Plant Science Says

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PSPP Celebrates Graduation

On May 3, the Plant Sciences and Plant Pathology Department held a reception and awards ceremony for our graduates in 108 PBB/Mathre Courtyard. The graduates received the following books: Landscape Design graduates - "The Artful Garden: Creative Inspiration for Landscape Design"; Crop Science and Sustainable Crop Production graduates - "Weeds of the West"; Plant Biotech graduates - "Plant Biotechnology: The Genetic Manipulation of Plants"; and Plant Biology graduates- "1493: Uncovering the New World Columbus Created". Horticulture Science graduates received loupes (magnifying glass). All the graduates received a cowbell from the College of Agriculture, a carabineer, a coffee mug and either a miniature jade, rex begonia or periwinkle from the Department. Pictures of this event are on page nine.

Jennifer Britton, Elisa Boyd, and Tracy Dougher, photo courtesy of Jill Scarson

For the second year in a row, one of our graduating seniors received the Outstanding Senior Award for our Department and the College of Agriculture. Elisa Boyd was the recipient of both of these awards this year. Congratulations Elisa!

Following are the names of all those that received diplomas and awards.

Faculty Awards

Florence Dunkel

ESA Excellence in Teaching Award
President's Excellence in Teaching Award

Jennifer Britton

NACTA Teaching Award of Merit
Alumni Association/Chamber of Commerce Award for Excellence Mentor

Graduate Students

Ryan Quire - M.S., Plant Genetics
Anna Snapp - M.S., Plant Science
Mina Talajoor—M.S., Plant Science

Undergraduates

Biotechnology - Plant Systems

Jakob Kammeraad - B.S.

Environmental Horticulture - Horticulture Science

Luke Bromley - B.S., Honors, ASHS Collegiate Scholars Award
Anna Jespersen - B.S.
Elena Johnson - B.S.
Laurie Neuman - B.S., Honors, ASHS Collegiate Scholars Award
Paul Schreiber - B.S.
Kristel Slifer - B.S., Honors
Hannah Stocks - B.S., Honors
James Trotter - B.S., Honors

Environmental Horticulture - Landscape Design

Adam Cayko - B.S.
Elisa Boyd - B.S., Highest Honors, ASHS Collegiate Scholars Award, Alumni Association/Chamber of Commerce Award for Excellence, Outstand Senior Award for the College of Agriculture, Outstanding Senior Award for the Department of Plant Sciences and Plant Pathology.

Plant Sciences - Crop Sciences
John Howe - B.S.
Russell Stebbins - B.S.

Plant Sciences - Plant Biology
Erika Whitney - B.S., Highest Honors

Sustainable Food & Bioenergy Systems - Sustainable Crop Production
Benjamin Clark - B.S.
Alexander Kaul - B.S.
Richelle O-Leary - B.S., Honors
Maximillian Smith - B.S.

Congratulations to each of you and we wish you all the best in your future endeavors!

Honey Bee Booth a Big Hit at the Farm Fair
By Kevin Wanner

The Gallatin Valley Farm Fair held annually each May at the Brainard's ranch northwest of Belgrade hosts nine hundred 4th and 5th grade students from the elementary schools in the valley. This well-organized event is tightly run. A horn signals groups of students to move between the different booths every 15 minutes, allowing the students to view a variety of agricultural topics including milking cows and goats, identifying weeds, learning about 4-H, seeing how farm animals work, and making ice cream. This was the fourth year running that my lab has hosted a honey bee booth at the farm fair. Talking to groups of 10-15 students every 15 minutes can be exhausting, but the kids' enthusiasm for honey bees makes it a rewarding effort each year. Ruth O'Neill maintains honeybee colonies on the campus so that we can bring a glass observation hive for the children to view. For the first time we purchased a queen bee that was incorporated into the observation hive to show how the female worker bees tend to their female queen. To make sure that no one lost their voice over the three day event, Ruth recruited several volunteers to help. Many thanks go to Michelle Flenniken, Dave Kennedy, Whitney Lutey and John Watts for helping out at the booth this year!

