PSPP - Plant Science Says *September, 2017*

Students - Welcome Back!
By Jill Scarson

The Department of Plant Sciences and Plant Pathology started the school year with 138 undergraduate students. Many of the students are majoring in Environmental Horticulture with 34 Environmental Horticulture Science students and 23 Landscape Design undergrads. Thirty-four students are studying Crop Science, 14 are majoring in Plant Biology, and 14 are biotechnology students. The Crop Production option of the Sustainable Foods & Bioenergy Systems major increased their total number of students to 19. We also added seven new graduate students this semester, bringing the total to 38. Twelve students are working toward their Master of Science in Plant Science, and one student is enrolled in the Master of Science in Entomology program. The department has 25 PhD students; three in the Plant Science program, ten in the Plant Pathology option and 12 in the Genetics option.

Welcome to our undergraduate and graduate students!

Cornell Symposium: Plant Pathology in the 21st Century
By Alan Dyer

On August 11th and 12th, plant pathologists gathered from across the globe to present their research and discuss the role of plant pathology in the next century. Twenty-three scientists gathered at Cornell University to discuss and present on diverse topics from CRISPRs and molecular pathology to ecology and innovations in teaching methods; the symposium covered a wide gamut of topics central to the future of plant pathology. Notable talks included one by Dr. Dani Shtienberg, who talked about how pesticides are often unnecessary if one knows the epidemiology of the disease. He stressed how small changes in production practices are often all that is necessary to effectively manage devastating diseases. As examples, he described how plastic covering over the soil of greenhouses dramatically decreases late blight (*Phytophthora infestans*) severity in tomato and that by delaying harvest until after 10 a.m., a time when humidity and leaf wetness are at a minimum, one may decrease the spread of bacterial canker to acceptable levels (*Clavibacter michiganensis*). Another notable talk was by Dr. Giovanna Danies Turano who is implementing cutting-edge and old school teaching methods to train the next generation of students in Columbia. Her agronomy program requires that students complete grower internships and international instruction to assure a broad understanding of production issues. In conjunction with the greater hands on experiences, she has developed virtual crop fields and plants to demonstrate how changes in inputs affect crop potentials and disease risks.

In the evening, participants gathered at the home of Dr. William Fry to eat great food, discuss topics and dance the night away.

Participants at the Plant Pathology Symposium at Cornell University.

Following the main symposium, participants went on a tour of the area including the Buttermilk Falls Gorge, the Americana Winery and Brewery (including their vineyard and hops yard) and the Knapp Winery. Sadly, it ended too soon but everyone left having lots of new ideas and wonderful memories.

"Getting Proximate" with the PATHS Program
By Florence Dunkel

"MSU's Fall Convocation speaker last Thursday urged 6000 people, including 3000 freshman, to 'get proximate' in order to change the narrative to create a world with greater justice. PSPP faculty, Dave Sands and Florence Dunkel, spent most of their summer doing just that through the PATHS Tribal College internship program they helped create along with other MSU professors, Holly Hunts (Health and Human Development) and Ed Dratz (Biochemistry). Helping us out was Claire Baker Sands, a Bozeman community leader and entrepreneur.

What is PATHS? It is a Pathway through Agriculture, Tribal Health, and food Sovereignty for tribal college students to succeed in using scientific knowledge. We identified out-of-the box thinkers, prospective tribal leaders, and science-curious tribal college students— four interns at tribal colleges in Montana and two peer mentors that had graduated from a Montana tribal college and gone on to become MSU students. They brought their families and came to live with us for six weeks on campus and work with us in our

In the Northern Cheyenne Botanical Park, Lame Deer MT, Dave Sands and Ed Dratz learn from PATHS interns, AJ Somers, Holly Reed, and Danielle Antelope as they prepare a traditional mosquito repellent of the Apsaalooke, water slurry of common yarrow leaves, Achillea millefolium.

