



Department of Entomology Newsletter

Events from 2016

Courtney Receives Regents Award

Dr. Greg Courtney, Professor, received the Regents Award for Faculty Excellence. The award is presented by the Iowa's Board of Regents to recognize tenured faculty who are outstanding university citizens and have rendered significant service to ISU. Greg is also the Curator of the ISU Insect Collection and Director of Insect Zoo (see pages 19 and 23). He is a broad-based organismal biologist whose primary research interests are in insect taxonomy, aquatic entomology, and arthropod biodiversity. Courtney has published more than 70 peer-reviewed publications, most representing either systematic revisions of major taxa or regional studies of faunal biodiversity. Courtney's pedagogical activities encompass development and instruction of courses, including Aquatic Insects, Systematic Entomology, and Advanced Systematics. He is known for his commitment to providing field experiences through trips to local and out-of-state destinations (e.g., Appalachian Mountains and Pacific Northwest; see page 22).



Greg Courtney and Bruce Rastetter, President of the Board of Regents.

Emerald Ash Borer Biocontrol in Iowa

Dr. Mark Shour, ISU Pesticide Safety Education Program, worked with Mike Kintner, Iowa Department of Agriculture and Land Stewardship, and agencies on a biological control project for emerald ash borer (EAB) in Iowa. Multiple releases of parasitoids specific to EAB occurred in Iowa with hopes of reacquainting this destructive exotic host with one or more of its natural enemies.

More than 15,000 parasitic wasps were released in Allamakee County (Mount Hosmer City Park, Lansing, IA) or Jefferson County (Whitham Woods County Park, Fairfield, IA) during the summer of 2016. The USDA Parasitoid Rearing Facility in Brighton, MI supplied the parasitoids. Such releases only occur on public lands on sites pre-approved by USDA-APHIS. Their plan is to provide parasitoids for two consecutive years, followed by one or more years of evaluating the establishment success by the state agency hosting these releases. Parasitoid releases occurred in 24 of 28 states where EAB is confirmed. Additional wasp release sites are being considered for Iowa in 2017.



IDALS, Entomology & Plant Science Bureau

Spathius galinae adults in cup.

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Showers Selected for ESA Achievement Award

Dr. William (Bill) Showers, Professor Emeritus, has been selected as this year's recipient of the ESA Plant-Insect Ecosystems (PI-E) Section Lifetime Achievement Award. For almost 30 years, Bill worked as a Research Entomologist with the USDA-ARS. After retiring in 1992, he served as a professor on the Entomology faculty at ISU. Since joining the ESA in 1957, Dr. Showers has actively participated on numerous committees in the ESA and the North Central Branch, including more than 35 years as a Board Certified Entomologist. He served as PI or Co-PI on more than \$2,000,000 in grants, and mentored or co-mentored 19 graduate students and two post-doctoral scholars. To date, Dr. Showers has published over 80 peer-reviewed journal articles. Research efforts by Dr. Showers resulted in several outstanding contributions to the fields of entomology, particularly in the ecology of insect migration. Results from his leadership have had important implications for resistance management of the European corn borer to transgenic



Joe Funderburk, Von Kaster, Bill Showers, and Gary Hein at the ISU Mixer during the 2016 ICE meeting.

corn. Dr. Showers' research has also had important impacts on developing management strategies for the black cutworm. He has received numerous honors and awards, including being elected as a Fellow of the ESA in 2009.

Bonning Accepts ISU Research Award

Dr. Bryony Bonning received the ISU Award for Outstanding Achievement in Research in 2016. This award recognizes faculty members for outstanding career achievements in research and/or creative activity. Recipients must provide 1) evidence of outstanding research/creative accomplishments and impact of their work on their discipline as evaluated by peers and experts in their field, 2) outstanding national and international recognition in the academic community, and 3) evidence of a substantial positive impact of their mentorship and/or teaching on undergraduate students, graduate students and/or postdoctoral associates. The candidates will be judged by the body of their work since their terminal degree.

Bonning is Professor in entomology and also the Director of the Center for Arthropod Management Technologies (CAMTech, see page 23). She received her B.Sc. in Zoology from the University of Durham, UK and Ph.D. in Entomology from the London School of Hygiene and Tropical Medicine, University of London, UK. Bonning oversees cutting-edge research on insect physiology and insect pathology with the goal of developing novel, environmentally benign alternatives to chemical insecticides for insect pest



Dean Wendy Wintersteen presented Bryony Bonning with the ISU Research Award in September.

management. Bonning has published more than 110 scientific papers and authored five patents. She is a Fellow of the ESA and of the American Association for the Advancement of Science, and recipient of the 2013 Nan-Yao Su Award for Innovation and Creativity in Entomology.

