

Plant Science Says



It will be celebrated...
with pomp and parade...
bonfires and illuminations
from one end of this continent
to the other.

John Adams (1735 - 1826)
- on July 4th celebrations

Happy 4th of July!

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Flenniken Joins Faculty

Dr. Michelle Flenniken is joining our faculty as an Assistant Professor on August 16. She has been an Assistant Research Professor for the last two years in this Department. Michelle's appointment is .8 FTE with our Department and .2 FTE with the Institute of Ecosystems. She will be teaching BIOB 375-Genetics every summer and an advanced course that has yet to be determined. Her research is focused on honeybees and the pathogens that infect them.

One Career Ends and Another Begins

The thirty year anniversary of the Blake Barley Breeding program was celebrated on June 5 along with Duke Pauli receiving his PhD in Plant Sciences. Tom Blake received a certificate along with an MSU blanket. Also, congratulations to Tom on being awarded Emeritus status by the Board of Regents. Tom officially retired on December 31, 2103; however, his post-retirement contract ends on December 31, 2014.

Duke will be starting a post doc at Cornell University this month. He will be working

with Dr. Mike Gore, one of the leaders in automated data acquisition.

Lab Focus - Mark Young



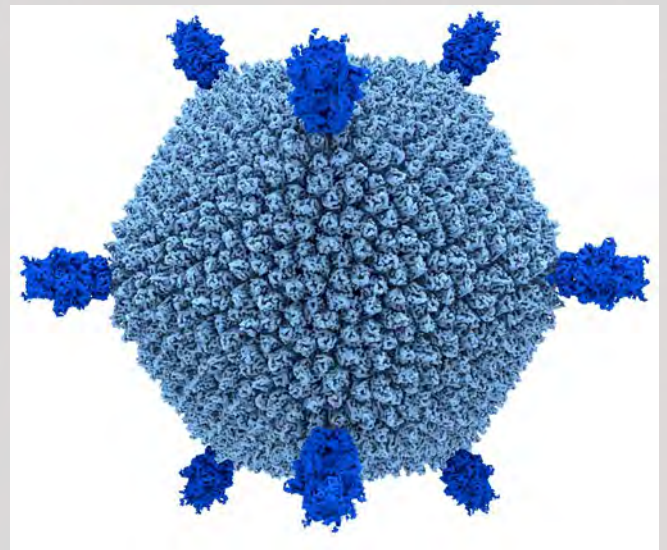
When you hear someone talking about viruses, you probably think of disease causing human or plant viruses... and you certainly don't shake their hand! I would like to change the perception that viruses are always disease-causing agents. Rather, the study of viruses

provide a unique window into many fascinating aspects of biology ranging from fundamental aspects of cell biology, to the ecology and evolution of microbial communities, to the understanding of life in extreme environments, to applications in nanotechnology. My lab has projects that touch on all of these topics.

We use Yellowstone as a unique natural laboratory for the discovery and molecular



A reception recognizing Tom Blake's retirement, the Blake Barley Breeding Program and Duke Pauli receiving his doctorate was held on June 5.



High resolution structure of STIV, a novel archaeal virus isolated from Yellowstone.

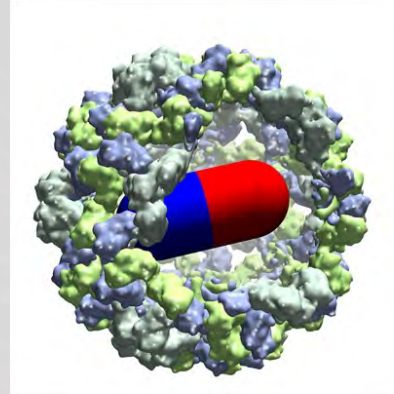


Former graduate student Jennifer Wirth surveys Yellowstone hot springs for geochemical signatures associated with archaeal cellular communities.

understanding of archaeal viruses. Compared to the thousands of viruses known to replicate in bacteria and eukaryotes, we only know a handful of viruses that infect Archaea. The boiling acid hot springs of Yellowstone are perfect hunting grounds for new archaeal viruses because they are archaeal dominated microbial communities. We use both culture-dependent and culture-independent (viral metagenomics) methods to find, and the tools of molecular biology and structural biology to characterize, these highly unusual viruses. Over the years, we have discovered a number of new archaeal viruses that have greatly expanded our understanding of virus diversity, ecology and evolution, and biochemical adaptations required for life at high temperatures.