Pausing on steps of Herrick Hall following healthy feast prepared by first cohort of PATHS interns and peer mentors. From left: Bryson Runsabove-Myers, Thedra Bird Rattler, Florence Dunkel, Winter Old Elk, David Sands, AJ Somers. in front row from left, Holly Hunts, Danielle Antelope, son Jace, husband Jason, in back row, Ed Dratz, Claire Baker Sands, Christine, wife of Holly Reed, Holly Reed.

labs and in our conference rooms. We challenged each other about how the narrative of drugs, alcohol, abuse, and epidemic-scale disease on the reservations could change with the right plants, the right insects, other natural products, along with just simply place-based, culture-based knowledge. We conceived this model based on our previous research in creating AGSC 465R, the service-learning course in our Department taught as part of the University Core in research; an Omega-3 and micronutrient study on the Apsaalooke reservation; and an exploration of the science behind food policy and law, such as FDPIR, The federal Food Distribution Program on Indian Reservations.

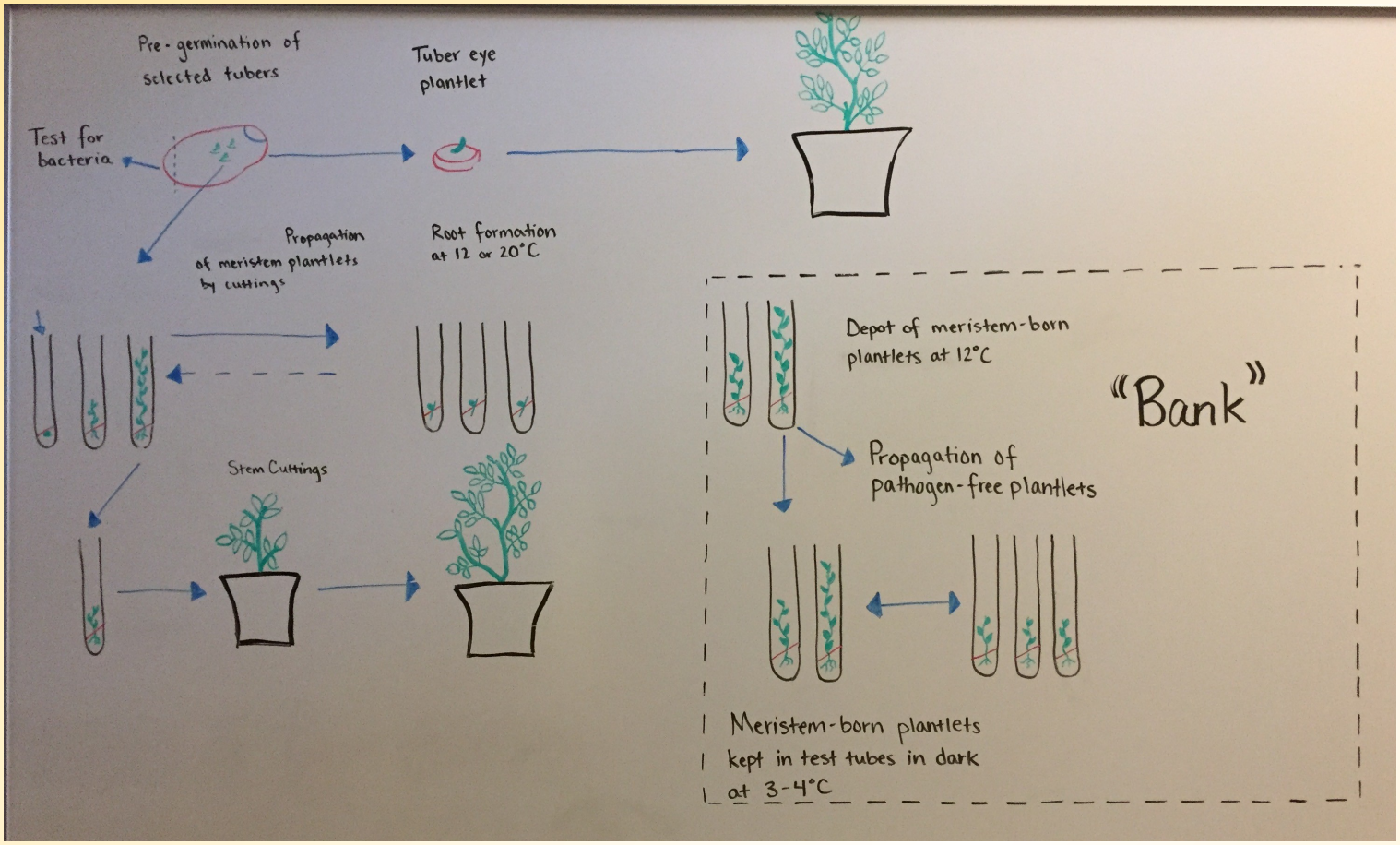
What happened this summer? Huckleberry Gold, the low-glycemic index potato developed by Dave Sands, was planted by Northern Cheyenne tribal members and is growing vigorously in two plots on the Northern Cheyenne Reservation, including one on the Tribal college campus, Chief Dull Knife College. Apsaalooke intern, Holly Reed, and peer mentor, Winter Old Elk, introduced the potato at the Crow Fair in August. In the test kitchens of Herrick Hall, PATHS interns and peer mentors tested 34 tribal recipes for traditional fry bread aiming at a "health" option, --low glycemic index, non-dairy, gluten-free, and high fiber. One secret ingredient - locally produced cricket powder.