Entomology Year in Review

Sue writes: If you visit campus this year, be prepared for many changes. In fact, you may not recognize it! The Entomology Department continues to prepare for our new digs in the Advanced Teaching and Research Building (ATRB) that we have been watching go up on the northwest corner of Stange Rd. and Pammel Dr. We meet periodically with the faculty liaison, David Oliver, and he assures us that the building continues to meet deadlines and budgets. It is scheduled to be opened in spring of 2018. Watch progress of the ATRB building with this live camera feed: www.fpm.iastate.edu/webcam/atrb/. **Drs. Coats, Gassmann, O'Neal, and Hodgson** are planning to move to ATRB and kudos for their participation in the planning meetings leading up to construction. The remaining Insectary and the Genetics Laboratory tenants will be moving across the street to Science II as the Genetics, Developmental and Cell Biology (GDCB) faculty members vacate space as they make the move to ATRB and Bessey.

Our newest faculty member, **Dr. Ryan Smith**, has stepped into very large shoes left by **Drs. Wayne Rowley** and **Lytic Bartholomay**. As the Zika virus issue bursts this year, Ryan and **Brendan Dunphy** were thrust into the spotlight, providing news releases, interviews, and updates on their Zika virus vector surveillance program that was expanded in Iowa this year (see page 17 for an update of Zika virus in Iowa).

The department was active in participating in the ESA North Central Branch meeting in Cleveland, OH in June and the International Congress of Entomology meeting held in Orlando in September (see page 24).



Sue Blodgett

The department had a number of social activities in 2016, like a luncheon to celebrate student awards and plates of treats all throughout December. In addition, our department has a thriving weekly seminar series coordinated by **Drs. Greg Courney** and **Rick Hellmich**. Please stop by when you travel to Ames. We would be happy to visit with you and catch up.

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, 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.

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, 103 Insectary, Ames, IA 50011-3140 or via email: 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.

Gassmann Reviews Report on GE Crops

Josh Lancette, ESA, writes: The National Academies of Sciences recently released a study on the safety of genetically engineered (GE) crops on human and livestock health and the environment. The study found no substantiated evidence that GE crops pose a greater risk to human, livestock, and environmental health than conventionally bred crops. However, it did find that overuse of GE crops resulted in damaging levels of insect resistance, and that there are no data showing that GE crops have increased crop yields over the past 20 years. **Dr. Aaron Gassmann**, Associate Professor, served as a reviewer of the report.

Aaron said the report did a wonderful job highlighting the important role that GE crops have in agriculture today and will almost certainly have in the future. Because of this importance, hopefully, there will be more public sector funding for research on GE crops.

Find the full 2016 600-page report from the National Academy of Sciences, *Genetically Engineered Crops: Experiences and Prospects*, online at DOI: 10.17226/23395.



Aaron Gassmann

Bradbury Serves on White House Committee

In 1986, the White House Office of Science and Technology Policy (OSTP) issued the Coordinated Framework for the Regulation of Biotechnology, which outlined a comprehensive Federal regulatory policy for ensuring the safety of biotechnology products. The Framework was updated in 1992. While the current regulatory system for biotechnology products effectively protects health and the environment, advances in science and technology since 1992 have been altering the product landscape. In addition, the complexity of the array of regulations and guidance documents can make it difficult for the public to understand how the safety of biotechnology products is evaluated, and navigating the regulatory process for these products can be unduly challenging, especially for small companies.

These circumstances call for revisiting the Coordinated Framework once more. Accordingly, the White House issued a memorandum directing the three Federal agencies that have oversight responsibilities for these products—the Environmental Protection Agency (EPA), the Food and Drug Administration (FDA), and the Department of Agriculture (USDA) — to update the Coordi-



Steve Bradbury

nated Framework, develop a long-term strategy to ensure that the system is prepared for the future products of biotechnology, and commission an expert analysis of the future landscape of biotechnology products to support this effort. **Dr. Steve Bradbury**, Professor, is serving on this committee to modernize the coordinated regulatory framework in the United States.

