

FALL / WINTER 2019

Horticulture



UNIVERSITY
OF MINNESOTA

CFANS

COLLEGE OF FOOD, AGRICULTURAL
AND NATURAL RESOURCE SCIENCES

ON THE COVER



Kiwiberries: Minnesota's next fruit crop

Kiwiberries (*Actinidia arguta*) are a new fruit crop being explored at the Horticultural Research Center. Drs. James Luby and Robert Guthrie have been collaborating for the better part of a decade and recently received funding through an MDA USDA grant to develop kiwiberry for Minnesota. They along with graduate student, Seth Wannemuehler, are researching harvest timing, post-harvest storability, and pest resistance of kiwiberry grown in Minnesota.

For more information about the Fruit Team and kiwiberry research, visit fruit.umn.edu

WHO WE ARE

**Community. Diversity of thought.
Excellence. Innovation. Impact.**

Our Mission

The primary mission of the department is to discover, interpret, and transfer new knowledge for the purpose of improving quality of life through a) improving productivity, value, and use of horticulture crops; b) contributing to a quality environment; and c) educating students.

CONNECT WITH US

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SUPPORT US

Horticultural Science advances our vision to catalyze collaborative plant research and expand real-world learning opportunities for students in horticultural science.

horticulture.umn.edu/support

THANKS TO:

Elizabeth Arnold

Samantha Grover

Emily Hoover

Lauren Matushin

Leslie McDougall

Laise Moreira

Kate Sammons

Pasia Vang

Seth Wannemuehler

HIGHLIGHTS

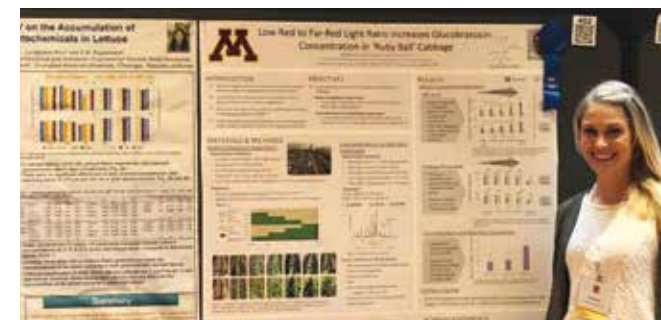


Photo by David Tork

Photo Contest Winner

Graduate student, David Tork, won an Honorable Mention in the 2019 National Association of Plant Breeders Photo Contest for his photo of a flax flower being pollinated by a bee.

About the photo: "Plant breeders at the University of Minnesota are working to domesticate perennial flax for agronomic and horticultural uses as part of the Forever Green Initiative. Long flowering periods make these plants a great source of forage for pollinators, which are often seen cruising from flower to flower during the summer months."



ASHS Poster Competition Winner

Graduate student, Ilse Renner, took 1st place in the Ph.D. poster competition at the annual ASHS conference. Her poster featured her research on how light quality impacts the health properties in cabbage.



Turf Team at the Fair

UMN President Joan Gabel and CFANS Dean Brian Buhr stopped by the Turf Team's education and outreach exhibit at the Minnesota State Fair this past August. They and many others learned about Fine Fescues for Minnesota lawns and roadsides, low-input turfgrass, and water conservation practices. Overall, it was a great opportunity for community members to meet the Turf Team and for the Turf Team to learn about common lawn issues and concerns of homeowners in Minnesota. turf.umn.edu



2019 Impact Innovation Award

Jim Luby, Ph.D., and David Bedford received the 2019 Impact Innovation Award. Luby and Bedford's extensive contributions to the University's apple breeding program have resulted in new apple varieties including the introduction of the world-renowned Honeycrisp apple. Most recently, they released First Kiss, (known as Rave when grown outside of Minnesota).

z.umn.edu/impactvideo

THE NEXT GENERATION OF GRAPES: Cold Hardy Table Grapes for Minnesota

By: Kelsey Bogdanovich



“This research could help shorten the selection process for breeding so we are able to spend more time on the cultivars that you want and less time on the ones that you don’t.”

