

Plant Science Says



Happy Thanksgiving!

Volume 17, No. 10 The Department of Plant Sciences and Plant Pathology November, 2015

Montana State Beekeepers Meeting By Michelle Flenniken

Michelle Flenniken and Laura Brutscher, Microbiology and Immunology PhD candidate in the Flenniken lab, shared their research with Montana Beekeepers at the annual meeting of the Montana State Beekeepers Association in Great Falls on October 15th-16th. The meeting was well attended by Montana's commercial beekeepers, as well as some small-scale beekeepers, bee researchers, queen breeders, and others involved in the beekeeping industry. This year's event was organized by Courtney and Greg Fullerton of Glacier County Honey and was a celebration of the association's 100th anniversary. Michelle presented results on the relationship between honey bee colony health (estimated by colony population) and pathogen incidence and abundance. A Montana Department of Agriculture Specialty Crop Block Program grant supported this research and the results were recently published as an open access article in the journal *Apidologie*. The keynote speaker was Sue Cobey from Washington State University who told the audience about her work on increasing the genetic diversity of honey bees in the United States. Jackie Park Burris described her intensive honey bee queen breeding operation in Palo Cedro, CA. It was interesting to learn about how her queen rearing operation has been perfected over multiple generations of family members in the business. Sue and Jackie recently traveled to Italy together to obtain additional Italian stock. Cam Lay from the Montana Department of Agriculture updated the association on bee colony registrations (193,000 colonies are registered in MT) and recent incidences of bacterial diseases,

American and European Foulbrood (AFB, EFB), caused by *Paenibacillus larvae* and *Melissococcus plutonius*, respectively. To avoid spread of these pathogens, it is important for infected colonies and equipment to be destroyed, though in some cases antibiotic treatments and/or transfer to a new hive body may be an appropriate course of action. The bacterial spores are hardy, thus it is important that as a colony succumbs to AFB or EFB that "robber bees", which steal resources from weak and/or dead colonies, don't spread the disease. On a more uplifting note, we learned that the USDA will invest \$4 million in assistance for landowners interested in growing more honey bee forage. Interested Montana landowners should contact their local National Resource Conservation Service (NRCS) representative to complete an Environmental Quality Incentive Program (EQIP) application. The 101st Montana State Beekeepers' Association meeting will be held in Whitefish, MT in 2016 – we are looking forward to it!

Immature Beetles Meeting in Prague By Frank Etzler

Early last month, I had the opportunity to go to the Czech Republic. I spent the entirety of my trip in the capital of the Czech Republic, Prague. Prague is a lovely city, with traces of human activity extending back at least 1,000 years. An interesting thing about the Czech Republic is that it has the (unofficial) statistic of having the most entomologists, both professional and amateur, per capita. It seems that there is a strong cultural trend to enjoy collecting insects!

The first few days of my travel were spent at the National Insect Collection in Prague, which had recently moved into a brand new building. I had the opportunity to sort through the



The attendees of the first day of the Immature Beetles Meeting. Frank Etzler is in the back row, fifth from the right.

this year by Drs. Martin Fikáček, Petr Sipek, and Jiri Skuhrovec. This meeting is held every other year and features talks covering many different aspects of the larval stage of the very diverse group of animals called beetles. The talks were given by an international group, with people from Brazil, Mexico, Germany, and the United Kingdom joining many Czech presenters and visitors. I gave a presentation on the first day of the meeting. I talked about



Presenting my talk to fellow beetle enthusiasts. Please note that this was an informal meeting, so the hand in the pocket was allowed!

how larval morphology could help create Holarctic generic concepts for the species that formally belonged to the elaterid genus, *Limonius*. There is no single definition for this genus, which causes lots of confusion as I am sure you are aware if you saw my PSCP presentation. The meeting was a wonderful way to meet many of my European colleagues. I even had the opportunity to hold the larva of one of the largest beetles.

collection and examine many Palearctic species of Elateridae. This was a wonderful opportunity for me to help curate their collection and to cement some generic concepts. Dr. Jiří Hájek, the head manager of the Entomology department, was a very helpful guide in the collection and also allowed me to borrow some specimens for a longer and more thorough study.

The latter part of my week (Oct. 1 and 2) was the Immature Beetles Meeting, put together



The larva of one of the largest beetles.

