

# *Plant Science Says*



*Happy  
4th of July!*

Volume 15, No. 6

July, 2013

## **Farewell to Susan Lanning**



Susan Lanning is retiring from MSU and her final day with the PSPP Department will be July 15, 2013. Following are a few parting words from Susan.

"Thank you for your support throughout the years in this position; it has been a big part of my life but after 29 plus years I

am looking forward to less stress and a change. I have enjoyed the years of successes along with the challenges in the management of the spring wheat breeding program with Luther Talbert. I have been proud to have been part of a team developing improved spring wheat varieties for Montana producers.

It has been a rewarding experience. Ever since I was a work study student with Dr. Bob Eslick's barley breeding program, I aspired to work on a breeding project. I will miss being in the wheat research plots and working with you!

Although my stubborn, straight faced demeanor doesn't express it, I truly have enjoyed working with all of you! There are so many people to thank including; co-workers, fellow researchers, PSPP staff, graduate students, and student workers who have worked with me over the years.

As I retire, I wish everyone I have worked and cooperated with much more success especially pertaining to the wheat breeding programs. Kind thoughts and memories will always be there."

There will be a farewell potluck for Susan on Monday, July 15, at 5:00 p.m. at the Post Farm - more details to follow. If you want to stay in touch with Susan, her email is [suzqcp@gmail.com](mailto:suzqcp@gmail.com).

## **Mike and Donna Ivie Visit Indonesia By Mike Ivie**

At the invitation of the Research Center for Biology, LIPI, Bogor, Indonesia, we traveled to Java to work at the Museum Zoologicum Bogoriense, founded by Dutch Colonials in 1894, and now under the direction of the National Biodiversity Museum of Indonesia. Unbelievably, there is no research beetle systematist in Indonesia. Since beetles are the largest single element of metazoan biodiversity, this is a terrible omission! So, they needed someone to help sort material from a major LIPI/NIH/UC Davis inventory effort on Sulawesi, and to work with and train students from local universities.

We traveled via Hong Kong, where we stopped for 2 nights to see Donna's niece and her husband, and then on to Jakarta, capitol of Indonesia. What a contrast! Asia's emerging cities are a mass of skyscrapers unlike anything in North America. Indonesia is the world's 4<sup>th</sup> most populous country, the 14<sup>th</sup> largest in area, and the largest made up entirely of islands - some 17,000 of them. Jakarta is HUGE, with traffic as difficult to navigate as any I have ever seen. Luckily, we were met at the airport and we were provided a Toyota Landcruiser and excellent driver.

The collections were in a modern building about ten years old, kept under excellent environmental conditions and with great housing. This was the best facility I have ever seen for a tropical insect collection! And, it was all wheelchair accessible, something I can't say even about all the U.S. museums.

Wallace's Line goes right through the country, so I got to contrast the Javan material already in the museum with the new collections from Sulawesi. It is rare to get to work with intact samples before they are divided taxonomically. Over the course of two weeks, I worked with staff and students to sort and morphotype some 10,000 beetles of 60 families and several



*The insect room at the Museum Zoologicum Bogoriense.*



*Mike with an English Class at SMK1 Technical High School in Cibinong, Bogor, Java.*



*Mike with staff and students*

hundred species, and taught the first beetle taxonomy course ever in Indonesia.

Over the course of the trip, we got to visit some outstanding local restaurants (Indonesian cuisine is amazingly diverse with many local forms), a conservation facility with endangered mammals like the Sumatran tiger, Komodo dragon and Asian tapir, as well as the spectacular Bogor Botanical Gardens, which is celebrating its 175 year.

One highlight was when the curator of Lepidoptera's wife invited us to visit the high school where she taught English, to allow the students to try their skills out on native speakers.