Graduate student Laise Moreira loves grapes, and it’s a good thing she does because she spends quite a lot of time with them. With her team, she is researching table grapes for Minnesota in the hope of developing a grape that is seedless, cold-hardy, and flavorful. Most seedless cultivars currently on the market were bred for warm climates, dry conditions, or mild winters, making them unsuitable for Minnesota’s climate.

To develop seedless grapes, Moreira is using a technique called ‘embryo rescue.’ The first step starts with choosing parents that are most likely to produce the best offspring adapted to the harsh Minnesota winters. “Hardiness is the biggest struggle because of the parent grapes, so right now we are picking parents based on hardiness,” Moreira explained.

Once parents are selected, Moreira performs an emasculation, or removal of the stamen and anther of the flower, to prevent the plants from self-pollinating. After, the flowers are covered to keep out any unwanted pollen from other plants.

At the veraison phase, when at least 25% of the grapes are soft to touch and changing color, Moreira comes back to collect ovules from the fruit and place them into growth media to grow the embryo. A few months later, she dissects each ovule one by one. “Every year you do this you will have 2,000-3,000 to open. You can’t just do this with your eyes, you need to use a microscope to see the embryo because it’s really tiny and because everything inside is white. It’s difficult to separate what is an embryo and what isn’t,” Moreira explained. This tiny embryo will grow into a new, unique plant.

After three months in a test tube, the new plants can be transferred to the greenhouse before being planted outside. “Then we cross our fingers and wait for four to five years, and then we will have the fruit!”

It’s because of this long waiting period that Moreira has begun another project. Teaming up with Professors Adrian Hegeman and Matthew Clark, Moreira has begun to look at flavor compounds in cold-hardy grapes to develop a genetic map that identifies where on the chromosome the ‘grape’ flavor exists. Wine grapes are used as a model since little information exists about table grape populations. “There is a lot of information about flavor for wine grapes, but not a lot for table grapes,” Moreira explained.

“This research could help shorten the selection process for breeding so we are able to spend more time on the cultivars that you want and less time on the ones that you don’t,” Moreira said. “If we develop markers that identify how the grape tastes, we can make selections before we even see the fruit. With the right selections, it could save a lot of time and money.”

Laise Moreira’s work is supported by the Minnesota Department of Agriculture and VitisGen. To learn more about her work and the work the Grape Lab is doing please visit, enology.umn.edu

WHERE WESTERN SCIENCE Meets Herbal Medicine

By: Kelsey Bogdanovich

Medicinal plants have been used by many people over generations, all over the world. Ginkgo is used to treat conditions from asthma to fatigue, garlic can be used for lowering blood pressure, and echinacea is used to prevent colds. Yet medicinal plants have been undervalued in the medical community because their effects and chemical underpinnings have not been well understood from a western science perspective. Graduate student Kate Sammons wants to shift that perspective and make herbal medicine more mainstream.

Kate Sammons' research aims to paint a more detailed chemical picture of medicinal plants. "Historically, people would focus on a single component, because that's what they could readily extract, characterize, and attribute activity to. I want to see everything that is going on in the whole plant and how it all works together to have an effect" Sammons explained. To do that, Sammons is using yarrow (*Achillea millefolium*) as a case study. "Yarrow has a long history of human use. It's found all over the world, and it has a lot of chemical variation, so it makes a great test case that could apply to other medicinal plants". Yarrow has many medicinal uses. The leaves can relieve a toothache, while the rest of the plant can be used for reducing fever to helping with gastrointestinal issues.

