

Plant Science Says



Happy Thanksgiving!

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MSU Students Listen/Learn on Northern Cheyenne and Apsaalooke Reservations By Florence Dunkel

Action research for the semester in AGSC 465R Health, Poverty, Agriculture began September 20 with a gathering in the field at Florence Dunkel's to learn to identify several plants important to the Northern Cheyenne and Apsaalooke: mountain big sagebrush, yarrow, prairie sage, chokecherry and peppermint. With students, Dunkel discussed the chemistry, morphology, growth patterns, and the medicinal and bioactive properties of these plants. She also contrasted information from Native Science and Western Science sources. In addition, Dunkel introduced students to her field studies with the Mexican marigold, *Tagetes minuta*, that came from traditional wisdom on organic gardening shared with her by subsistence farmers in Rwanda. Students shared a dinner from the garden and harvested vegetables for their stay on the reservations and for gifts to the Elders.

The next morning, students departed with Dunkel for four days living on the reservations.



Native American Studies and Liberal Arts student, Avery Old Coyote reunites with his auntie, Apsaalooke Luella White Man Runs Him at her home when she met with his classmates.

During these special teaching moments, students listened to elders on both reservations, met family members of their Northern Cheyenne and Apsaalooke classmates, visited one of their off-the-grid homes, and participated in the march of Chief Dull Knife's students and faculty to the Tribal Council chambers to meet with the Northern Cheyenne Nation President.

Students met with both the President of Chief Dull Knife College, Dr. Richard Littlebear, and the Vice President of Little Big Horn College, Dr. David Small.



Ag Ed grad student JB Gans gathers spinach while his classmates harvest kale in Dunkel's and her husband, Bob Diggs', garden, for the reservations visit.



In Crow Agency MT, Liberal Studies and former AGSC 465R student and Apsaalooke site mentor, Tracie Small briefs AGSC 465R students on the Elders and her family we are about to visit. From left, Equine Science student Katherine Fletcher, Rhea Henning, Carissa Stein, Sustainable Foods student Karen Page, Avery Old Coyote, Tracie, Liberal studies students Brady Hogan and Monica Gray.

The Apsaalooke team returned September 28 -30 to hold a traditional buffalo berry picking event with an Apsaalooke Elder and junior high and high school students on the reservation in Lodge Grass, Montana. Planning for this event began with AGSC Apsaalooke students from previous semesters who had learned through the holistic process with Elders (107th Meridian Committee) and Lodge Grass High School students that this was a highly valued activity that they needed help organizing.

Then, on October 17, Dr. Littlebear travelled to MSU to participate in our three hour class. Together, using role plays, we explored environmental issues facing these reservations.

The Northern Cheyenne team within AGSC 465R returned to the Reservation October 25 -27 to put into action what the Cheyenne had requested. Through the holistic process, MSU students learned that the Northern Cheyenne would like help initiating place-based, outdoor environmental education sessions for fourth graders at St. LaBrea (Ashland Montana) and reservation schools and initiating green energy technology educational opportunities.

This semester, other AGSC 465R students are working remotely in Sanambele, Mali; Nagoya Japan; and Kingston, Jamaica.

Toby Day Wins Distinguished Staff Award



Toby Day receives Distinguished Staff Award. Photo courtesy of Jenny Lavey.

Congratulations to Toby Day, Extension Horticulture Associate Specialist and Montana Master Gardener Coordinator, for being awarded the Distinguished Staff Award during the 2013 MSU Homecoming Ceremony on October 4. This award recognizes a staff or non-Senate academic appointee from each college for having

distinguished himself or herself in the areas of leadership, achievement, outreach, and/or meritorious service to the college. Toby is a Bozeman, Montana native and an alumnus of

MSU. He has an unsurpassed enthusiasm for gardening and when he is not traveling the state educating people on horticulture issues; he can likely be found planting or designing something for his unique yard at the home he shares with his wife Jennifer Dunn.

Dara Palmer, Assistant Master Gardener Coordinator, states, "No one is more deserving of this award than Toby; he is passionate about and dedicated to all aspects of his position and he is a very motivational and inspiring employer," said Dara Palmer.

Congratulations Toby!