This was one of the smaller groups, typically they averaged 10-15 in number. But the focus and attention of the kids on the honeybees, observed in this photo, was common with all the groups.

For the first time this year we incorporated a queen bee into the observation hive. The female worker bees have clustered in the top right hand corner, covering and tending to their queen.

By using demonstrations and by quizzing the students, we educate them on the importance of honey bees as pollinators for agriculture, their intriguing biology and how they can be raised. For example, honey bees pollinate over 130 crops in the U.S. and their pollination is valued at $15 billion annually. In Montana, beekeeping is the 10th largest business based upon income and we are the 6th largest honey producing state. Items for the kids to feel and touch included an empty hive with empty frames with drawn comb, containers of beeswax and a bee veil for the students to try on, as well as lots of pictures of bees inside the hive for the

students to see. A fun interactive question we asked is how many visits to a flower it would take to make one pound of honey. They loved guessing and were shocked to find out that it was two million visits. A hive of bees will fly 90,000 miles, the equivalent of three orbits around the earth, to collect two pounds of honey, hence the phrase "busy as a bee".

Most rewarding was all the questions from the kids and their adult chaperones! Often they hung around after the horn trying to ask more questions. Questions included how long the female queen lives for (up to five years), how long the female workers live for (four to six weeks in the summer) and how many bees are in a hive (around 70,000). Many of the boys repeatedly asked "Is there a king bee?"! This was an interesting point for future education. When I asked, "Are there more boys or girls in the colony?" only one group answered correctly that most of the colony is composed of female bees. Time will tell if we have managed to inspire a future generation of hobby beekeepers!

Share the Wealth Symposium
By Florence Dunkel

Why is this Symposium about wealth when it is presented by students in a course about “poverty”? From the first reading assignment students receive even before the first class,[1] students learn that there are many forms of poverty and many forms of wealth. Western cultures usually equate poverty and wealth with economic status, ignoring other forms of wealth and poverty such as relational, cultural, emotional, biological, spiritual, and environmental. But, what in the world do these other forms of wealth and poverty have to do with plant sciences, plant pathology or agricultural sciences of any kind? Many useful entomopathogenic bacteria (such as *Bacillus thuriengensisz)*, wheat varieties (such as Turkey), and plant-based insect growth regulators (such as neem, *Azadirachta indica*) have come from traditional knowledge. Along with these forms of traditional wisdom, come many important life lessons, not only for the students, but for the rest of us as well. In the course of the community-based research using the holistic process, [2] students find that they become facilitators, making learning between indigenous cultures possible.

This semester, students presented the results of their collaborative community-based research in their 4 sites: the Apsaalooke Reservation; Lame Deer, MT; Sanambele, Mali (a subsistence farming community); and a Palestinian refugee camp. The symposium began with a series of posters. One poster, for example, highlighted the ways that yarrow and yucca tradition uses could inform western medicine and food safety related to *Staphlococcus aureus* and *Listeria* strains. It is an amazing connection.

If you missed this semester’s presentations, 14 in all, check with Dr. Dunkel for a video transcript of each of these.

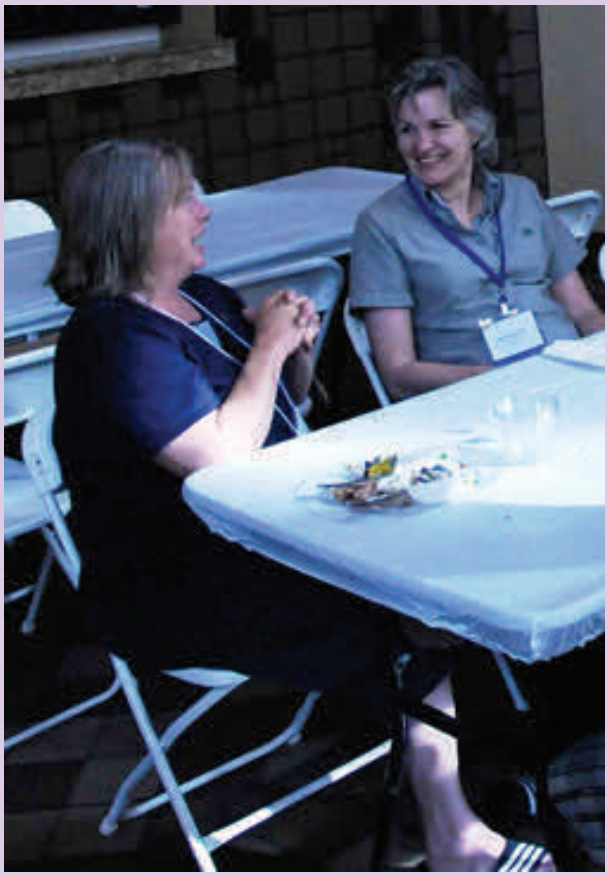
[1]H. Norberg-Hodge. Ancient Futures: Learning from Ladakh.
[2]A. Savory and J. Butterfield. Holistic Management.

