

Plant Science Says



Volume 17, No. 6

The Department of Plant Sciences and Plant Pathology

July, 2015

Rupp Joins Faculty



Jessica Rupp will be our newest faculty member as of September 14. She is replacing Barry Jacobsen as an Extension Plant Pathologist.

Jessica was born and raised in Pittsburg, Kansas, small college town in the southeast corner of the state.

Pittsburg's claim to fame lies in fried chicken and long-past coal mining days. She attended Pittsburg State University, which is famous in its own right for a National Championship DII football team, and a very unique mascot, Gus the Gorilla. Jessica received a B.S. in Biochemistry and Cellular and Molecular Biology. She also minored in music, and was a member of the PSU jazz and marching bands.

Jessica's mother Bille, who will be relocating to Bozeman with Jessica, is a life-long gardener. While growing up, a great deal of time was spent working with her in the garden. The natural next step for Jessica was plant pathology. She then moved to Manhattan, Kansas to attend Kansas State University. While at Kansas State, she was forced to take a course in statistics, which eventually led to a graduate certificate in statistics. Her PhD research focused on trying to provide new sources of virus resistance in wheat. While at K-State Jessica was exposed to Extension, which for her, finally answered the question, "What do I want to be when I grow up."

While this appears to be a long distance move for her family, it will actually bring them the closest to family that they have been in 30 years, as Jessica's aunt and uncle reside in Great Falls, MT. Jessica's ten year old daughter Hailey is also very excited to move

to Bozeman. This is probably due to the fact that she has been promised snowboarding and a vibrant running community.

At Montana State University, Jessica looks forward to developing her own extension education program focused on sugar beets, seed potatoes, legumes and forages. While the main focus of her future programs will be applied research, she also plans to work on host gene silencing to induce resistance in a number of host-pathogen relationships.

Retirement Bound from the Montana Seed Growers Association By Ron Larson



I present this article as an opportunity to say "THANK YOU" to the many people who are currently in the PSPP Department and in other parts of the university with whom I have had the privilege of working and knowing. Over all, I would rate my life experience here as being a huge blessing.

It seems to me that there is an aspect of living and working a place for many years that makes people seem like family. I am really going to miss the people I have worked with, although I don't believe I will mind the reduction in responsibility. If I tried to mention by name all those of you who have touched my life, I would likely fail miserably, so I won't try that. But I am going to try to remember you all in my heart and mind. If things work out, I might actually be around to attend a departmental coffee break once in a while, although I had better not make any promises.

My future plans include staying in the area. We have our daughter, son-in-law and granddaughter close by and what greater reason could there be for sticking around. I plan to work some of the time as an independent contractor with the Montana Ag. Safety Program (S&R Consulting LLC). I will likely explore some other part-time possibilities,

such as working with my son in his commercial spray business, or with my brother in his small business near Miles City. Maybe there will be time (I hope) to do some home maintenance that I have been putting off, but should be addressed.

With the end of this article, I bid you all "farewell". I like the words of that famous Charles Dickens character, Tiny Tim "May God bless us one and all!"

I'm Retiring!

By Jackie Kennedy



After working in the Cereal Quality Lab for over twenty years, I'm going to retire and spend time with my family, sew/quilt, travel a little, and maybe go fishing once in a while.

The present plans include a trip to Rock Lake, North Dakota. My husband was born in

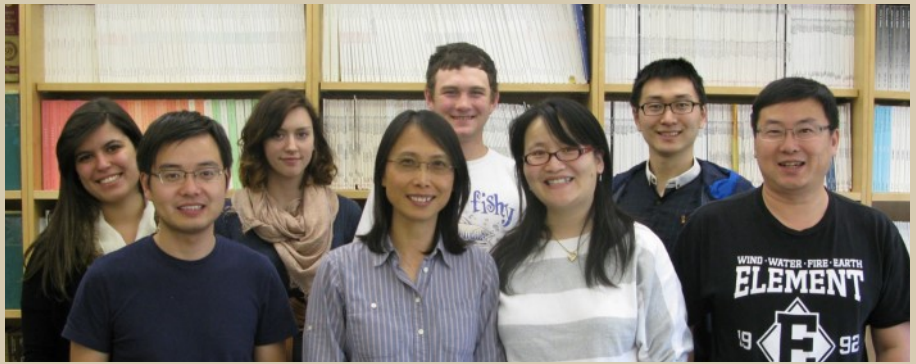
Devi's Lake, ND, and spent his early childhood in Rock Lake. The town of Rock Lake is having a reunion so this trip will be a good chance to be get reacquainted with childhood friends and see where the family farms were, etc. It should be fun.