Steve Hystad Wins Second Place in Student Competition

This October, I had the opportunity to present my research project at the annual meeting of the American Association of Cereal Chemists International (AACCI) in Albuquerque, New Mexico. Earlier in the year, I had submitted an abstract of my work entitled, "The incorporation of a nil polyphenol oxidase (PPO) trait into Montana Wheat Varieties" into the "Best Student Research" competition.



Steve Hystad, third from right, along with the other best student research finalists. Photo courtesy of Steve Hystad.

Of about the 30 abstracts submitted, I was chosen as one of the six nationwide finalists to give a short 20 minute presentation of their work to an audience of fellow AACCI attendees as well as six judges consisting of industry experts and professors of cereal science from Kansas and North Dakota State University. I was a little apprehensive about presenting my research for the first time at a conference. Days prior to the event, the thought of being the lone Master's student competing among five other PhD students with much larger projects became apparent in my mind. This mental notion certainly did not assist any efforts to avoid a feeling of unassertiveness. However, before I got up to speak, I remember chuckling to myself as I

recalled the somewhat wise words of Duke Pauli, "No one cares about your research as much as you do." That perception had been quite right in this context, as I doubted the judges would critique my research as intensively as I had done myself.

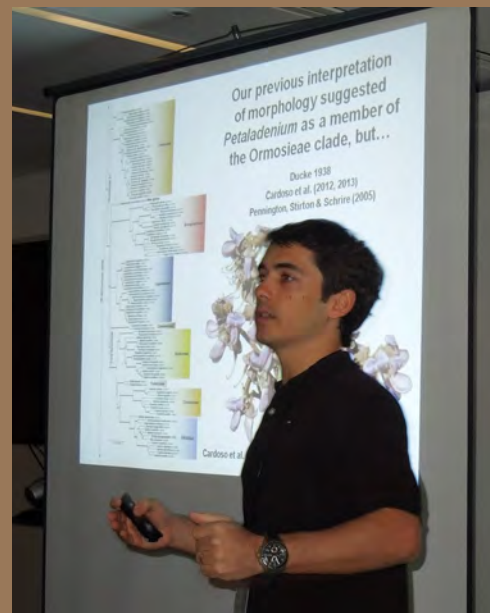
With a few days to spare until I found out the results of the competition, I got the chance to briefly explore Albuquerque opting out of the tour of the botanical gardens and instead indulging my inner geek by visiting a few sites in close proximity to the convention center that had been frequented by the fictitious characters of Jesse Pinkman and Walter White of AMC's television series, *Breaking Bad*. The rest of the time, I wandered around the rest of the convention hearing seminars, networking with R&D members of the food industry and eating "Yet to be released" food products from Pepsico, Tree Top, Quaker and Kellogg's.

Overall, my first convention was an invaluable experience. In my involvement at MSU in the PSPP department, research and courses taught reflect scientific inquiry into "Preharvest" aspects of agriculture. The majority of topics discussed at the AACCI convention were dealing with "Postharvest" issues which ranged from making food based products more nutritional and shelf stable to detecting mycotoxins in flour. Altogether, it was very enlightening to discuss postharvest issues with students and experts in this previously unfamiliar area of research. While waiting for my connecting flight into Bozeman, I found out that I had done much better than I had expected, finishing 2nd overall in the competition. A big thanks to everyone who helped me prepare for this talk, including my committee members, fellow graduate students and my associates in the Giroux lab. Another big thanks to John Sherwood for the nomination.

Congratulations Steve!

Domingos Receives Award from Brazilian Ministry of Higher Education By Matt Lavin

Domingos Cardoso, who spent most of 2011 working on the molecular systematics portion of his PhD research in Matt Lavin's lab, has just received an award for the best Brazilian PhD thesis in the area of biodiversity (among all those produced by Brazilian post-graduate programs in Botany, Zoology, and Ecology). This award comes from the Brazilian Ministry of Higher Education. Through its CAPES program



Domingos presenting on part of his PhD research to the staff and faculty at the Herbarium of the Royal Botanic Gardens, Kew (U.K.) during October of 2013.

(Coordination for the Improvement of Higher Education Personnel from the Portuguese Coordenação de Aperfeiçoamento de Pessoal de Nível Superior), this Ministry presents awards every year for the best PhD thesis in different areas of knowledge, one of which includes biodiversity.