How did this happen? We 'got proximate' with Montana's Native American young people. We immersed ourselves in their lives, their hopes, their visions for themselves and their people. Some interns and peer mentors came with their families. Some stayed for a while with us in our homes until campus housing worked out. We went to two reservations for several days each and our visits continue this week. We listened and we learned what the narrative there was. Over the summer, PATHS interns and peer mentors read and discussed scientific articles, learned the chemistry of foods, the chemistry behind health, disease, behavior and decided how they wanted to change the narrative in their communities.

These six interns and peer mentors will continue for a total of 18 months with us both electronically and in person. Additional mentors in our conversations are retired-from-USDA NIFA in Washington D.C., Dr. Hiram Larew, and University of Arkansas law Professor Janie Hipps, Director of Indigenous Food and Agriculture Initiative. In May, 2018, they will be joined by a new cohort of Tribal college interns and peer mentors. Holly Hunts is Principal Investigator for the USDA NIFA grant supporting this three-year program.

Big things are coming to Montana in 2020!
By Jessica Rupp

Last month, I attended the 101st meeting of the Potato Association of America, which took place in Fargo, North Dakota. The meeting brings together potato breeders, agronomists,



Method of fast sterile micropropagation at the start of clone propagation and seed production.

entomologists, and pathologists from around the United States, as well as international partners. The meeting kicked off with a variety of social activities, including a welcome reception featuring the "Taste of Fargo." Several focuses were presented at this year's meeting including sessions focused on Late blight, *Potato virus Y*, and an emerging bacterial disease concern, Dickeyea. An outstanding competition for graduate student presentations took place with 27 participants. It was a great opportunity to network with potato scientists and work towards future collaborations. A variety of special sessions featured physiology, Extension, breeding and genetics, and plant protection. The meeting ended with a banquet dinner. One last opportunity that I took part in was dubbed the Fargo Agricultural Tour. This was a tour of NDSU campus and USDA facilities led by Gary Secor. The highlight of the tour was seeing their tremendous greenhouse facilities.

However, that does not cover the big news. Nina Zidack and I submitted a bid to host the Potato Association of America in 2020. Our bid was accepted and we will begin our planning process to host this fall. We are very excited to share the downtown vibe of Missoula, Montana and the uniqueness of our seed potato industry with our potato loving guests.

American Phytopathological Society Meeting
By Frankie Crutcher (EARC)

This year's American Phytopathological Society meeting was in San Antonio, Texas, and the theme was "Changing Landscapes of Plant Pathology" with a focus on new technologies and the next generation of pathologists. The five-day long conference began with an afternoon of workshops. Jessica Rupp attended "Meta-Analysis for Combining Results from Multiple Studies in Plant Pathology" and both Frankie Crutcher and Bright Agindotan participated in the "Morphological ID of Phytopathogenic Fungi". Committees focused on planning for the 2018 International Congress of Plant

Jessica Rupp and Frankie Crutcher at The Alamo.