My parents could use a helping hand at this point in their lives and I also want to share in the time they have left.

I feel it has been a privilege to be able to work for so long in the Cereal Quality Lab and be a part of the Montana State Wheat Breeding Program. I have learned so much from so many and have lot of great memories to take with me. I'll miss this!

Lab Focus - Li Huang

The Plant Host-Pathogen Interaction Lab in the PSPP department focuses on two major research areas: 1) Understanding the molecular mechanism of wheat-rust interactions and 2) Creating new resistant wheat germplasms for biotrophic pathogens. The lab currently has eight members including PI Li Huang, research scientist Hongtao Zhang, research associate Yongchun Qiu, PhD student Zhiwei Chen and four under graduate students: John Holst, Jasmyn Burdsall, Marcelle Almeida, and Chang Hao.



From left to right: Marcelle Almeida, Zhiwei Chen, Jasmyn Burdsall, Li Huang (Principle Investigator), John Holst, Hongtao Zhang (Lab Manager), Chang Hao, Yongchun Qiu

Wheat (*Triticum aestivum*, L.) is an important food crop in the world providing about 20% of all the food calories and proteins for mankind. In 2014, Montana exported \$929 million dollars of bulk wheat products through the world trade market (montana.gov), ranked third in wheat production, and is the top exporter in the U.S.

Wheat has four major biotrophic fungal pathogens causing three rust diseases and powdery mildew. To secure wheat production, pathologists and breeders are constantly monitoring pathogen populations and breeding resistant cultivars for farmers. However, sources of effective resistance are limited in currently cultivated bread wheat (hexaploid) and durum wheat (tetraploid). Breeders have often made crosses with wild relatives to introduce new resistance genes. During these practices, on a number of occasions following attempts to transfer resistance genes from lower ploidy donor species to bread wheat, the loss of the resistance in a higher ploidy level species was noted. Suppression of resistance genes in bread and durum wheats has impeded our ability to use already limited resistance gene resources.

Currently, we are leading a five-year international collaborative project funded by NSF and the Gates Foundation to investigate the nature of this suppression. We found a suppressor located on the 7D long arm of the chromosome suppresses stem rust resistance genes derived from either A or B genome in a specific pattern. One of the genes suppressed by the 7D suppressor has been cloned; the gene locates on 7AL, a homeologues location of the suppressor. This result implies the suppression is more likely in a homologous-based pattern; the finding will facilitate the cloning of the suppressor. If we can better understand the nature and mode of actions of the wheat suppressors, we will gain access to



From left to right: Linda Tabe (CSIRO, Australia), Li Huang, Evans Lagudah (CSIRO), Bill Gates, Sridhar Bhavani (CIMMYT, Kenya-base)

a new pool of resistance genes to combat wheat rust diseases.

The lab is also focusing on another project funded by the Montana Wheat and Barley Committee. This project is aiming to create a new category of resistance genes in wheat via the modification of host target genes in bread wheat genome through mutagenesis. We want to identify wheat genes that are required by the pathogens for colonization. We hypothesize that without those host genes, the pathogens will have reduced pathogenicity to infect wheat. The first goal of this project is to identify the genes in wheat that are the targets of the pathogens. Second, the function of the candidates will be tested during disease infection. Once the functions of the candidates are confirmed, we will identify wheat mutants that carry the mutations on the target genes. Those mutants are likely resistant to the pathogens and therefore are a new source of resistance for breeding resistant cultivars.

