



**Aquatic Plant Symposium**

**By Ryan Thum**

The 15<sup>th</sup> International Symposium on Aquatic Plants was held in beautiful Queenstown, New Zealand February 18-23. The symposium was limited to approximately 150 delegates, which was large enough for exciting international connection, but small enough to keep the event intimate.

The symposium was organized into three themes: 1) Biodiversity, Conservation, and Biomonitoring, 2) Invasive Plant Management, and 3) Ecosystem Response and Restoration. I was honored and humbled to be the keynote speaker for the first theme, where I spoke about my empirical work on cryptic biodiversity in

aquatic plants and its implications for aquatic plant invasions and management. The international element of the conference was very exciting. I met many international colleagues for the first time, including those that I have interacted extensively with electronically, and even co-authored papers in some cases! I was particularly excited about possible collaborations with European colleagues that share interests in topics like genomics and biogeography, South African colleagues that share interests in aquatic plant biodiversity and monitoring, and of course, with my New Zealand colleagues that organized the symposium and have an excellent program in both native and exotic aquatic plants in New Zealand.



Ryan Thum with his two children, Logan and Grace, in Milford Sound in the Fjordland region of the South Island of New Zealand underneath a glacially-fed waterfall.

It is impossible not to notice how far away New Zealand is; if that escapes your observation when looking at a map, you certainly become keenly aware of it on the long flights to and fro! Being that far away from home in a different hemisphere provides ample opportunities for unique experiences.

I was fortunate enough to squeeze in some memorable New Zealand naturalist experiences while I was away, including seeing two species of penguins, three species of albatross (you cannot describe how large and amazing they are), cave glow worms (which are predatory larval fungus gnats), some really amazing birds, and even a few ziplines in the bush!

### **30<sup>th</sup> Annual Bug Buffet: What's New? By Florence Dunkel**

On February 20, one thousand people from the ages of 4-84, including preschoolers and their teachers from the MSU Daycare, streamed into the Student Union Building for five and a half hours beginning at 10:30 a.m. on February 20. While the 40 preschoolers shared insect stories and learned why eating insects is a good idea with Dr. Dunkel at an early, private luncheon; Christine Lux, a Health and Human Development Department professor and her MSU students majoring in Early Childhood Education set up learning stations in the center of the Ballroom.

Simultaneously Dr. Holly Hunts, MSU Family Consumer Economist, met a Park County High School teacher and her students in training to be sous chefs. MSU students in BIOO 162, a Contemporary Issues in Science core class focused on the Issues of Insects and Human Societies, stood ready to greet each successive group. These 24 students had trained for a month to guide visitors in this exposure to edible insects.

Bug Buffet Week began with the first annual cook-off organized by Chef Marcy Gaston and ended with the first annual MSU Insects for Food and Feed academic conference led by Dr. Steve Stowers, Department of Cell Biology and Neuroscience. Tours to insects for food and feed systems in Gallatin Valley happened mid-week. Kathy and James Rollin, MSU students and owners of Cowboy Cricket Farms and Commercial Kitchens, Belgrade Montana, hosted about 30 faculty and students and Dr. Wendy Sealey, USDA Fish Technology Center, Bozeman hosted a

similar group at the fisheries and fish feed formulation facility near Bozeman.

This year, a professional insect chef and well-known author, David George Gordon, Seattle Washington, and Dr. Valerie Stull, a University of Wisconsin scientist, focused on edible insects and the human gut biome, and helped us launch respectively, the Cook-Off and the academic conference on "Chitin and the Human Gut Biome." There will be more about this conference in next month's newsletter.



*Chef David George Gordon, a popular science author and Dunkel, author of a new textbook published by Elsevier, participate in a book signing set up by the MSU Bookstore.*



*Following President Waded Cruzado's welcoming remarks, Dunkel presents her with a dragonfly pin made by co-chair Dr. Holly Hunts. The dragonfly is an edible insect in the South Pacific and also a revered insect in Montana by both the Nations of Apsaalooke and the Northern Cheyenne.*



All five teams were winners. Each included significant amounts of Thai black ants, Tenebrio larvae, whole crickets, and cricket powder in their dishes. First place went to two computer science students, Cesar Cruz and Kendall Black with their chicken pizza and blueberry brownie topped with their own homemade ice cream. Second place was awarded to a Gallatin College student who prepared a meat and potatoes entree with gremolata topped asparagus and biscotti and a pot de crème for dessert; third place went to a freshman in psychology, Emily Weaver with her tacos filled with sautéed crickets and Tenebrio parfaits.