Domingos successfully defended and completed his PhD thesis during 2012 and the CAPES prize he just received during 2013 represents the first time it has been awarded to a thesis involving the study of plant diversity (rather than animal diversity) using plant taxonomic and molecular phylogenetic methods. Domingos' thesis was entitled "Systematics of Papilionoideae (Leguminosae): phylogeny of the early-branching lineages and taxonomic revision of *Luetzelburgia*" and supervised by Dr. Luciano Paganucci de Queiroz at Universidade Estadual de Feira de Santana, Bahia, and co-supervised by Matt Lavin. So far, Domingos has produced ten peer-reviewed publications from his PhD research and has already gained considerable international recognition for his efforts.

Domingos will formally receive the CAPES award in an official ceremony in the Brazilian capital, Brasilia, on the 10th December, 2013. Domingos currently has a post-doc studying the diversity of the legume family (Fabaceae) in tropical South

America, which includes visits to European plant collections. This CAPES prize will also guarantee to Domingos a three year post-doctoral scholarship in Brazil or a one year post-doctoral scholarship abroad. We can only hope that Domingos will return to Montana State University during at least part of his upcoming post-doc!

**Horticulture Students Win Awards
By Bill Hoch**

Five Environmental Horticulture students recently passed the Montana Nursery & Landscape Association Certified Plant Professional (CPP) examination and received their CPP certification. Heather Begger, Hannah Estabrooks, Tyler O'Leary, Josh Pecukonis and Kia Simshaw successfully completed the plant identification segment of the CPP examination on Sept. 21st, and had previously passed the written segment in May. Congratulations to all!



Tyler O'Leary



Hannah Estabrooks



Heather Begger



Josh Pecukonis



Kia Simshaw

SFBS Harvest Fest

The Sustainable Foods and Bioenergy Students hosted a Harvest Fest at Towne's Harvest Garden on Thursday, October 3, to celebrate the new academic year and autumn harvest. Delicious seasonal, local fare such as pumpkin apple soup, herbed potatoes, zucchini bread, and local range burgers was provided by the SFBS Student Collaborative. The music was provided by Murder Mountain Speedway. Approximately 50 students, staff, and faculty attended.



Among those attending the event were John Sherwood, Bill Dyer, David Baumbauer, Chaz Holt, Bruce Maxwell, Pat Hatfield, and Selena Ahmed, new Director of SFBS. Photo courtesy of Chaz Holt.

2013 Ag Fair



The MSU Ag Fair (formerly Ag Appreciation Weekend) was held the weekend of October 26. Our Department was represented by The Schutter Diagnostic Lab, The Cereal Quality Lab, Dave Sands' Lab, The Montana State Seed Testing Lab, The Montana Seed Growers Association, The MSU Seed Potato Certification Program, and The Turfgrass Management Class.

Please go to the last page of this newsletter for more images of our participation in the MSU Ag Fair.

New Employees

Faye Jorgensen

I was born and raised on a 70 cow dairy farm with four brothers and two sisters in Perham, Minnesota. I came to MSU after seeing a picture of the campus with the M in the background. After marrying Dale and graduating from MSU we set up a farming



operation in Perham, Minnesota and then moved to Bridger, MT and farmed there. From there we moved to Miles City where Dale sold Ag Chem products and then to Aberdeen SD. There I started working as a grain inspector at Aberdeen Grain Inspection.

Seeing the opportunity to work at the Montana State Seed Lab, we jumped at the chance to move back to Montana and are amazed with our good fortune to be here. We have five children living all over the world, (one in Afghanistan right now) and they are all more than happy to come see us in Bozeman to go skiing, hiking and camping.

Hobbies: cycling, hiking, pottery, baking bread, watching sports, reading.
 Favorite Sports: Baseball and Football
 Favorite Teams: Minnesota Twins, Miles City Cowboys, MSU Bobcats
 Favorite Book Giants in the Earth
 Favorite pastime: Walking a restored prairie

Laurie Kerzicnik



I am very excited to join the Plant Sciences and Plant Pathology Department as the Insect Diagnostician and Assistant IPM Specialist.