The final part of my trip was visiting the International Insect Exchange. This event featured collectors from all over the world who meet to sell insect gear and literature and to make exchanges of insects. I was fortunate enough to spend time with some of the curators from the British Museum of Natural History while I was there.

This was a wonderful opportunity to borrow some very important Palearctic specimens for study, as well as making lots of new connections. I can't wait for another opportunity to head back to Prague in two years time!

Lighting Retrofits for PGC Growth Chambers and Growth Rooms By David Baumbauer

Trials of LED lighting fixtures and High Pressure Sodium (HPS) are underway in a PGC growth chamber and growth room. MSU Facility Services has funded the purchase and installation of LED fixtures for growth chamber PGC #2 and HPS lamps in Growth Room #1. Many of the older growth chambers and all the growth rooms are equipped with T-12 fluorescent lamps which are inefficient and the production of the lamps are being phased out. With approximately 700 of the T-12 lamps currently in use in PGC growth chambers and rooms, we need to identify suitable replacement lighting systems. Below are photos of the first round of tests of the LED fixtures as compared with the standard fluorescent fixtures. PAR levels were approximately 250 micromoles/m²/sec under both lamps. The three LED fixtures draw ~ 1000 watts, while the fluorescent fixtures draw ~ 2000 watts.



MAES Seminars for 2015

Mike Ivie

Monday, Nov. 9 at 1:00 in 60 Marsh Lab
"Revision of the Dinoderinae (Coleoptera: Bostrichidae), an emerging threat to global grain stores"

Bob Sharrock

Thursday, Nov. 23 at 9:00 a.m. in 108 PBB
"Molecular Genetics of Plant Light Responses and Reproductive Development"

Bill Hoch

Friday, Nov. 20 at 3:00 p.m in 108 PBB
"Development and Production of Ornamental
Plants for Montana"

Jennifer Britton

Monday, Nov. 30 at 3:00 p.m. in 138 ABB
"Landscape Evaluation and Interpretation"

Tracy Dougher

Friday, Dec. 4 at 9:00 a.m. in 138 ABB
"Commercializing production of native
Montana species"

Mac Burgess

Monday, Dec. 7 at 1:00 in 108 PBB
Production Practices for Small Acreage
Specialty Crop Growers.

Luther Talbert

Tuesday, Dec. 8 at 1:00 in 108 PBB
Spring wheat breeding and genetics

Mike Giroux

Wednesday, Dec. 9 at 9:00 a.m. in 108 PBB
Small grain quality and molecular biology

Years of Service Honorees

Recently, MSU honored all classified and professional employees that reached a five year increment of service as of June, 2015. Following is a list of the honorees from our Department:

Becky Evans	5
Charles Holt	5
Ruth O'Neill	10
Jim Berg	20
Eileen Carpenter	25
Elaine Nichols	25

Thank you for all your contributions to this Department and MSU!

Course Focus

AGSC 465R Health, Poverty, Agriculture: Concepts and Action Research
By Florence Dunkel

AGSC 465R is a 4-credit University Core course in Research and Creative Activity offered every semester under this rubric since Spring 2008 and under other rubrics since

2000. It is a mentored, original research course with a service-learning format. Students learn to explore causes and solutions to rural poverty holistically by discovering the interconnections of health, agriculture, and governance. Students gain skills appropriate to one's own academic major to provide leadership in alleviating poverty worldwide and valuing traditional ecological knowledge.

It is capped at 15 students per semester. If more than one professor is co-teaching the course, we raise the cap. Together with professors, co-instructors, and teaching assistants, students explore various forms of poverty and the pockets of traditional ecological knowledge and other forms of non-monetary wealth. Food production and consumption play a key role in most of the resulting research.

What do students do? While getting to know their site mentors in their chosen community of focus, students explore ten basic concepts related to teaching, learning, and conducting research with indigenous peoples. Basic skills learned are intercultural competency, participatory diagramming, IRB training and navigating the IRB approval system at MSU and in their indigenous community. The course meets in the classroom once a week and students have individual research mentor sessions with me of at least 30 minutes per week, but the action takes place in the community of focus. In this course the long term relationships have been with the Apsaalooke, and the Northern Cheyenne reservations in Montana and a subsistence farming village (of Bambara people) in southern Mali (West Africa). Students address research requests of the community and in the process often work with malnutrition (stunting), malaria, revitalization of native foods, and other forms of health/food security.