In this department, the lab has a close collaborative relationship with wheat geneticist Mike Giroux, winter wheat breeder Phil Bruckner, spring wheat breeder Luther Talbert and wheat pathologists Mary Burrows and Alan Dyer.

Putting Health and Agriculture Together By Florence Dunkel

Graduate student, Anna Markowitz, in the Global Health Department at George Washington University in Washington, DC, Milken Institute, School of Public Health has chosen to spend her "Culminating Experience" or Capstone at Montana State University in Plant Sciences and Plant Pathology with Associate Professor Florence Dunkel. Anna's capstone research paper entitled "Insects Role in Alleviating Food Insecurity" specifically considers the role of local insects for food and feed in food aid programs.

Anna has navigated the MSU IRB process and conducted intensive, in-depth interviews with many folks on campus, in Montana, and in Africa. She has interviewed our Malian collaborators at Peace Corps Mali; Secondary School principal in Mali; former PSPP student Keriba Coulibaly, now working for the U.S. Agency for International Development on leave from the Mali national

agricultural research organization (IER) on a project with the Asian Vegetable Research and Development Center (AVRDC); Kristin Blacker, in the MSU Sustainability office; and Tommy Black, Extension Animal Science. This week, she and Dunkel will visit Dr. Stefan Jaronski at USDA ARS Sidney Montana, and Dunkel's former student, Rob Schlothauer, who manages the grasshopper and cricket mass rearing facility in Sidney, Montana and works with food scientists in Uganda on a food katydid program.



Anna Markowitz from George Washington University School of Public Health and Dr. Tracy Dougher prepare the Girl Scouts' mini-Bug Banquet (land shrimp cocktail shown here) in Bear Canyon MT (photo courtesy of Dunkel).

Policy is Anna's specific major within Global Health and so she has explored with Dr. Dunkel the origins and alleviation of the "disgust factor." This factor acquired early in life often creates a challenge and even a barrier by high level policy makers in national and international aid organizations in considering the role of over 2000 insect species serving as sustainable protein sources enjoyed currently by one-third (2 billion) of the world's population.

To further understand origins of the disgust factor, Anna joined with Dr. Dunkel and Dr. Tracy Dougher in surveying perceptions and attitudes of scouts, Daisies, Brownies, and Girls Scouts during their mini-bug buffet and Bear Canyon Camp last week. They hypothesized that there is an inverse relationship between age and the disgust factor in Western cultures.

Alleviating food insecurity also requires local knowledge informing mother's choices for meals of their young children. Anna has joined with Sustainable Foods and Bioenergy Systems graduate, Carly Grimm, in drafting with Dr. Dunkel and the Malians, a sustainable foods article on "Mom's Choices" in Mali for the journal *Health & Place*.

High Tunnels By Mac Burgess

On May 27, The Burgess Lab's Season Extension Research Project (SERP) mobile high tunnels were moved off of March- and April-planted cool season vegetables, which enabled a May harvest of spinach, kale, and salad turnip, leaving broccoli, beets, and kale to mature outdoors in June well ahead of the earliest outdoor plantings. These spring plantings were the site of David Baumbauer's research into

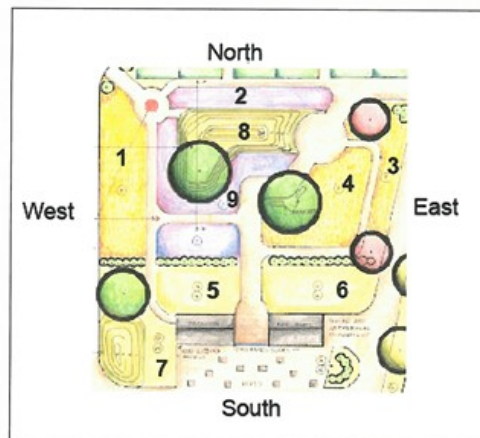
the tradeoff between light transmission and heat retention under various row covers. The tunnels were rolled on tracks to their new location protecting variety evaluation projects for cucumber, determinate and indeterminate tomatoes, eggplant, pepper, and muskmelon. The tunnels will move again this fall to protect summer-planted cool season vegetables again into the winter.