AOSA/SCST Meeting
By Ron Larson

Recently Ron Larson and Bridget Westfall attended The 2013 Annual Meeting of the Association of Official Seed Analysts (AOSA) and Society of Commercial Seed Technologists (SCST) held in Boise, Idaho, May 17-23, 2013. This was the 103rd annual meeting of the AOSA and the 88th meeting of the SCST. This event provides a unique forum for collaboration and communication with seed testing professionals from regulatory, independent, certification, university and seed company laboratories. Proficiency testing is done at these meetings, allowing analysts to obtain their certification as AOSA or SCST analysts. In the AOSA/SCST system there are 49 AOSA accredited state seed labs and 120 SCST seed labs (70 private company labs, 10 crop improvement labs, and 30 private labs), basically all the labs in the U.S.

Ron Larson, along with other attendees, at the AOSA/SCST Meeting. Photo courtesy of Harold Armstrong.

The meeting also provides an opportunity for technical training and worthwhile discussions during the various workshops. Workshops included purity testing, germination and dormancy testing, seed identification, herbicide bioassay and genetic technology. Rule-making committees included those on tetrazolium, seed moisture, statistics, ethics, proficiency testing, international relations and the handbook, among many others. There were interesting sessions on the international movement of seed and the needs of the seed industry in terms of labeling and testing.



Bridgett Westfall enjoying a good discussion with a fellow attendee. Photo courtesy of Harold Armstrong.

The seed industry is always pressing for uniformity of testing between laboratories both nationally and internationally, which is also the goal of these two associations. Testing rules are developed for new species, existing rules are revised as needed, and all are made available in the association handbook of analysis procedures. There is also time for socializing with fellow analysts along the way, with an award's banquet and a couple of social hours. An open discussion forum was held regarding analysis of corn seed with stacked genetic traits and the concept of "refuge in a bag", where two varieties are mixed, one resistant to corn rootworm and corn borer, the other susceptible, in the same bag of seed. Discussion was ongoing regarding proper methodology for germination re-testing on holdover seed of these types of products in order to comply with rules in the Federal Seed Act.

Dr. Neal Foster, former director of the Montana State Seed Lab, was elected President of AOSA for the next year.

Relatively New Employees
HwaYoung Heo (Luther Talbert)

I am Dr. HWA-YOUNG HEO, a visiting research scientist from the National Institute of Crop Science in Suwon, South Korea. I received my Ph.D. from Korea University. I think many of you already know me, but it is a good thing for me to introduce myself and let you know what I have been doing here in this space.

I have been working in Dr. Luther Talbert's laboratory off and on since 2010; this is my 3rd visit here. I think there might be a special relationship between me and Montana.

My research focuses on QTL analysis of favorable genes from winter wheat for use in the spring wheat breeding program. I came here with my wife and two daughters. My wife was a mathematic teacher at a high school in my country and she is now is now a part time volunteer at Reach in addition to teaching mathematics to a GED class at Wilson School. She is very busy working, volunteering, studying, etc., busier than me. My oldest daughter graduated from Bozeman High School and is studying biology at Georgetown University and the younger one is a junior at Bozeman High School.

We are enjoying everything including skiing, golf and many other outdoor activities. Also, we love our new hometown, Bozeman, very much and feel very happy to be part of such a wonderful community in Montana.