Faculty Recognized in 2016

Dr. Wendy Wintersteen (Ph.D. 1988) is the 2016 recipient of the Carl F. Hertz Distinguished Service to Agriculture Award from the American Society of Farm Managers and Rural Appraisers. This award is presented to a person or group in appreciation for service to agriculture other than directly in the farm management and rural appraisal professions. The award's namesake, Carl F. Hertz, was the founder of Hertz Farm Management of Nevada, IA, who graduated from ISU with a degree in animal science in 1933. Wendy is the Endowed Dean of the College of Agriculture and Life Sciences at ISU and Director of the Iowa Agriculture and Home Economics Experiment Station.



Wendy Wintersteen. Photo by Chris Gannon, ISU.

Dr. Craig Abel, Collaborator Professor, was honored with the 2016 USDA-ARS Research Leadership and Center Directorship of the Year Award, "For sustained creative leadership encouraging scientific excellence, agricultural impact, and human capital development." He accepted the award at the Henry A. Wallace Beltsville Agricultural Research Center, Beltsville, MD. Craig is Research Leader for the USDA-ARS, Corn Insects and Crop Genetics Research Unit since 2009 (position previously held by **Dr. Les Lewis**). The team that Abel leads improves crop production through basic research in entomology, plant pathology, plant genetics, and stewardship of plant genomic data. Research enhancements are made to several crops, including corn, soybean,

barley, and legume species. He is also an alumnus of ISU (M.S. 1993 and Ph.D. 1998), mentored by **Dr. Richard Wilson**.



Left-to-right: Chavonda Jacobs-Young, Craig Abel, Robert Matteri, and USDA-REE Undersecretary Catherine Woteki (Dean CALS, ISU 2002-2005).

Dr. Keri Carstens, Collaborator Assistant Professor, was named the DuPont Working Mother of the Year in *Working Mother* magazine in October 2015. Keri is Senior Manager of Integrated Product Research and Stewardship for DuPont Pioneer's Seed Treatment Enterprise. She is also the key contact for global seed treatment stewardship. Keri is also an alumna of ISU, with an M.S. in Toxicology (2004) and a Ph.D. in Toxicology and minor in Entomology (2008). She worked with **Dr. Joel Coats** for her graduate degrees.



Keri Carstens and her family.

Symposium Honors Rowley Legacy

Dr. Lyric Bartholomay writes:

Many of us who have learned from, and laughed alongside, **Dr. Wayne Rowley** gathered at the American Mosquito Control Association meeting in Savannah, GA in February to celebrate Wayne's truly impressive legacy. Alumni **Jason Kinley** (M.S. 2008) (Gem County Mosquito Abatement District, ID) and **Bruce Christensen** (Ph.D. 1977) (UW-Madison, Professor Emeritus) organized and spoke at the symposium, "The Power of One," to honor Wayne's many contributions to the study and practice of Medical Entomology.



Sara Erickson, Joel Coats, and Edmund Norris.

In the preparations for this symposium, **Kelly Kyle** identified 38 M.S. and Ph.D. students under Wayne's supervision. We compiled a list of 80+ peer reviewed publications that capture Wayne's enthusiastic and stalwart pursuit of knowledge related to a broad range of blood-sucking arthropods. Through the "Power of One" symposium, we had the opportunity to delineate and reflect on his many, many impressive contributions to public health in Iowa, and to the field of Medical Entomology. But what shone through most profoundly in this experience was the loyal connections Wayne made with the people who came through his lab at ISU. With heartfelt thanks, Jason concluded the symposium with this acknowledgement that resonated with each of us: "Thank you, Dr. Rowley, for giving me the opportunity to be a part of this service, giving me a chance, and providing me with the tools to be successful in the field of mosquito and vector control."



Kelly Kyle and Wayne Rowley.



Scott Ritchie, Wayne Rowley, and Bruce Christensen.

Speakers in the event included **Scott Ritchie** (M.S. 1980) (James Cook University, Australia), **Mark Novak** (Ph.D. 1992) and **Renji Hu** (postdoc) (California Department of Public Health), **Sara Erickson** (M.S. 2005) (Walter and Eliza Hall Institute, Australia), **Jennifer Remmers** (M.S. 2001) (Air Force Reserve), **Lyell Clarke III** (Ph.D. 1988) (President and CEO, Clarke, ISU Distinguished Alumnus 2012), **Joel Coats**, who spoke on behalf of the Department, and myself, an academic granddaughter and successor in Medical Entomology at ISU. The positions that these alumni hold encompass and exemplify the training Wayne provided. These are people who have gone on to exceptional careers in Medical Entomology and Public Health in state government agencies, U.S. Military, academia, mosquito control technology development and innovation, and leadership in mosquito abatement.