Sammons grows yarrow in a randomized pattern in her garden to limit environmental effects that may occur. Once the yarrow is grown, she runs a battery of tests: ploidy analysis, to reveal the number of copies of chromosomes there are in a plant; genotype analysis, to determine the differences in the genetic make-up; and

chemical analysis, to determine the chemical composition of the plant. Sammons is hoping to pinpoint and describe the sources of the chemical variation within yarrow populations.

One colorful difference Sammons has seen so far is that some types of yarrow produce an essential oil that is dark blue in color, while others are pale yellow. "This is something that people have known, but it is always interesting to see because of the stark color contrast between the essential oil samples," Sammons said.

Because of her outstanding academic work, Sammons has been chosen as a recipient of the Herman Charles Cohen Fellowship for Dissertation Improvement as well as the Anne S. Chatham award in Medicinal Botany. She reflected on how these awards have impacted her research. "I am able to make choices about my research that are good decisions for science. To not have to choose the cheapest option for my work has given me a lot of freedom." Sammons is using some of her award funds to travel to a historical botanical medical library in Cincinnati, Ohio. She wants to contextualize her research by tracking the shift from herbal medicine to western medicine in parallel to the development of modern technology.

Sammons' long-term goal is to educate people about herbal medicine, bridging the ideological gap with Western medicine. She hopes that raising standards in herbal medicine and increasing public awareness will help boost its mainstream use. "If we familiarize more people with herbal medicine, it will help to build a connection with plants and the earth, and it could lead to a more sustainable future."

To provide scholarships or learn about other funds in support of student education in horticultural science, please visit horticulture.umn.edu/support or contact us at hort-tc@umn.edu.

"I am able to make choices about my research that are good decisions for science. To not have to choose the cheapest option for my work has given me a lot of freedom."



INTRODUCING THE LEARNING GARDEN FOR HORTICULTURAL SCIENCE:

By: Kelsey Bogdanovich

The Department of Horticultural Science Trial and Display Garden was established in the late 1970s on a small plot near the corner of Gortner and Folwell Avenues where it still stands today. Originally, the garden was used to trial and assess annual flowering plants for their suitability to Minnesota summers. Each year, hundreds of annuals—including All American Selections—were planted, observed, and assessed by different faculty members. Today, the purpose of the garden is largely educational, supporting a wide variety of uses from our garden intern program, to courses that use this space for plant identification, to public outreach.

Through our garden intern program, we prepare students to work in modern horticultural careers by providing them with opportunities to gain valuable skills. Students gain hands-on experience in planning and maintenance of managed landscapes, managerial

experience operating a public garden, as well as practice conducting public outreach in horticulture. “When I chose to switch my major to Plant Science, I didn’t really know anything about it,” said undergraduate garden intern, Quinn Johnson. “Working in the garden has helped me learn how the industry works, which is valuable to my future career.” Both Quinn and her fellow garden intern, Maigao Yang, discovered the garden internship through Plant Propagation, the main introductory course to careers in horticulture.

Garden manager Laura Irish is also the instructor for Plant Propagation’s laboratory section. Irish uses the garden to grow plants for the upcoming academic year. “It’s great to see students using the skills they learn in lab and applying them in the garden. Using the garden to grow what we need for class helps bring some context to plants. Students can see exactly where they are coming from.”

RENEWING, RENAMING, AND PLANNING FOR THE FUTURE

The garden’s public mission has also expanded. The garden now hosts numerous programs such as the Extension Master Gardener led children’s programs and Minnesota Landscape Arboretum intern programs. “So many people use the garden,” said former intern Yang. “We get to share so much about plants with different people!”

With the revitalized mission of the garden, we’ve realized the time is right for a name change. We are proud to announce the garden’s new name as the “Learning Garden for Horticultural Science.” Along with the name change, we are making a concentrated effort to ensure the sustainability of the garden as a learning space for years to come. We recently received a generous donation to establish an endowment for the garden - but we need your help to grow the fund to continue educational programming for our students.