Teaching assistant, Claire Zahner (second from left), and B100 162CS students hold/create information booth at the MSU International Street Food Bazaar February 3 and sell chocolate "chirpy" cookies to help defray cost of Bug Buffet Week expenses.



Black ants from Thailand grace the ants-on-a-log appetizer, signature dish of Chef Gordon.

Chef Gordon provided in-class workshops for Bozeman High School students in training to be sous chefs. He also served as chief judge for the Cook-off along with Chet Layman, KBZK anchor, and Chris Seifert, Director of Educational Services for Montana PBS. Chef Gordon called the Cook-off and the whole week, "a wild success."

Chair of the weeklong set of events was Florence Dunkel, Associate Professor of Entomology. Co-Chair was Holly Hunts, Associate Professor Department of Health and Human Development. Student leaders were Claire Zahner, Biotechnology major, and Michael Thienes, post-bac student in Ecology. Dr. Michelle Flenniken provided a pollination booth. The buffet menu was developed by Amber Wivholm with food safety advice provided by Dustin Schreiner, MSU Sanitarian. All graphics were provided gratis by Sarah Thienes, who will now, thanks to this experience, launch her own company, Who I am Designs.

Bug Appetit!

### **Wheat Quality Council Meeting, Feb 21-22, 2018**

**By Jim Berg**

The Wheat Quality Council (WQC) held its 68<sup>th</sup> annual meeting, forum, and technical review sessions on February 21-22, 2018 at the Embassy Suites Airport Hotel in Kansas City, MO with over 125 university and industry participants in attendance. Cassiday Marn, Trade and Marketing Manager for the Montana Wheat and Barley Committee, reported on weather conditions and wheat planting prospects for Montana.

The WQC is the only industry-wide organization that brings together all wheat interests from breeders and producers to millers, processors and bakers. These participants are provided information on the milling and baking qualities of wheat varieties that will be released, grown and processed in the next few years.

Wheat breeders have an opportunity to network with the industry to determine what quality characteristics the millers and bakers would like to see in new wheat varieties. Forty-two breeder-submitted lines and checks were entered for evaluation from the 2017 growing season. These lines were hard spring (10) and hard winter wheats (32). Yukiko Naruoka, a former PhD student under Luther Talbert, now residing in Glyndon, Minnesota,

represented Syngenta Crop Protection, LLC in a spring wheat variety (SY Rockford) evaluation. A new spring wheat grow-out nursery in Havre, Montana was ably managed by Peggy Lamb at Northern Ag Research Center and will be planted again for the 2018 grow-out. The WQC has an open invitation for Peggy to attend a meeting in the near future.

Winter wheat evaluations ranged from Montana to central Texas. The MSU winter wheat breeding program entered one common (to all programs) check (Jagalene), one local check variety (Yellowstone), and two experimental lines (both hollow-stemmed). Within the group of eight public and private breeding programs involved in hard winter wheat submissions, the Montana program lines ranked #3 for both milling and baking scores and #2 overall. One of our experimental lines (MT1465) was approved for release in January 2018 and will be given the name 'FourOsix'. It will be available to seed growers in fall 2018. Our set of lines won the 'Miller's Award', the second time MSU has received this honor since 2008.

The theme of the forum for 2018 was "My Role in Wheat Quality". Brett Carver, wheat breeder at Oklahoma State University, discussed how he carefully manages more than 1000 crosses a year keeping track of parental loaf volume, SDS (sodium dodecyl sulfate) sedimentation rates, and water absorption of flour. Romullo Lollato, Extension Wheat Specialist at Kansas State University, described on-going experiments on nitrogen rates and timing to increase both yield and protein in wheat. Andrew Hoelsher, Kansas wheat farmer and consultant said that for farmers most decisions are based on the future's market and not on wheat quality or protein premiums. He recommended that farmers should "know what they grow" and that millers and bakers should communicate their demands to growers and let them (the growers) bear the burden of innovation. Vince Lamb of ADM Milling said that sourcing consistency and flour functionality was his most important concern. Len Heflich, representing the baking industry expressed

concern for increased costs due to imported foreign gluten (mainly from Poland and the Czech Republic) which is subpar to U.S. and Australian gluten. Increased whole grain bread products have surpassed the white pan bread market in recent years. There is an increased need for gluten to hold these whole grain products together.