Faculty, Staff, and Alumni News

Dr. Marlin Rice, Collaborator Professor, is a Product Biology Technical Manager of Insect Resistance Management Traits with Syngenta. In 2016, Rice received the ESA North Central Branch C.V. Riley Award for outstanding contributions to entomology. He served ESA for 26 consecutive years,



Marlin Rice

and was recognized as an Honorary Member in 2015. For nine years, he served on the ESA Governing Board and was elected by the membership as Representative (Section E), Secretary-Treasurer, and President. He is a co-founder and is currently Co-Editor-in-Chief for ESA's *Journal of Integrated Pest Management*.

Sue Jones has been here over 20 years. Sue has an accounting degree from ISU (2007) and is currently an Account Clerk for Entomology and NREM. Sue processes purchases and requisitions for both departments, and just about anything else that comes along (including popping popcorn on Fridays). Sue is married with 2 adult children, Joe and Annette. Both are married and have children for a total of 10 grandchildren. Sue's family keeps honey bees and also farms on an acreage southwest of Maxwell. They have a menagerie of animals at the farm, including too many cats, two goats (green herbicide), one dog (security), and eight Meskovie ducks.



Sue Jones and her husband, George.

Dr. Erin Hodgson, Associate Professor and Extension Entomologist, was elected Secretary-Treasurer of the ESA North Central Branch. Her 3-year appointment starts in 2017. Erin was also a finalist in the annual YouTube Your Entomology contest at the ICE meeting in September. Her 3-minute



Erin Hodgson

video, *Black Cutworm Trapping*, was a collaboration with Adam Sisson and Brandon Kleinke in the IPM Program at ISU. Watch the video here: <http://bit.ly/29VMMPX>. Erin has received six ESA YouTube contests since 2009.

Dr. Aaron Gross was recently presented with the AGRO New Investigator Award by Dow AgroSciences. He received his M.S. (2010) and Ph.D. (2014) in Toxicology (minor in Neuroscience and Entomology) from ISU under the direction of **Drs. Joel Coats** and Michael Kimber. For his dis-



Aaron Gross

sertation, Aaron received a U.S. Environmental Protection Agency – Science to Achieve Results (EPA-STAR) fellowship to study the mechanism of action of plant essential oil terpenoids against a tyramine receptor from the southern cattle tick. Currently, he is a Postdoctoral Research Associate at the Emerging Pathogens Institute at the University of Florida. Aaron is interested in studying the mode of action and mechanisms of resistance associated with pesticides. His research focuses on understanding the physiology, pharmacology, and toxicology of G-Protein Coupled Receptors (GPCRs) and ion channels in arthropods.

Knipling Receives Golden Goose Award

Two prominent entomologists were posthumously selected as winners of the 2016 Golden Goose Award, which honors scientists whose federally funded work may have been considered silly or obscure when first conducted but resulted in significant benefits to society. **Dr. Edward Knipling** and Dr. Raymond Bushland are being cited for research that led to the “sterile insect technique,” in which lab-raised and sterilized male insects are used to overwhelm and eventually eradicate native pest populations. The technique has been heralded as “the only truly

original innovation in insect control in [the 20th] century,” and continues to inform ongoing fights against other agricultural pests and insects carrying infectious pathogens. Knipling and Bushland received many awards for their research in sterile insect technique, and were honored with the 1992 World Food Prize. Dr. Knipling earned a Ph.D. in entomology from Iowa State College in 1947. He was elected to the National Academy of Sciences in 1966, and became an ESA Fellow and an Honorary Member.

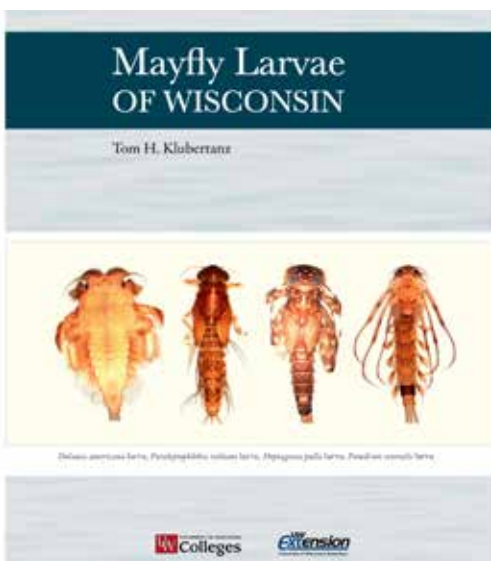
Ghidiu Honored with Service to Agriculture

Dr. Gerald Ghidiu (Ph.D. 1977) was recently presented the Distinguished Service to Agriculture citation by the New Jersey State Board of Agriculture during the New Jersey State Agricultural Convention in Atlantic City. Since 1932, the New Jersey State Board of Agriculture has awarded the prestigious Citation for Distinguished Service to Agriculture to men and women who have given unselfishly of their time and talents to the advancement and betterment of the agricultural industry and rural life in New Jersey. This award is given to recognize and honor those individuals who have made outstanding contributions of public service to New Jersey agriculture. Gerald was an extension specialist and director of the Rutgers Agricultural Research and Extension Center before retiring in 2012.