Well, when you are 12 time zones from home, Bali is "just over there" so after Java, we went on a short vacation as a thank you to Donna for all her help. Well,



*Mike and Donna with Language Teachers at SMK1 Technical High School in Cibinong, Bogor.*

Bali is fantastic, it makes Hawaii look like WalMart! Art of every kind everywhere, it is deep within people's lives. Even the rice paddies are beautifully laid out. And, very affordable! Donna never shops for fun, but boy did she have fun there! Batik, painting, silver work, brass, kites – just a fantastic place, we highly recommend it.



*Arrangement on a street in Bali: hibiscus leaves cut into shapes and laid around a ring of hibiscus petals, with cut frangipani flower skewered by the center of the hibiscus flowers. Plus other stuff – all floating on water - just to be pretty!*

Our hotel had the most beautiful garden I have ever seen right outside our door, with a pool, breakfast pavilion and a pet flying fox. That is a combo you just don't see very often! There was a monkey temple, a place to play with elephants (really!), a



volcano with a crater lake, luscious mangostens and all other types of great fruit, and all without ever going near a beach!

And, besides the roast pig, roast duck and red rice, we found this. Don't knock it until you try it!

#### Recipe for Chocolate Avocado Juice

Squirt a line of chocolate syrup (Hershey's) down 2 sides of a glass soda fountain glass. Blend in blender one ripe avocado, milk, simple syrup and ice until smooth. Pour into glass and top with chocolate syrup. Drink with a straw. Strange, but good strange.

Then, it was the three day flight home Bali-Jakarta-Hong Kong-Narita-Seattle-Bozeman. I really am tired of waiting for Scotty to get the transporter working!

### **The National Association of Plant Breeders and the Plant Breeding Coordinating Committee 2013 Meeting By Jamie Sherman**

NAPB and PBCC held their joint meeting June 2-5 in Tampa, Florida. Titled "*Positioning Plant Breeding for the Future*", the meeting focused attention on how plant breeders, institutions, agencies and companies can optimize the future by recognizing breeding-relevant challenges, opportunities and trends. Genomics, high-throughput phenotyping, global positioning systems, biotechnologies, other "-omics", and "big data" are among the high-impact opportunities for enhancing plant breeding. Challenges include the need to regain resources and programs to sustain public plant breeding, breeding research and plant breeding education, so that we can provision our nation adequately and sustainably. A major need is to increase societal understanding and thus appreciation for the contributions of plant breeding and agriculture to food security and environmental sustainability on national and international scales.

The meeting featured four sessions of invited speakers who addressed topics essential to discussions about how the U.S. might position plant breeding in the future. Session themes were 1) Excellence in Plant Breeding, 2) Plant Breeding Education 3) Populations and Phenotypes", and 4) Data Collection, Archiving, and Analysis.

Student poster awards went to Steve Becker (Colorado State University) Jill

Recker (North Carolina State University) and Gerardo Nunez (UFL). Duke Pauli (Montana State University) won Honorable Mention for his poster entitled, "Large, Multi-Year Field Trials Identify Novel Barley Marker-Trait Associations."

Meeting features included tours, panel-led discussions, workshops, a meeting banquet and a plenary speech by Dr. Molly Jahn of the University of Wisconsin, on "*Agricultural Sustainability and the Future of Plant Breeding*".

Tours highlighted cutting-edge UFL plant breeding at the Gulf Coast Research and Education Center (GCREC) for fresh tomato and juice orange markets. Among the highlights were breeding efforts described by UFL scientists Dr. Jay Scott and Dr. Sam Hutton for tomato flavor, tomato virus and bacterial disease resistance, and a description of citrus breeding by Dr. Fred Gmitter of the UFL, as well as the ongoing devastation of the citrus industry by "Yellow Dragon Disease" ("Huanglongbing"). The history behind this disease and its multi-billion dollar ramifications underscored why the US needs to re-invigorate its support for plant breeding and agriculture. The continuing "tsunami" of destruction to the Florida citrus industry exemplifies what can and will happen to other important crops without support of plant protection and breeding programs.