Department of Research Centers/ MAES 2013 Field Day Schedule

Northern Ag Research Center - Havre, MT
Wednesday, June 26, 2013
3:00-4:00 pm-Registration
4:00-5:30 pm-Tours of field plots
5:30-7:00 pm-Dinner with Speakers
7:00-8:00 pm-Tours

MSU's Post Research Farm
Thursday, June 27
8:30 a.m. - 3:30 p.m.

Central Ag Research Center - Moccasin, MT
Tuesday, July 9, 2013
9:00 am - Registration
9:30-1:30 pm - Field Tour

Western Triangle Ag Research Center - Conrad, MT
Wednesday, July 10, 2013
8:00 am-Registration and Refreshments
8:45 am-Welcome and Announcements
9:00 am-On-Station Research Tours/ Discussions
12:30 pm-Lunch

Eastern Ag Research Center - Sidney, MT
Thursday, July 18, 2013
8:30 am-Coffee and Rolls
9:00 am-Greetings from Jeff Jacobsen and Barry Jacobsen
9:20 am-Tours of plots begins
12:00 pm-Lunch provided

DRC/MAES Summer Conference at EARC
Thursday, July 18, 2013, 1:30 pm
Friday, July 19, 8:30 am - 12:00 pm

Northwestern Ag Research Center - Kalispell, MT
TBA

Montana Ag Live! Schedule - Sundays at 6:00 p.m.

June 2 - Perry Miller, MSU's cropping systems specialist, "The reality of using cover crops in Montana to improve soil health".

June 9 - David Sands, "Methods used to improve nutritional value of Montana's crops".

Class Focus
Norm Weeden – BIOB 377
Practical Genetics

What is cancer? What is genetic diversity—and what is the best way to measure it in a species? What will I learn about myself if I get my genome sequenced? What is the most dangerous environment mutagen I am likely to encounter? Why don't I ever see a male calico cat? What genes make a leaf, or a leg—and how did scientists make those flies with a leg coming out of their head? All these are questions we address in Practical Genetics. The goal of this course is to have you develop a practical knowledge of genetics, allowing you to perform successfully in roles requiring a general knowledge of biology, as well as to assess the importance and accuracy of genetic information/interpretations presented to you in newspapers or magazines, people in leadership positions,

or your physician.

The course primarily consists of a series of lectures/discussions that are augmented by readings and problems from a standard genetics text (Concepts of Genetics by R.J. Brooker has been recommended for the last two years). The course is divided into three parts, the first third being transmission genetics (how traits are passed on from one generation to the next). We then take up DNA structure and how that molecule is amazingly well-suited for its function. Finally, in the last third of the course we apply what we have learned to current issues or aspects of life that turn out to be intimately associated with fundamental genetic principles. Although there is no laboratory specified for the course, you will also obtain hands-on experience performing the same experiments Mendel did and analyzing your own data. Concepts such as segregation, linkage, meiosis and recombination will become second nature to you. In addition, you will become MSU's expert on the genetics of a genus of your choosing.

This course is taught each Spring Semester, and for many majors it is interchangeable with BIOB 375 (General Genetics) and has the same pre-requisites (a 100 or 200 level course in cell and molecular biology). However, the class size of BIOB 377 is about 30, while that for BIOB 375 is over 100. I do get to know every student in my class, and we do have time to discuss some of the ethical and social issues associated with DNA genotyping and other aspects of this rapidly developing field. I look forward to seeing you next spring.