This year for Give to the Max Day, we are excited to announce a 1:1 match from an anonymous donor to help us reach our goal of raising \$3000 to support undergraduate garden internships. We invite you to join us in supporting students on November 14th - Give to the Max Day, Minnesota’s statewide day of giving. Keep an eye on your email and social media for updates!



For more information on Give to the Max Day and how you can contribute visit z.umn.edu/GTTMD2019



THE SCIENCE OF SUMMER: Undergraduate researchers put their summer break to work

By: Lauren Matushin

Instead of spending their summers lounging by the lake or binging the latest hit show, undergraduate students from across the country arrived on the Saint Paul campus with a mission. Through grant programs like the USDA sponsored Collaborative Opportunities in Horticulture (COHORT) Program, students extracted DNA, measured biodiversity, and harvested samples, all while gaining hands-on experience in their fields. As they returned home for the final years of their undergraduate programs, these students shared the highlights of their summer research—the good, the tough, and the eye-opening.



Asha McElroy

LSSURP - SENIOR, FOOD AND NUTRITIONAL SCIENCE; NORTH CAROLINA AGRICULTURAL AND TECHNICAL STATE UNIVERSITY, GREENSBORO NC

Where did you find your passion for urban agriculture?
My mom told me to pursue something I was passionate about. I knew I was passionate about food. I knew I liked helping and educating people. This program opened my eyes to urban agriculture, especially by going to a school where agriculture is a focus.

What research are you working on this summer?
I'm looking at how two different factors--high light intensity and phosphorus deficiency--affect anthocyanin production in creeping bentgrass.

Uh...which means?
Anthocyanins are basically pigments found in foliage like grass, or in fruits and vegetables. We want to determine the interaction between those two factors, and find if they affect anthocyanin production.

What's the most exciting thing you've done so far?
We got to visit local urban farms, community gardens, food hubs. That was something I had never seen in my hometown.

So, what's the dream job?
My ultimate goal is to become a registered dietitian and go back to my hometown to open a community health clinic, offering educational workshops, medical nutrition therapy, and physical activity intervention.

What are you doing when you aren't in the greenhouse?
I just started knitting and crocheting. I'm sticking with the basics right now.



Brittany Stokes

LSSURP - SENIOR, BIOLOGY; AUGSBURG UNIVERSITY, MINNEAPOLIS MN

Where did you find your passion for plant science and genetics?
I took a genetics course at Augsburg. It could have been the topic or the teacher, who was a fantastic professor, but it was fascinating. How these random molecules produce a being. How small differences determine different species. How small differences change from one human from another!

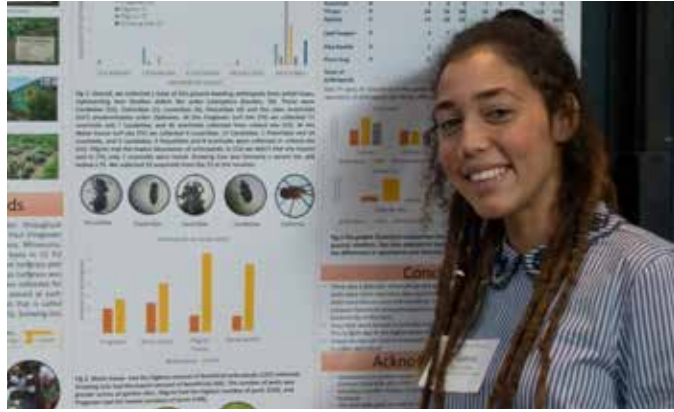
What research are you working on this summer?
My main project was to determine pollen viability and to produce diploid potatoes through pollination.

Okay...and that means?
Potatoes are tetraploid. They have 4 copies of their genes compared to the 2 copies that corn, dogs, and humans have (diploid). It's relatively simple to produce new breeds of dog or corn, but since potatoes have twice the amount of genetic information, it's considerably more difficult. The goal of our lab is to produce diploid potatoes.