My background is with IPM and spiders as pest control agents in agroecosystems. I received my Master's and

PhD in Entomology from Colorado State University and am originally from outside of Detroit, Michigan. I described the spider fauna in eastern Colorado agroecosystems, and my collection of spiders now resides at the Denver Museum of Nature and Science. I also looked at diverse versus conventional farming systems and compared the density and diversity of spiders in these two systems.

Concerning outreach, I have given a lot of entomology and arachnology outreach talks to K-12 schools, the community, and to growers. I traveled to schools with tarantulas, spiders, mantids, scorpions, and cockroaches for hands-on learning. I love extension and serving as a link between science education and the community. I look forward to working with faculty, extension agents, growers, and the community for insect and spider identification.

In my free time, I like to ski, hike, and am excited to learn how to fly fish! I have two pet tarantulas (down from 10). I look forward to meeting all of you and working with you in the near future.

**Update on Rich Stout
By Matt Lavin**

Rich Stout, a retired member of the PSPP Department, continues with his creative activity in Bellingham, Washington, where he and his wife, Lynn, moved in 2008 upon retiring from MSU. As some of you know, Rich reads a lot and occasionally scribbles away, and some of these scribbles can be viewed from his blog, howplantswork.com. From Rich's blog site, you can access additional information on how to obtain his two new e-books, "How Plants Make Flowers" (how and why plants tell time, what cues they use, and a big picture on flower origins and development) and "Plant Trek" (a popular-but-thorough, politically neutral, 'star trek' description of GMO's including a do-it-yourself section). "Plant Trek" has been well received and reviewed (e.g., Dr. Nigel Chaffey who writes the "Plant Cuttings" column for the Annals of Botany, <http://aob.oxfordjournals.org/content/112/6/iv.full> - scroll down to "On track with Plant Trek".) If you are on Twitter, from Rich's blog you can sign up to follow him at @howplantswork. Rich has 2,262 followers to date. These Twitter posts include a lot of interesting and newsworthy facts about plants (research, evolution, agriculture, politics, you name it!). Thanks Rich for keeping up the excellent work on plants!

**Course Focus
PSPP 555/AGSC 455 - Li Huang**

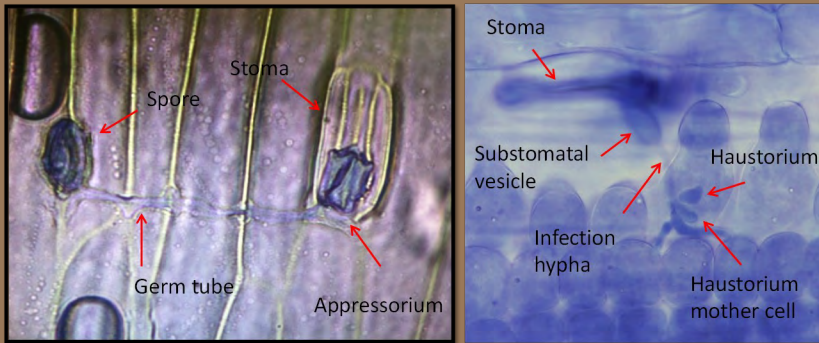


Do you want to know what makes microbes become plant pathogens? How do pathogens invade plant hosts and obtain nutrients? How do plants respond to their enemies? A new course co-listed as PSPP555/AGSC455 "Molecular Plant-Pathogen & Pest

Interactions" will be offered in the spring of 2014 for graduate students and senior level undergraduate students.

The new course will teach students the molecular mechanisms by which plants and pathogens/insects interact during the progression of pathogenesis or resistance,

the understandings of how plants recognize relatively conserved microbial patterns to activate defenses, the methods used to study and visualize intracellular interactions during pathogenesis and defense. Current information and hypotheses using different host/pathogen or host/pest interactions as examples will be presented. Interactions between plant hosts and pathogens & pests will be illustrated from physiology, biochemistry, molecular biology, and molecular genetics points of views.



Left: A rust spore landed on wheat leaf surface, formed a germ tube toward a stoma, produced an appressorium and penetrated through the stoma opening.

Right: After penetration, the fungus produces a sub-stomatal vesicle, then infection hypha. Haustorium mother cell is differentiated after the infection hypha encounters a mesophyll cell; a haustorium is formed inside the mesophyll where the fungus gets nutrients.