Pathology in Boston met that same evening. Some ideas included a fungal foray at Walden Pond and a tour of cranberry production areas. Next year's meeting is looking like it will be the best one yet.

There were several interesting new and returning sessions. New this year was One-to-One Conversation with an Expert, giving early career scientists the chance to discuss their research with an established expert in their field. We also had the opportunity to hear from four phytopathologists of distinction (PoDs) and learn about their careers as plant pathologists in both academia and industry. This year there was also a number of Hot Topic sessions including "Navigating Contentious Conversations," "Science as Story and Story as Science: Telling Plant Pathology Research Stories," and "Highs and Lows of Cannabis Pathology". With more than 50 sessions and 700 posters, it was definitely difficult to choose where to spend our time! As always, there were a number of social events making it easy to reconnect with old friends and make new contacts from around the world. This included Idea Cafés intended to provide an in-depth, round table discussion on an area of interest, including Graduate School 101, how to combat disease in organic agriculture, the looming threat of multiple fungicide resistance, and many more. The APS meeting ended with The Last Alamo Revelry final night celebration, which included armadillo races, Texas style hors d'oeuvres, and traditional music. Of course, we went to see the Alamo because no trip to San Antonio would be complete without that stop!

Diverse Crops, Diverse Challenges
by Traci Hoogland

The title of the National Association of Plant Breeders (NAPB) annual meeting was "Diverse Crops – Diverse Challenges", and the conference organizers truly sought to embody this theme with the wide range of speakers and topics they were able to bring together at UC Davis. Attendants of the conference were able to hear sessions covering many different crops: From cotton to carrots to walnuts to wheat; as well as a wide range of technologies, techniques and focuses. The attendants themselves were a diverse group – including a mix of policy makers, representatives from NGO's, and researchers from both the public and private sectors.

But, amongst all of the diversity of people, crops, and topics there was a unifying theme. Forefront in the minds of all of the attendees was the question of how plant breeding will meet the future needs of agriculture and human nutrition. In a very real way this was the question at the heart of all of the diverse challenges presented

From left: Traci Hoogland, Emma Jobson, Justin Vetch, Brittney Brewer and Kevin King.

by the speakers. Even as the titles of the talks included such things as "UAVs", "Association Genetics", and "Induced Mutations"; the underlying motivation was the same – to answer the question, "How will plant breeding meet the needs of the future?" Technology, germplasm, data pipelines, the accumulated knowledge and experiences of all the people at this conference – all of these things can be thought of as tools to achieve this one, ultimate aim.

And so, perhaps the most important thing that I took away from the 2017 NAPB meeting was a much greater sense of the vastness of the plant breeding network and the value of collaboration amongst its members. Dr. Stephen Baenzinger, a cereal breeder at the University of Lincoln-Nebraska for more than 40 years, ended his seminar with this proverb: "If you want to go quickly, go alone. If you want to go far, go together."

Montana Ag Live Schedule

9/10 - The Bugs of Montana - the Good, the Bad, and the Ugly. Entomologists Laurie Kerzicnik, Dave Weaver, Jeff Littlefield, and Mike Ivie will look at the beneficial as well as the nasty bugs that inhabit our state. Learn about pollinators, predators, pets and pests.

9/17 - Judge Russ McElyea, Chief Water Court Judge for Montana, will look at water needs of the future and how Montana will cope with these needs.

10/1 - Marcia Goetting, renowned Montana State University Economist, will provide information on estate planning for all Montanans and especially for Montana's farms and ranches.

10/1 - Richard Browning, Montana Department of Revenue, will field questions concerning the 2017 Agricultural Land re-appraisal and look at possible natural disaster property tax relief.

10/8 - Joshua Wagoner, Region 4 Fish Wildlife and Parks Maintenance Supervisor, will bring viewers up to date on Managing weed issues along Montana rivers and parks.

