



# Department of Entomology Newsletter

## Events from 2019

### Entomology Department Begins a Merger

*Aaron Gassmann (associate chair) and Stephen Dinsmore (interim chair) write:* 2019 was an eventful year for the Department of Entomology. In May, **Dr. Sue Blodgett** retired after serving as department chair since 2011. All indications are that she is enjoying the next chapter of her life in Montana. Currently, a search is underway for a new chair, but some other changes to the department will accompany the arrival of the new department chair. During the coming months, the Department of Entomology will transition to having a shared department chair and business office with the Department of Plant Pathology and Microbiology, with the intention that the two departments will formally merge into one department with a new name.

In addition to the realignment and upcoming merger, several other transitions are underway. Importantly, the departmental merger will come with an opportunity to hire two new faculty, increasing the breadth of expertise within the department. **Sue Jones** retired from ISU, after serving as the department's accountant for many years, and the department's secretary, **Kelly Kyle**, has taken a new position within ISU, working as an account specialist. Our entomology USDA-ARS colleagues, **Drs. Abel, Coates, Hellmich, and Sappington**, are moving from the Genetics Building to newly renovated laboratories in Science II. During the fall of 2019, work began on the demolition of the Insectary Building. The Insectary was decommissioned in 2018 following the move of faculty and staff to Science II and to the newly constructed Advanced Teaching and Research Building (ATRB). The department's occupants of ATRB, **Drs. Coats, Gassmann, Hodgson, and O'Neal**, have now been in ATRB for more than a full year, and this new building is providing a wonderful research and teaching space for them and their laboratory groups.

While the name of the department will change as part of the upcoming merger, the graduate program in entomology will remain, and all indications are that the graduate program continues to thrive. This is in addition to several students successfully completing their M.S. or Ph.D. degrees during the past year (see page 16), and incoming graduate students joining the department.

In addition to the success of the department's graduate students, there were several other noteworthy items from 2019. **Dr. Matt O'Neal** was promoted to Full Professor (see page 3) and **Dr. Joel Coats** was named a Fellow of the American Chemical Society (see page 2). **Ginny Mitchell** received the Regents Award for Staff Excellence for her work with the Insect Zoo (see page 7). A number of the department's faculty and students attended the national ESA meeting in St. Louis, MO, and the ESA North Central Branch Meeting in Cincinnati, OH (see page 17). The department's alumni mixer at the recent national ESA meeting was held jointly with Colorado State University, Kansas State University, and University of Nebraska, as the Prairie States Mixer. The event, which was organized by **Dr. Donald Lewis**, was well attended and offered a nice opportunity for people to reconnect. We hope to see you at the alumni mixer in 2020 or on campus if you are traveling to Ames.



Aaron Gassmann

## Forest Entomologist New CALS Dean

When **Dr. Wendy Wintersteen** moved from Curtiss to Beardshear as the new ISU President in 2017, a national search was undertaken for the College of Agriculture and Life Sciences (CALS) dean position. **Dr. Daniel Robison** was selected and began his tenure at ISU in January 2019 as the 11th dean of the college. His appointment includes being the director of the Iowa Agriculture and Home Economics Experiment Station. Dr. Robison is a forester and forest entomologist by discipline with a background in pest management, silviculture of natural hardwoods, and agroforestry. Before coming to ISU, he was the dean of the Davis College of Agriculture, Natural Resources and Design at West Virginia University for seven years. Prior to that, he was on the faculty at North Carolina State University for 16 years, where he directed the Hardwood Research Cooperative working with the forest products industry. His Ph.D. is in entomology from the University of Wisconsin at Madison and he has an M.S. in silviculture and a B.S. in forestry from the State University of New York – Syracuse. When **Dr. Sue Blodgett** retired in May 2019 and



*Dean Dan Robison*

Dr. Thomas Baum wanted to step down as chair of Plant Pathology and Microbiology Department, Dr. Robison decided it was time for entomology, plant pathology, and microbiology to consider a merge (see cover page). After several meetings throughout 2019, both faculty voted to begin the process and work toward a merger. Stay tuned for updates on that process.

## Coats Becomes Society Fellow



*Joel Coats*

**Dr. Joel Coats**, Charles F. Curtiss Distinguished professor in the Department of Entomology at ISU recently was conferred with the title of Fellow of the American Chemical Society (ACS). He was presented with the honor in a ceremony at the National ACS Meeting in San Diego, CA this Fall. Fellows are recognized for outstanding achievements in and contributions to sci-

ence, the profession, and the ACS Society. Joel's research program includes two main areas: (1) insect toxicology and (2) environmental toxicology and environmental chemistry of agrochemicals. His scientific publications include 14 books, 9 review articles, 50 book chapters, and over 150 peer-reviewed journal articles, and he holds 9 patents and has 6 pending.



## O'Neal Promoted to Professor

*Matt O'Neal writes:* In the spring of 2004, I began my career at ISU. Sixty-five articles, 18 graduate students, 5 department chairs, and 2 buildings later, I was promoted to professor in July 2019. I have been very fortunate to collaborate with colleagues and students in the Departments of Entomology, Natural Resource Ecology and Management, Agronomy, Ecology Evolution and Organismal Biology, and Agricultural Biosystems Engineering. These collaborations have allowed me to address several problems facing agriculture in Iowa, while advancing the fields of applied entomology and conservation.

My research program is interested in improving upon pest management by exploiting the ecology of the target pest, which for most of my work at ISU has been soybean aphid. In 2003, a statewide soybean aphid outbreak contributed to a 32% statewide reduction in soybean yield. During the summer of 2004, very few soybean aphids were found in Iowa. Despite this early setback, I formed a team that contributed to development of an economic threshold for soybean aphid and published some of the first studies evaluating the performance of seed-applied insecticides for managing this pest. Beyond insecticides, we explored natural enemies as a source of aphid mortality, and what limits them as a source of biological control. Eventually, with the collaboration of **Dr. Erin Hodgson**, I called this group of students, staff, and postdocs the "A" team. We are working with soybean breeders to reveal how aphid-resistant soybeans can replace both foliar and seed-applied insecticides



*Matt O'Neal*

for preventing soybean aphid outbreaks. This study has resulted in a public-private partnership with industry to test aphid-resistant varieties for widespread commercial release.

In 2009, my research added a focus on pollinators. My lab began a survey of the pollinators that can be found in corn and soybean fields and we formed the "B" team. These results revealed more than 50 species of bees could be found in both crops. Ten years later this work generated a publication featured on the cover of the *Proceedings of the National Academy of Sciences* (see page 22).

This is a remarkable university and town, and I'm looking forward to continuing my research and teaching programs at ISU.

## Courtney Reappointed to Smithsonian

**Dr. Greg Courtney** (professor, curator of the ISU Collection, and director of Insect Zoo) was reappointed as a research associate of the National Museum of Natural History, Smithsonian Institute. Greg is concurrently a research associate for the Natural History Museum of Los Angeles

County. Also in 2019, he was the lead organizer (with D.E. Bowles, National Park Service) of a field meeting of the North American Dipterist's Society, held at Bull Shoals Field Station, Missouri. One of Greg's photos made the cover of a journal in 2019 (see page 23).



Smithsonian  
*National Museum of Natural History*



## Toth Takes Patagonian Sabbatical



Amy Toth

Dr. Amy Toth, associate professor in the Department of Ecology, Evolution, and Organismal Biology, and Entomology, completed a one-year sabbatical in the Patagonia region of Argentina, South America. Toth was supported by a Fulbright Science and Technology

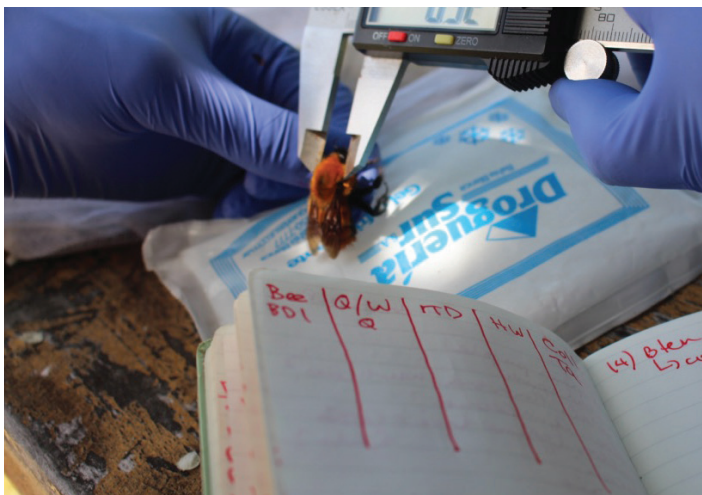
Scholarship, and initiated a new collaboration with researchers at the National University of Comahue, in Bariloche. Working with a world-renowned pollination ecology group (Drs. Marcelo Aizen, Carolina Morales, Marina Arbetman, and Eduardo Zattara), Toth worked on conservation of an endangered species of bumble bee, *Bombus dahlbomii*, the giant Patagonian bumble bee. The bee is the largest bumble bee in the world and is endemic to Patagonia, but is critically endangered and locally extinct throughout much of its range.