#### SESSION and TOUR DETAILS:

In several aspects, Plant Breeding Education is in a state of metamorphosis and diversification. Influential factors include the importance of breeding, rapid incorporation of new technologies in breeding programs, growth of plant breeding for some economically important plants in the commercial sector, web-based and other non-conventional educational options, assimilation of new technologies, and decades of eroded support for public field-breeding programs that educate professional breeders. Thus, NAPB devoted a panel-based session to present and discuss various forms of Plant Breeding Education. These included "The Syngenta Breeding Academy" by Dr. Heather Merk, "Inquiry-based learning and the Plant Breeding and Genomics Community" by Dr. Shawn Yarnes, an approach at Western Illinois University emphasizing undergraduate education in plant breeding, by Dr. Winthrop Phippen, the present and future of USDA/NIFA funding for plant

breeding education by Dr. Liang-Shiou Lin, the Monsanto fellowship program, by Dr. Michael Lohuis, and the Dow AgroSciences Professional internship program by Dr. Don Blackburn.

As genomics, phenomics, metabolomics, and other technologies gain momentum, breeders' choices, challenges and opportunities are multiplied and magnified. These were some of the topics highlighted in the "Populations and Phenotypes" session. EUCARPIA's president, Dr. Beat Boller, led off the session by describing EUCARPIA's efforts to position plant breeding in this century, and the potential for interactions with NAPB, as plant breeding in Europe faces huge opportunities and challenges that are mostly similar to those in the US. Dr. Natalia de-Leon (Univ. of Wisconsin) discussed the use of complementary population structures for genome wide association studies in maize. Dr. Gary Peter (UFL) described historical, cooperative and largely conventional aspects of the major Southern pine breeding program. This was followed by Dr. Patricio Munoz's (UFL) discussion of new features and opportunities created in the forest program through assimilation of genomics data and new statistical methods. UFL strawberry breeder Dr. Vance Whitaker described how consumer-assisted selection in strawberry and correlated chemical analyses are paving the way to breed scientifically for enhanced flavor, field performance and yield, and also whetted

everyone's appetite for dinner. The session on data collection, archiving and analysis included an invited talk by Victoria Blake entitled "T3 database" (for Triticeae crops) was presented by USDA scientist Dr. Victoria Blake.



*Dr. Victoria Blake gave an invited talk entitled "T3 database"*

During the last afternoon of the meeting, attendees chose one of two workshops or a tour of a Dole blueberry facility. The two workshops addressed "Data" and "Life Skills, respectively. In the "Data" workshop, domestic and international attendees

discussed and planned how breeders, data specialists and web specialists can coordinately move towards developing data systems that enhance plant breeding multi-dimensionally. The Life Skills workshop, "Beyond Science" was led by Dr. Kim Kidwell from Washington State University and Dr. Jamie Sherman of Montana State University. Industry representatives Dr. Don Blackburn (Dow AgroSciences), Dr. Tabare Abadie (Pioneer Hi-Bred Int'l) and Dr. Donn Cummings (Monsanto) shared what industry is looking for in new hires. Industry requires not only good scientists, but also people with a broad array of human capital skills, including teamwork, management, problem solving, communication and leadership. Students were able to ask industry representatives advice on skills they need to develop.

Attendees were reminded that the 2014 annual meeting will be in Minneapolis, August 5-8, immediately preceding the American Phytopathological Society meetings Aug. 9-13.