The keynote dinner speaker on Wednesday was Brad Seabourn, Supervisory Research Food Technologist for the USDA-ARS Grain Quality Lab in Manhattan, Kansas. Dr. Seabourn outlined the history and research done in the USDA's four quality labs in the past 80 years and its contribution to the understanding of present day wheat quality. He also talked about the USDA's regional testing programs of which MSU has been a part of since the 1930's. A present day concern is that 1300 of the USDA's 6000 positions are open around the country. There is legislation in place to fill 600-700 jobs, but funding has not been forthcoming.

Technical quality concerns in the next few years include California's Proposition 65 (The Safe Drinking Water and Toxic Enforcement Act of 1986) possibly entering glyphosate (Round-Up) on its list of 900+ chemicals having the potential to cause birth defects. This could require a 'consumer facing' label on cookies, crackers, flour, etc. Glyphosate is used as a pre-harvest weed control and dry down treatment on around 1,000,000 acres of spring wheat. It is most commonly used in fallow situations prior to crop planting in the U.S.

Another concern, expressed by Mary Guttieri from the USDA Hard Wheat Quality lab in Manhattan, was sulfur fertility as it relates to yield, asparagine and quality. There is an increased prevalence of the toxin, acrylamide, in food stuffs such as French fries, hash browns, biscuits, crackers, and bread crusts. Asparagine (one of the amino acids) plus reducing sugars combined with high heat and low moisture can lead to increased acrylamide formation. Field grown wheat is usually low in acrylamide but there

are variety and location differences. In the absence of sulfur, more asparagine is produced in food products. There also appears to be less mineralization of sulfur in relatively cooler no-till planting conditions. A low nitrogen to sulfur ratio appears to reduce acrylamide formation. Further research on sulfur fertilization to address this problem is needed.

Millers and bakers, in general, conclude that new wheat varieties, in both the winter and spring wheat breeding programs in the U.S., are favorable to their needs.

### **WheatCAP – Positional Cloning Workshop By Jason Cook**

Starting in 2017, a multi-institutional consortium of wheat breeders/geneticists known as WheatCAP was funded by the USDA to positional clone genes that control yield component traits in wheat. The lead principle investigator on this project from Montana State University is Luther Talbert. Specific objectives of the project are to: 1) Characterize 15 QTL for grain yield and identify the underlying genes. 2) Validate the candidate genes using mutants and transgenic approaches. 3) Deploy beneficial alleles in commercial varieties and advanced breeding lines. 4) Develop genomics tools to characterize the regulatory regions of the wheat genome. 5) Train a new cohort of 15 plant breeders, and make the training resources publically available.

To achieve these objectives, WheatCAP graduate students are invited to attend several face-to-face workshops throughout the course of their studies to be trained on how to clone their gene(s). The first workshop was recently hosted by Jorge Dubcovsky's research group at the University of California – Davis. Eight instructors introduced 26 participants to various aspects on how to positional clone a gene. Participants who attended the workshop from MSU's Plant Sciences and Plant Pathology department included graduate students Brittney Brewer and Megan Hager. DeAnna Crow and Jason Cook, both part of the WheatCAP education



*Above: Megan Hager, Brittney Brewer, and Jason Cook enjoying a group social at Jorge Dubcovsky's home.*

*Below: Students participating in hands-on bioinformatic computer training for tools they will use on their project.*



coordination team, helped organize the workshop. Specific topics covered at the workshop included how to reduce genotypic and environmental variation and strategies to increase statistical power to Mendelize quantitative traits. Also, the students were introduced to various computational tools they will use to succeed in completing their project. Additionally, WheatCAP Project Co-Director Eduard Akhunov from Kansas State University gave an excellent lecture on his lab's progress in optimizing the CRISPR/Cas9 gene editing system for wheat. Eduard's lab will edit candidate genes WheatCAP students identify to validate if the gene is controlling the trait of interest. Lastly, Sarah Davidson-Evanega, a science communications expert from Cornell, introduced the students to concepts on how to properly engage the public on scientific topics

with a primary focus on the CRISPR/Cas9 gene editing system. All lectures given at the positional cloning workshop were recorded and will be made available to the public.