What's the most exciting thing you've done so far?
Field trips! We'd go to a different farm, field, or co-op and learn how agriculture and business work together. Though, the challenge is, plants have seasons and when seasons don't go well, you don't have plants.

So, what's the dream job?
The end goal is an M.D. specializing in pediatrics or gynecology obstetrics, and doing genetics research on deformities and genetic abnormalities that show up early in development.

What do you like to do for fun?
I like to cook and bake. I miss my kitchen. We don't have one right now. Well, there's a kitchen, but everyone uses it and I prefer to have my own!



Yashira Gutierrez Cardona

LSSURP - SENIOR, SUSTAINABLE AGRICULTURE; UNIVERSIDAD DE PUERTO RICO

Where did you find your passion for urban agriculture and entrepreneurship?

When I started university, I took a workshop on politics in horticulture and agriculture. It talked about food systems and food security. In Puerto Rico we can grow a lot of things, but we depend a lot on the U.S. I thought, I have to do this.

What research are you working on this summer?

I'm working with arthropods. I measure the biodiversity in urban gardens, and I'm measuring levels of beneficial pests.

Arthropods?

Insects! We try to see what biodiversity abundance is present and if it is beneficial or a pest for that garden.

What's the most exciting thing you've done so far?

I've never worked with insects before. And working in the lab! I never had that experience. I have field experience, but not lab.

What are your plans after the program?

I want to go to graduate school for ecology and desarrollo ecológico (ecological development). After that, I want to start a farm where researchers can come conduct their research, but I want the farm to be open to the public, so ordinary people can come see what the researchers are doing and learn from them!

Any cool hobbies?

I like to play soccer. Defensa y delantera (defense and forward).



Guerldyn Joanem

LSSURP - SENIOR, INTERNATIONAL STUDIES/PRE-MED; LOYOLA UNIVERSITY OF CHICAGO

Where did you find your passion for urban agriculture and entrepreneurship?

My parents are from Haiti, so there's always a variety of food coming in and out of my house, but in high school we went through a rough patch. My parents were able to access food markets and shelves. We still had our home, but those supplementary items supported us and it opened my eyes. If you don't know a resource exists, you can't use it.

What research are you working on this summer?

I conducted a survey with Twin Cities farmers and gardeners to learn how they keep soil healthy in urban areas, and how they dealt with pollution and damaged soil.

That's intense!

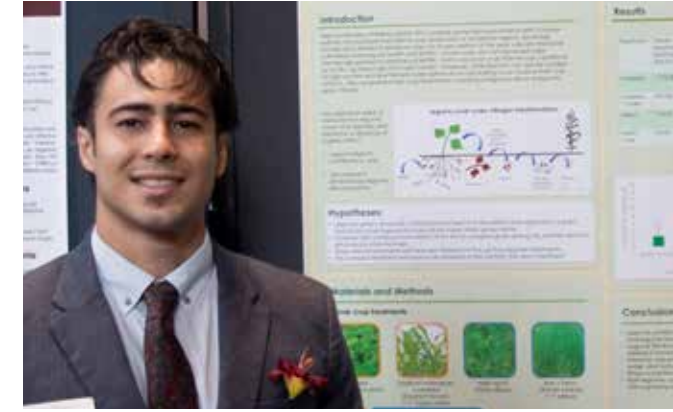
Well, a lot of urban growers don't have access to the information they might need. Most started out growing as a hobby, not to sell product, but now there's a huge movement to do so with no real information about how to do it.

What's the most exciting thing you've done so far?

We visited urban farms and got to see exactly what they were doing. I didn't realize how many urban farms there were in Minnesota. Huge farms! Plus, we got to taste test produce.

What's the dream job?

Whatever business I end up working in, it's going to involve nutrition and giving care to people who don't have access to it. I want to lessen the gap in access to women's healthcare. That means educational programs that, say, work with a community garden to provide access to information on food deserts, nutrition, and urban gardening.