We are also applying our tools of virus discovery to another strange extreme environment... the human gut microbial community. The two overall questions we are addressing are what are the viruses that replicating in the gut microbial communities and what role do these viruses play in determining the structure and function of the human gut? We are examining the viruses found in the gut microbiomes of two healthy individuals using next-generation deep sequencing technology. Ultimately we are interested in uncovering the role these viruses play in human health and disease.

My lab continues its interests in the use of viruses as biotemplates for applications in nanotechnology. In these projects, we think of



Schematic illustration of tailoring viral protein cages for targeted drug delivery.

virus particles as addressable nano-protein cages. We use the tools of chemistry and molecular biology to impart function by design to viral protein cages to create functional nanomaterials that have applications in medicine, electronics and

catalysis. Current projects use modified viral protein cages for selective killing of pathogenic bacteria within an oral biofilm model while maintaining the beneficial bacteria within the biofilm.

Our lab is located in the Chemistry and Biochemistry Building. The lab is comprised of a talented collection of postdocs., technicians, graduate students and undergraduates. Come over and visit anytime. We would love to talk to you about viruses!

Jacobsen's travels in June By Barry Jacobsen

The USAID IPM CRSP/IPM Innovation Lab sponsored a seed pathology workshop for vegetable seed producers Hyderabad, India June 2-4. The workshop was attended by ~60 persons representing 11 seed companies. Hyderabad was chosen as the location because it is the center of seed production for South Asia and seeds from production here are marketed widely in India, Nepal, Bangladesh, Southeast Asia and Africa. The workshop was developed because we have noticed the importance of seedborne, viral, bacterial and fungal disease in IPM implementation projects in Africa, Southeast and South Asia. Dr. Bob Gilbertson from UC-Davis taught the bacterial disease section and also taught the viral disease section with Dr. Sue Tolin of Virginia Tech and Dr. Niadu Rayapatti of Washington State University. I taught the fungal disease section and how to manage these diseases in the seed production field. We all taught methods for detecting seedborne pathogens, how to disinfect and disinfest vegetable seeds and what seed treatment fungicides do or don't do and how other treatments such as hot water treatment, acid or trisodium phosphate soaks work and what their limitations are. This was an intensive

three day workshop and was held at the India National Institute for Plant Health Management. This institute has faculty in plant pathology, weed science, entomology, pesticide/biological control formulation, pesticide residue analysis and conducts long (2-4 months) and short (days to week long) workshops on all aspects of IPM and crop protection. It is well worth the time to look at their website: niphm.gov.in. I think such an Institute and program would be very useful here in the USA.

June 15 found me in Uppsala, Sweden speaking at The International Organization for Biological and Integrated Control (IOBC)- Biological Control of Fungal and Bacterial Pathogens Working Group. This year's meeting was held on the campus of the Swedish University of Agricultural Sciences. The theme of the meeting held June 15-18 was Biological Control of Plant Diseases: From the field to the laboratory and back again. I presented a talk entitled "Use of *Bacillus mycoides* isolate J induced resistance in IPM programs". I presented data on how BmJ was first identified; the mode of action; formulation



Note from David Ezra: "This is a picture of my family from a few weeks ago—Sigal, Bar, Noy, David, Nadav, and Yaniv. Bar was 11 when we left Bozeman, Noy was 6, Yaniv was 5 and Nadav (he is the one who was born in Bozeman) was 1 year old. Bar is 20 years old now and she is on her 2nd year of her military service in the Israeli defense force (it is mandatory both for boys and girls in Israel). Noy is in the 11th grade, Yaniv is in the 10th grade, and Nadav is in the 6th grade. We are doing fine. Sigal my wife is working as the head nurse of the orthopedic rehabilitation department in one of the biggest hospitals in Israel and I have a position in ARO The Volcani Center a governmental agricultural research center similar to the USDA in the US. I hope I will have the chance to come with my family to visit Bozeman again."

