*PSPP - Plant Science Says* *April 2018*

**MGGA Board Visits Cereal Genomics Lab**
**by Fernando Guillen-Portal**

On Tuesday, March 13, 2018, the Board of Directors of the Montana Grain Growers Association (MGGA) led by its President, Michelle Erickson-Jones, visited the Cereal Genomics Targeted Breeding Program where they had the opportunity to learn about the different scientific activities the lab is involved in. Dr. Hikmet Budak, leader of the cereal genomics group, provided the Board with insights into the science the lab is conducting, focusing on the use of the CRISPr-Cas9 gene editing tool and the OMICs approach. Hopefully, they came away with a better understanding of the genetics associated with biotic and abiotic stress in cereal crops. He also addressed the involvement of his research group in applied science in regard to the topic of micronutrient deficiency in wheat. Dr. Hikmet reported the results of last year's foliar application of zinc in spring wheat in Montana, a study that was conducted at three representative sites across the state. This study indicated that elite spring wheat cultivars of Montana showed, on average, a nearly 7% increase in grain yield in response to the foliar application of Zn.

*Dr. Budak answering questions from the members of the MGGA during the visit the association made to the Cereal Genomics Lab.*

**"The Voice of Montana Farmers"**
**by Fernando Guillen-Portal**

The first session of "The Voice of Montana Farmers" workshop was held at the Plant Bioscience Building on Wednesday, March 14, 2018. This workshop is an initiative of the Cereal Genomics Targeted Breeding Program in the PSPP Department. It is intended to constitute a link between the farmers of Montana and those in MSU's academic community that are involved in agricultural research. In this workshop, farmers across the state will share their perspective in regard to the current status of agriculture in Montana. This will give the academic community an opportunity to assess the impact of its current research agenda and also aid them in identifying new areas of agricultural research. The speaker of the first session was Buzz Mattelin, a third generation farmer on a family farm along the Missouri River in Northeast


*Buzz Mattelin giving his talk at the 1st session of "The Voice of Montana Farmers" workshop.*

Montana. Mr. Mattelin's talk focused on his experiences in cereal marketing in the U.S. and across the globe and on sustainable agriculture. A good number of farmers, faculty, staff, and graduate students attended the first session of this workshop.

**IPM Education on Capitol Hill**
**By Mary Burrows**

As part of the 9th International IPM Symposium, the IPM Institute coordinated a trip to Capitol Hill for interested participants. Frank Laufenberg coordinated a webinar for participants and coached us through making appointments with our representatives, what (and what not) to say during our visit, and how to follow up after the visit. Several of us from the Western Region brought along the annual report poster from WRIPMC, kindly provided by Amanda Crump. Talking points included encouraging continued support of IPM funding, the difference our programs make in the state, and in general, a thank-you for supporting our educational and research efforts.

Pat Beauzay (North Dakota) and I 'buddied up' during the visit, jointly visiting a couple of representatives and helping each other remember where we were supposed to be. I met with aides in the offices of Greg Gianforte and Steve Daines. In John Tester's office, I had the opportunity to meet John and talk about the difficulties of growing organic crops, particularly chickpeas. He was well aware of the funding challenges and highly supportive of our efforts, giving me a brief update about how topics of interest to me were faring in the new budget, which was signed that day. All of the aides were very kind, listened, and took notes. I left a copy of the

*Pat Beazuay, NDSU IPM Coordinator, Extension Entomology and Mary Burrows*

poster we presented at the IPM Symposium since it illustrated a number of the efforts we have made to educate the citizens of Montana about IPM. I also left a magnet from the Schutter Diagnostic Laboratory and a hand lens. I believe they all said they would use the hand lens to read the new spending bill.

The visit was educational for us all, and I have to say I now feel more comfortable calling to register my opinion as a citizen on a particular issue and/or visiting their offices.

**69th Pacific Northwest Pest Management Conference**
**By Laurie Kerzicnik**

After being surrounded by white snow for months in Montana, Hood River, Oregon was a welcome getaway with lush and green vegetation. The Pacific Northwest Management Conference had over 300 attendees with pest control professionals from Oregon, Washington, and Idaho. I was the sole Montana representative. The keynote speaker was Dr. Nancy Hinkle from the University of Georgia, who talked about the latest research on delusory parasitosis, a disorder where you mistakenly believe that your body is infested with bugs, mites, worms, or parasites. People with this disorder think they have insects living on and under their skin. They harm their skin in many ways by picking, cutting, and scratching to try to find the invisible creatures. Although this was the hot topic of the conference with unforgettable images of bloody scabs, Nancy also talked about the latest research on commercial and residential flies. Rick Vetter gave an update about spiders in the Northwest, and Dr. Laurel Hansen talked about residential ants and control measures.

