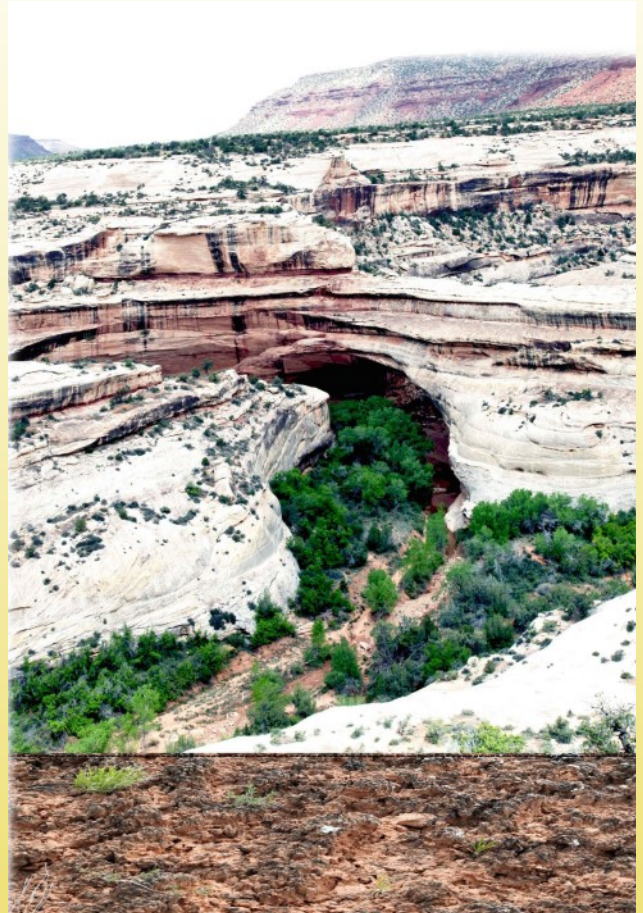
Publications

Gary Strobel, Cover Photo, *Microbial Ecology* Vol 70 No 2., August, 2015.



Lichens are one of the world's most interesting microbial life forms since they consist of a symbiotic relationship between a fungal and algal or cyanobacterial species. Lichens occur in a wide range of ecological conditions and on a wide range of surfaces as illustrated in these photos. Color on the Montana prairie is imparted by a variety of lichens in the three panels shown on the cover. The majority of the lichens shown are of the crustose type growing on sandstone in the top photo while the middle photo shows a lichen species nearly covering both a granitic stone and a tuft of organic matter. In the latter case the fruiting – disc shaped fruiting structures of the fungal ascomyceteous symbiont are numerous. In the last panel is the beginning of two lichen colonies on a dinosaur bone fragment (top middle bone fragment) from the cretaceous period (65-70 million years ago). (The black line is equivalent to 4.5 cm)

Gary Strobel, Cover Photo, *Microbial Ecology* Vol 70 No 1 , July, 2015.



The Kachina natural bridge (with a span of 262') is located in Natural Bridges National Monument, Utah, and designated as such during Theodore Roosevelt's administration in April of 1908. The Colorado Plateau was uplifted at the end of the Cretaceous period and since then the combined forces of erosion including flowing water, glacier action and wind have each helped to dissect the landscape that is seen today (upper part of the cover photo). Associated with the much of the park area are untouched cryptobiotic soils (lower photo). These tufts of soil create a crust that can be found in many parts of the world. They are extremely sensitive to compaction and other forms of disruption. The primary microbes found in these soils are various cyanobacteria while many other forms are also present including filamentous fungi, bacteria, lichens, green algae, mosses and actinomycetes. These fully formed soil crusts are important in erosion control, nutrient recycling and water retention.

The Mathre Courtyard Blooms Again!

Once again, thank you to Deanna Nash, Toby Day, Dara Palmer, and several Master Gardener and PSPP volunteers for making The Mathre Courtyard look absolutely amazing this year! David Baumbauer supplied the soil that Easton Volz and Josh Brewer used to prep the six pots for planting. Deanna filled the pots with lobelia, geraniums, bacopa, licorice, petunias, verbena, osteospermum, and yellow biden. Toby and several volunteers brought in new soil and planted dozens of annuals.



Six planters were planted by Deanna Nash, Manager of the Cereal Quality Lab.



Annuals planted by Toby Day and Master Gardeners.



Yvonne Baskin and Toby Day organize annuals for planting in the Mathre Courtyard.



Gallatin County Master Gardeners sort plant ID tags for display.

Toby Day and Gallatin County Master Gardener volunteers planted the Mathre Courtyard with annuals grown by Day's Hort 232

Herbaceous ID class. For their annual flower project the students have to grow annuals from seed and care for them throughout the semester. They are required to create a professional quality ID/care tag complete with growth habit, flower color, photos, and cultural

requirements. In the spring those annuals are planted at the Mathre Courtyard, along with their care tags, for everyone to enjoy over the summer. Gallatin County Master Gardener, Shelley Lewton, cared for the garden this season, making sure it was weeded and adequately watered. Big thanks to Shelley for a great job keeping the courtyard looking great!