MSU's Honey Bee Research Site and Pollinator Garden is taking shape! By Michelle Flenniken

On July 22nd at 10am* a "volunteer work day" is planned so that we can get a lot of the plant material in the ground. The bee colonies will be moved into their new surroundings later this fall. Thanks to all for your efforts thus far!

Montana State University's Pollinator Garden:

A Hub for Sustainable Agriculture Activities, Community Integration, and Discovery



Location: MSU Horticulture Farm
Planting Day: Wed., July 22nd 10 am

For more information contact:
Michelle Flenniken
Assistant Professor PSPP, MSU
E-mail: michelleflenniken@gmail.com,
406-994-7229

Areas 5, 6, 7, and 8 –
low/no mow grass (maybe w/ flowers)

Area 2 – showcase bed
or Bridger Seed Demo plot

Area 9 – native plants showcase bed

Area 4 – pollinator/MT friendly bed

Designed by MSU undergraduate student H. Begger with H. Jang, and Dr. J. Britton; and bee experts D. Baumbauer and Dr. M. Flenniken



Joseph Kibiwott and Madilynn Honnold tending warm season crops in one of the high tunnels.

Important team members include: Michelle Flenniken and Flenniken Lab members; David Baumbauer and Hort Farm Staff; Jennifer Britton and USP student Heather Begger assisted by H. Jang; John Sherwood; Hughes Undergraduate Scholars Emma Garcia, Ian Cavigli, and Dani Berger for educational signage; Rory Running-USP art student for making an observation hive for the site; and the Montana Native Plant Society for providing funding for native plant material and signage, and many others.

*Date and time subject to change due to weather and other factors; check poster in PSPP office for updates.

Course Focus
BIOO 437 - Plant Development
By Andreas Fischer



Our functional understanding of plant developmental processes has made incredible progress over the last 15 years. Accordingly, I will focus on topics such as plant signaling pathways (including plant hormone receptors and hormone signaling), development of apical-basal and radial patterns during embryonic development, meristem maintenance and function, functional details of floral transition and the development of flowers. For a plant's reproductive (and evolutionary) success, it is critical to identify the optimal time point for the initiation of flowers. The mechanisms controlling this 'decision' have therefore attracted a lot of attention, and finally (after a decades-long search... quite a fascinating story) led to the identification of 'florigen' during the last decade. As it is becoming clear that, at least in annuals, the regulation of flowering and senescence (my favorite subject) are linked, I will emphasize the progress which has been made with the identification of molecular, genetic and epigenetic controls of floral induction. Unsurprisingly, I will then also spend some time on the regulation of the plant's last developmental phase, senescence. The goal of the class is to provide students with a thorough understanding of basic plant development, and with an understanding of the most important molecular principles governing it. The class is taught every other spring (2016, 2018), alternating with BIOO 460 ('Plant Metabolism'; 2017, 2019)."

New Employees

Anna Jespersen - Potato Lab



I am Anna Jespersen, the new Research Assistant at the MSU Potato Lab. Originally from Eastern Washington, I moved here seven years ago after working in Yellowstone Park. I graduated in 2013 with a B.S. in Environmental

Horticulture from MSU and am now very excited to be a continuing part of the University.

I am an avid equestrian, read constantly, and am always on the lookout for something good to bake.

New Graduate Students

Deji Owati (Burrows)



I am a new graduate student in the department of Plant Sciences and Plant Pathology and my advisor is Dr. Mary Burrows. Currently, I assist in the pulse diagnostics laboratory managed by Dr. Bright Agindotan. We are

saddled with the responsibility of meeting the demands of our clients by diagnosing the causes of their crop diseases and consequently informing them of the health status of seeds meant for cultivation or exportation.