development; our data on control of sugarbeet, potato and tomato diseases and data from others showing control of diseases on pecans, tomato, pepper, spinach, lettuce and cucurbits; data on how induced resistance can be incorporated into fungicide resistance management program; and finally on the closing stages of registration by CERTIS USA. The IOBC Biological Control of Fungal and Bacterial Pathogens Working Group meets every two years and is an excellent meeting for plant pathologists working on biological control. One familiar face to our Department at the meeting was Gary Strobel's former post-doc David Ezra. David is now a Research Professor in the Department of Plant Pathology and Weed Research at the Volcani Center in Bet Dagan Israel. David continues to work on endophytic fungi that produce antimicrobial gasses. He reported on an isolate of *Daldinia concentrica* isolated from olive, that produces bactericidal, fungicidal, nematocidal and insecticidal volatiles.

Gardens in London and Edinburgh by Matt Lavin

During 11-25 June, my wife Kristi and I visited friends and colleagues at the natural history museums in Kew Gardens (on the outskirts of London) and in the Edinburgh Botanic Gardens. This visit was kindly facilitated by Drs. Gwilym Lewis and Brian Schrire (at Kew) and Toby Pennington (at Edinburgh). Brian Schrire worked in my lab during the month of October in each of 2004, 2006, and 2008, whereas Toby Pennington visited and worked in my lab during month-long stints in 1998 and 2004, as well as six months during the winter of 2006-2007. I had the good fortune of working so closely with these colleagues on our research that all of our families became quite close friends. Therefore, this visit combined both work and fun.

The plant collection at the Royal Botanic Gardens Kew houses over seven million specimens, of which one million belong to just the legume family. Legumes have been a focus of research because of their economic and ecological importance throughout the world. For example, many of the most commercially important tropical hardwoods belong to the legume family. While at Kew, I was able to study many of these specimens belonging to certain taxonomic groups and verify their identification and obtain leaf samples for DNA analysis and geographical locality data as part of an ongoing study.



The garden of tropical-desert-shrub plants at the Kew Botanic Gardens, which is located near the plant museum.



Kristi Lavin and Toby Pennington in the alpine garden at the Edinburgh Botanic Gardens, which exemplifies the perfectly manicured and partially open landscape that humans often demand of plant communities.

The museum at the Edinburgh Botanic Garden houses about 3 million specimens, of which about 300,000 are legumes. I visited this collection for the same purpose as the Kew collection. Also, while in Edinburgh, Kristi, Toby, and I ran a local race, The Seven Hills of Edinburgh, which is a 14 mile route around the city that climbs each of the seven prominent hills within the city limits. Edinburgh is a remarkably easy place in which to live with its many surrounding hills and mountains and trails throughout the city.

Academic research is a lot of fun, but when it is carried out in collaboration with good friends, it is even more fun!



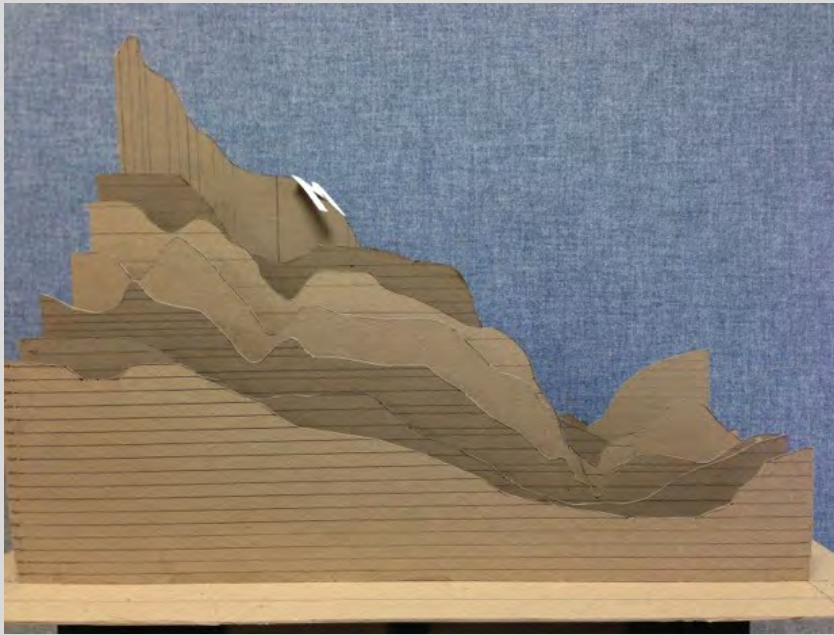
Kristi Lavin and Toby Pennington descending off the fourth of the Seven Hills of Edinburgh (Craiglockhart Hill) and looking eastward across the city with The Firth of Forth in the distance (the estuary or firth of Scotland's River Forth, where it flows into the North Sea).