Masters Gardeners from around the State take Level 3 Class

By Toby Day, Extension Horticulturist

Twenty-seven Master Gardeners from ten counties around the state completed the Level 3 intensive training in Bozeman, August 20-22. Level 3 Master Gardener is the highest level in Montana and the volunteers are handpicked by their county or reservation agents to represent MSU Extension in their communities.

Master Gardeners had temperament training to learn how to work more effectively with volunteers, learned from each other about current IPM issues, toured the PGC and the Schutter diagnostic lab, had a great lecture from Mike Ivie, and a tour and learning



2015 Level 3 Master Gardeners visit Rocky Creek Farm and listen intently to Pete Fay, owner and former MSU Extension specialist and professor, talk about raspberries.

session at the insect collection at Marsh Lab. They also toured the Farmer's Market, Hort Farm, a local market farm and a U-pick operation. The counties represented include: Broadwater, Cascade, Chouteau, Fergus, Flathead, Gallatin, Jefferson, Lewis & Clark, Pondera and Yellowstone. A big thank you to Dara Palmer, David Baumbauer, Eva Grimme, Laurie Kerzicnik, Noelle Orloff, Mike Ivie and all of Mike's graduate students and helpers during the visit, and also Pete Fay with Rocky Creek Farm and Three Hearts Farm for the tours.

Late-summer Wasps

By Laurie Kerzicnik, Extension Entomologist



Western yellowjacket

It's that time of year again where we start to share our backyards and porches with wasps. We have both social and solitary wasps. Some of our more common social wasps are the Western yellowjacket, the baldfaced hornet, the

aerial yellowjacket, and the European paper wasp. For solitary wasps, we have spider wasps and mud daubers. With the exception of the Western yellowjacket, the social wasps are typically not aggressive unless their nest is disturbed.

The baldfaced hornet, aerial yellowjacket, and paper wasps feed on live insects. Thus, most are beneficial and feed on a lot of our garden pests. The Western yellowjacket is a scavenger, so it feeds on garbage, anything you eat on the backporch, and dead insects. It is the biggest nuisance pest this time of year around our backyards and porches. Although other wasps and bees can sting, most of our stings come

from the Western yellowjacket. For control, most of the social wasps are beneficial and won't bother you. For the Western yellowjacket, try to locate the nest. This is often difficult as their nests are subterranean or sometimes in wall voids. In general, the best time to control social wasps is early in the spring when the nest size is just a few cells. In the early spring (or now, if absolutely necessary), if you spot the nests, you can jet them down with water or wasp/hornet spray (synthetic pyrethroids) on a cold morning or evening when the nest is not very active. The colonies will be abandoned in late summer, and only the queen and fertilized females will survive. They will find another place to overwinter and will start a colony elsewhere the following spring. There are Western yellowjacket-specific traps available from local garden or hardware stores. These are most effective when in the early summer, before the Western yellowjacket colonies become large.

Recipe of the Month

Double Berry French Toast Special



2 (6 oz) containers raspberries
1 (16 oz) container strawberries
5 T sugar, divided
10 oz cream cheese softened
12 oz French bread, cut diagonally into 16 slices
1 1/2 c whole milk
1/2 t cinnamon

1/2 t vanilla extract
1/4 t salt
5 large eggs, lightly beaten
2 T turbinado (raw) sugar
Warm maple syrup
Garnish with sweetened whipped cream and fresh strawberries and raspberries

Combine raspberries, strawberries, 2 tablespoons sugar in a medium bowl; toss gently to coat. Let stand 30 minutes.

Strain berry liquid into a medium bowl, reserving berries. Add cream cheese to liquid, stirring to combine. Spread cream mixture evenly over 1 side of 16 bread slices. Place 8 bread slices, cream cheese side up, in a 9- x 13-inch baking dish. Sprinkle with reserved strawberries and raspberries. Top with remaining 8 bread slices, cream cheese side down.

Whisk together milk, cinnamon, vanilla, salt, eggs, and remaining 3 tablespoons sugar in a medium bowl; pour milk mixture evenly over bread slices, and sprinkle with turbinado sugar. Cover with foil, and refrigerate 8 hours or overnight.

Preheat oven to 350°. Bake, uncovered, 50 minutes or until top is lightly browned and set. Serve with maple syrup; garnish, if desired.

September Birthdays

Tracy Dougher	1
Laurie Kerzicnik	2
Irene Decker	5
Michelle Flenniken	18
Gary Strobel	23
Judah Davich	23
Joseph Kibiwott	23
William Dyer	26
David Baumbauer	27