For her sabbatical, Toth searched across many wild and beautiful areas of Patagonia and was lucky enough to find few, precious individuals of this exceedingly rare species. She made observations of their foraging behavior, morphological and physiological measurements, and non-

destructively sampled individuals (by clipping a tarsus and then releasing them) to gather material for genetics studies. Toth and colleagues are investigating several hypotheses about the causes of this important pollinator's decline, including competition with invasive European bumble bees (*Bombus terrestris*), pathogen spillover from the invaders, climate change, and interactions between these stressors. They are currently preparing a publication summarizing what is known about the causes of decline and possible conservation solutions. Toth's sabbatical work also resulted in a recent review paper with one of her new collaborators, exploring the potential role of phenotypic plasticity in invasions and declines of social insects). In addition, Toth and her Argentine colleagues acquired funding from the National Geographic Society to continue their work on genetic aspects of *Bombus dahlbomii* conservation.



Giant Patagonian bumble bee.



Amy taking caliper measurements in Patagonia.

Toth's Fulbright award also involved an educational component. Toth taught a course to 20 graduate students on genes and behavior, gave 5 public seminars at research institutes and universities in Argentina, and participated in 4 outreach events in Bariloche related to bees, beekeeping, insect social behavior, and species conservation (all in Spanish, which created some excellent opportunities for improving her science Spanish). Toth plans to return to Bariloche in the coming year to continue this newfound collaboration, and hopes that her research can provide information directly applicable to conservation efforts for the giant Patagonian bumble bee.

## Iowa Hosts National Pest Resistance Tour

The Iowa Pest Resistance Management Program (IPRMP) is an Iowa-specific effort to address pests, including weeds, insects and diseases, that can adapt and become resistant to chemical, genetic, and agronomic control practices. **Dr. Steve Bradbury** coordinates the IPRMP effort to outline approaches for effective, integrated management solutions that will sustainably control pests. By fostering methods to detect resistance, resistance can be delayed or even prevented, limiting the spread of pest resistance.

The Iowa program seeks to engage farmers on the issue of pest resistance with the goal of keeping technology and tools available and effective. It is also important that farmers know they are not alone in their effort to address resistance; a wide variety of experts and resources are available to help. The Iowa program will also include wide participation from all sectors of Iowa agriculture in order to educate and prevent broad applications that could lead to resistance.

The IPRMP achieved national attention this fall, as over 70 invited participants from across the United States came to Iowa for a Science Policy Experience event addressing pest resistance management. The event was sponsored by ESA, Weed Science Society of America (WSSA), Corteva Agriscience, and the USDA Animal and Plant Health Inspection Service. The meeting organizers featured the IPRMP because it is the only program, and Iowa is the only state, actively pursuing community-based approaches to pest resistance management. Participants included growers, ag retailers, commodity groups, pes-



ticide and biotechnology firms, lenders, NGOs, EPA, USDA, and university research and extension scientists, who traveled to Iowa in August to learn about community-based approaches to address insect and weed resistance management. Participants gained new perspectives and strategies to engage stakeholder groups in local, voluntary, community-based resistance management efforts. The two-day event started in Logan, IA and featured the Harrison County Pest Resistance Management Project, one of four pilot efforts of the IPRMP. The ESA/WSSA organizers featured the Harrison County pilot due to its success in forming a locally led team that collaboratively shares information and coordinates local outreach efforts. On day two of the event, the participants convened in Ankeny, IA, to discuss and explore how experiences such as those gained in Iowa could be adapted to other parts of the country.



*2019 Science Policy Tour participants.*



## Enormous Painted Lady Migration of 2019

*Royce Bitzer writes:* I've been enthusiastic about painted lady butterflies and other butterflies in the genus *Vanessa* for a long time, and I maintain a citizen science website (<https://vanessa.ent.iastate.edu/>) where people help me keep track of their whereabouts. The summer of 2019 was another massive migration year for painted lady butterflies. The adults are the small orange-and-black butterflies that often get mistaken for Monarch butterflies. When abundant, painted ladies fill the skies and surprise everyone by their sheer numbers.

Painted ladies set off from their wintering grounds in the Mojave and Colorado deserts of southeastern California as winter gives way to spring. They travel roughly the same path every year, flying northwest to Sacramento en route to Oregon, Washington, and beyond. They've been spotted as far north as Alaska. What was unusual this year was the number of butterflies making the journey. The first painted ladies began appearing in the southwestern deserts around late January and early February, in response to unusually heavy late-winter rainfall, and their numbers quickly grew. Large numbers of migrants were spotted in numerous locations in southern California, southern Nevada, southwestern Arizona and northwestern Mexico as early as February 15. Many continued northward into Oregon, Washington, and western Montana throughout the spring, and first entered Alberta, Canada in late May.



*Painted lady butterfly. Photo by Whitney Cranshaw.*

Besides migrating northward, painted ladies also spread eastward. Two full generations in California were followed by a third and a fourth in Colorado and New Mexico. Some of the third- and fourth-generation butterflies were probably among the first to reach Iowa and eastern Nebraska beginning in mid-April.

The first large outbreak of adults in Iowa, a fifth generation, occurred in late June. The larvae, known here as thistle caterpillars, feed on thistles as the common name suggests, but can also feed on soybean. The caterpillars are normally found on soybean in the early vegetative stage, with a second generation found in early reproductive soybean. Following the late-June generation was another, perhaps even larger, sixth generation in late July. Both these and their offspring, a seventh generation, gradually began migrating in early August, first moving northward into Minnesota, and then later in the month switching to a southward to southwestward migration that continued into September.

The annual migration probably passes through Iowa every year. However, they become most noticeable in years of large outbreaks such as 2017 and 2019. What seems to precipitate such extensive and enormous migration waves is for the next several spring and summer generations in their turn to encounter optimal conditions to thrive and breed - timely rainfall, abundant nectar plants, abundant larval food plants - wherever they might go. Will that happen next year?



*Thistle caterpillar. Photo by Erin Hodgson.*

## Regents Award Goes to Mitchell



*President Wendy Wintersteen, Ginny Mitchell, and Provost Jonathan Wickert.*

**Ginny Mitchell** received the Regents Award for Staff Excellence in 2019. Since 2012, the Insect Zoo has reached over 180,000 Iowa youth and thousands of adults, traveled to 92 of the 99 Iowa counties and has given over 2,000 presentations. Known as “The Bug Lady,” Ginny’s presence in a school is likened to that of a rock star. Bugs in tow, she engages the participants in hands-on learning with over 120 species and transforms their perceptions in under an hour. Ginny has been described as one of Iowa State’s most effective ambassadors. While crisscrossing the state and traveling over 40,000 miles each year, she continues to spread the “Bug Love.”

## Danielson Wins National Award

**Betsy Danielson** has been an extension program specialist with the ISU Pesticide Safety Education Program since 2007. She won the President’s Award for Pesticide Safety Education in 2019. The American Association of Pesticide Safety Educators (AAPSE) President and the Board recognize members and others for extraordinary achievements and contributions to the organization. The AAPSE’s mission is to provide a collective voice and forum for professional development, advocacy, and collaboration in the development, delivery, and advancement of pesticide applicator certification and safety education.