We use the Expansive Collaborative Model (Dunkel et al. 2011, NACTA Journal). Some students continue their research after the

course is over and this has resulted in a series of peer-refereed journal articles. Former students *and* co-instructors are now engaged in writing a book, *Recognizing Culture in the Food and Agricultural Sciences* under contract with Elsevier Publishing Company.

Poverty and traditional ecological knowledge have no disciplinary home but are relevant to every discipline and profession so students come from all over campus. The 250 plus students who have taken this research course and its precursors have come from all colleges and most majors at MSU. Recently, most of the students are in Sustainable Foods and Bioenergy Systems, Cell Biology, Plant and Animal Sciences, Foreign Languages, Liberal Studies, and the graduate program in Health Sciences.

All students travel together to the Apsaalooke and Northern Cheyenne reservations in the first three weeks of class to practice listening, experience immersion in a Native American culture, and practice the holistic process that was developed by Savory and Butterfield 1999 and adapted for this community-based research (Dunkel et al).

AGSC 465R culminates with student presentations in a poster session in the atrium of the Thayer Conference room followed by formal presentations in the Conference Room, audience comments, and dinner in the atrium. All faculty, friends, family, and students for next semester are invited. The next one will be December 3 at 4pm. Please join us!

New Employees

Ryan Peters (Mike Giroux)



Hello, and thank you for the warm welcome to the department! As I have yet to meet many folks outside of Mike Giroux's lab, I thought it might be useful to share a bit about my background and interests! I am a 2014 graduate of Saint John's University in my home

state of Minnesota, where I pursued degrees in Biology and Psychology. Having visited Bozeman many times during my undergraduate career, I recognized what a fantastic place this would be to live and moved here immediately following graduation to pursue passions for climbing, skiing, and mountain wandering. Since the move, I have discovered the world class trout fishing water here and added fly fishing to my list of lifelong pursuits! In the past year, I have developed a love for simple travel; I completed my first bike tour of the West coast last fall with my year-old Australian Shepherd in tow, and spent a month hiking the high Sierras this spring. I am an aspiring naturalist and student of Biology, and am perhaps most interested in the world of genetics as it relates to plant and animal sensation and communication.

I am excited to be a part of the novel research going on in the wheat lab, and to be a part of the greater community here at MSU! I look forward to meeting more of you in the near future!

Monica Brelsford (Mary Burrows)



I am very excited to be working in the Department and conducting research again. Many of your faces are familiar and I look forward to working with all of you. In recent

years, I have been working in the construction industry with my husband. We create log buildings, and custom lumber products from our family owned forest in the Bangtail Mountains. Prior work at MSU was in the Department of Land Resources and Environment Sciences in which I conducted crop/weed research throughout the State. Cheers, Monica

Invited Talks

Laurie Kerzicnik, "Urban Insects" Rocky Mountain Tree School Annual Conference, Sept 30, Livingston, Montana.

Laurie Kerzicnik, "Spiders" Insectarium's Spider Month. October 17, 2015, Missoula, Montana.

Laurie Kerzicnik, "Emerald Ash Borer" Montana Trails, Recreation, and Park Association & Idaho Recreation and Park Association Annual Conference. October 28, 2015. Bozeman, Montana.

Grants

Laurie Kerzicnik, Montana Department of Agriculture Specialty Crop Block Program grant . "Integrated pest management of insect pests in fruit trees", Oct 1, 2015-Mar 1, 2018.

Michelle Flenniken, Montana Department of Agriculture Specialty Crop Block Program grant, "Investigating the Role of Pathogens on Honey Bee Colony Health", Oct. 2015 – Oct. 2017.

Bright Agindotan, Mary Burrows, Montana Department of Agriculture, "Survey of Montana State for Pathogens of Economic Importance in Field Peas", Oct. 2015—Oct 2018.

Bill Dyer, MSU College of Agriculture, "Ecological implications of an altered spectrum of volatile compounds from multiple herbicide-resistant *Avena fatua* (wild oat) accessions".

Chaofu Lu, MSU College of Agriculture, "Improving phosphorus acquisition and utilization efficiency in *Camelina*".