Harywilliam Gonzalez Vidal

LSSURP - SENIOR, SUSTAINABLE AGRICULTURE/HORTICULTURE; UNIVERSIDAD DE PUERTO RICO UTUADO

Where did you find your passion for urban agriculture and entrepreneurship?

I began studying social science, but started getting conscious about food problems in the current system, like food security or soberania alimentaria (food sovereignty). Studying social science made me realize that food is the most essential thing for humans. That gave me a purpose to continue my studies.

What research are you working on this summer?

Our project is nitrogen fixing by winter and summer legume cover crops in high tunnels.

And that means?

Legume cover crops have the ability to grab nitrogen from the atmosphere and take it into their biomass, incorporating it into the soil for the system as a whole. It works like an organic fertilizer since nitrogen is good for cash crops, like peppers, tomatoes, and spinach.

What's the most exciting thing you've done so far?

The COHORT field trips were really fun. We visited three or four organic farms, and it was interesting learning about temperate regions' crops, since I'm from the tropics.

So, what's the dream job?

I want to have my own sustainable farm with polyculture, which means many different crops. I would like it to be an agrotouristic farm, open to the public with a hostel and farm to table food.

Any cool hobbies?

I grew up on the beach. I do a lot of water sports, like free diving, boogie boarding, and surfing, but you have a lot of lakes here, so I did canoeing and paddle boarding.

This was the final year of the Collaborative Opportunities in Horticulture (COHORT) Program, offered as part of the University's Life Sciences Summer Undergraduate Research Program (LSSURP). Started in 2016, the COHORT Program offered unique summer research opportunities to students from underrepresented communities, covering topics from agroecology to urban agriculture, while helping students build a vision of their future careers.

A major part of the program was mentoring from small business owners and exposure to entrepreneurial opportunities in agriculture through a partnership with the Carlson School of Management, where students participated in workshops and visited local businesses. "The MBA students at Carlson led workshops on entrepreneurship and business risk," said Professor Neil Anderson, project lead, "but had little experience with horticulture. This partnership inspired them to explore a new world, too. And that's what this whole grant was about: taking the fear and intimidation out of being at a Big Ten school, showing the diversity of research going on, and creating a cohort where students could form real bonds."

Central to the COHORT was the cohort itself, the creation of a peer group for the students to experience the program alongside, to share troubles and triumphs. "The students made a connection to one another," said co-project lead Professor Mary Rogers, "and a lot of them are still friends! It's important to have that peer group because it offers a different level of support than faculty mentors alone could provide." That support is key to the COHORT's goal: dispelling the mystery around graduate research, and making graduate school more approachable. And it's paying off. Professor Rogers has recruited a new graduate student in her lab this year - Naomi Candelaria, a former COHORT student.

To support undergraduate research in the Department of Horticultural Science, visit horticulture.umn.edu/support.



FAREWELL TO BRIAN HORGAN & JOHN ERWIN

By: Emily Hoover

When it rains, it pours. For the first time in many years, we have two faculty leaving the department for different greenery.

In early September, Professor Brian Horgan began a new chapter in his career as Head of the Department of Plant, Soil and Microbial Sciences at Michigan State University. Since 2001, Horgan has been a faculty member in the Department of Horticultural Science working closely with the turf and grounds industries. His research focused on the transport and fate of pesticides and nutrients in turfgrass systems, as well as water conservation strategies. In his outreach role, Horgan worked closely with turfgrass managers in Minnesota and around the country, employing his expertise in golf course management.

Horgan is a graduate of Michigan State. "I am thrilled to be back on Michigan State's campus in the Plant, Soil and Microbial Science Department, working hand-in-hand with students, staff, and faculty in the promotion of a sustainable and economically sound agricultural ecosystem," Horgan said. "I am honored and grateful for this opportunity."