*Betsy Danielson*

### ***Keep in Touch and Stay Connected!***

We have more departmental news to share with our alumni and friends! Visit the ISU Entomology website, [www.ent.iastate.edu](http://www.ent.iastate.edu), to see our seminar schedule, research news, and social events. Also, find updates and hear about fun entomological news by “liking” us on our departmental Facebook page, [www.facebook.com/ISU.Entomology](http://www.facebook.com/ISU.Entomology).

Please let us know if you have information to share with Department of Entomology friends and alumni. Items could include job changes,

honors and awards, and personal notes. Kindly direct information to the newsletter editor, Erin Hodgson, Iowa State University, Department of Entomology, 2005 ATRB, Ames, IA 50011-3140 or via email: [ewh@iastate.edu](mailto:ewh@iastate.edu).

The ISU Department of Entomology Newsletter is for alumni and friends, and is produced by ISU entomology faculty, staff, and students. This newsletter and previous issues are available online at [www.ent.iastate.edu/alumni](http://www.ent.iastate.edu/alumni).

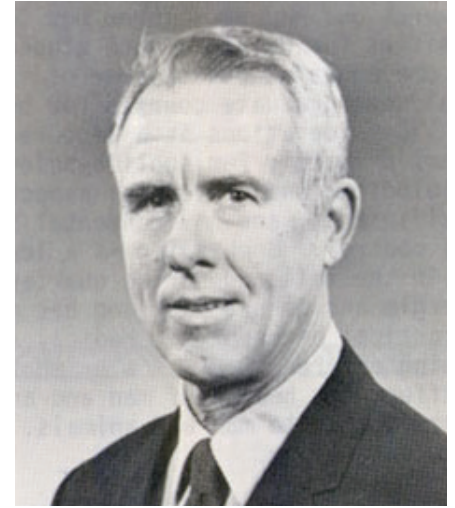


## Roe Gives the 28th Dahm Lecture

Our special speaker for the Paul A. Dahm Memorial Lecture in 2019 was Dr. Michael (Mike) Roe, Distinguished Professor in the Department of Entomology at North Carolina State University. His lecture was titled, "Ticks are not insects--how do they see, smell and reproduce?" and he emphasized the differences in how ticks smell, how they see, how they reproduce, and what hormonal systems they use compared to insects. He made his case very well. He also presented a few minutes on the development of his novel mechanical (non-chemical), sprayable mechanical insecticides for agricultural production and vector control, which is made from a volcanic amorphous glass. His lab also works on insecticide resistance, novel textiles for the protection of crops and humans, and natural repellents for ticks and mosquitoes.



Mike Roe



Paul Dahm

**Dr. Paul Dahm** was a faculty member of Entomology at ISU for 34 years (1953 to 1987) in insecticide toxicology. He was conferred the Charles F. Curtiss Distinguished Professor of Agriculture in 1969, and served as Chairman of the Department of Entomology from 1975 to 1982.

## Coyle Presents Gunderson Lecture

This year, the 2019 Harold (Tiny) Gunderson Memorial Lecture featured Dr. David Coyle. David is an assistant professor in the Department of Forestry and Environmental Conservation at Clemson University with a 100% Extension appointment. His extension program focuses on forest and tree health and invasive species management in trees and forests. He provides insect, fungal, and plant pest identification and management recommendations to people throughout the southeastern U.S. Dr. Coyle interacts with many different groups of people, from children to landowners to forestry and arboriculture professionals. His research centers around finding effective pest management strategies for invasive plants and native bark beetles in southern pines. He also works to determine the ecological implications of non-native trees on native insects, specifically pollinators and the saproxylic insect community. Dr. Coyle grew up on a farm in Harmony, MN, and completed his B.A. in Biology at Luther College. He worked with **Dr. Woody Hart** and the late Dr. Rick Hall at ISU, completing his M.S. in entomology and



Woody Hart and David Coyle

forestry. He worked for the USDA Forest Service – Southern Research Station in South Carolina, completed his Ph.D. in entomology at the University of Wisconsin, and completed a postdoc at the University of Georgia's Warnell School of Forestry and Natural Resources.

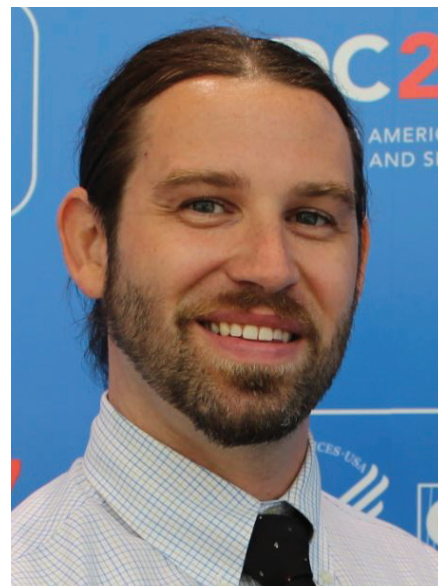


## Featured Staff: Ryan Tokarz

**Dr. Ryan Tokarz** served in a post doctoral capacity in **Dr. Ryan Smith's** laboratory from the beginning of 2018 through the summer of 2019. In this position, he managed the Iowa West Nile virus (WNV) surveillance program and focused his research efforts on the population dynamics of Iowa's insect vectors and the use of remote sensing technologies to better understand disease transmission throughout the state. Ryan was also involved in the development, implementation, and management of a state-wide Lyme disease active/passive surveillance program that commenced during the spring of 2018.

Prior to his time at ISU, he completed his MPH and Ph.D. at the University of South Florida (USF) in Global Communicable Disease where he specialized in vector borne diseases. While at USF, he conducted field epidemiological research in multiple international settings, with extensive work in Angola, Cambodia, and Uganda. There he investigated insect vectors responsible for diseases such as malaria, dengue fever, chikungunya, yellow fever, Zika virus, lymphatic filariasis, WNV, loiasis, and onchocerciasis. After leaving ISU, Ryan returned to the international sector, where he now works with the Centers for Disease Control and Prevention (CDC) at the Ethiopian country office in Addis Ababa, Ethiopia. He cites many of the skills developed during his ten-

ure with ISU as integral for guiding his approach to country-wide disease surveillance and emergency response capacity building. Dr. Tokarz is also closely involved with Ethiopia's Field Epidemiology Training Program where he assists in training the future outbreak responders for the country. He continues to pursue his entomological passion through technical assistance with the country's vector-borne diseases. In the future, Ryan plans to pursue an academic career driven by a research focus on remote sensing and vector borne disease, predictive disease modeling for optimized integrated vector management, and implementing community-driven disease control programs.



*Ryan Tokarz*

## Oberhauser Presents Monarch Seminar



*Karen Oberhauser*

Dr. Karen Oberhauser was invited to give a seminar titled, "Monarchs, milkweed and citizen monitoring: setting conservation." Karen is the director of the University of Wisconsin-Madison Arboretum and the founder and director of the Monarch Larva Monitoring Project, a nationwide citizen science project. She discussed ways in which human activities affect monarch butterfly habitats, including her research on habitat management and availability and the risks posed by global climate change and pest control practices. Oberhauser has a strong interest in engaging K-12 students and teachers in inquiry-based science and promoting scientific and environmental literacy. As part of the Monarch Larva Monitoring Project, she developed a comprehensive science education program, Monarchs in the Classroom, which involves courses and workshops for teachers and opportunities for youth to engage in research and share their findings with broad audiences. She earned her undergraduate degree from Harvard, and graduate degrees at the University of Wisconsin, Madison (M.S.) and the University of Minnesota (Ph.D.).

### Corona Finds Musical Outlet

*Caleb Corona writes:* When I began graduate school at ISU, it became apparent to me that this was going to be a very different experience than any I had before. My daily routine transitioned from the seemingly stress-free days of undergraduate school into extremely fun, yet mentally-strenuous, days full of essays, analyses, and writing. I thought devoting every second of my day would be the best way forward. With some wonderful advice from **Ashley St. Clair** (a phenomenal friend/my life coach), I realized I needed to also have a creative outlet where I could step away from the constant mental engagement and focus on another passion of mine – music.