Mark Young, MSU College of Agriculture, "Field diagnostic kits for detection of agriculturally important viruses for Montana".

Jamie Sherman, MSU College of Agriculture, "Cropping systems and resistant lines impact on nematode community structure".

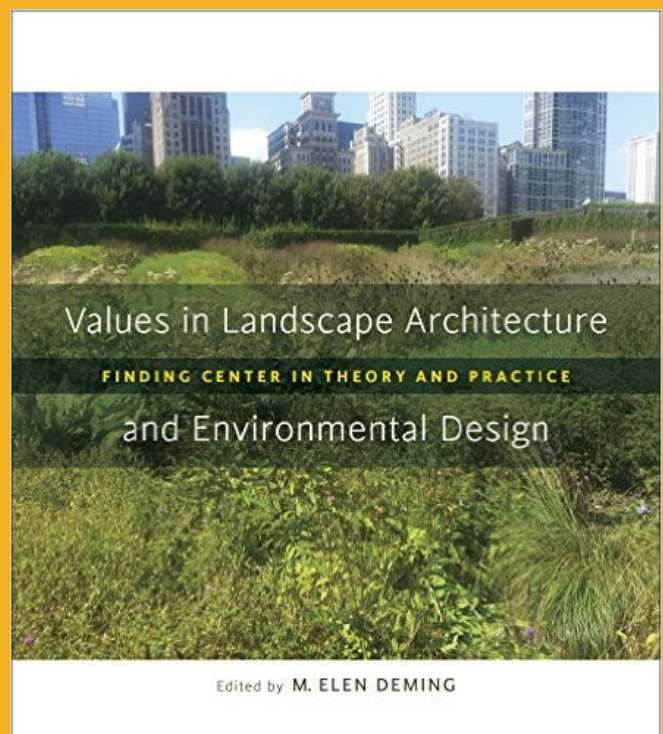
Jamie Sherman, MSU College of Agriculture, Equipment grant.

Publications

Jennifer Britton authored a chapter in the recently published book: *Values in Landscape Architecture and Environmental Design: Finding Center in Theory and Practice*

Jennifer's Chapter: Imbibing Terroir: Values in Napa valley's Cultural landscape of Wine
Louisiana State University Press with Editor M. Elen Deming

"The successful realization of diversity, resilience, usefulness, profitability, or beauty in landscape design requires a firm understanding of the stakeholders' values. This collection, which incorporates a wide variety of geographic locations and cultural perspectives, reinforces the necessity for clear and articulate comprehension of the many factors that guide the design process. As the contributors to this collection reveal, dominant and emerging social, political, philosophical, and economic concerns perpetually assert themselves in designed landscapes, from manifestations of class consciousness in Napa Valley vineyards to recurring themes and conflicts in American commemorative culture as seen in designs for national memorials. One essay demonstrates the lasting impact of the doctrine of Manifest Destiny on the culture



and spaces of the Midwest, while another considers the shifting historical narratives that led to the de-domestication and subsequent re-wilding of the Oostvaardersplassen in the Netherlands. These eleven essays help foster the ability to conduct a balanced analysis of various value systems and produce a lucid visualization of the necessary tradeoffs.

Offering an array of case studies and theoretical arguments, *Values in Landscape Architecture and Environmental Design* encourages professionals and educators to bring self-awareness, precision, and accountability to their consideration of landscape designs."

Andy Burkhardt, Archana Gawde, Charles L. Cantrell, and Valtcho D. Zheljazkov. 2015. "Effect of varying ratios of produced water and municipal water on soil characteristics, plant biomass, and secondary metabolites of *Artemisia annua* and *Panicum virgatum*". *Industrial Crops and Products*. 76:987-994.

Andy Burkhardt, Henry Y. Sintim, Archana Gawde, Charles L. Cantrell, Tess Astatkie, and Valtcho D. Zheljazkov. 2015. "Method for attaining fennel (*Foeniculum vulgare* Mill.) seed oil fractions with different composition and antioxidant capacity". *Journal of Applied Research on Medicinal and Aromatic Plants*. 2 (3):87-91.