Course Focus HORT 335 - Site Development By Rebecca VanWieren



Site Development introduces landscape design students to relevant concepts in site *engineering*. Now, you may be asking, "Why does someone who designs landscapes and planting plans need to know about engineering?" Site engineering encompasses principles

of landform, grading, drainage, earthwork, and stormwater management design. These engineering concepts are key considerations that landscape designers take into account when assessing site conditions and proposing design ideas. Essentially, *grading* (landform manipulation) *is design*, with soil as a medium, and it provides the base for which a landscape plan is built upon. The course covers the functional, ecological, and aesthetic implications of landform manipulation, including ADA accessibility and EPA stormwater management regulations, with the intent to prepare students to utilize an ecological and artistic approach to grading and drainage design.



Physical topographic model in cross-sections of the "M"

The first half of the course is spent learning how to communicate grading and drainage information through technical drawings (i.e. construction documents), so that, ultimately, a landscape design can be built. Learning how to draw topographic maps and other grading details requires the use of many mathematical formulas and application of the slope formula in more ways than students imagine. Visualization skills are needed to translate three-dimensional concepts into two-dimensional drawings. Students calculate and draw grading plans for elements like sidewalks, roads, swales, recreational fields, walls and berms, as well as larger site plans.

The second half of the course is dedicated to designing stormwater management strategies, using an ecological approach. Nowadays, municipal codes require development projects of a certain size to manage rainwater that falls on the property at pre-development rates and patterns. This stormwater is conventionally managed through hard engineering solutions, like drains, pipes, and detention ponds. In this course, students learn how to manage this stormwater by also integrating "soft engineering" solutions, like infiltration basins, swales, and permeable paving, where the landscape performs filtration, evapotranspiration, percolation among other benefits. Students learn how to calculate rainwater volumes, size pipes, and design ponds. Stormwater management is an area of the field where landscape designers have the opportunity to work with civil engineers, hydrologists, and ecologists.

For the final course project, students design and draft the technical drawings for a rain garden. Last year's class designed a potential campus rain garden near the Plant Growth Center. The goal is that a student-designed rain garden be installed somewhere on the central part of campus in the future.

Farewell to Jean Allen

Starting September 2, Jean Allen will be pursuing a PhD in Neuroscience at McGill University in Montreal Quebec, Canada. She will be studying glutamate receptors with Dr. Derek Bowie. During her time here, she worked for Kevin Wanner studying insect odorant receptors. We wish you all the best Jean!

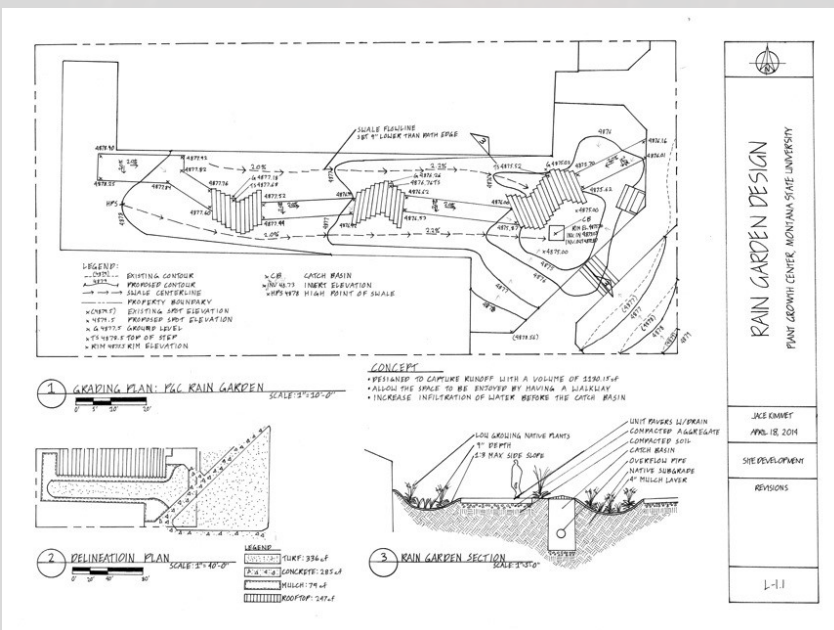
New Employee

Karen Maroney—Accounting Associate III



Karen with her 15 year old mare, River.