*Columbia River near Hood River, Oregon*

**9th International Integrated Pest Management Symposium**
**By Sarah Eilers**

*Larry Hountz the owner of City-Hydro Microgreens.*

The first day of the conference Mary Burrows and I had the opportunity to get out into the community. Field trips were available to tour the home of the Baltimore Orioles and M&T Bank Stadium, home of the Baltimore Ravens, to discuss IPM as it applies to professional sports facility management. The topic of another tour was pest management in public housing. The final tour was named "Urban Growth-The Green Kind", where several urban farms were visited. One of the stops was City-Hydro Microgreens, a hydroponic rowhouse that grows microgreens for restaurants in one room of their home.

Dr. Dini M. Miller, a professor at Virginia Tech University was the keynote speaker. She is a recognized expert in the area of urban pest management, specializing in bed bug and German cockroach biology, behavior, and control. She discussed the misuse of the term IPM in the urban pest management industry. She proposes changing the term IPM to Assessment-Based Pest Management (APM) to help establish pest monitoring as the foundation of structural urban pest management.

*Sloop-of War USS Constellation docked in Baltimore, MD*

The five-day workshop focused on seven main topics. Communication and new tools in pest management was one area that offered sessions on building partnerships, promoting IPM techniques, and communication with diverse audiences. Sessions were also available on nanotechnology and its increasing role in IPM along with weather driven epidemiological forecasts for efficient IPM strategies. Row/Agronomic Crops/Field Crops, Rangeland/Livestock/Pastures and Fruit, Nut, Specialty, and Vegetable Crops were all topics covered.

The closing session highlighted the achievements of three men who have spent their careers focusing on IPM - Dr. George W. Norton, Virginia Polytechnic Institute and State University, Dr. Frank G. Zalom, University of California, Davis, and finally Dr. Peter B. Goodell, University of California.

**Western States FHB Workshop**
**By Nancy Blake and Jason Cook**

The Western States FHB (Fusarium Head Blight) Workshop was held at MSU March 14. The workshop was organized by the U.S. Wheat & Barley Scab Initiative to bring together researchers from the Western region that have been or are beginning to work on Fusarium Head Blight in cereals. FHB has been a serious disease problem in cereals in the Midwest and Eastern U.S. for many years. With changing climatic conditions and increased corn acreage in the West, FHB is becoming a serious concern. Wheat and barley researchers from Oregon, Washington, Idaho, Montana, and the USDA-ARS participated in the workshop. Each participant spoke about the focus of their FHB research and breeding, along with FHB researchers from the Midwest who shared their expertise. The workshop ended with several regional joint collaboration efforts planned.

*Fusarium Head Blight*

**The Buzz from the Flenniken Lab**
**By Michelle Flenniken**

Alex McMenamin Awarded American Bee Federation Scholarship

Alex McMenamin, a Microbiology PhD and Molecular BioSciences Program student in the Flenniken lab, received a scholarship, including a travel grant, from the American Bee Federation (ABF). Alex was also given an award and presented a poster at the ABF meeting.

In addition, he gave an excellent research presentation at the co-convened American Bee Research Conference (ABRC) entitled, "Honey bee host-pathogen interactions at the colony, individual, and cellular levels".

Congratulations Alex!

Honey Bee Presentations

Recently, Michelle gave two presentations at a Masters Beekeeping Course at the University of British Columbia in Vancouver, Canada, in February 2018. This course, which is held biannually, is taught by honey bee scientists in the U.S. and Canada and provides an excellent venue for scientific discussions. Flenniken gave two presentations, "Bee Pathogens 501" and "Honey Bee Pathogen and Immune Pathway Discovery".

Michelle Flenniken and David Baumbauer (PGC Manager, PhD graduate student, and beekeeper) gave presentations at "Beekeeping for Montana Hobbyists and Landowners" which was held at the Museum of the Rockies on March 10, 2018. This workshop was sponsored by the Gallatin Valley Beekeeping Club.

Michelle was back at the Museum of the Rockies two weeks later to give a talk on the factors impacting honey bee health to a nearly full house in Hager auditorium. The talk was sponsored by the Gallatin Valley Friends of Science, www.gallatinscience.org.

Pollinator Garden Volunteer Days

MSU's Honey Bee Research Site and Pollinator Garden upcoming volunteer days are set for Friday May 18, 1 - 5 p.m. and Friday June 15, 8 - 11 a.m. at the Horticulture Farm. Please email Michelle for more information – or just show up!