10/15 - Perry Miller, Cropping systems agronomist, and Joe Janzen, Agricultural economist, look at the production and marketing issues surrounding Montana's booming pea and lentil production. Learn why Montana's agricultural landscape has changed so dramatically.

10/22 - Lance McNew, wildlife management researcher in MSU's Animal and Range Science Department, will discuss "Critter" problems and living with wildlife in Montana.

New Graduate Students

Raman Sandhi- (Reddy)

My name is Ramandeep Kaur Sandhi and I am from India. I am a PhD student in the PSPP department under the guidance of Dr. Gadi V P Reddy. I received my BS and MS from Punjab Agricultural University, India. During my childhood, I used to see my grandfather and father discussing their problems in cultivation of crops, especially related with the management of the insect pests and diseases. Over time, this close interaction with nature gradually strengthened my bond with agriculture and I opted for agricultural studies as my educational focus.

My PhD work will focus on "Evaluation of Entomopathogenic nematodes (EPN's) for their efficacy against wireworms". In recent years, an increasing wireworm population and the damage they have caused has become a major problem for growers in the Golden Triangle Region of Montana. The development of effective biological control strategies is therefore required to manage this pest to avoid huge losses in wheat fields. Entomopathogenic nematodes

(EPN's) are the novel biological control agents that are being evaluated for the management of various insect pests on a wide range of crops. EPNs have a broad host range, are safe for non-target organisms and humans, and have no known negative effects on the environment. The development and utilization of this new technology for wireworm management is expected to have a significant and positive impact on wheat and barley cultivation, thereby widely benefiting the farming community.

Bozeman is a beautiful city and offers a lot of outdoor activities like hiking, camping, fishing, and skiing. I really enjoy being here and exploring. I am excited about joining the PSPP department, working with my professors and making new friends.

Chance Noffsinger- (Cripps)

My name is Chance Noffsinger and I am a new graduate student pursuing a Master's degree in Plant Pathology. I graduated with a Bachelor's of Science in Environmental Biology from Montana State University (MSU) this spring. This past summer I worked for the Beaverhead-Deerlodge National Forest (BDNF) on a botany crew focused on understanding the suitability of habitat for the threatened sage grouse. As an undergraduate, I became enticed by fungi after taking Dr. Cathy Cripps' Mycology and Ecology of Fungi courses; now I'm honored to be able to continue my education in Dr. Cripps' lab. My research will focus on the systematics of the fungal genus *Russula* found in the alpine. I grew up in Whitefish, Montana and have always loved exploring this great state, whether it be on my snowboard, in my climbing harness, or in the woods looking for mushrooms. I'm unsure of my plan following my graduate education; however, I hope my dedication to mycology and biological research will allow me to work closely with fungi. I am excited to dive into my research and continue exploring Montana with the amazing faculty and staff here in the Plant Sciences and Plant Pathology Department.

Miriel Otero- (Wanner)

My name is Miriel Otero; I will be working on my PhD degree in Plant Science/ Plant Pathology with Dr. Kevin Wanner. My research is going to be focus on the Elateridae family. I have a Bachelor's degree in agronomy and masters degree in entomology, both degrees earned from the University of Puerto Rico, Mayagüez Campus (UPRM). Before I was admitted to MSU, I was a Research Assistant in a molecular laboratory at Ricetec Inc. located in the State of Texas. My long-term goal is to finish my PhD, work in the academy as a professor and researcher and make great contributions to science. Entomology is definitely my passion and profession and for that reason my greatest desire is to earn my PhD at Montana State University and learn more every day about this great science in order to acquire the knowledge necessary to educate future generations.

Jason Myers- (Lu)

Jason Myers is an incoming PhD student in Dr. Chaofu's lab and will be studying the genetics of fatty acid biosynthesis in *Camelina sativa* for both industrial and nutritional applications. He previously obtained a Master's of Science in Tropical Plant and Soil Science at the University of Hawaii at Manoa, where he worked with cacao agronomy and pathology. As part of that, he gained experience on cacao variety establishment, processing, and flavor analysis with

renowned chocolate manufacturers and tasters. On the lab-based side of the field, he has especially enjoyed tissue culture, pathogen assays, and transfection studies, including use of the now ubiquitous CRISPR technology. Jason has a family with two young daughters, and enjoys hiking, surfing, and travelling in the tropics whenever possible.