### **WERA-1017**

#### **By Mary Burrows**

In June, I attended the 'Coordination of Integrated Pest Management Research and Extension/Educational Programs for the Western States and Pacific Basin Territories' meeting in Fort Collins, CO. This is a meeting where the western state IPM coordinators get together and discuss current and future programming. This year, we had a day and a half of meetings and a day-long tour of Rocky Mountain National Park. I'm not quite sure how we justified the park tour, but it



*Bill Jacobi explains the fungi, birds, insects, and other factors involved in aspen decline.*

was pretty fun to learn about some of the major issues they face in the Park: Insect and weed management for chemically sensitive visitors and nitrogen contamination (50% from vehicles). Bill Jacobi told us a lot about his efforts to quantify insect movement in

firewood, and how browsing by elk has decimated tree populations in the park. We intended to have lunch by one of the animal enclosures, but due to high winds, freezing temperatures, snow, and a couple of 'sensitive' individuals from Hawaii and



*Ned Tisserat describes thousand cankers disease of walnut next to an affected tree on the CSU campus.*

Guam, we opted to have lunch indoors. Oliver Neher attended the meeting and it was great to catch up with him. I also got to see thousand cankers disease of walnut for the first time. Ned Tisserat got to name the disease after it was discovered in Colorado and has since been found to be widespread.

## **WERA-97**

### **by David May**

Dr. Alan Dyer, Riyadh Alkhafaji and I attended the WWW-WERA 97 meeting in Pendleton, OR on June 18. It was a long drive to Pendleton – about 9 or 10 hours – through some open and lonely country. We pulled into town the evening of the 17<sup>th</sup> and met a cadre of regional plant pathologists and breeders for supper at a local cafe. The group included Drs. Chris Mundt and Dick Smiley out of Oregon State University, Tim Murray of Washington State University, Juliet Marshall of University of Idaho, as well as Drs. Dale Clark and Jason Cook, who are breeders for Westbred and our Department Head, John Sherwood. Alan, Riyadh and I were particularly eager to meet Dick, whose work on soilborne pathogens of wheat has greatly informed our research here at MSU in wheat breeding and pathology. Unfortunately, Dick was tied up with other obligations for the greater part of our stay in Pendleton, but invited us back to tour his labs and research plots at the Columbia Basin Agricultural Research Center at a later date.

The following day the meetings began. Bob Zemetra, the wheat breeder for OSU, began the conference with a brief

overview of the controversial transgenic wheat discovery in eastern Oregon. He explained that he and his team of researchers had confirmed, on several separate occasions, that a small number of wheat plants found in a farmer's field contained the gene for resistance to glyphosate, the key ingredient in the herbicide Roundup. Beyond that, he said, they didn't know too much. The matter of how the plants got there, the number of plants involved, the spatial distribution of the plants in the field, were all unknown to him at that point in time. The Animal and Plant Health Inspection Service, or APHIS for short, had taken over the investigation shortly after their discovery and Dr. Zemetra and his colleagues were left out of the loop.

The meeting continued with annual reports presented by the breeders and pathologists from Idaho, Montana, Oregon and Washington who were in attendance. At one point, the pathologists and breeders were split into separate groups so that issues specific to those fields could be discussed. Riyadh and I sat in on the breeding portion while Alan went with the pathologists. Regional wheat breeders and geneticists from the University of Idaho, Oregon State University, Washington State University, Limagrain, Monsanto and Syngenta discussed whether or not breeders should be able to cross to any cultivar entered into western regional wheat trials. Breeders from public institutions, on average, seem to be more supportive of open exchange of germplasm while breeders from private companies are, understandably, more protective of the varieties they develop. There was also a brief squabble over the sharing of unpublished molecular markers between breeding programs.

The final segment of the meeting included tours of the breeding plots at the Hermiston Agricultural Research and Extension Center. The tour began with a quick look at some forage triticales a retired OSU small grains breeder was working with. The diversity in his field plots was pretty amazing, the colors of the plants varying from purple to red to green, awned and awnless types, plants both short and tall and in between. The tour then shifted to some of the wheat breeding trials plots. The breeding objectives are different in Oregon than they are here in Montana. A lot of the





*Riyadh Al-Khafaji standing next to a plot of triticale and a closeup of triticale below.*



*Triticale*

production is under irrigation, with the acreage largely soft white wheats. Unadapted wheat types I saw in the plots often had grown too tall, unaccustomed to the high inputs, and had lodged. The high moisture environment was also ideal for diseases that I haven't seen in Montana winter wheat breeding plots, such as black chaff and powdery mildew. There were also several plots planted to club wheat varieties. We don't see club wheat at all in Montana; they are funny-looking things with short, squat heads, and are used in the production of pastry flours. The tour concluded with a look at a soilborne mosaic virus resistance trial in which only three of several dozen plots survived. Dinner followed, and Riyadh and I had the opportunity to interact with another plant breeding graduate student from WSU, which was nice.