Teaching Tips
Flipping the Classroom – Part III: Not My Style
By Tracy Dougher

In my quest to flip the classroom I was partly cognizant of the literature that suggested students each have a particular learning style. We've all heard it somewhere along the way….kinesthetic learners, auditory learners, etc. So I made it my challenge to try to address as many learning styles as possible during classtime. I focused on attempting this in only one of my courses. The fallout was one traditional lecture period, one lecture period turned into a discussion, and the lab section covered hands-on learning. I figured I covered all the bases (or most of them) and it seemed to me the students were more engaged. Therefore, I was quite shocked by what I heard on 'The Skeptics Guide to the Universe' a favorite podcast of mine. On the podcast they play a game called 'Science or Fiction' in which the lead host lists three to four science headlines, one of which is fiction and the others current science findings. The cohosts try to give an educated guess as to which one is fiction and share their thought process during the podcast. This is actually a wonderful exercise during class to help develop critical thinking skills, but I digress. On Septemebr 15, 2010, podcast #270, (http://www.theskepticsguide.org/archive/podcastinfo.aspx?mid=1&pid=270) was the quiz that shook up my learning styles world.

Can you pick out which one headline is fiction? (the rest are science):

#1 After studying the material, self-testing is more effective at enhancing learning that repeated studying.

#2 It is best to study in a consistent and uncluttered environment.

#3 A recent review concludes that there is no evidence to support the notion that different people benefit from different learning styles, such as visual vs auditory.

#4 It is better to study a topic spaced out and mixed with other topics, than all at once.

Number 2 is fiction (which also shook up my notions about studying, but more on that later). That means that #3 is SCIENCE. The review cited in #3 is a paper by Paschler et al. (2009) and a meta-analysis of the learning styles literature. What Paschler et al. found is that of the

thousands of studies done on learning styles, only one meets true scientific scrutiny of learning styles and, at best, the rest of the literature is mixed in their conclusions. Part of the problem lies in defining learning styles. Some researchers let the learner define what learning style they are whereas other researchers test students and utilize results of the test to conclude which learning style category best fits the student. Then throw in how each researcher defines the categories and the result is no less than 70 learning style schemes. The hefty conclusion of Paschler et al. is that we should quit throwing away good tax dollars on K-12 students trying to categorize their learning style and tailoring coursework to the student. So in my own anecdotal little world, I felt like I was reaching students and their interest and they were learning more than when I was teaching with traditional lecture. What was going on? What Paschler et al. suggests is that we not address student learning styles, but instead provide opportunities for students to engage in learning with multiple senses and multiple resources. Providing multiple modalities for learning the material increases the likelihood that students are studying the material more (I call it practicing) and engaging more of their senses to hardwire connections in the brain (both of which we do have scientific evidence for). I am continuing to alter my courses, not to address multiple learning styles but to provide more opportunity to engage the students and to practice the material.

Paschler et al. (2009) Learning Styles: Concepts and Evidence, *Psychological Science in the Public Interest* 9(3):105-119.

Publications

G. Bellante, S.L. Powell, R.L. Lawrence, K.S. Repasky, and T. Dougher (2013) Aerial Detection of a Simulated CO_2 Leak from a Geologic Sequestration Site Using Hyperspectral Imagery. *International Journal of Greenhouse Gas Control* 13:124–137.

Landscape Fabric
By Toby Day, Extension Horticulture Associate Specialist

One of my biggest pet peeves in landscaping is the overuse of landscape fabric – often called “weed fabric.” Sold by the acres and used by almost all the landscape professionals in the area, landscape fabric has become the norm in landscape materials. I think the biggest farce about landscape fabric is that it provides a “permanent solution” to weeds. At best, landscape fabric is only a temporary solution that is many times harder to remove when it does degrade, and the damage it does to landscape plants when removed outweighs any weed control benefit.

Not convinced? You need only look at the landscape plantings around the perimeter of my house. Landscaped years before I bought the house, the landscaper put in several shrubs surrounded by landscape fabric. Over the landscape fabric, the landscaper placed river rock (1-3” river pebbles) about 3 inches thick. I’m sure it looked good the first two years, but now it is a big mess. The landscape fabric has decomposed and the whole thing is a big mixture of weeds growing on top and through the degraded fabric, as well as a sea of rock that makes removing the whole thing a misery. Ugh, what a mess!

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Originally this may have appeared to be a good idea; however, now it is difficult to re-move.

The fact is that landscape fabric will decompose over time and will need to be removed. And, in some instances, the roots of the shrubs or trees can grow into the fabric and can be damaged in the removal. The event of removal becomes a huge back-breaking effort, much more than simply weeding the area. So much for saving time and energy!