Greg Chorak- (Thum)

My name is Greg Chorak and I am a new Ph.D. student in Dr. Ryan Thum's lab. I earned my M.Sc. in Aquatic Biology at Grand Valley State University's Robert B. Annis Water Resources Institute in Muskegon, Michigan. My masters focused on understanding the genetic structuring of a small bodied game fish (yellow perch) in Lake Michigan and how connected waterways to Lake Michigan affected that structuring. As a Ph.D. student, I will continue to focus on the genetics of populations particularly aquatic invasive plant populations and how management of those populations can affect them. Invasive plants offer a great system for me to study the types of management to population genetic interactions that I am interested in. As with many of the people living in Bozeman, I also love the outdoors and like to hike, camp, snowboard, fly fish, and run. I'm excited to be part of such an awesome community and live in such a cool place!

BIOCOMP'17

Hikmet Budak is an organizing committee member of BIOCOMP'17 - The 18th International Conference on Bioinformatics & Computational Biology, Las Vegas, Nevada, USA. http://americancse.org/events/csce2017/conferences/biocomp17/committees.

Bioinformatics is an interdisciplinary field that develops methods and software tools for understanding biological data. Computational Biology involves the development and application of data-analytical and theoretical methods, mathematical modeling and computational simulation techniques to the study of biological, behavioral, and social systems.

Invited Talks

Michelle Flenniken, Bee Viruses and Honey Bee Health. San Diego, CA.-University of California San Diego campus in La Jolla, CA -Society for Invertebrate Pathology Conference.

Grants

James Rolin (Florence Dunkel Student), Undergrad Scholars Program, "Creation of an Algorithm for the standardization of commercial rearing, processing, and distribution of *Acheta domesticus* for human consumption in the United Sates".

Publications

Josephine Mgbechi-ezeri, Lyndon Porter, Kenneth B. Johnson, Nnadozie Oraguzie (2017). Assessment of sweet cherry (Prunus avium L.) genotypes for response to bacterial canker disease. Euphytica 213:1-12.

Andrea C. Varella, David K. Weaver, Jason P. Cook, Nancy K. Blake, Megan L. Hofland, Peggy F. Lamb, Luther E. Talbert (2017). Characterization of resistance to the wheat stem sawfly in spring wheat landrace accessions from targeted geographic regions of the world. Euphytica 213:153.

Erin E. Burns, Barbara K. Keithohammed Y. Refai, Brian Bothner, William E. Dyer, (2017). Proteomic and biochemical assays of glutathione-related proteins in susceptible and multiple herbicide resistant Avena fatua L. Pesticide Biochemistry Physiology 140:69-78.

Ayodeji Owati, Bright Agindotan, Julie S. Pasche, Mary Burrows (2017). The Detection and Characterization of QoI-

Resistant Didymella rabiei Causing Ascochyta Blight of Chickpea in Montana, Frontiers in Plant Science 8:1165.

Patents

The U.S. Patent Office has granted Gary Strobel US Patent 9706773 -"Antimicrobial compositions and related methods of use". The patent relates to the discovery of *Muscodor crispans* and its volatile antimicrobial activity with the reduction of the volatile components having complete retention of antimicrobial activity.

The company that uses this technology is Jeneil Biotech of Saukville, Wisconsin. A number of products are now on the market that contain the ingredients outlined in the formula mentioned in the patent.

Extension Horticulture Training August 3-4 in the Flathead
By Toby Day, Horticulture Extension Specialist

Several agents, specialists and Master Gardeners met in the Flathead for a horticulture training August 3-4. The training included information and a site visit of a Heritage Orchard site on the Wild Horse Island that Brent Sarchet, Lewis and Clark Co. Extension agent and I have been working on; sweet cherry cultivar research from Dr. Pat McGlynn, Flathead County Extension agent, Dark fruit research at the Flathead Community College (part of a statewide grant); fruit insect management by Dr. Laurie Kerzicnik; and even a hops variety test plot. A big thanks to all that helped put on such a great event! It will likely become an annual event, so contact me if you would like to participate next year.