We left the next day even though there were more tours of field trials scheduled. It was just as well, because there were heavy rains and the tours ended up being canceled anyway. All in all, it was great seeing something different and meeting some more people involved in plant

breeding and plant pathology. I look forward to participating in similar meetings. Riyadh took several videos during the trip and this one is a short video about the history of the Columbia Basin Agricultural Research Center:

<http://www.youtube.com/watch?v=D0WJaN8BeFU&feature=youtu.be>

For more information on WERA-97, go to: <http://plantsciences.montana.edu/wera97/Default.htm>.

### **PSPP Outreach**

Montana Farmers Union tour of Montana State, June 6-7, 2013

By Mary Burrows

About 60 members of the Montana Farmers Union and five couples participating in the young farmer and rancher program in other states toured the Post Research Farm, Marsh Labs, and the PSPP department in June. We also had representatives from the offices of John Tester and Max Baucus. Thank you to everyone who participated; I keep getting notes and emails about what a good time they had and how much they learned about the activities here.



*Bill Grey brings the group into 'the field' to explain certified seed while other groups looked at insects and the seed lab.*



*David May tells the group about nematodes.*



## The Honey Bee Investigators (HBI)

By Michelle Flenniken

The Flenniken Lab welcomed fourteen 6<sup>th</sup> and 7<sup>th</sup> grade students into the laboratory as part of the Peaks and Potentials Program offered by MSU's Extended University (June 17-June 21<sup>st</sup>). This program hosts students from across Montana for a one-week experience at MSU. Some of the students from Bozeman stay at home, but the majority of them stay in the dorms. They attend three classes per day, participate in evening activities, and have a great introduction to MSU.

Michelle's Honey Bee Investigators (H.B.I.) class challenged the students by having them do honey bee/pathogen RNA preparations, cDNA synthesis, and PCR detection of common honey bee pathogens. While some of the labs were "staged" and relied on the expertise of undergraduate and graduate students in the Flenniken lab (Madison Martin, Emma Garcia, and Laura Brutscher) and assistance from Dr. Katie



*Michelle Flenniken starting the day with a short lecture and question/answer session.*



*Michelle Flenniken with her Peaks and Potentials class of 6th and 7th graders.*



*Michelle Flenniken showing a frame of bees to her students on their trip to the apiary on the Hort Farm.*

Daughenbaugh, the students learned real molecular biology skills (i.e., pipetman use, PCR reaction set-up, and gel electrophoresis). In lectures, they learned about bee biology and molecular biology. They were quizzed on DNA, RNA, genomes, and PCR. Although these topics challenged the students, they seemed to understand the overall concept and enjoyed their H.B.I. experience. The highlight of the week was a trip to the bee yard at the horticulture farm, which generated numerous questions and a lot of excitement.

## **New Employees**

**Dr. Hans Schneider**

Dr. Hans Schneider was recently appointed Superintendent and Plant Pathologist at Eastern Agricultural Research Center in Sidney.

Dr. Schneider, currently living in the Netherlands, will join the Montana State University faculty and will be both



*Dr. Hans Schneider showing symptoms of Cercospora leaf spot to Dutch sugarbeet growers.*

Superintendent and Associate Professor of Plant Pathology at the Eastern Agricultural Research Center in Sidney, Montana pending approval by the Montana Board of Regents. He will assume these duties on July 15. Dr. Schneider will be present for the Eastern Agricultural Research Center Field Day on July 18.