Hi, my name is Karen Maroney. My family and I moved to Bozeman from Green River, Wyoming, 13 years ago. I have been employed as the accounting manager for Gallatin Laundry at the Kagy location for the last five plus years. My husband is a Chem E grad from MSU and my son is in his fourth year in the Engineering



Grading plan (Jace Kimmet) for a proposed campus rain garden

Department at MSU. We also have a daughter in Wyoming at Northwest and a daughter living in Washington.

In my free time, I enjoy riding horses, hiking, gardening and watching my daughter rodeo. I'm looking forward to getting to know all of you and working with you.

New Graduate Student Amy Dolan



Amy Dolan is a new Master's student in the Ivie lab. She arrived in Bozeman at the end of May and within a week was up in the Kootenai National Forest to begin work on her project: *Huckleberry Challenges: Pollinator Mysteries, Pests, and New Invasive Threats.*

Amy moved to Bozeman from Prescott, AZ, where, for the past four years, she has been teaching high school science at Northpoint Expeditionary Learning Academy. Before living in Prescott, she taught ecology for an outdoor education center on St. Simons Island in Georgia, was a senior youth crew leader with the Montana Conservation Corps based out of Helena, and taught middle school science near Boston, Massachusetts. She grew up in Wisconsin and graduated with a BS in Biology in 2001 from Wisconsin Lutheran College in Milwaukee, WI.

Besides being outdoors and exploring the world through hikes and road trips, Amy enjoys books, coffee, pastries, movies, microbreweries, and cooking (sometimes). She is a proud auntie x6, with the two newest nephews born in April and May. While it is sometimes a challenge, Amy does the best she can to stay in touch with family and friends who are scattered all over the United States.

Amy says, "I am incredibly excited to be back in Montana and enrolled at MSU and I look forward to facing the new challenges that graduate school will bring."

Invited Talks

Gary Strobel was invited to give the keynote speech at the 2nd International Congress of Biotechnology and Biodiversity in Guayaquil, Ecuador (June 9-12). Attendees were from 22

countries and over 500 people were registered for the meeting. Strobel was invited to discuss his work on the biodiversity of endophytes and their bioactive products.

Beautification of the Mathre Courtyard

A huge thank you to Deanna Nash, Toby Day, Dara Palmer, and several Master Gardener and PSPP volunteers for making The Mathre Courtyard look absolutely amazing this year! Deanna filled the six planters with lobelia, geraniums, bacopa, licorice, petunias, verbena, osteospermum, and yellow biden. Toby and several volunteers brought in new soil and planted dozens of annuals.



Six planters were planted by Deanna Nash, Manager of the Cereal Quality Lab.



Bill Grey and Mike Giroux planting annuals in the Mathre Courtyard.



Gallatin County Master Gardeners planting annuals in the Mathre Courtyard.



Lance Ellis, U of I Extension educator gives a talk on back yard poultry to Master Gardeners

**Extension Horticulture
By Toby Day**

Horticulture In-Service, University of Idaho
Six Montana Extension agents and I attended the 2014 Extension Horticulture In-Service Training at Island Park, Idaho June 26-27. The University of Idaho sponsored training that included a shrub and tree borer lecture from Dr. Edward Bechinski, Professor of Entomology and IPM Specialist, U of I; a forest and field tour with Bechinski, Dr. Stephen Love, U of I Consumer Horticulture Specialist, and Dr. Wayne Jones, Bonneville County Extension Educator, U of I; a lecture from our very own Dr. Barry Jacobsen on diseases of vegetables and fruits; and a lecture from Dr. Whitney Cranshaw, Professor of Entomology at Colorado State University on identification of bees, wasps, and their habitat and management. Each attendant received free books and a tool kit worth upwards of \$300 to help them in their