Growing up in eastern Tennessee, country and bluegrass music was the soundtrack of my life. Not a day went by that I did not hear my grandfather playing some record by Merle Haggard or his personal favorite, Glen Campbell. When I became old enough to have a real place in the music of the South, I began singing and playing mandolin to those old country tunes I so often heard on my grandparent’s porch while my Granny broke green beans. Through high school and undergraduate school, I participated in several choirs and played mandolin in a few groups around my hometown.

When I relocated to Ames, I realized that I was missing that creative element in my life. Mandolin is a lot of fun, but is not the best instrument for playing alone or for writing music (actual opinions may vary). I decided if I really wanted to continue music, I needed to start playing guitar, so I found one. As I developed all the neces-



*Caleb Corona*

sary skills, it wasn’t enough to simply play songs I already had heard. I never considered myself to be much of a writer, as I always focused on cover songs and playing requests. When I began to write songs, I really started to understand the hold music and storytelling has on me. I began writing songs about the things I knew well, growing up in the South, traveling with friends, and the always-relatable love and heartbreak songs. Ames has also given me the opportunity to see how music can really hit people, standing on a stage seeing someone singing a song you wrote, or a couple dancing to a love song that you really poured your heart into; that is a feeling that I am not sure I can explain in this newsletter article.

I can safely say I have found my place in Ames, from the fancy new labs of ATRB to the rickety-stages of sticky-floored dive Main Street bars!

### Hodgson is a State Fair Winner

**Dr. Erin Hodgson** would generally call herself a “maker” in her spare time, working on all sorts of crafting media, like fiber, paper, sewing, painting, and graphic illustration. She has been a crocheter for about 20 years, creating blankets, toys, and doilies. Erin submitted several crocheted scarves and doilies at the 2019 Iowa State Fair and walked away with three ribbons for her efforts. Although not a popular division at the Fair, she was excited to have her work recognized by the judges. Erin is already working on some entries for the 2020 Fair!





## Another New Mosquito Virus in the News

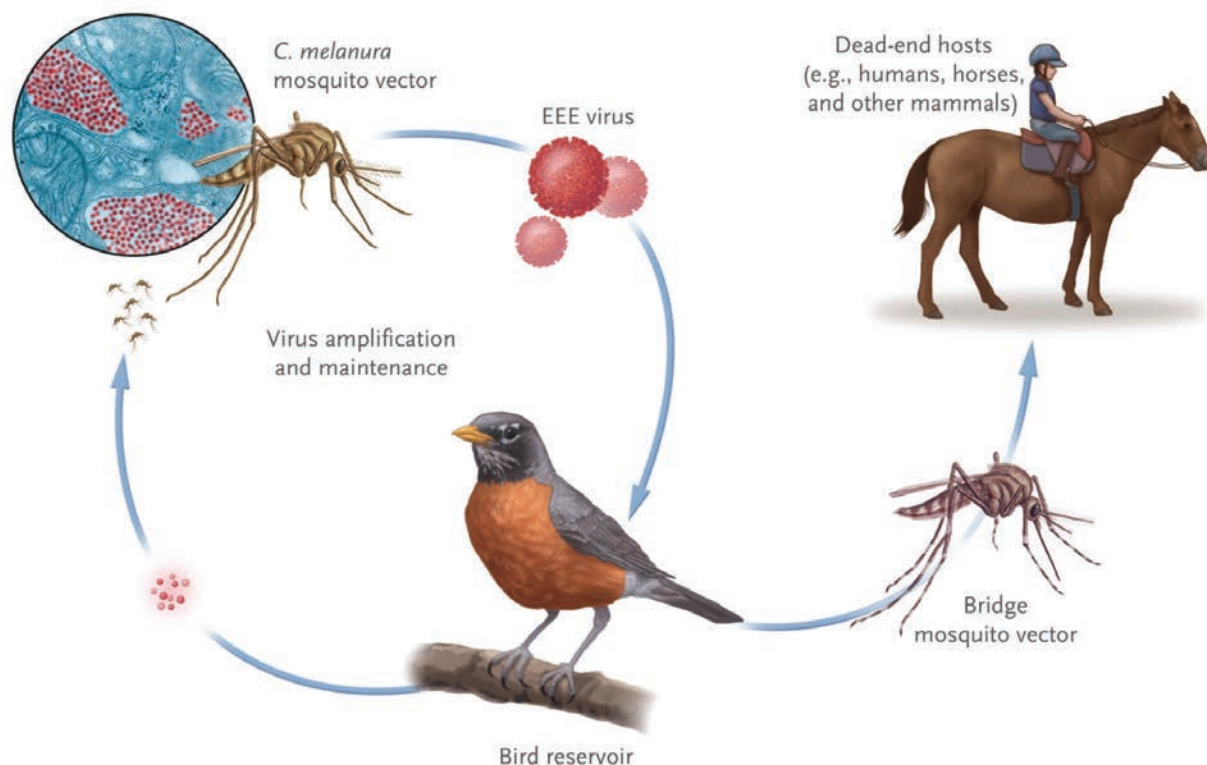
*Rebekah Reynolds writes:* Although medical entomologists have long-known about the vector born disease Eastern Equine Encephalitis (EEE), the U.S. experienced an unprecedented number of human cases and deaths in 2019. EEE is a virus transmitted by mosquitoes which commonly affects horses, but also infects humans, birds, and donkeys. As implied by the name, this arbovirus disease is primarily found on the eastern part of the U.S. but is also found in Central America, South America, and the Caribbean.

In 1831, EEE was discovered in the U.S. when over 70 horses died in Massachusetts from an unidentified viral disease. Almost 100 years later, the virus was identified and diagnosed as EEE after dissecting infected horse brains. In 1938, scientists discovered that EEE also infects humans after 30 children died from the virus.

Annually EEE infects approximately seven people in the U.S. and is lethal to 30% of those infected. In 2019, over 30 people were infected with EEE and 11 people died from the disease. This outbreak led to national warnings about traveling to states with known EEE cases such as Massachusetts, Connecticut, Rhode Island, New Jersey, and North Carolina.

One theory of disease spread involves migration of birds and the evolution of EEE viral strains. Given that birds are commonly infected with EEE, birds often built up a resistance to the disease. However, recent droughts in states such as Massachusetts led to smaller mosquito populations and a reduced number of birds exposed to the disease. Substantial amounts of rain in the fall and spring led to increased mosquito populations in Massachusetts and increased likelihood of EEE transmission to birds. Because of reduced EEE exposure in younger birds they did not build up a resistance to the disease and were more susceptible than previous bird populations. Additionally, the virus adapts and evolves new strains in states with year-round warm weather. New strains are believed to be introduced by birds migrating from southern states like Florida and increase the likelihood of EEE exposure to humans, birds, and horses in northern states.

Whether EEE will be a problem in summer 2020 is hard to predict. Continue watching the news and applying ample amounts of repellent!



*Life cycle of Eastern Equine Encephalitis.*

## Featured Alum: Yong-Lak Park

*Yong-Lak Park writes:* My journey in entomology would not be what it is today without four years of academic metamorphosis spent in the Insectary Building and endless cornfields of Iowa. The experience gained from ISU Entomology translated directly into my future work and still proves to be endlessly valuable. I graduated in 2003 with **Dr. Jon Tollefson**.

This began my postdoctoral research at the Department of Entomology at University of California, Riverside. I applied learned knowledge on spatial ecology of corn rootworms to California vineyards, combatting glassy-winged sharpshooters transmitting Pierce's disease. Using aerial images and mass ground trapping, the disease was detected and spatial patterns of the insects were modeled successfully.

In 2006, I became a citizen of West Virginia, a state that required strategies of efficiency due to fewer entomologists and resources. I found the strategies required the use of advanced aerospace and sensor technologies for large-scale pest detection and management, which could not be done in conventional ways. I am currently a professor at West Virginia University (WVU).

During the past 14 years at WVU, my research with talented transdisciplinary teams covered spatial and technology-oriented entomological issues, including use of satellites and spectral sensors for large-scale forest pest detection; drones for release of natural enemies against noxious invasive plants (Bug Bomb); artificial



*Yong-Lak Park*

intelligence (AI) and robotics to develop pollination robots (BrambleBee); and spatial statistics to elucidate spatial ecology of brown marmorated stink bugs. With these incredible teams, we have been fortunate to receive over \$8 million of research funding from federal agencies.