My master's research will focus on detection of fungicide resistant ascochyta blight on chickpea and pea in pulse growing areas of Montana. This will broaden my knowledge of plant pathology with an emphasis on mycology. I am hopeful that my stay at MSU will enhance my capacity to contribute to the field of plant pathology.

Prior to my admission to Montana State University, I worked as a research supervisor in the Virology and Molecular Diagnostics unit of the International Institute of Tropical Agriculture, Ibadan, Nigeria. I was responsible for molecular detection and characterization of plant viruses and other pathogens on staple crops. Also, I was involved in conducting investigative and epidemiological disease surveys to report the incidence and spread of new and existing plant diseases in sub-Saharan Africa and subsequently, in collaboration with government agencies (Quarantine services) ensure passage of disease free germplasm within her borders.

I am married with a daughter. I enjoy watching movies and meeting people.

Joseph Kibiwot (Burgess)

Joseph Kibiwott joined the department on June 1, 2015 to pursue a M.S. Degree in plant sciences under the guidance of Dr. Mac Burgess. He grew up in Kenya's Rift Valley and developed an interest in soil science and plant nutrition in his sophomore year in college. He taught high



Joseph Kibiwott - new graduate student

school for four years and worked in an agricultural research lab in Nairobi for another four years before going back to school.

Joseph has a BS in Soil and Water science from the University of Florida and a proficiency certificate in crop production from the University of Illinois.

Joseph has a great interest in studying soil fertility, cropping systems, soil and water conservation, and sustainable agriculture. In his view, knowledge gained in pursuing a research based graduate degree will give him insight and a fresh approach when combining available technologies that improve soil fertility, promote food production and improve environmental and ecosystem quality.

In his spare time, Joseph loves hanging out with his wife Carolyn and their three sons; Larry, Laban and Lance.

2015 Field Days

June 24 – NWARC - Creston
 July 1 – NARC - Havre
 July 14 – EARC - Sidney
 July 16 – Central – Moccasin
 July 17 – West Triangle - Conrad
 July 21 – Post Farm – Bozeman
 July 23 – WARC - Corvallis
 July 30 – Hort Farm, Bozeman

Publications

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

Brutscher, L.M., Daughenbaugh, K.F., and Flenniken, M.L., Antiviral Defense Mechanisms in Honey Bee (2015), *Current Opinion in Insect Science* 10:71-82.

Grants

Norm Weeden, "Genetic investigation of the gene(s) on pea chromosome 2 providing tolerance to Fusarium root rot from accession PI220174"

Norm Weeden, "Identification, Preservation, and Propagation of Heritage Orchards in Montana"

Ryan Thum, "Incorporating Genetic Monitoring into Fresh Water Vegetation Mapping to Improve Adaptive Management of Lakes"

Ryan Thum, "Evaluation of invasiveness and control for pure versus hybrid Eurasian watermilfoil in Montana"

Luther Talbert, "Fusarium head blight resistance for Montana spring wheat"

Jamie Sherman, "Fusarium Head Blight Resistance for Montana Barley"

Mike Ivie, "Montana State University Woodboring Beetle Collection Curation"

Phil Bruckner, "Fusarium head blight resistance for Montana Winter wheat"

Electrolytic Rust Remover for your Tools By Toby Day, Extension Horticulturist

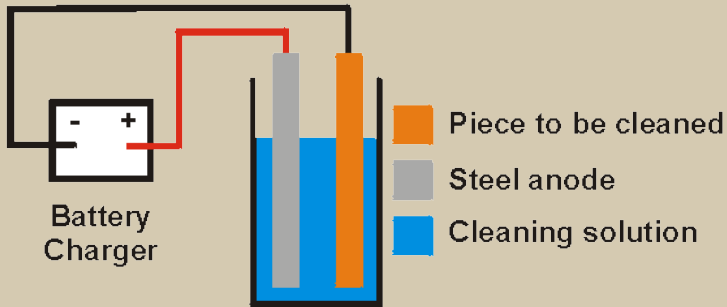
I was recently an instructor at the 2015 Regional Master Gardener conference, June 25-26 in Rexburg, Idaho, where I gave an unconventional demonstration called "Resurrecting Garden tools via Electrolysis." Although the class didn't have much to do with plants, it has an application for the tools we use to grow plants. Rather, an application for the tools we tend to neglect in our garden, garage or tool box.