Dr. Laurie Kerzicnik talks about the threat of spotted wing drosophila

Dr. Pat McGlynn educating about sweet cherry research to help growers compete in the marketplace.

Orange Petunia Dilemma
By Toby Day, Horticulture Extension Specialist

A little-known phenomenon happened this year at garden centers and nurseries across the U.S. and Europe. You probably missed it, unless you were specifically looking for orange or coral-colored petunias. There were absolutely none on the shelves. This phenomenon even escaped me, an avid petunia gardener until I was talking one day with Cheryl Moore-Gough. She advised me to look into it.

Apparently, orange is a difficult color to traditionally breed into petunias. The issue at hand is that the petunias that were used for breeding the orange color (and other colors) were in fact, genetically modified (GM). Whether we should be using GM plants and all the hype that goes along with GM was not really the issue, it was that the plants were not properly permitted. The European Union

and the U.S APHIS (Animal and Plant Health Inspection Service) bar the distribution of genetically modified plants without special permits. So, there was an order by APHIS to destroy a whole list of petunia cultivars (and the list keeps getting larger). Nurseries and distributors received the lists of petunias to remove last spring – and most of them have voluntarily destroyed them. They usually were compensated by the breeders.

The big question is whether they will have this all sorted out and are able to breed more orange petunias for this coming season. I wouldn't count on it. I doubt you will find them on the shelves or hanging baskets next year. If you want to learn more about this or see the list of cultivars that were removed, look at this article from Horticulture Week back in June: http://www.hortweek.com/gm-not-just-orange-petunias/ornamentals/article/1435976

September Birthdays

Tracy Dougher	1
Laurie Kerzicnik	2
Irene Decker	5
Jennifer Lachowiec	14
Michelle Flenniken	18
Gary Strobel	23
William Dyer	26
Mark Young	27
David Baumbauer	27
GunNam Na	27

Recipe of the Month

Zucchini Lasagna

1 lb 93% lean ground beef
1 1/2 teaspoons kosher salt
1 tsp olive oil
1/2 large onion, chopped
3 cloves garlic, minced
1 (28 oz can) crushed tomatoes
2 tbsp chopped fresh basil
black pepper, to taste
3 medium (8 ounces each) zucchini, sliced 1/8" thick
1 1/2 cups part-skim ricotta
1/4 cup Parmigiano Reggiano or parmesan
1 large egg
16 oz (4 cups) shredded part-skim mozzarella cheese

In a medium sauce pan, brown meat and season with salt. When cooked drain in colander to remove any fat.
Add olive oil to the pan and sauté garlic and onions about 2 minutes. Return the meat to the pan, add tomatoes, basil, salt and pepper. Simmer on low for at least 30-40minutes, covered. Do not add extra water, the sauce should be thick.

Meanwhile, slice zucchini into 1/8" thick slices, lightly salt and set aside or 10 minutes. Zucchini releases a lot of water when cooked, salting it takes out a lot of moisture. After 10 minutes, blot excess moisture with a paper towel.

Preheat a gas grill to medium high, and grill 2 to 3 minutes per side, until slightly browned. Place on paper towels to remove excess moisture.

Preheat oven to 375°.
In a medium bowl mix ricotta cheese, parmesan cheese and egg. Stir well.

In a 9x12 casserole spread 1/2 cup of sauce on the bottom and layer the zucchini to cover. Spread 1/2 cup of the ricotta cheese mixture, then top with 1 cup of the mozzarella cheese and repeat the process until all your ingredients are used up. The last layer top with remaining zucchini and sauce, cover with foil and bake 30 minutes. Uncover the foil and bake 20 minutes (to dry up the sauce) then place the remaining 1 cup mozzarella and bake until melted, 10 minutes.