**USDA Student Diversity Program**
**By Emma Jobson**

This year I was selected as one of ten graduate students to participate in the USDA Student Diversity Program. The program took place in Washington D.C. from February 19-23. On the first day, we toured the USDA building and met with various offices within the department. We also had the opportunity to meet Dr. Sonny Perdue, the current Secretary of Agriculture. On the second day we went to the Hill and met with members from the Senate Committee on Agriculture and took a bus tour to see the monuments.


*U.S. Department of Agriculture (USDA) Secretary Sonny Perdue presents a certificate of appreciation to Outlook Forum Student Diversity Program winner Emma Jobson in Washington, D.C., on February 20, 2018.*

The third and fourth day we attended the annual USDA Outlook Forum. Speakers came from a diverse background including industry, academia, and legislature. The attendees were equally diverse; I met a rancher from Australia, an organic farmer from England, and a representative from the Dutch embassy. Overall, it was a great opportunity to see the relationships between agricultural science, business, and policy. I would strongly encourage other MSU graduate students to apply for the program next year.

**Montana Ag Live Schedule**

4/8 Jake TeSelle, MSU graduate and fifth generation Gallatin County producer, will inform viewers on Hop production, one of Montana's newest agricultural industries. If you like Montana craft beers, don't miss this program.

4/15 Stephen VanTasse, Vertebrate Pest Specialist with the Montana Department of Agriculture, addresses unwanted Montana critters - voles, moles and pasture pooches.

4/22 Tim DelCureto, Nancy Cameron Endowed Chair in range land beef cattle production, MSU - Animal and Range Sciences Deptartment, will look at the sustainability of

range land beef production in Montana and the western states.

4/29 Clain Jones, MSU Extension Soil Scientist, will discuss the change of Montana's high pH soils to acid soils in several Montana counties and why it is occurring at an alarming rate.

**Susie Siemsen Retires**

Since 1986, I have worked in the Chemistry Department, PSPP Department, and finally in the PSPP/ Potato Lab. I feel very privileged to have had the opportunity to work with so many people diverse in age, culture, and ideas. Being a part of MSU has rewarded me with a gratifying career and being able to stay in the great state of Montana.

I will miss the adventure of working at MSU, the Potato Lab staff, the growers, and the certification industry. The Potato Lab has allowed me to combine my passion of working in a lab with a newfound love of agriculture.

After retiring, I am looking forward to relaxing full time and traveling around Montana in the summer. After summer, I may explore several options such as learning more about computer programming languages or I may work part-time. If any of these new experiences end up being tied to agriculture, retirement is bound to be an exciting adventure.

**Grants**

Mike Giroux, "Understanding How Genetics Impact the Functionality, Nutrition and Flavor of Sprouted Wheat Flour", Bay State Milling.

**Publications**

McMenamin, A. and Flenniken, M.L. (2018), Recently identified bee viruses and their impact on bee pollinators, *Current Opinion in Insect Science,* 26:120–129 https://doi.org/10.1016/j.cois.2018.02.009

Mehmet E. Ozseyhan, Jinling Kang, Xiaopeng Mu, Chaofu Lu, "Mutagenesis of the FAE1 genes significantly changes fatty acid composition in seeds of *Camelina sativa*", Plant Physiology and Biochemistry, DOI: 10.1016/j.plaphy.2017.11.021.

Cathy L. Cripps, Janet E. Lindgren, Edward G. Barge, "Plant Sciences & Plant Pathology *Amanita alpinicola* sp nov., associated with *Pinus albicaulis*, a western 5-needle pine" Mycotaxon, https://doi.org/10.5248/132.665

Stuart J. Lucas, Ayten Salantur, Selami Yazar, Hikmet Budak, "High-throughput SNP genotyping of modern and wild emmer wheat for yield and root morphology using a combined association and linkage analysis" Functional and Integrative Genomics, Funct Integr Genomics. 2017 Nov;17(6):667-685.

Andrew C. Hogg, John M. Martin, Michael J. Giroux, "Novel ssIIa Alleles Produce Specific Seed Amylose Levels in Hexaploid Wheat", Cereal Chemistry, https://doi.org/10.1094/CCHEM-06-17-0124-R

Erin E. Burns, Barbara K. Keith, Mohammed Y. Refai, Brian Bothner, William E. Dyer, "Constitutive redox and phosphoproteome changes in multiple herbicide resistant *Avena fatua* L. are similar to those of systemic acquired resistance and systemic acquired acclimation", J Plant Physiol. 2018 Jan;220:105-114.

John M. Martin, Andrew C. Hogg, Richard W. Webster, Michael J. Giroux, "Creation and Characterization of a Double Null Puroindoline Genotype in Spring Wheat". https://doi.org/10.1094/CCHEM-04-17-0071-RW.