I was proud to hear from **Dr. Dan Robison**, a former WVU Dean (see page 2), that the origami butterflies made by EGSO members 17 years ago are still displayed on the walls of ATRB. I have been working on folding an origami Mantophasmatodea since I left Ames, and we'll see if I finish that faster than I can figure out who to support in ISU vs. WVU games.

## Coyle is Now a Tiger

Dr. David Coyle (Ph.D. 2000) is a new assistant professor in the Department of Forestry and Environmental Conservation at Clemson University. Dave completed his M.S. in entomology and forestry with **Dr. Woody Hart** and the late Dr. Rick Hall. He received his B.A. at Luther College in 1997 and his Ph.D. at the University of Wisconsin in 2011, after which he was in a post-doctoral research position at the University of Georgia. In 2015, Dave began a regional forest health and invasive species outreach program with Southern Regional Extension Forestry. This program provided training and education about identification and management of insects, fungi, and plants to professionals across the 13-state southeastern region. Training methods included online materials, webinars, and in-person workshops. Dave brings this experience with him to Clemson, where he has a 100% Extension position in forest health and invasive species.



*David Coyle*



## BFFs: Bug Friends Forever!

*Rayda Krell and Patti Prasifka write:* The friends that you make in graduate school become some of the most important relationships in your life. It's probably something about surviving an intense and challenging experience together that creates a lasting bond. We met at an infamously snowy and treacherous NCB-ESA meeting in Sioux Falls, SD, in 1998 before we were both graduate students at ISU. Patti was confident and fun and I liked her right away! Rayda was kind and welcoming to me, a student from a small department who didn't know many other students. Each year, we connected at meetings, and then in 2000 Patti enrolled as a graduate student at ISU after working in Oklahoma for a few years. In 2001, we became housemates, and worked hard and played hard. Our days were filled with corn rootworm research (Patti's) and bean leaf beetle research (Rayda's), and we made the most of whatever free time we could carve out. We made entomological signs when we saw Sting at Hilton Coliseum (which he even acknowledged during the show!) and hosted a legendary 70's party.



*Patti and Rayda in Vancouver at 2018 ESA meeting.*

ESA meeting in San Diego, CA (working with ISU alums **Drs. Scott Hutchins** as ESA President and **Dr. Bob Peterson** as Program co-chair). This year, we were Program co-chairs for the ESA annual meeting in St. Louis, MO (working with Dr. Peterson, this time in his capacity as ESA President!). We have also co-organized and co-spoken in symposia at ESA and co-organized the Women and Allies in Entomology breakfast for several years. We have been able to capitalize on our many years of trust and friendship, and apply it to these endeavors. We work really well together because we play off each other's strengths and we can be honest with each other. Over the years, we have supported each other as we have gone on to win awards, get married, have children, find jobs, and move around the country. Entomology is just small enough as a profession, that it has given us an opportunity to stay connected and work as colleagues even though we have not lived in the same location since 2002. We will continue to work together as poster co-chairs for the 2020 annual meeting and then...who knows what's next!?!  
Current graduate students...look at who is sitting next you in class, or on the Linnaean Games team, or sharing a pitcher at the bar...these are special people...get to know them now and enjoy the friendships for the rest of your career!



*Rayda and Patti hosting a 70's party while at ISU.*

Our relationship started with a lot of fun, and we have been able to carry our enthusiasm for entomology into working together on ESA annual meetings. In 2007, we were Local Arrangements and Technology co-chairs for the



2019 National ESA Mixer (left-to-right): Scott Hutchins, Sharron Quisenberry, Bob Peterson, Marlin Rice, Phil Mulder, and Mike Gray.

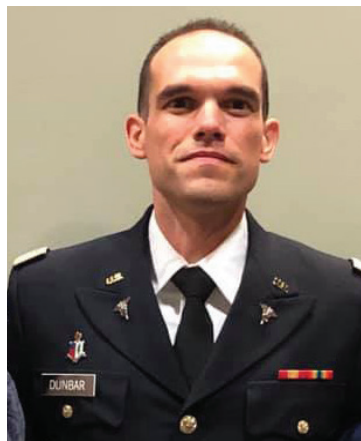
**Dr. Megan O'Rourke** (M.S. 2005) is an assistant professor at Virginia Tech University. She recently was awarded the 2019 Presidential Early Career Award for Scientists and Engineers. This award is the highest honor bestowed by the U.S. government on outstanding scientists who are beginning their independent research careers.



Megan O'Rourke

**Dr. Phil Mulder** (M.S. 1981; Ph.D. 1984), Department of Entomology head at Oklahoma State University, was honored as an ESA Fellow in 2019. The purpose of this award is to honor individuals who have made outstanding contributions to entomology and thereby highlight their career accomplishments to inspire all entomologist.

**Dr. Mike Dunbar** (Ph.D. 2016) completed his Basic Officer Leadership Course and is now full time in the U.S. Army.



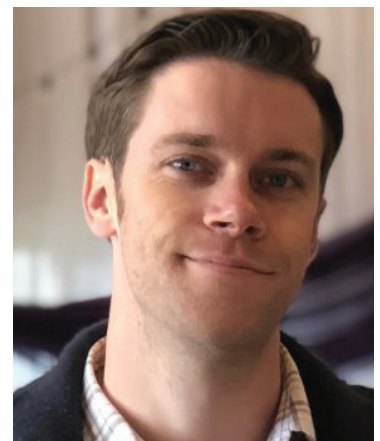
Mike Dunbar

**Dr. Clint Pilcher** (M.S. 1996; Ph.D. 1999), integrated field sciences lead, was in the inaugural class of Distinguished Fellows for Corteva Agriscience. The designation recognizes a select group across the Corteva Agriscience research and development community for extraordinary technical expertise and sustained contributions to innovations that enrich the lives of those who produce and those who consume.

**Ximena Cibilis Stewart** (B.S. 2010), Ph.D. student at Western Sydney University in Australia, won the John Henry Comstock Graduate Student Award for the ESA International Branch.

**Dr. Edmund Norris** (Ph.D. 2018) is a postdoctoral associate at the University of Florida working in the Jeff Bloomquist Lab.

**Dr. Eric Clifton** (Ph.D. 2017) is a postdoctoral associate at Cornell University in the Ann Hajek Lab. He recently published a research article in Proceedings of the National Academy on fungal pathogens of spotted lanternfly, a new invasive insect. DOI: 10.1073/pnas.1903579116.



Eric Clifton



## EGSO Starts Coffee Hour

*Maura Hall writes:* The Entomology Graduate Student Organization (EGSO) elected **Abigail Kropf** (Secretary), **Courtney Huerter** (Treasurer), **Jacob Johnson** (Graduate and Professional Student Senate representative), **Ashley St. Clair** (Vice President), and **Maura Hall** (President) as the 2019-2020 officers. It was a busy year in 2019 for the EGSO group! In the spring, we hosted Dr. Kirk Larsen from the Department of Biology at Luther College as the invited EGSO-sponsored seminar speaker. His research focuses on prairie ecology and insect behavior. He gave a well-attended talk titled, "Beetles, bees and butterflies: a comparison of insect communities of remnant and planted prairies in Northeast Iowa." Faculty and students spent time with him after his talk at an EGSO-organized potluck. We had a well-practiced Linnaean games team (see photo on page 17), consisting of six members, that attended the NCB-ESA meeting in Cincinnati this year. Unfortunately, the competition was tough and our team lost in the first round. However, we will be making a comeback in 2020 at the NCB-SWB joint annual meeting in Oklahoma and are feeling like this will be our year! We finished up the spring with an entomology department cook-out where we enjoyed lots of delicious treats and outdoor lawn games.

Entomology graduate students focused hard in 2019 on hosting outreach events to engage the public, with an emphasis on elementary youth.

In June, we volunteered in the annual Pollinator Fest at Reiman Gardens where we hosted an activity titled "to catch a pollinator." Children of all ages caught their own insects and EGSO members assisted in identifying them. In November, EGSO hosted the annual Insect Film Festival at Reiman Gardens, with a showing of *The Ant Bully*. The ISU Insect Zoo was in attendance to help excite visitors about different insects, while our trained students gave tours of the Reiman Garden Butterfly Wing. We also hosted insect-themed games and crafts, such as helping young visitors dig for insects in the sand or make tie-dye butterflies. A new addition this year was face painting, which was a huge hit. This event was once again a success!