He will develop a field-oriented research program that focuses on integrated disease management in pulse crops, sugar beets, and other crops under production in Eastern Montana. Additionally, he will be responsible for the administration and management of resources in support of EARC's research and outreach programs pertinent to Montana agriculture.

Barry Jacobsen, long time MSU Plant Pathologist and Interim Head of the Department of Research Centers states, "We are very fortunate to have someone of Dr. Schneider's experience and abilities join our faculty. Dr. Schneider will bring exceptional expertise to addressing sugarbeet diseases as he has spent the majority of his career working on sugarbeet diseases with the Institute for Sugarbeet Research in the Netherlands. He has also worked on diseases of bulb crops, potatoes and woody ornamentals so he is well situated to address diseases of other crops important to Eastern Montana."

He received his Ph.D. in 1998 from Wageningen Agricultural University in The Netherlands. His dissertation was supervised by Drs. J.C. Zadoks and N.J. Fokkema.

#### Dan Gustafson



By Michael Ivie, Curator, MTEC  
Daniel L. "Dan" Gustafson, long-time programmer, statistician and aquatic entomologist/malacologist/botanist/fisherman/etc. in Dan Goodman's lab, recently

retired from the Ecology Department, and will be joining PSPP's Montana Entomology Collection as Associate Curator of Aquatics. A regionally famous organismal biologist of extraordinary breadth, Dan is one of the best collectors ever, and has donated his extensive collections of aquatic specimens, books and field notes – 9 cubic meters of materials – to the MTEC. He had donated

his terrestrial holding several years ago. Dan received his B.S. degrees from Michigan State University, the first in Biology in 1977 and his second in Fisheries and Wildlife a year later. After a M.S. in Zoology with a minor in Botany at the University of Florida in 1981, Dan received his Ph.D. in 1991 from Montana State University in Biology with a minor in Statistics. Since then, he has been working with Daniel Goodman on a wide variety of programming and statistical projects. Dan has scoured what he calls Greater Montana for the rare and unique as well as the widespread and poorly documented. If you get it out of the water, Dan can probably tell you what it is. His collection is a wealth of material that holds the makings of innumerable papers, and documents such events as the colonization and spread through Montana's rivers and streams by Whirling Disease and the New Zealand Mud Snail. There is hardly an aquatic habitat in the State and surrounding areas that he does not know. After some time off to kill fish, Dan will share room 49 Marsh Lab with Associate Curator Justin Runyon. His phone will continue to be 994-2771.

#### **Beautification of The Mathre Courtyard**



*One of the planters Deanna Nash planted.*

Thank you to Deanna Nash, Donna Duff, and Dara Palmer for all their hard work in the Mathre Courtyard.

Once again, during the first week of May, Deanna Nash purchased plants and planted them in the five large planters in the Courtyard.

Thank you also to David Baumbauer for allowing the pots to be kept in the greenhouse until the danger of frost had passed.

Donna is a Master Gardener and the Mathre Courtyard is her Level III project. She has been clearing out the diseased, old plants and she and Dara Palmer recently planted annuals. In the fall, she and Dara will be moving several of the Plant Select plants from the Horticulture Farm to the Courtyard. If you want to know more about Plant Select plants, see Toby's article on page 10.





Donna Duff planting petunias in the Mathre Courtyard.



Dara Palmer planting marigolds

Thank you to all of you for making the Mathre Courtyard beautiful!

### Grants

Norm Weeden, "Identification of candidate genes for resistance to Fusarium wilt race 1, the powdery mildew resistance locus er2, and the non-shattering phenotype in pea and lentil", Northern Pulse Growers Association, \$12,400.

### Publications

Maier, C.A., and M.A. Ivie. 2013. Species and Records of *Chrysobothris* (Coleoptera: Buprestidae) from Monserrat, Saba, and Anguilla with a key to *Chrysobothris* of the thoracica-group in the West Indies. *Coleopterists Bulletin* 67: 81-88.