J.R. Kalous, J.M. Martin, J. D. Sherman, H.Y. Heo, N. K. Blake, S.P. Lanning, J. L. A. Eckhoff, S. Chao, E. Akhunov, L.E. Talbert, Plant Sciences & Plant Pathology, "Impact of the D genome and quantitative trait loci on quantitative traits in a spring durum by spring bread wheat cross". *Theoretical & Applied Genetics*

Benjamin Bolduc, Jennifer F. Wirth, Aurelien Mazurie, Mark J. Young, Plant Sciences & Plant Pathology, "Viral assemblage composition in Yellowstone acidic hot springs assessed by network analysis". *ISME Journal*

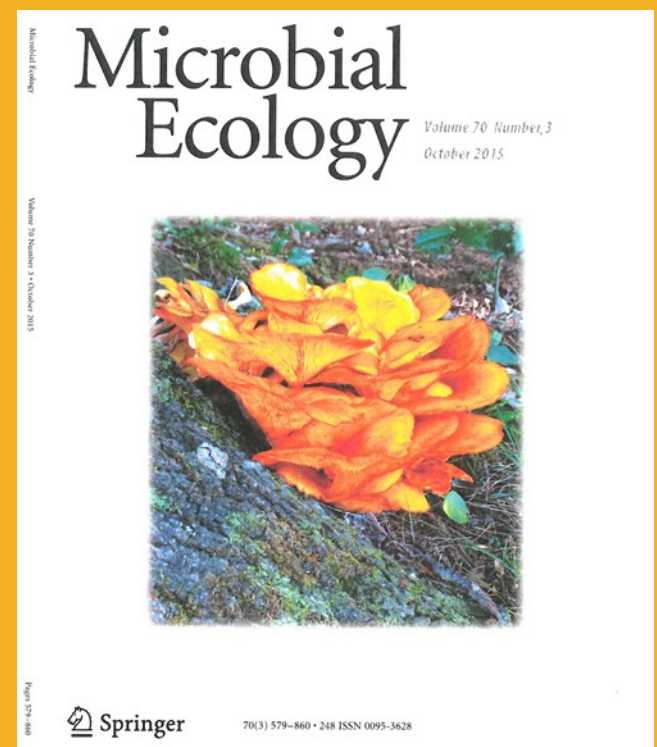
Rebecca Hochstein, Daniel Bollschweiler, Harald Engelhardt, C. Martin Lawrence, Mark Young, "Large tailed spindle viruses of Archaea: A new way of doing viral business *Journal of Virology*". *Journal of Virology*.

Cavigli, I., Daughenbaugh, K.F., Martin, M., Lerch, M., Banner, K., Garcia, E., Brutscher, and Flenniken, M.L., "Pathogen Prevalence and Abundance in Honey Bee Colonies Involved in Almond Pollination". (2015), *Apidologie*; doi:10.1007/s13592-015-0395-5).

Daughenbaugh, K.F., Martin, M., Brutscher, L.M., Cavigli, I., Garcia, E., Lavin, M., and Flenniken, M.L. "Honey bee infecting Lake Sinai viruses". (2015), *Viruses*, 7, 3285-3309; doi:10.3390/v7062772

Gary Strobel - Cover Photo, *Microbial Ecology*, October, 2015.

The jack-o-lantern mushroom (*Omphalotus olearius*) growing near the base of a white oak tree in the Great Smoky Mountains National Park, Tennessee. This toxic mushroom contains the compound illudin S and is poisonous to humans. Most interesting is the fact that this fungus is beautifully bioluminescent producing a blue green color



and only the gills are capable of glowing due to the presence of luciferin and luciferase. Sam Watkins and his buddy Tom Webb, of the 1st Tennessee regiment, (company H - Confederate States of America) were on night guard duty. They greatly feared when they saw a large number of “Yankee” lanterns moving through the forest near Corinth, Mississippi, in October, 1862. They opened fire but lo, they were only shooting at a large flush of Jack-o-lantern mushrooms growing on the forest floor. Fungi are not only interesting, but play a huge role in the natural world by recycling nutrients and reducing the volume of waste plant and animal materials.

Invited Talks

Jamie Sherman, “The State of Our Raw Ingredients: Perspectives on Montana barley from every point in the supply chain”, Brewers Association, Missoula, Montana.