Montana Library 2 Go By Janelle Zauha

Find downloadable e-books and audiobooks brought to you for free by your MSU Library. Tap into MontanaLibrary2Go to easily download a novel to read on your Kindle or to listen to on your smartphone.

MontanaLibrary2Go is a subscription service that offers over 10,000 downloadable e-book and audiobook titles to patrons of participating libraries, and as of this fall, MSU is a participating library! Titles are available for download in multiple formats so they work on various devices, including audio players, tablets, and e-readers.

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Invited Talks

Florence Dunkel was invited to present a university seminar at Virginia Commonwealth University, Richmond, Virginia as part of an intense 20 hour meeting September 29-30 with grad and undergrad students and faculty in the Biology and French Departments as well as with International Programs. Small group discussion topics included: World Studies, Global Education, and Service-Learning. The seminar title was: "What's for lunch?: Food security worldwide and the potential of edible insects."

Petra Academy, Bozeman Montana invited Florence Dunkel to give a 70 minute interactive session on October 14 to 4th graders who had just completed their entomology studies. Among the topics we explored were figs, fig wasps, fig newtons, and using microscopes.

Michelle Flenniken was an invited speaker at a workshop, "Synthesizing transcriptome data to explore interspecies bee-pathogen molecular interactions that may underpin pollinator decline (Trans-Bee)", hosted by iDiv German Centre for Integrative Biodiversity Research in Leipzig, Germany in October; the group will meet again in March 2014.

Michelle Flenniken and Laura Brutscher, a PhD student in Michelle's lab, gave presentations on their research at the Montana State Beekeeper's Annual Meeting in Butte, Montana on October 17th. The Montana State Beekeeper's Association gifted \$1000 to Flenniken Lab Research.

Publications

J. Xie, G.A. Strobel, M.T. Mends, J. Hilmer, J. Nigg, and B. Geary. *Collophora aceris*, a Novel Antimycotic Producing Endophyte



Associated with Douglas maple. *Microbial Ecology* 66(4):784.

Flenniken, M.L. and Andino R. Non-specific dsRNA-Mediated Innate Immune Response in the Honey Bee (**2013**), *PLoS ONE* 8(10): e77263.

In this work, Flenniken developed an RNA virus infection model and discovered that dsRNA, a viral associated molecular pattern, triggers an antiviral response that controls virus infection in honey bees. Interestingly, dsRNA mediated virus mitigation was independent of dsRNA sequence specificity, suggesting the involvement of an RNA-independent immune mechanism. Current studies in the Flenniken Lab are focused on determining the mechanism and relative contribution of non-specific dsRNA-mediated antiviral immunity in honey bees.

Grants

Michelle Flenniken was awarded a Montana Department of Agriculture (MTDA) Specialty Crop Block Grant Program grant for monitoring pathogens and the health of Montana honey bee colonies before, during, and after almond pollination.

Wood Chips as Mulch

By Toby Day, Extension Horticulture

This year, I removed a long hedge and some large branches from a silver maple I had recently pruned. I now have a large pile of branches that I will soon be chipping and putting around my garden beds. However, before I put these chips down I thought that I should answer some of those nagging questions about the addition of wood chips as mulch. I hear and read a lot about natural mulches, some good and some bad. We all know about mulch and its benefits such as improving soil structure, enhancing water infiltration, and suppressing weeds. However, will the wood chips tie up the nitrogen in the soil? Will it attract ants? Can the chips be allelopathic? Should I let them age or apply them right away? Is there a benefit, or am I wasting my time?



Typical wood chip mulch

So, I did some research on what my colleagues were saying about the subject and ran across an article written by Dr. Linda Chalker-Scott, Extension Urban Horticulturist and Associate Professor from Washington State University, about the use of wood chip mulch. I respect and have routinely used Dr. Chalker-Scott's website "Horticulture Myths" to better explain and dispel some of the myths that I hear from gardeners and read in garden blogs. I think her information is well-explained and well-researched.