Overall, the greatest benefit the students gained from the workshop was the opportunity to meet their student counterparts located at other institutions, build collaborations, and begin to see the full scope of the project. Looking forward, the WheatCAP students will have an opportunity to attend a more in-depth science communications workshop at Cornell towards the end of June and the students will have the opportunity to attend a hands-on RNA-Seq workshop at Kansas State University in July.

### **Etzler Wins Award**



Frank Etzler was recently chosen by the Ecology Department as the Outstanding Graduate Teaching Assistant (GTA). This award means that he is also nominated for the College of Letters and Science Outstanding GTA award.

Frank received the award because of the effort and time he has spent in BIOB.160 labs, and for the influence he has been to more than 450 students over the last 8 semesters. We wish you great success in your future endeavors.

Congratulations Frank!

### **Montana Ag Live Schedule**

3/25 Mac Burgess, Department of Plant Science and Plant Pathology and a specialist in small farm production will discuss the growth of specialty farms in Montana.

4/8 Jake TeSelle, MSU graduate and 5th generation Gallatin county producer will inform viewers on Hop production, one of

Montana's newest agricultural industries. If you like Montana craft beers, don't miss this program.

4/15 Stephen VanTasse, vertebrate pest specialist with the Montana Department of Agriculture addresses unwanted Montana critters, voles, moles and pasture pooches.

4/22 Tim DelCureto, Nancy Cameron Endowed Chair in range land beef cattle production, Montana State University, will look at the sustainability of range land beef production in Montana and the western states.

4/29 Clain Jones, MSU Extension Soil Scientist will discuss the change of Montana's high pH soils to acid soils in several Montana counties and why it is occurring at an alarming rate.

## New Employees

### Steve Hystad (Nina Zidack)



I am extremely excited to return to the PSPP Department here at MSU. Six years ago, I received an excellent opportunity to pursue a M.S. degree in Plant Sciences under the tutelage of Jack Martin, Phil Bruckner, and Mike

Giroux. Our focus to identify the genetic basis of wheat end use quality traits cultivated my interest in applied research with hopes of providing sustainable advancements in food and agriculture technology. Upon graduating, my research aspirations and love of biotechnology led me to Simplot Plant Sciences where I worked with the molecular research teams to characterize novel mutations that impact quality traits of potato and other fresh market produce.

After leaving Simplot, I spent some time serving as the main technical expert at a local software company that analyzes Next Generation Sequencing (NGS) data to filter, annotate, and identify pathogenic variants associated with cancer and other hereditary diseases in humans. While this 'sabbatical' into

human genetics and disease was exciting, I knew my passion lay with agriculture, potato production, and plant biotechnology.

The Seed Potato Certification Program at MSU serves as a critical component in a holistic health management program that ensures Montana's seed potato growers possess clean, quality seed. As a new addition to the Potato Lab, I will be working with the team to continue our existing screening pipeline and strive to implement new diagnostic tests to continually address the needs of the seed potato growers. I look forward to seeing familiar faces and fostering new relationships with the latest faculty additions in the department.

## Grants

Mike Giroux, "Understanding how Genetics Impact Wheat Functionality and Nutrition", Bay State Milling.

## Publications

Jenkins, M. (Marlee), Cripps, CL, and Gains-Germain, L. 2018. Scorched Earth: *Suillus* colonization of *Pinus albicaulis* seedlings planted in wildfire-impacted soil affects seedling biomass, foliar nutrient content, and isotope signatures. Plant and Soil, Online 2018.

Antibus, R., Hobbie, E. and Cripps, CL. 2018. "Sporocarp  $\delta N$  and use of inorganic and organic nitrogen in vitro differ among host-specific suilloid fungi associated with high elevation five-needle pines". Mycoscience, Online 2018.

Gordon, SP, Contreras-Moreira, B, Woods, DP, Des Marais, DL, Burgess, D, Shu, S, Stritt, C, Roulin, AC, Schackwitz, W, Tyler, L, Martin, J, Lipzen, A, Dochy, N, Phillips, J, Barry, K, Geuten, K, Budak, H, Juenger, TE, Amasino, R, Caicedo, AL, Goodstein, D, Davidson, P, Mur, LAJ, Figueroa, M, Freeling, M, Catalan, P, Vogel, JP. 2017. "Extensive gene content variation in the *Brachypodium distachyon* pan-genome correlates with population structure Nature communications 8 (1), 2184.