IPM endeavors. The University of Idaho Extension horticulture team was able to bring this training to the area extension educators (Wyoming and Utah educators were also present) through a NIFA grant (National Institute of Food and Agriculture). There were 26 educators that attended and the training was free to area educators. 2014 Regional Master Gardener Convention
Over one hundred area Master Gardeners, including several Master Gardeners from Montana, attended the regional Master Gardener Convention on the beautiful campus of BYU-Rexburg June 27-28. The keynote speaker, Dr. Whitney Cranshaw, Professor of Entomology at Colorado State University spoke Friday night about: "Lifestyles of the Swift and Vicious; Predatory Insects of the Garden & Landscape." The following day area Master Gardeners got to choose from a list of several classes being offered each hour, everything from herbal lore and legend to drip irrigation and pruning to asparagus gardening. The Master Gardeners got a fantastic education on a host of several subjects. I taught composting and straw bale gardening in the morning and afternoon. Both lectures were very popular with nearly 20 people attending each class. Overall, this is one of the best regional conventions for Master Gardeners in Montana, Idaho and Wyoming.



Dr. Wayne Jones, U of I gives a talk on tree pathology.

July Birthdays

Susie Couch	2
Jingling Kang	3
Mary Burrows	7
Andy Hogg	8
Susie Siemsen	22



Recipes of the Month

Rosemary Ranch Chicken Kabobs

- 1/2 c olive oil
- 1/2 c ranch dressing
- 3 T Worcestershire Sauce
- 1 T minced fresh rosemary
- 2 t salt
- 1 t lemon juice
- 1 t white vinegar
- 1/4 t ground black pepper or to taste
- 1 T white sugar (optional)



5 skinless, breast halves cut into 1 inch cubes.

In a medium bowl, stir together the olive oil, ranch dressing, Worcestershire sauce, rosemary, salt, lemon juice, white vinegar, pepper, and sugar. Let stand for five minutes. Place chicken in the bowl, and stir to coat with the marinade. Cover and refrigerate for 30 minutes.

Preheat grill for medium-high heat. Thread chicken onto skewers and discard marinade. Lightly oil the grill grate. Grill skewers for 8-12 minutes, or until the chicken is no longer pink in the center and the juices run clear.

Star Berry Cobblers

Biscuits

- 1 1/2 c flour
- 1/3 c sugar
- 1 1/4 t baking powder
- 1/2 t salt
- 6 T unsalted butter, chilled, and cut into small pieces
- 1/2 c milk



Filling:

- 8 c mixed berries
- 3/4 c sugar + 2 T
- 3 T flour
- 1 1/2 t lemon juice
- 1/2 t cinnamon
- 3 T unsalted butter, melted

Make biscuits: Pulse dry ingredients in a food processor. Pulse in butter until mixture resembles coarse crumbs. Add milk; process for 30 seconds until dough forms a ball. Wrap dough in plastic wrap; refrigerate for 1 hour.

Preheat oven to 425°F; butter 8 1-cup ramekins. Make filling: Bring berries, 3/4 cup sugar, flour, lemon juice and cinnamon, if desired, to a boil over high heat. Lower heat; simmer for 5 minutes.

Roll dough into a 1/2-inch-thick circle. Cut out 8 stars with a 3-inch cookie cutter. Divide filling

among ramekins; place biscuits on top. Brush stars lightly with butter; sprinkle with 2 Tbsp. sugar. Place ramekins on a foil lined baking sheet and bake for 25 minutes. Cool for 15 minutes before serving.

It would probably work to bake this in a 9x13 pan instead of the ramekins.



From David Baumbauer - The attached photo is from June 11th. EJ Hook, director of Environmental Services called to inform me of a swarm of honey bees that was in a tree on the north side of Hamilton Hall. Thanks to the ground's crew and their bucket truck that swarm is now hived at the hort farm. Rumor has it the bees are enjoying their new home.

Two grain bins were transferred from the Central Ag Research Center to the Post Farm thanks to Dave Wichman, Dave Gettel, Bill Grey and Jeff Todd.