Overall, her recommendation is to mulch away. Thank goodness, because I have a lot of wood chips for mulch. All of my questions were answered and I feel more confident that I am doing the right thing. If the wood chips are not incorporated into the soil, it shouldn't cause a nitrogen deficiency, it won't attract ants, they shouldn't be allelopathic, and really, it doesn't matter if I use it now or let it age (which I was not wanting to do). Every one of my questions was answered. Chalk it up to Extension!

There are, however, a few things that you should know about mulching with wood chips, or any product for that matter as mulch. Don't pile it up around the trunk of any tree. Mulch piled around the trunk can create an environment conducive to fungal growth and thus rot, and can harbor and aid boring insects. For best benefits and weed protection, apply the mulch 4-6 inches high, tapering to no mulch around the trunk.



Mulching right up to the trunk of a tree is never a good idea.

Also, there are too many times where I see mulches that are too thin. You really need to add 4-6 inches and you also may need to check the depth of the mulch yearly as more may need to be added to maintain depth to ensure benefit of the mulch.

Finally, the only wood chips that I would avoid are those of black walnut and maybe eastern cottonwood. These trees have shown to have potential allelopathic compounds that adversely affect your landscape plant material. Other than those two species, wood chips used as mulch have many benefits in the garden.

If you want to learn more about wood chip mulches, you can find the article at: http://puyallup.wsu.edu/~Linda%20Chalker-Scott/Horticultural%20Myths_files/.

Recipe of the Month

Turkey Stuffing Recipe

1 loaf of day old French bread, cut into 3/4 inch cubes—about 10-12 cups.

1 c walnuts

2 c each of chopped celery and onion

6 T butter

1 green apple, peeled, cored, and chopped

3/4 c currants or raisins

5-10 chopped green olives (the ones with the pimento)

Stock from the turkey giblets (1 c to 2 cups, can substitute chicken stock)

1/4 c chopped fresh parsley

1 t poultry seasoning or ground sage (to taste)

Salt and freshly ground pepper



Toast the walnuts by heating them in a frying pan on medium high for a few minutes, stirring until they are slightly browned or put them in the microwave on high until you can smell the aroma of them toasting, about a minute or two. Let them cool while you are toasting the bread, then roughly chop them.

Melt 3 T butter in a pan, add the bread cubes and stir to coat the bread pieces. Let them toast; only turn them as needed. Dry cubes in the oven first if you are using fresh bread.

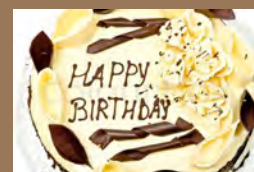
In a large Dutch oven, sauté chopped onions and celery on medium high heat with the remaining 3 T butter until cooked through, about 5-10 minutes. Add the bread. Add cooked chopped walnuts. Add chopped green apple, currants, raisins, olives, parsley. Add one cup of the stock from cooking the turkey giblets or chicken stock (enough to keep the stuffing moist while you are cooking it). Add sage, poultry seasoning, salt & pepper.

Cover. Turn heat to low. Cook for an hour or until the apples are cooked through. Check

every ten minutes or so and add water or stock as needed while cooking to keep the stuffing moist and keep it from sticking to the bottom of the pan.

November Birthdays

Harvey TeSlaa	1
Jim Berg	4
Jack Martin	8
Steve Hystad	10



GO TO NEXT PAGE FOR IMAGES OF PSPP PARTICIPATION IN THE 2013 MSU AG FAIR.

2013 Ag Fair



Toby Day and local Master Gardeners Nan Brandenbergerpayne and Chris Pummel answer questions from Dr. Mike Giroux at the Ag Fair.



Rocio Rivas and Eylül Kaya introducing people to salsa made with camelina instead of cilantro.



Nina Zidack and Eileen Carpenter sharing their extensive knowledge of seed potatoes at the Ag Fair.



PSPP graduate student Charissa Bujak (on the right) giving tips on how to get a hole in one and win a PSPP water bottle at the Ag Fair.



Linnea Skoglund introducing Yellowstone County Extension Agent Steve Lackman to Laurie Kerzicnik, our recently hired Insect Diagnostician.



Nick Krob, Rob Partain, Khaled Shamesaldain, and Catie Opar demonstrate the benefits of turfgrass for participants at the Ag Fair.



Ron Larson demonstrating the cleaning of seed and pointing out the various seed samples on display.