**Invited Talks**

Chaofu Lu. "Genetic improvement of Camelina oilseed for industrial applications". USDA Western Regional Research Center, Albany, CA. March 14, 2018.

**When to Plant**
**By Toby Day, Horticulture Extension Specialist**

Long-time residents of the Gallatin Valley will tell you to wait on planting your garden until you can no longer see snow on Bridger mountains. If I followed that rule last year, I would have planted my garden around the later part of June. Other ways to determine when to plant may include looking at planting calendars, trying to predict the last frost, or just winging it and planting when you can – which will work, but is often risky.

If you are planning on putting in a vegetable garden this year, the foolproof way to determine when to seed is to check soil temperatures. You can purchase a soil thermometer locally at garden centers or on the web for about $10. A soil thermometer will usually have a dial (or may be digital), and a probe that is around 6" long. They are easy to use and relatively accurate – at least enough to determine when to seed. To check soil temperatures, insert the probe into your garden soil at a depth of about 3".

The amount of time garden seed takes to germinate is mostly determined by the soil temperature. If you look at peas on the graph (see last page), you will see that, at a soil temperature of 41 degrees F, peas will take 46 days to germinate. However, when the soil temperature is around 70 degrees F, the pea seeds will germinate in about one week. Anyone who has had damping off problems with beans or peas knows it is usually because they were planted way too early when soil temperatures are too cool. When certain seeds sit in soils too long, especially in the Gallatin valley, they succumb to many of the fungal and bacterial issues in our soils. To avoid these issues, it is recommended to plant later – you guessed it, when the soil temperatures are warmer!

In the graphs provided on the last page of this newsletter, it shows that you *can plant earlier*. And, as we head into April, and hopefully into some warm, sunny spring days (although, I am not holding my breath), we have that itch to plant our garden – even though it is way too early! When looking at seeding/soil temperature graphs, a good soil temperature range for planting is between 60°F and 80°F. Unless you are growing under plastic, in raised beds, or in cold frames or hotbeds, you likely aren't going to see those soil temperatures until late May. Personally, I like to wait until the soil temperatures are a minimum of 60°F before I plant just about anything. I might even wait until 70°F soil temperatures before setting out my peppers, planting my squash or even my beans (due to damping off issues). And, since I have learned to wait, I have had great success.

I often tell people that I planted one of the best gardens the 3rd week in June (due to buying a new house and other circumstances). I was at least 3 weeks behind everyone else. And yet, my garden thrived and even looked better than many of my friend's gardens! That's when I learned that soil temperature has such an impact on germination and plant health. Who knew? Maybe those old timers were right, and we should just wait until the snow is off the Bridgers before planting.

For further reference on soil temperatures and seeding, a good chart from OSU Extension called "Soil Temperature Conditions for Vegetable Seed Germination" can be found at: http://extension.oregonstate.edu/columbia/sites/default/files/soil_temperature_conditions_for_vegetable_seed_germination.pdf

**Recipe of the Month**

Amish Breakfast Casserole
(courtesy of Taste of Home)

1 pound sliced bacon, diced or breakfast sausage
1 medium sweet onion, chopped
6 large eggs, lightly beaten
4 cups frozen shredded hash brown potatoes, thawed

2 cups shredded cheddar cheese
1-1/2 cups 4% cottage cheese
1-1/4 cups shredded Swiss cheese
Preheat oven to 350°. In a large skillet, cook bacon and onion over medium heat until bacon is crisp; drain. In a large bowl, combine remaining ingredients; stir in bacon mixture. Transfer to a greased 13x9-in. baking dish.

Bake, uncovered, 35-40 minutes or until a knife inserted in the center comes out clean. Let stand 10 minutes before cutting. Yield: 12 servings.  OK to assemble a day in advance and refrigerate.