I would suspect that almost everyone (minus David Baumbauer) has a garden or conventional tool in their garage or tool box that is so rusted that it is rarely used. While many would just go down to the hardware store and buy another, I have recently stumbled upon a process that can bring those tools back to life – electrolysis! The definition of electrolysis is "the producing of chemical changes by passage of an electric current through an electrolyte." In other words, "It removes rust from metal tools using an electric current." No kidding, the process really works and is relatively safe!

The process works by submerging a rust laden tool or object in an electrically conducting solution of washing soda (sodium carbonate) in a plastic bucket lined with electrodes. For my project (I like to call it "Mr. Sparky"), I used rebar as the electrodes. The rebar is tied by 12 gauge wire to one another and eventually to the positive lead of a car battery charger. The tool that is to be cleaned is attached to the negative lead of the car charger and dipped into the solution (I know, sounds scary huh? Really it isn't).

The charger is then turned on to trickle charge (10 amps or less) and the process begins.

If the process is working, you should be able to see bubbles coming from the tool that is submerged in the solution. After two hours to two days (depending on how rusty the tool is), simply take a wire wheel or brush and scrub off the tool, then lightly spray with oil to keep rust from forming again.



Schematic of the Electrolytic process



"Mr. Sparky" minus the charger



Two pickaxe heads. The bottom one I cleaned using electrolysis. Originally, it looked just like the top head.

At the conference, I found a pair of plyers in their greenhouse shop that were so rusty they wouldn't even close. By the end of the day and about a three hour electrolytic soak, a bit of brushing (only about two minutes), and a light coat of WD-40, the plyers were as good as new.

I will leave handouts on electrolytic rust removal, as well as the tools that I have cleaned, with Irene in the main office at PBB for the week following the release of the newsletter. That way you can see the full contraption in its strange and somewhat "Frankenstein-like state". No, it will not be plugged in. However, if you have any questions about the process, feel free to give me a call (994-6523). I would be happy to run down to the office to answer any questions or concerns.

Schematic of the Electrolytic process (schoepp.hylands.net)

Recipe of the Month

Best Marinated Grilled Chicken

1 1/2 c water
1/3 c rice wine
1/3 c sesame oil
1/4 c soy sauce
2 T honey mustard
1/4 c brown sugar
2 dashes liquid smoke
flavoring
1 (.7 oz package dry
Italian-style salad dressing
mix)
1 T grated orange zest
1 t ground ginger
2 t paprika
1 t fines herbs
1 (4 lb) chicken, skin removed, cut into
pieces
6 sprigs rosemary



In a large shallow dish, combine water, wine, sesame oil, soy sauce, mustard, brown sugar and liquid smoke. Stir in Italian dressing mix, orange zest, ginger, paprika, and fine herbs. Place chicken in the dish and turn to coat. Cover, and refrigerate overnight.

Preheat an outdoor grill for medium heat, and lightly oil grate.

Discard marinade. Grill chicken 15 to 20 minutes per side, until no longer pink and juices run clear. Occasionally place rosemary sprigs on coals to impart a unique smoky flavor to chicken.

July Birthdays

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



**Please go to next page for photos of
Ron Larson's Retirement Party!**

Ron Larson Retirement Party



Ron Larson, Susan Johnston, and Angela Suffridge



Mike Giroux , Andy Hogg, and Kendra Hertwick grilling burgers



Katie Cash, Gary Schaff, and Dan Biggerstaff



John Sherwood giving Ron Larson a photobook with Happy Retirement wishes.



John Wold and Pat Lake giving Ron Larson a gift certificate to Yellowstone Park.



John Sherwood giving Ron Larson a blanket and certificate from the MSU Foundation.



Craig Cook giving Ron Larson a present from The Seed Trade Association



Greg Stordahl , Heather Rimel, and Pat Lake.