S Biyiklioglu, B Alptekin, BA Akpınar, AC Varella, ML Hofland, DK Weaver, B Bothner, and H Budak. 2018. "A large-scale multiomics analysis of wheat stem solidness and the wheat stem sawfly feeding response, and syntenic associations in barley, Brachypodium, and rice". *Functional & Integrative Genomics*, 1-19

Fehmida Bibi, Gary A. Strobel, Muhammad Imran Naseer, Muhammad Yasir, Ahmed Abdullah Khalaf Al-Ghamdi, Esam Ibrahim Azhar, "Microbial flora associated with the halophyte-Salsola imbricata and Its Biotechnical Potential, *Frontiers in Microbiology*", section Extreme Microbiology. 31 January 2018 | <https://doi.org/10.3389/fmicb.2018.00065>

An article appeared in *The Furrow* concerning David Sands and the work he is doing to identify and breed more nutritious crops. <https://www.johndeerefurrow.com/2017/10/30/functional-foods/>.

### Invited Talks

Ryan Thum, Keynote speaker at 15th International Symposium on Aquatic Plants. Queenstown New Zealand, February 20, 2018.

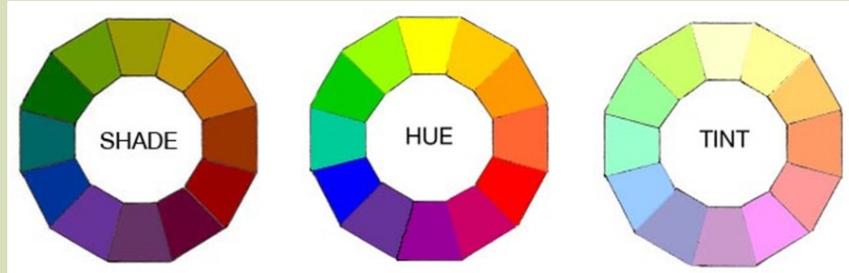
### Do Your House and Garden Match? By Toby Day, Horticulture Extension Specialist

Have you thought about the color of your house compared to the colors in your landscape? I have. Is your house blue, yellow, green, brown? Do the landscape colors match or clash? I like the bold colors in my landscape, but I often wonder if it goes with the color of my house. I feel lucky because my house is grey, and everything goes with grey right? Wrong! Sometimes it depends on the tint, shade or hue of a color that can make or break good landscape design. If that last sentence left you thinking "what?" you are not alone.

I'll break it down: A hue is a pure color. If you think about opening a classic 8 crayon box, the colors you would find are hues – pure colors. A

shade is darker than a hue – not just purple, but *dark purple*. A tint is a lighter color than a hue. A tint of purple would be a *light purple*. If this still leaves you confused, look at a color wheels below and you will get the idea.

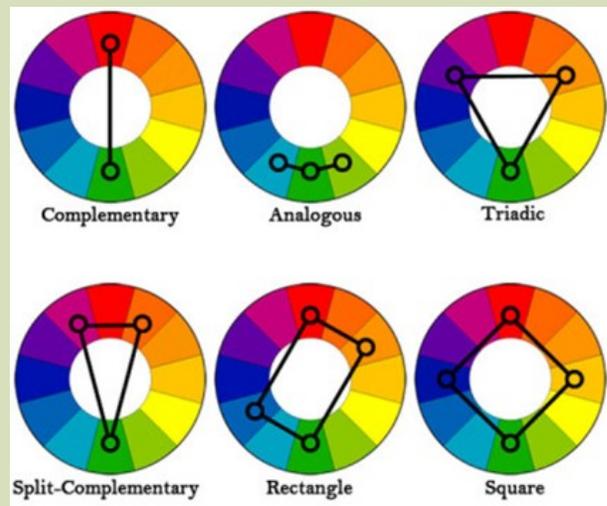
### Shades, Hues and Tints



<https://www.greenhousefabrics.com/blog/color-wheel>

Using a color wheel, pick out a color scheme (combination of colors) for your garden. Whether the colors are analogous, complementary, triadic, or any other color scheme, we often mistake not using the color of our house within the scheme – a big mistake!