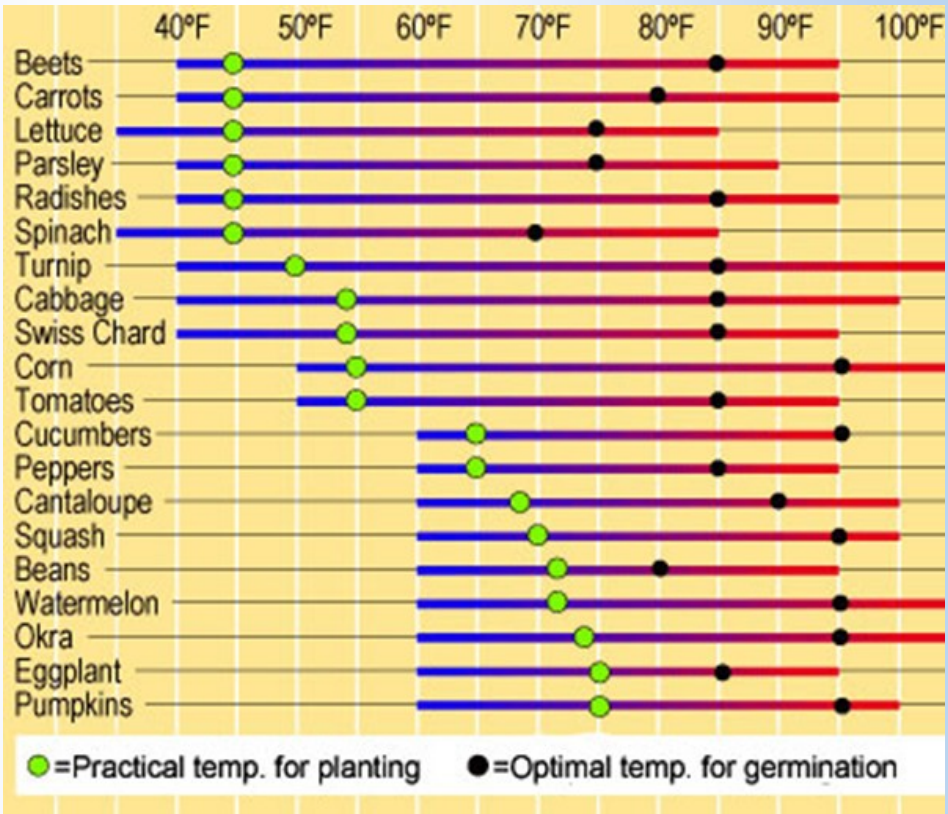
**Birthdays**

| | |
|---|---|
| Mike Giroux | 12 |
| Sarah Eilers | 13 |
| Toby Day | 15 |
| Dongjin Kim | 18 |
| Matt Lavin | 20 |
| Andreas Fischer | 25 |
| Nina Zidack | 26 |
| Rebekah VanWieren | 28 |
| Lipi Parikh | 29 |


**SEE NEXT PAGE FOR INFORMATION ON WHEN TO PLANT.**

## Days to Germinate according to Temperature

| degrees(f) | 32° | 41° | 50° | 59° | 68° | 77° | 86° | 95° | 104° |
|---|---|---|---|---|---|---|---|---|---|
| parsnips | 172 | 57 | 27 | 20 | 14 | 15 | 32 | | |
| onion | 136 | 50 | 13 | 7 | 5 | 4 | 4 | 13 | |
| spinach | 62.6 | 23 | 12 | 7 | 6 | 5 | 6 | | |
| lettuce | 49 | 15 | 7 | 4 | 3 | 2 | 3 | | |
| cabbage | | 51 | 17 | 10 | 7 | 6 | 6 | 9 | |
| carrots | | 50 | 17 | 10 | 7 | 6 | 6 | 9 | |
| celery | | 41 | 16 | 12 | 7 | | | | |
| peas | | 46 | 14 | 9 | 8 | 6 | 6 | | |
| radishes | | 29 | 11 | 6 | 4 | 4 | 4 | 3 | |
| asparagus | | | 52 | 24 | 14 | 10 | 11 | 19 | 28 |
| tomatoes | | | 43 | 14 | 8 | 6 | 6 | 9 | |
| parsley | | | 29 | 17 | 14 | 13 | 12 | | |
| sweet corn | | | 21.6 | 12 | 7 | 4 | 4 | 3 | |
| cauliflower | | | 119 | 9 | 6 | 5 | 5 | | |
| beets | | | 14 | 9 | 6 | 5 | 6 | | |
| turnips | | | 5 | 3 | 2 | 1 | 1 | 1 | 3 |
| lima beans | | | | 30 | 17 | 6 | 7 | | |
| okra | | | | 27 | 17 | 12 | 7 | 6 | 7 |
| peppers | | | | 25 | 13 | 8 | 8 | 9 | |
| snap beans | | | | 16 | 11 | 8 | 6 | 6 | |
| cucumbers | | | | 13 | 6 | 4 | 3 | 5 | |
| squash | | | | | 6 | 4 | 3 | | |
| eggplant | | | | | 13 | 8 | 5 | | |
| watermellon | | | | | 12 | 5 | 4 | 3 | |
| muskmellon | | | | | 8 | 4 | 3 | | |




*https://www.gardeners.com/how-to/when-is-it-warm-enough-to-plant/9029.html*