Hart, C.J., J.S. Cope and M.A. Ivie. 2013. A checklist of the Cerambycidae (Coleoptera) of Montana with distribution maps. *Coleopterists Bulletin* 67: 133-148

Hart, C.J., and M.A. Ivie. 2013. Synonymy of *Megacyllene comanchei* Rice and Morris and *Megacyllene angulifera* (Casey) (Coleoptera: Cerambycidae). *Coleopterists Bulletin* 67: 89-93 .

Etzler, F.E., J.Huether, P.J. Johnson, F.W. Skillman, Jr., and M.A. Ivie. 2013. Use of Morphology and CO1 BarCoding to Test the Validity of *Tetraopes huetheri* Skillman (Coleoptera: Cerambycidae). *Coleopterists Bulletin* 67: 46-49.

Looy, H., F.V. Dunkel, and J.R. Wood. 2013. How then shall we eat? Insect-eating attitudes and sustainable foodways. *Agriculture and Human Values*. 30:web published <http://link.springer.com/article/10.1007%2Fs10460-013-9450-x>.

### Invited Speakers

Michelle Flenniken was invited to speak at the Honey Bee Health Summit hosted by Project *Apis m.* and Monsanto in St. Louis, MO, 6/11-6/14.

### Course Focus

**Mike Giroux - AGSC 441  
Plant Biotechnology**



Plant Biotechnology is a senior level course taken by both junior and senior level Plant Science majors as well as graduate students. Coming in to the course, students often have a pre-conceived notion of what plant biotechnology is. Broadly defined, we

have been altering plants to suit our purposes for thousands of years. More specifically defined plant biotechnology often refers to ways to make and analyze transgenic plants. Comparisons are made between "traditional" plant improvement methods and more modern methods of plant improvement. Note that this line is of course blurring over time with molecular markers being used in "traditional" plant breeding and "non-transgenic" transgenic plants being created.

This course has two components, 2 credits of lecture and a 1 credit lab component. A year or so ago, MSU began requiring defined learning outcomes for each course. The objectives for this course are to:

- Understand the history of plant

improvement from simple plant selection to modern day transgenic plants.

- Understand the process required to research, develop, and test transgenic plants.
- Able to perform a number of plant molecular biology techniques.
- Demonstrate proficiency in DNA preps, PCR, and agarose gel electrophoresis.

Enrollment in the course has averaged ~10-15 students and the lectures emphasize the theories and principles behind the creation and analysis of transgenic plants. Given the importance of developing plant molecular biology techniques for plant science majors, and the scarcity of classes that offer labs, great effort is made to help each student develop proficiency in some common lab techniques. Fortunately, assistance from the department in the form of a teaching assistant has always been available for the lab portion of the course and Anna Snapp, Alanna Schlosser, and Andy Hogg (it was a long time ago now for Andy) have all served as excellent TAs. Anna even added a separate lab section so that we could give each student more personal instruction. The techniques emphasized in lab include DNA cloning, sequence analysis, gene expression analysis, PCR, and creation and analysis of transgenic plants. Some components being considered for further emphasis in the course for spring 2014 are manipulation and analysis of gene sequences and data management. An example of a new method of importance is the manipulation of data sets as in examining the expression of all genes in a tissue using RNAseq and whole genome sequencing.

The course requires that students demonstrate proficiency (sometimes just understanding if lab skills are not their forte) in a range of methods required to manipulate plant genomes. At the end of the semester each student turns in a research paper on a topic of their choice related to the use of plant biotechnology.

Overall, it is quite an enjoyable course to teach given the high level of interest and enthusiasm exhibited by the students and the fact that it dovetails well with my research interests.

## **Plant Select By Toby Day, Extension Horticulture Associate Specialist**

For two years, thanks to a grant from the Gallatin Gardeners Club, private donations, and space offered at the MSU Horticulture farm, the Master Gardeners' have been trialing ornamental plants that have been selected for the Rocky Mountain region. The plant selection program called Plant Select® is "a cooperative program administered by the Denver Botanic Gardens and Colorado State University in concert with horticulturists and nurseries throughout the Rocky Mountain region and beyond."