Master Gardeners and Fall Check List By Toby Day, Extension Horticulturist

I would like to recognize the various Master Gardeners and the Southwest Montana Master Gardener Association members as they have been a great help in providing educational, philanthropic, and beautification projects around the area. Gardens that they have helped maintain include the Story Mansion annuals, the Plant Select Demonstration garden at the Bozeman Public Library, the iris plots at the BART horticulture farm, and the Mathre Courtyard annuals – just to name a few. I especially want to recognize Dara Palmer for organizing the local Master Gardener volunteers. Without her help we wouldn’t have had so many great projects. I also would like to thank Shelley Lewton for her many hours of volunteer labor in the Mathre Courtyard this summer ensuring that it was a beautiful space.

Fall Garden Checklist:

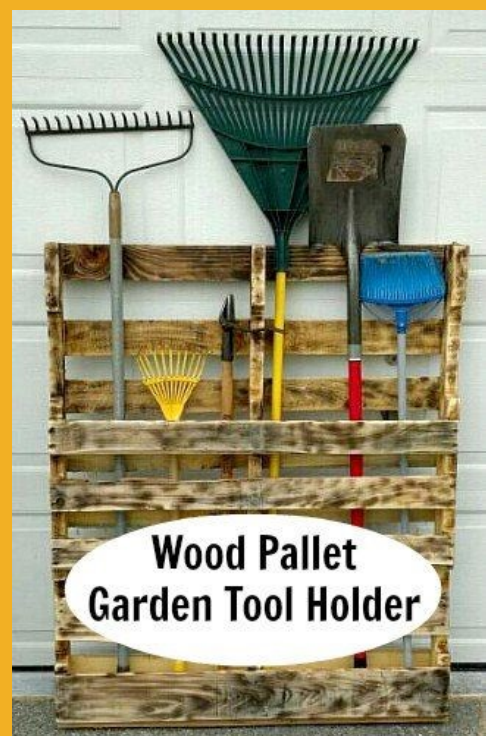
The following is a list of fall garden chores you may want to complete before it get too cold and the snow gets too deep.

The mower is drained of gas (or stabilizer is added to the fuel), the blade is sharpened and the bottom is cleaned out. **Tip:** Oil the bottom with penetrating oil to ensure less rust and to keep further crud from accumulating.

Pesticides are stored in an area where they will not freeze. Frozen pesticides can break the container and cause quite a mess, besides freezing may decrease effectiveness. **Tip:** It rarely gets too cold if they are in a cabinet in a garage that is attached to the house. The heat will transfer into the cabinet, keeping them from freezing.

Make sure all irrigation hoses are drained and they are detached from the hose bibs. Also, if you have battery powered timers, bring them inside. The water or the batteries in the timer may freeze causing breakage. How do I know? I have already had to replace two of them.

Clean tools and wooden handles of soil, then sharpen and oil. Linseed oil works best for oiling handles, and even the metal parts of tools, to keep them from rusting. **Tip:** A pallet is great for storing tools. Place a board on the bottom of the pallet and just screw it to the wall.



Prune back perennials. I like to prune back perennials 2"-6" from the ground. However, I will leave some perennials if they have some type of winter interest, such as Sedum 'Autumn Joy' and ornamental grasses.

Clean the remaining annuals and vegetables out of the garden. It is also a great time to build a compost pile. I have had compost cooking clear into December some years. We have a MontGuide on composting! http://store.msuextension.org/Products/Home-Composting_MT199203AG.aspx

Wrap smooth and thin dark bark trees. Sun scald usually doesn't happen until later in winter when the trees go into quiescence (a secondary dormancy that happens after the first of the year). But hey, might as well get it done and not trample through the snow later...

Bring in and dry your herbs. Why buy herbs when you can dry them from your garden? It is easy with a food dehydrator.

Empty out any garden containers. Most will crack if they are not empty before it really freezes. **Tip:** If you store them outside, store them upside down to keep any residual water from cracking them.

Mow your lawn short if you think you will have a lot of snow cover this year. Snow mold can cause quite an issue for late green-up in lawns. Mowing short will help relieve this. Plus, as Jack Riesselman always says, "It allows all the leaves to blow into your neighbor's lawn." It will also keep vole populations down.

Keep away debris around posts, trees and anywhere there is a place for a vole to hide. Chances are if we have a mild winter, we are going to have bad vole problems again.