Due to the coming changes in our department, one of the primary goals of 2019 for EGSO was to ensure that the department maintained cohesion. To do this, we created a new tradition, the bi-weekly entomology coffee hour. The idea behind this event was to create a time where entomology faculty, staff, and students could enjoy a cup of coffee while conversing with one another. The coffee hour has been a success at creating and maintaining relationships, and will be continuing this social activity in 2020. We thank the department and all the members of EGSO for helping our organization prosper in 2019, and we are looking forward to another exciting year of fun and outreach in 2020!



*EGSO members (left-to-right): Elliott Smith, Jacob Johnson, Rebekah Reynolds, James Klimavicz, Kelsey Fisher, Coy St. Clair, Ashley St. Clair, Caleb Corona, Ashley Dean, Maura Hall, John McCulloch, Abigail Kropf, Niranjana Krishnan, Colin Wong, Ivair Valmorbida, Ge Zhang, and Ellie Field.*

## 2019 Graduations

**Erika Rodbell** received her M.S. in entomology with Drs. Matt O'Neal and Erin Hodgson in the summer of 2019. Her thesis was titled, "Impact of host plant health and host plant resistance on *Aphis glycines* (Hemiptera: Aphididae)." Erika is a Ph.D. student at Montana State University.



*Erika Rodbell*

**Ashley Dean** received her M.S. in entomology with Drs. Matt O'Neal and Erin Hodgson in the winter of 2019. Her thesis was titled, "What are the consequences of resistance? Exploring the impacts of insecticide and host plant resistance for insect pest management." Ashley is currently a program extension specialist in the Hodgson Lab.



*Ashley Dean*

**Dr. Xiaoyi Dou** received his Ph.D. in entomology with Dr. Russ Jurenka in the summer of 2019. His dissertation was titled, "Transcriptome analysis and identification of genes involved in moth sex pheromone biosynthetic pathways." Xiaoyi is now a post-doctoral associate at the University of Georgia in the Michael Strand Lab.



*Xiaoyi Dou*

**Dr. Ashley St. Clair** received her Ph.D. in entomology with Drs. Matt O'Neal and Amy Toth in the fall of 2019. Her dissertation was titled, "A life in the green desert: Wild and managed bee response to soybean agriculture." Ashley is currently a postdoctoral associate in the Toth Lab.



*Ashley St. Clair*

**Dr. Coy St. Clair** received his Ph.D. in entomology with Dr. Aaron Gassmann in the fall of 2019. His dissertation was titled, "Western corn rootworm in Iowa: understanding management strategies and relevant spatial scales." Coy is currently a postdoctoral associate in the Gassmann Lab.



*Coy St. Clair*



*Soybean gall midge larvae. Photo by Mitchell Helton.*



## Students Active at ESA Meetings



The 2019 ESA North Central Branch meeting was in March (Cincinnati, OH). Many ISU students participated in the oral competitions at the 74th annual meeting, including forming a team for the entomological-related quiz bowl called Linnaean Games.

Unfortunately, our team lost in the first round, but they intend to make a strong showing at the 2020 meeting! There were five winning presentations at the meeting:

1. **Ashley St. Clair** (1st): Ph.D. P-IE Session II: Combining crop production and conservation for improved bee health: Impacts on honey bee queen quality? Ashley is co-advised by Drs. Matt O'Neal and Amy Toth.

2. **Ashley Dean** (2nd): M.S. P-IE Session II: Optimizing profit for farmers managing soybean aphid. Ashley is co-advised by Drs. Matt O'Neal and Erin Hodgson.

3. **Erika Rodbell** (1st): M.S. P-IE Session II: Effect of crop rotation on soybean aphid. Erika is co-advised by Drs. Matt O'Neal and Erin Hodgson.

4. **Kelsey Fisher** (3rd) Ph.D. P-IE Session I: Estimates of common milkweed (*Asclepias syriaca*) utilization by monarch (*Danaus plexippus*) caterpillars. Kelsey is advised by Dr. Steve Bradbury.

5. **Colin Wong** (1st): Ph.D. SysEB-MUVE-PBT Session: Evaluation monoterpenoids and their parent oils for ability to repel ticks. Colin is advised by Dr. Joel Coats.

The 2019 National ESA meeting was in St. Louis, MO. We had several competition winners at the 67th annual meeting:

1. **Colin Wong** (1st): PBT Toxicity Session: Search for natural personal repellents for the tick, *Dermacentor variabilis*. Colin is advised by Dr. Joel Coats.



2019 Linnaean Game team members (left-to-right): Erin Hodgson (coach), Caleb Corona, Ellie Field, Maura Hall, Kelsey Fisher, Ashley St. Clair, Ashley Dean, and Joel Coats (coach).

2. **Abigail Kropf** (2nd): P-IE Biocontrol Session III: Quantifying the susceptibility of western corn rootworm larvae to entomopathogenic fungi. Abigail is advised by Dr. Aaron Gassmann.

3. **John McCulloch** (1st): P-IE IPM Field Crops Session I: Evaluating the use of a soil-applied insecticide as a pyramid with Bt corn for western corn rootworm management. John is advised by Dr. Aaron Gassmann.

4. **Ashley Dean** (2nd): P-IE IPM Field Crops Session I: Optimizing profit for farmers managing soybean aphid. Ashley is co-advised by Drs. Matt O'Neal and Erin Hodgson.

5. **Caroline Murray** (2nd): P-IE Pollination Session III: Do small patches of prairie conserve pollinators, including monarch butterfly, in an agricultural setting? Caroline is advised by Dr. Matt O'Neal.

6. **Maura Hall** (2nd): PBT Toxicity Session II: Quantification of neonicotinoid residues in pollen and nectar. Maura is advised by Dr. Joel Coats.

7. **Ashley St. Clair** (1st, poster): P-IE Pollinator Session: Impacts of landscape complexity and honey bee presence on wild bee community in a highly cultivated landscape. Ashley is co-advised by Drs. Matt O'Neal and Amy Toth.

## Entomology Student Awards and Scholarships

The Wayne A. Rowley Scholarship in Entomology provides \$3,000 to students with preference given to applicants concentrating on medical entomology. **Ellie Field** was the 2019 recipient and is mentored by Dr. Ryan Smith. Ellie also won first place in the ISU regional 3MT (three minute thesis) competition in the spring of 2019. Her presentation was titled, "Understanding West Nile virus trends: mosquito biology across seasons."



*Ellie Field*

The Jean L. Laffoon Memorial Scholarship for \$1,000 was presented to **Maura Hall**. This scholarship was established in 2012 in memory of Dr. Laffoon, who was a systematist in entomology from 1946–1973. Maura is advised by Dr. Joel Coats.



*Maura Hall and Ryan Smith*

**Kelsey Fisher** was the 2019 recipient of the Larry Pedigo Graduate Scholarship in Entomology. This scholarship of \$2,000, established to honor the many contributions of Dr. Larry Pedigo to the department and college, recognizes scholarly performance. Kelsey is advised by Dr. Steve Bradbury.



*Kelsey Fisher and Ryan Smith*

Kelsey also received the Brown Graduate Fellowship from ISU for the 2019-2020 academic year. The Brown Graduate Fellowship is for Ph.D. students or exceptional M.S. students to strategically advance ISU research in the areas of study in science, agriculture, and space science.



*Kelsey Fisher*



The Jim Oleson Scholarship in Entomology, which provides \$1,000 to students who demonstrate academic promise and initiative, was awarded to **Ashley St. Clair**. Ashley also won the Entomology Alumni Scholarship for undergraduates or graduates in entomology. This \$1,000 scholarship was awarded based on promise for a career in entomology. Ashley is co-advised by Drs. Matt O’Neal and Amy Toth.



*Ashley St. Clair*

Ashley received the ISU Graduate College Research Excellence Award. It is awarded to students with outstanding research in a graduate program, representing the top 10% of graduate researchers. She also won the ISU Graduate and Professional Student Senate’s Excellence in Teaching Award which is awarded to only three to five students per year for demonstrations of high quality and inventive teaching.