Several plants are chosen that thrive in the sunny, variable conditions of Rocky Mountain gardens. These can be plants that have grown here for years and have not yet attained the popularity.



*Red birds in a tree (Scrophularia macrantha). One of my favorite selections from Plant Select®*

Introductions represent taxa that are discovered by Plant Select® cooperators. Plant Select® plants that have and will be selected are evaluated on:

1. Performance in a broad range of garden situations in the Central Rocky Mountain Region
2. Adaptation to the Central Rocky Mountain Region's challenging climate
3. Uniqueness
4. Resistance to pests (disease pathogens, insects and mites)
5. Exceptional performance under low water conditions
6. Long season of beauty in the garden
7. Non-invasiveness
8. Capability of being mass produced
9. Longevity in containers (retail appeal)
10. Current availability from current propagators



11. Ease of propagation using basic propagation protocols
12. Availability of images of established specimens in landscapes (for publications)

Now that we know what species will survive here in Bozeman, Master Gardener Donna Knudson, Dara Palmer and I will be moving the best examples to the Mathre Courtyard in the fall. During the transition, we have planted some annuals to brighten up the spot until we can add amendments and the selected plants.



*In case you missed it, the irises that are grown for charity at the Horticulture Farm were beautiful this year. In this picture, Don Heyden is updating records on several hundred varieties that were planted through the help of Toby Day and the Gallatin County Master Gardeners. This is the first time iris have been planted at the Horticulture Farm since the 60's and 70's when Homer Metcalf conducted iris research. Photo courtesy of Toby Day.*

## Recipe of the Month

### Pizza on the Grill!

- 1 package active dry yeast
- 1 c warm water
- 1 pinch white sugar
- 2 t kosher salt
- 1 T olive oil
- 3 1/3 c flour
- 2 cloves garlic minced
- 1 T fresh basil
- 1/2 c olive oil
- 1 t minced garlic
- 1/4 c tomato sauce
- 1 c chopped tomatoes
- 1/4 c roasted red peppers
- 2 c shredded mozzarella cheese
- 4 T chopped fresh basil



In a bowl, dissolve yeast in warm water, mix in sugar. Proof for ten minutes or until frothy. Mix in the salt, olive oil, and flour

until dough pulls away from sides of the bowl. Turn onto a lightly floured surface. Knead until smooth, about 8 minutes. Place dough in a well oiled bowl, and over with a damp cloth. Set aside to rise until doubled, about 1 hour. Punch down, and knead in garlic and basil. Set aside to rise for about 1 hour until doubled again (the rising will all take less time if it is a hot day).

Preheat grill for high heat. Heat olive oil with garlic for 30 seconds in the microwave. Set aside. Punch down dough and divide in half. Form each half into an oblong shape 3/8 to 1/2 inch.

Brush grill grate with garlic flavored olive oil. Carefully place one piece of dough on the grill. The dough will begin to puff almost immediately. When the bottom crust has lightly browned, turn the dough over using two spatulas. Working quickly brush oil over crust, and then brush with 2 T of tomato sauce. Arrange 1/2 cup chopped tomatoes, 1/8 cup sliced black olives, and 1/8 cup roasted red peppers over crust. Sprinkle with 1 c cheese and 2 T basil. Close the lid and cook until the cheese melts. Remove from grill and set aside to cool for a few minutes while you prepare the second pizza. Enjoy!

## July Birthdays

Jinling Kang	1
Susie Couch	2
Mary Burrows	7
Andy Hogg	8
Susan Siemsen	22



## New Arrival!



Steve Hystad and his fiancée, Shawn Knutzen, celebrated the birth of their first child on May 31. Her name is Piper Lee Hystad and she weighed 8lbs 14oz. Congratulations to you both!