In mid-October, Professor John Erwin began his tenure as Head at the University of Maryland in the Department of Plant Science and Landscape Architecture. Erwin earned his Ph.D. at Michigan State University. He was hired on the faculty at the University of Minnesota 1989, originally working in the area of greenhouse production expanding his reach to include new and novel

growing techniques in controlled environments. Most recently, his research has focused on exploring high-temperature effects on photosynthesis, cellular respiration, and root health of plants growing in controlled environments.

"It's with great regret I leave the University after 30 years, but I am looking forward to the new challenges this will bring," Erwin said.

We wish Professors Horgan and Erwin the best in their new roles, but we will certainly miss both their professional contributions and comradery around the department. Please join us in saying congratulations and farewell.

Above left: Professor Brian Horgan
Above right: Professor John Erwin

2020 DISTINGUISHED ALUMNI AWARD WINNER

Our 2020 Distinguished Alumni Award winner is Dr. John M. Dole. Dr. Dole will be presenting at the Kermit Olson Memorial Lecture on February 26th in Green Hall on the Saint Paul Campus. His lecture, "A Floral Journey - Discovering the Magic of Flowers" will discuss how flowering plants are the backbone of horticulture, to all of agriculture, and how the flowers they produce are integral to our society. Flowers occur in an almost infinite range of colors, sizes, shapes, fragrances and more. How did they get that way and what do the variations mean? During the lecture, we will explore the importance of flowers in our society, the evolutionary history of flowers and the pollination strategies that have shaped flowers.

Dr. Dole received his Ph.D. from the department in 1989. He is currently at North Carolina State University where he has been a professor, Department head and is currently the Associate Dean for Academic Programs in the College of Agriculture and Life Sciences. Dr. Dole has an international reputation in horticulture for his work in floriculture crop production and handling and use of cut flowers, especially locally grown cut flowers. His work in postharvest handling of cut flowers, cuttings, and poinsettias are world-famous.



Dr. Dole has given numerous presentations in the US as well as all over the world, he is known as an accomplished speaker and floriculture expert throughout. Dr. Dole is one of the founders of the non-profit Seed Your Future initiative that aims to increase awareness of horticulture while also providing teaching materials to middle and high school students.

Dr. Dole is an outstanding example of a successful scientist who has advanced horticulture through research, teaching, and outreach. We are thrilled award him our Department of Horticultural Science Distinguished Alumni Award. Please join us on February 26th to congratulate him.

For a more in-depth look at what Dr. John Dole has done, please visit z.umn.edu/JohnDole

UPCOMING EVENTS

"Enhancing Chrysanthemum Germplasm for Novel Traits: Pyrethrin Content & Salt Tolerance"

Neil Anderson, University of Minnesota
February 12, 2020
3:30 p.m. 310 Alderman Hall, UMN St. Paul Campus

"Postharvest Quality is Affected by Preharvest Conditions"

Cindy Tong, University of Minnesota
February 19, 2020
3:30 p.m. 310 Alderman Hall, UMN St. Paul Campus

Kermit Olson Memorial Lecture "A Floral Journey - Discovering the Magic of Flowers"

John Dole, North Carolina State University
February 26th, 2020
5:00 p.m. 110 Green Hall, UMN St. Paul Campus

"Woody Ornamental Plant Breeding"

Ryan Contreras, Oregon State University
March 18, 2020
3:30 p.m. 310 Alderman Hall, UMN St. Paul Campus
*This lecture is supported by the Hoover Family Fund

"Grasses as Landscape Plants in Cold Climates"

Mary Meyer, University of Minnesota
April 15, 2020
3:30 p.m. 310 Alderman Hall, UMN St. Paul Campus

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GIVING

Your support makes a critical difference in what the Department of Horticultural Science is able to do together as a community - in the research we are able to advance, the new programs we are able to create, and the talented students we are able to support. Your spirit of giving is a tremendous vote of confidence in our shared endeavor. Support us: <http://horticulture.umn.edu/support>

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