### Color Wheel Color Schemes



[www.risaann.com](http://www.risaann.com)

Year's back I stumbled across an article from *Fine Gardening Magazine* called "Matching the Colors of Your House and Garden" <http://www.finegardening.com/article/matching-the-colors-of-your-house-and-garden>. It was the first time I thought about the color of a home being part of a *landscape* color scheme. And, that tints and shades of hues do matter! For instance, the article says if your house is

brick red, warm colors like yellow, orange and scarlet go well, as do tints of peach/pink and yellows. However, you want to stay away from reds, purples and lavender-pink tints.

If your house is white (or light grey, like mine), you want to use whites and pastels (tints) and avoid only using large amounts of rich shades, because they look too harsh. Oops, out with the black-eyed Susans and salvia. Who knew?

If you plan on designing a garden near your house, you may want to take a closer look at the article and see if the plants you like match your house. If you have an existing bed and don't want to change it, you might look at painting your house to match the landscape. Personally, I would rather change the plants. I hate outside painting!

Tip: If you are having issues trying to see what flower colors go well together with the color of your house, go to a fabric store and pick out a textile with multiple colors, one that includes your house color. Someone has already done the work to make sure the colors go well together. Then pick the plants that have foliage or flowers the same as the remaining colors on the textile.

### **Cheryl Moore Gough Promoted in Aikido**

Cheryl Moore-Gough has been promoted by Aikido Doshu Moriteru Ueshiba, head of World Aikido Headquarters in Tokyo, to Godan (5th degree black belt). Cheryl Sensei has studied Aikido for over 25 years and is an instructor at



*Cheryl Moore Gough was recently promoted to 5th degree Black Belt in Aikido.*

Big Sky Aikido. Cheryl teaches Vegetable Production at MSU and Introduction to Plant Biology at Gallatin College.

### **Recipe of the Month**

Beef and Guinness Stew - Happy St.

Patrick's Day!

4 slices bacon, cut into small pieces

2 1/2 pounds boneless beef chuck, cut into 2-inch pieces

1 teaspoon salt, or more to taste

freshly ground black pepper to taste

2 onions, coarsely chopped

1/2 teaspoon salt

4 cloves garlic, minced

1 (14.9 ounce) can dark beer (such as Guinness(R))

1/4 cup tomato paste

4 sprigs fresh thyme

3 carrots, cut into 1-inch pieces

2 stalks celery, cut into 1-inch pieces

1 teaspoon white sugar

1/2 teaspoon freshly ground black pepper, or to taste

2 1/2 cups chicken stock, or as needed to cover

4 cups mashed potatoes (optional)



Cook and stir bacon in a heavy skillet over medium-high heat until bacon is browned and crisp, 3 to 4 minutes. Turn off heat and transfer bacon into a large stew pot, reserving bacon fat in the skillet.

Season beef chuck cubes generously with 1 teaspoon salt and black pepper to taste. Turn heat to high under skillet and sear beef pieces in the hot fat on both sides until browned, about 5 minutes. Place beef in stew pot with bacon, leaving fat in skillet. Turn heat down to medium; cook and stir onions in the retained fat in the skillet until lightly browned, 5 to 8 minutes; season with a large pinch of salt.

Cook garlic with onions until soft, about 1 minute; pour beer into skillet and stir with a wooden spoon, scraping up and dissolving

any browned bits of food into the liquid. Pour cooking liquid from skillet into the stew pot. Stir in tomato paste, thyme sprigs, carrots, celery, sugar, 1/2 teaspoon black pepper, and enough chicken broth to cover.

Bring stew to a gentle simmer, stirring to combine; reduce heat to low and cover pot. Simmer stew until beef is fork-tender, about 2 hours. Stir stew occasionally and skim fat or foam if desired.

Remove cover and raise heat to medium-high. Bring stew to a low boil and cook until stew has slightly thickened, 15 to 20 minutes. Remove and discard thyme sprigs and adjust salt and pepper to taste.

Arrange mashed potatoes in a ring in a serving bowl; ladle stew into the center of the potatoes.

### **Birthdays**

Myron Bruce	2
Sarah Olivo	2
Eva Grimme	9
Richelle O'Leary	13
Jason Cook	16
Anna Jespersen	24
Erin Gunnink Troth	24
Rachel Black	30
Elaine Nichols	31