Potato Lab serves it up at Community Café!

By Nina Zidack

On October 30, MSU Potato Lab staff joined by Jessica Rupp, Tara Donohoe and Eli Saum



Back Row: Anna Jespersen, Nina Zidack, Jessica Rupp, Eileen Carpenter, Alice Pilgeram, Eli Saum. Front Row: Tara Donhoe and Becky Evans.

volunteered at the Community Café. Eileen Carpenter organized our service date through the MSU Office of Activities and Engagement (OAE) website at <http://www.montana.edu/engagement/events-programs/CommunityCafe.html>. The MSU community is encouraged to host dinners on Wednesday evenings at The Community Café, a program of the Gallatin Valley Food Bank. The café provides a hot dinner to anyone who wishes to join them seven evenings a week, 365 days a year. The OAE is a Café partner and is responsible to rally volunteers each Wednesday evening to seat, serve, and engage with the customers of the café.

The volunteers were very enthusiastic about their jobs which included hostess (Nina Zidack), servers (Eileen Carpenter and Tara Donohoe), bussing tables (Anna Jespersen), plating food (Jessica Rupp and Becky Evans), and dishwashing (Alice Pilgeram and Eli Saum). Tara even took the opportunity to provide a little musical atmosphere with her exceptional piano playing. All of us agreed that it was a phenomenal experience and we plan to do it again. We encourage other members of our Department to serve at the Community Café and recommend it as a great place to eat. If you cover the cost of your meal (3-5\$) and put in some extra you can pay it forward for someone who could really use it.

Ireland Adventures!

By Deanna Crow

The year started off with me setting a personal goal of running my first 10k. I signed up for the Run to the Pub and little did I know how my life was about to change! After finishing my first 10k my number was drawn and I had won the trip of a life time, to run in the Dublin Marathon in Ireland! I bought a new pair of running shoes, and set my mind to accomplishing this goal that seemed so far out of my reach! Before I knew it I was off to Ireland for 10 days to see all that I could before race day!! After



Rod and Deanna Crow in Galway Ireland



Right before crossing the finish line!!

countless early mornings, long miles, and energy gels, it was finally the morning of October 26th! It was a cool, wet, and windy morning, but with the excitement of over 15,000 runners, the beautiful fall colors, a city that was almost completely shut down to celebrate the marathon, and cheers from the sidelines for almost the whole 26.2 miles, it was the experience of a life time! I accomplished something I never thought I would be able to do! I went from running my first 10K in March to running three 1/2 marathons through the summer, and now I have completed a full marathon!

A huge thank you to Pub 317 for a great experience I will never forget!

Recipe of the Month

Perfect Turkey - perfectly seasoned and juicy turkey

- 1 (18 pound) whole turkey, neck and giblets removed
- 2 cups kosher salt
- 1/2 cup butter, melted
- 2 large onions, peeled and chopped
- 4 carrots, peeled and chopped
- 4 stalks celery, chopped
- 2 sprigs fresh thyme
- 1 bay leaf
- 1 cup dry white wine

Rub the turkey inside and out with the kosher salt. Place the bird in a large stock pot, and cover with cold water. Place in the refrigerator, and allow the turkey to soak in the salt and water mixture 12 hours, or overnight.



Preheat oven to 350 degrees F (175 degrees C). Thoroughly rinse the turkey, and discard the brine mixture.

Brush the turkey with 1/2 the melted butter. Place breast side down on a roasting rack in a shallow roasting pan. Stuff the turkey cavity

with 1 onion, 1/2 the carrots, 1/2 the celery, 1 sprig of thyme, and the bay leaf. Scatter the remaining vegetables and thyme around the bottom of the roasting pan, and cover with the white wine.

Roast uncovered 3 1/2 to 4 hours in the preheated oven, until the internal temperature of the thigh reaches 180 degrees F (85 degrees C). Carefully turn the turkey breast side up about 2/3 through the roasting time, and brush with the remaining butter. Allow the bird to stand about 30 minutes before carving.

November Birthdays

Jim Berg	4
Jack Martin	8
Traci Hooglund	8
Emby Davich	15
Harvey TeSlaa	15
Charissa Bujak	26
Ryan Thum	30