*Ashley St. Clair and Ryan Smith*

**Niranjana Krishnan** was the 2019 recipient of the Henry and Sylvia Richardson Research Incentive Grant for \$1,000. Her project was titled, “Understanding the effect neonicotinoid insecticides have on insect pupal development.”



*Niranjana Krishnan and Ryan Smith*

Niranjana won several other awards in 2019. First, she got the Joan Mosenthal DeWind award from the Xerces Society. She was one of two students worldwide to receive this award. Second, Niranjana received the ISU Graduate and Professional Student Senate Leadership Award in March. Third, she won the General Science Post Category Award from ScienceSeeker for a general scientific communication article. Lastly, Niranjana was one of 50 graduate students (out of 700 applicants across the U.S. and Canada) selected to attend the National ComSciCon (Science Communication) Workshop in July.



*Niranjana Krishnan*

# Opportunities to Contribute to Entomology

The Department of Entomology at Iowa State University is increasingly dependent upon the generosity of alumni and friends. To support the department, please fill out this section and return it with your check or money order (made out to The ISU Foundation) to the Department of Entomology, Iowa State University, 339 Science II, Ames, IA 50011. Alternatively, donations can be made online at [www.foundation.iastate.edu/ent](http://www.foundation.iastate.edu/ent).

My support this year is in the amount of \_\_\_\_\_

Please designate my gift to the area(s) in the amount(s) shown below:

- Biosystematics Travel Fund for travel costs associated with biosystematics research
- BugGuide: an online resource for insect identification
- Entomology Alumni Scholarship for scholarships
- Entomology General Account
- Entomology Memorial Fund for various expenses, including graduate student travel
- Iowa State University Insect Zoo
- Harold "Tiny" Gunderson Memorial Lectureship for Extension
- Fred Clute Memorial Entomology Fund for general support for the Department of Entomology, including The Entomology Student Scholarship for Student Excellence
- Jean L. Laffoon Memorial Scholarship for graduate students in Entomology
- Jim Oleson Scholarship in Entomology for students who demonstrate academic promise
- Larry Pedigo Graduate Scholarship in Entomology for scholarly performance
- Henry and Sylvia Richardson Research Incentive Grant provides funding for graduate research experiences beyond their degree program
- Wayne A. Rowley Scholarship in Entomology for graduate and undergraduate scholarships, with preference given to those with an interest in medical entomology

For more information about these funds, please contact us at the departmental address above or call 515.294.7400. For more information about other gift designations, please contact Ray Klein via phone: 515.294.3303 or e-mail: [rklein@iastate.edu](mailto:rklein@iastate.edu).





## Record-Breaking Year for Insect Zoo

*Ginny Mitchell writes:* The Insect Zoo had another record-breaking year by reaching just under 39,000 lowans in 2019, 324 more than our last recording-breaking year in 2015! We began our year with the Bald Eagle Appreciation Days in Keokuk. I put on my chef's hat and cooked up some insect cuisine of Scorpion Scaloppini and Katydid Sheesh! Kabobs recipes were prepared from *The Eat-a-Bug Cookbook* written by The Bug Chef himself, David George Gordon. The residents of Keokuk ate us out of bug and home...

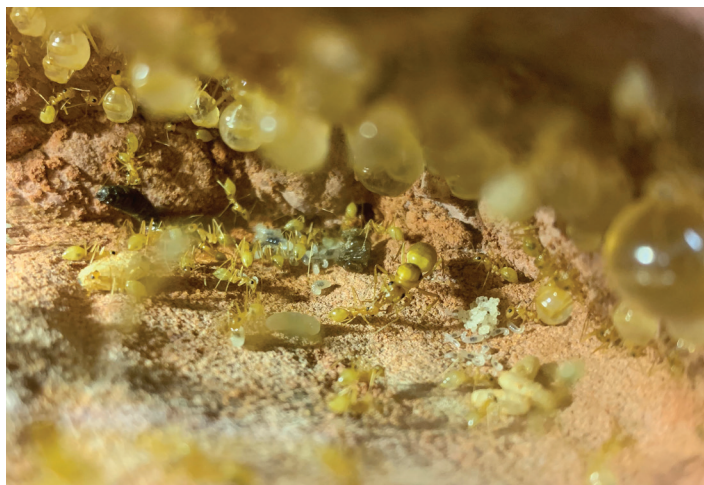


*Chef Ginny at Keokuk Bald Eagle Days with fresh Scorpion Scaloppini.*

Spring brought many trips to schools in Johnston, Cedar Rapids, Waukee, and small towns such as Stratford and Belmond. We introduced a new school program this year which allows for the growing number of program requests and the increased number of students per class. This new program allows for 65 (instead of 30) students to participate in one 1-hour program and brings more than double the animals which are showcased in a display style with many "touch-bowls." This has been a real hit and it will continue to be offered.

Summer was busy with our "Outta This World Bugs!" tour. We visited 49 Iowa libraries, several county fairs and many daycares and summer camps. We also had two all-day bug camps in Hamilton and Marion counties! Our bug camp here on campus was insectacular! We ate ants on a log, hunted for bugs and learned how to pin the insects we collected.

As always, fall brought more school programs and the addition of new Insect Zoo students. I would like to say thank you to all of the Insect



*Queen Phoenix, repletes, larvae, and workers.*

Zoo student workers, Ryan Pate, Avery Wickham, Lauren Brewer, Chloe Bauler, Jacob Allen, Andrea Orozco, Madalyn Rimstad, Maggie Furman, Emily Dirks, and Emily Gamble. Without your hard work and determination, the Insect Zoo would not be able to manage the over 120 species of living arthropods and reach tens of thousands of lowans each year.

Our most ANT-icipated (sorry) event of 2019 was the arrival of our honeypot ant colony. This colony and formicarium was donated by Isaac's Ant Foundation. We are over the moon about being the only land-grant university to have a colony of honeypot ants. We can't travel with the colony, so if you want to see it, plan a family visit! Soon we will have a webcam live on the colony. Stay tuned to our Facebook, Twitter, and Instagram pages for when it goes live!



*Jacob Allen at the EGSO Insect Film Festival at Reiman Gardens.*

## Selected Publications from 2019

- Adler and Courtney. 2019. Ecological and societal services of aquatic Diptera. *Insects*. DOI: 10.3390/insects10030070.
- Coates, Kozak, Kim, Sun, Wang, Fleischer, Dopman, and Sappington. 2019. Influence of host plant utilization and pheromone strain on variation between sympatric *Ostrinia nubilalis* populations. *Molecular Ecology*. DOI: 10.1111/mec.15234.
- Courtney. 2019. Aquatic Diptera, pp. 925-1022. *In Merritt, Cummins, and Berg (eds.), An introduction to the aquatic insects of North America*, 5th ed. Fifth Edition. Kendall/Hunt Publishing Co., Dubuque, IA.
- Courtney and Marshall. 2019. Aquatic insects of North America: a photographic overview, pp. 193-230. *In Merritt, Cummins, and Berg (eds.), An introduction to the aquatic insects of North America*, 5th ed. Kendall/Hunt Publishing Co., Dubuque, IA.
- Dean, Pritchard, Tyndall, Hodgson, and O'Neal. 2019. Evaluating soybean aphid-resistant varieties in different environments to estimate financial outcomes. *Journal of Economic Entomology*. DOI: 10.1093/jee/toz309.
- Dolezal, St. Clair, Zhang, Toth, and O'Neal. 2019. Native habitat mitigates feast-famine conditions faced by honey bees in an agricultural landscape. *Proceedings of the National Academy*. DOI: 10.1073.pnas.1912801116.
- Dou, Liu, Ahn, Choi, and Jurenka. 2019. Transcriptional comparison between pheromone gland-ovipositor and tarsi in the corn earworm moth. *Comparative Biochemistry and Physiology*. DOI: 10.1016/j.cbd.2019.100604.
- Dou, Liu, Soroker, Harari, and Jurenka. 2019. Pheromone gland transcriptome of the pink bollworm moth: comparison between a laboratory and field population. *PLoS One*. DOI: 10.1371/journal.pone.0220187.
- Dunphy, Kovach, Gehrke, Field, Rowley, Bartholomay, and Smith. 2019. Long-term surveillance defines spatial and temporal patterns implicating *Culex tarsalis* as the primary vector of West Nile virus. *Scientific Reports*. DOI: 10.1038/s41598-019-43246-y.
- Field, Gehrke, Ruden, Adelman, and Smith. 2019. An improved multiplex PCR assay for the identification of mosquito blood meals. *Journal of Medical Entomology*. DOI: 10.1093/jme/tjz182.
- Field, Tokarz, and Smith. 2019. Satellite imaging and long-term mosquito surveillance implicate the influence of rapid urbanization on *Culex* vector populations. *Vector Biology and Ecology*. DOI: 10.3390/insects10090269.
- Gassmann, Shrestha, Kropf, St. Clair, and Brenizer. 2019. Field-evolved resistance by western corn rootworm to Cry34/35Ab1 and other *Bacillus thuringiensis* traits in transgenic maize. *Pest Management Science*. DOI: 10.1002./ps.5510.
- Grant and Bradbury. 2019. The role of modeling in monarch butterfly research and conservation. *Frontiers in Ecology and Evolution*. DOI: 10.3389/fevo.2019.00197.
- Kozak, Wadsworth, Kahne, Bogdanowicz, Harrison, Coates, and Dopman. 2019. Genomic basis of circannual rhythm in the European corn borer. *Current Biology*. DOI: 10.1016/j.cub.2019.08.053.
- Kwon and Smith. 2019. Chemical depletion of phagocytic immune cells reveals dual roles of mosquito hemocytes in *Anopheles gambiae* anti-*Plasmodium* immunity. *Proceedings of the National Academy of Sciences*. DOI: 10.1073.
- Lopez, Dennison, Paque, Yandea-Nelson, Abel, and Lauter. 2019. Development and application of a quantitative bioassay to evaluate maize silk resistance to corn earworm herbivory among progenies derived from Peruvian landrace Piura. *PLoS One*. DOI: 10.1371/journal.pone.0215414./