I highly recommend when planting any landscape to keep the fabric only to the walkways and even then, do you really need it? Use mulches 3-4 inches thick (4-6 inches when newly planted) without the "weed fabric" to suppress the weeds. You may need to keep up on weeding once or twice a year, but you will have considerably less weeds if you keep the mulch at optimum levels and are diligent about weeding.

Still not convinced? See what other Extension Horticulturists are saying about landscape fabrics, including Linda Chalker-Scott, Ph.D. Extension Horticulturist from Washington State University. Here is a link to her fact sheet on the subject: http://puyallup.wsu.edu/~linda%20chalker-scott/horticultural%20myths_files/Myths/Landscape%20cloth.pdf

Recipe of the Month

California Grilled Veggie Sandwich

1/4 c mayonnaise
3 cloves garlic
1 T lemon juice
1/8 c olive oil
1 c sliced red bell peppers
1 small zucchini, sliced
1 red onion, sliced
1 small yellow squash, sliced
2 focaccia bread pieces, split horizontally
1/2 c crumbled feta cheese

In a bowl, mix the mayo, minced garlic, and lemon juice. Set aside in the refrigerator.

Preheat the grill for high heat.

Brush veggies with olive oil on each side. Brush grate with oil. Place bell peppers and zucchini closest to the middle of the grill, and set onion and squash pieces around them. Cook for about 3 minutes, turn, and cook for another 3 minutes. The peppers may take a bit longer. Remove from grill, and set aside.

Spread some of the mayo mixture on the cut sides of the bread, and sprinkle each one with feta cheese. Place on the grill cheese side up, and over with lid for 2-3 minutes. This will warm the bread, and lightly melt the cheese. Watch carefully at so the bottoms don't burn. Remove from grill, and layer with the vegetables. Enjoy as open faced grilled sandwiches.

June Birthdays

Israel Davich	2
Jill Scarson	3
Zach Miller	4
Ron Larson	12
Li Huang	12
Jennifer Britton	12
Ron Ramsfield	15
Jackie Kennedy	15
Pamela Burkenpas	15
Luther Talbert	18
Eileen Carpenter	22
Bill Hoch	25

Something to Crow about!

Rod and Deanna Crow are the proud parents of EmmaLeigh Grace Crow, born on May 24 and weighing in at 7 lbs 2 oz. She joins sisters Naomi and Madalynn.

Congratulations to all of you!

CONGRATULATIONS!

Department of Plant Sciences and Plant Pathology, Class of 2013


Class of 2013


Jennifer Britton, Elisa Boyd, and Tracy Dougher

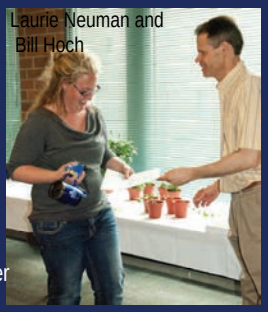

Tracy Dougher and Florence Dunkel


Adam Cayko, Jennifer Britton and Rebekah VanWieren


Jakob Kammeraad and family


Anna Jespersen and Bill Hoch


Tracy Dougher and Elisa Boyd


Laurie Neuman and Bill Hoch

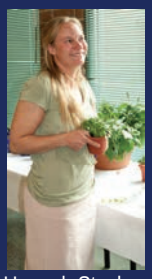

Tracy Dougher and Jennifer Britton


John Howe and Jack Martin


Jamie Raznoff and Bill Hoch


Tracy Dougher and Paul Schreiber


Luke Bromley and Bill Hoch


Hannah Stocks


Ddn Mathre, Tracy Dougher, and Chaofu Lu


Alexander Kaul, Bill Hoch, and guest


Kristel Slifer and Bill Hoch


Rachel O'Leary and Bill Dyer


Elena Johnson, Bill Hoch, and James Trotter


Family and friends enjoying the Mather courtyard


Nicholas Marchi


James Trotter


Alexander Kaul and Bill Dyer


Class of 2013 and guests


Family and friends of graduates at Awards Ceremony


Jennifer and Bill Hoch with guests