Norris, Coats, Gross, and Clark (eds.) 2018. *Advances in the Biorational Control of Medical and Veterinary Pests*. American Chemical Society, Washington, DC. DOI: 10.1021/bk-2018-1289.

Norris, Gross, Bartholomay, and Coats. 2019. Plant essential oils synergize various pyrethroids and antagonize malathion in *Aedes aegypti*, *Medical and Veterinary Entomology*. DOI: 10.1111/mve.12380.

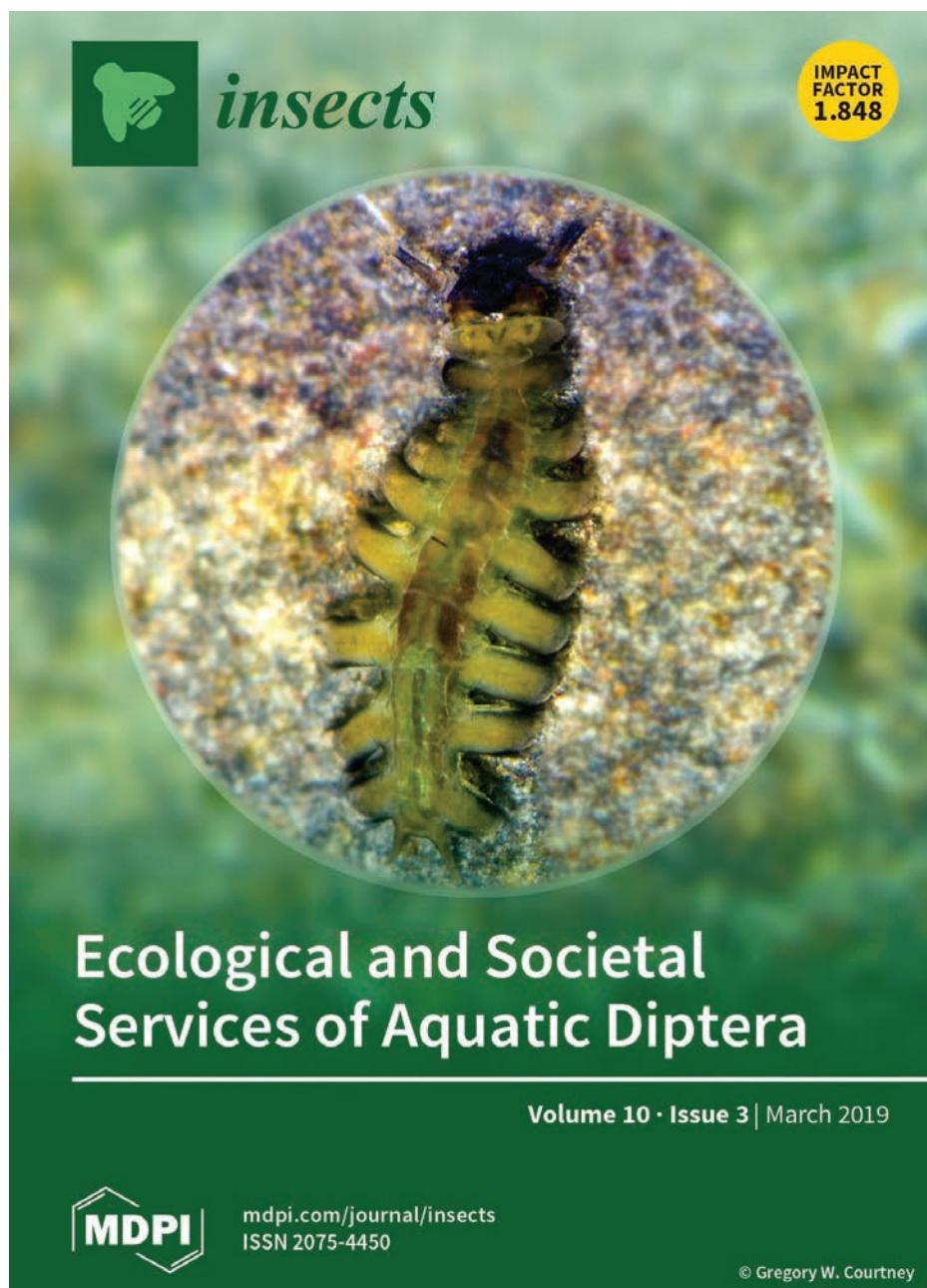
Ozcan, Sharma, Bradbury, Schweitzer, and Blodgett. 2019. Milkweed plant detection using mobile cameras. *Ecosphere*. DOI: 10.1002/ecs2.2992.

Shanovich, Dean, Koch, and Hodgson. 2019. Biology and management of Japanese beetle in corn and soybean. *Journal of Integrated Pest Management*. DOI: 10.1093/jipm/pmz009.

Shrestha and Gassmann. 2019. Field and laboratory studies of resistance to Bt corn by western corn rootworm (Coleoptera: Chrysomelidae). *Journal of Economic Entomology*. DOI: 10.1093/jee/toz130.

Liu and Bonning. 2019. The principal salivary gland is the primary source of digestive enzymes in the saliva of the brown marmorated stink bug. *Frontiers in Physiology*. DOI: 10.3389/fphys.2019.01255.

Valmorbida, Muraro, Hodgson, and O'Neal. 2019. Soybean aphid response to lambda-cyhalothrin varies with its virulence status to aphid-resistant soybean. *Pest Management Science*. DOI: 10.1002/ps.5661.



*Journal cover photo by Greg Courtney.*

Yu, Gassmann, and Sappington. 2019. Using flight mills to measure flight propensity and performance of western corn rootworm. *Journal of Visualized Experiments*. DOI: 10.3791/59196.

Yu, Gassmann, and Sappington. 2019. Effects of larval density on dispersal and fecundity of western corn rootworm. *PLoS One*. DOI: 10.1371/journal.pone.0212696.



# Photos From the 2019 Winter Gathering



*Steve Dinsmore, Aaron Gassmann, and John VanDyk*



*Abigail Kropf*



*Ge Zhang, wife (Xia Liu) and daughter (Iris)*



*Rebekah Reynolds and Maura Hall*



*Matt O'Neal*



*Ben Brenizer*



*Caleb Corona*



*Sue Jones and Kelly Kyle*