Gerald Ghidiu and his wife, Lillie.

Klubertanz Publishes Mayfly Book



Dr. Tom Klubertanz (M.S. 1989 and Ph.D. 1993) is Professor and Chair of biological sciences in the University of Wisconsin system in Janesville, WI. Tom recently published a 300-page book, *Mayfly Larvae of Wisconsin*. He got his graduate degrees with **Dr. Larry Pedigo**. Tom currently teaches courses at UW-Rock County in the biological sciences, including Animal Biology, Anatomy and Physiology, Human Biology, Concepts of Biology, Environmental Biology, Natural History of Wisconsin, and Ornithology. His primary research interests are in entomology, ornithology, and ecology, particularly mayfly taxonomy, distribution, and ecology; soybean insect pest management; and bird conservation and ecology. Ornithological work primarily involves monitoring projects, including a long-term research project at the Cook Arboretum. Find Tom’s mayfly book here: <http://bit.ly/2iLCzLk>.

Featured Alum: Robin Pruisner

Robin Pruisner (B.S. 1994) is the State Entomologist, Entomology and Plant Science Bureau Chief, Ag Security Coordinator and State Seed Control Official for the Iowa Department of Agriculture and Land Stewardship.



National Association of State Departments of Agriculture President Greg Ibach (left) presented the award to the team: Robin Pruisner, Iowa Ag Security Coordinator; Jeff Kaisand, Assistant State Veterinarian for Iowa; and Bill Northey, Iowa Secretary of Agriculture.

Robin writes: Dr. Suess had it right – Oh, The Places You'll Go(!) when you have an entomology degree from ISU. My path since 1994 has been a meandering through various aspects of agriculture in Iowa. I initially enjoyed splitting my time between ISU FEEL (Field Extension Education Laboratory) and assisting **Dr. Jon Tollefson** with corn rootworm research. Then, to a private consulting firm in western Iowa working with water quality, and exploring opportunities to utilize insurance to advance the adoption of refuge acres associated with Bt corn planting.

Water quality work won out, and I moved to the Iowa Department of Natural Resources first working on the state nutrient strategy, and then CAFO (Confined Animal Feeding Operations) Coordinator. In 2003, the opportunity to assume the State Entomologist role was one I could not resist. The Entomology Bureau regulates plants and plant products at the State level. This includes inspecting and issuing ~5,000 federal and state phytosanitary (export) certificates for

plant and plant product export; inspecting 300+ Iowa-grown nursery stock operations annually; conducting statewide surveys for nonnative, invasive insect, disease and plant pests; collaborating with USDA to permit biotech crop activities in Iowa and international and interstate plant pest movement permits; issuing European corn borer certificates for movement of Iowa-grown corn to the west coast; overseeing the sale of agriculture seed in Iowa; and, housing the State Weed Commissioner and State Apiarist.

In 2015, I was the state incident management commander for the highly pathogenic avian influenza (HPAI) outbreak in Iowa, resulting in the loss of nearly 32 million poultry in Iowa. This foreign animal disease outbreak was the largest animal health emergency in US history. The Iowa Incident Management Team was awarded the James A. Graham Award for Outstanding Service by the National Association of State Departments of Agriculture (NASDA).

My husband, Mark Venner (B.S. Animal Science 1994), and I peek out a bit of time to keep a few beehives, make mead, attend ISU sporting events, and squeeze in world travel when we can find the time. We keep an informal blog about our bees: <https://idiotskeepingbees.com>.

Michael Fisher (B.S. in Animal Ecology 2001 and B.S. in Entomology 2003) is a Ph.D. student at North Carolina State University. He recently received a \$2,000 scholarship from Pi Chi Omega, a national entomology fraternity. Michael is also a Lieutenant Commander in the U.S. Navy; he is currently on Duty Under Instruction to pursue his graduate studies full-time.



Michael Fisher and Wayne Ohnesorg at the ISU Mixer during the 2016 ICE meeting.

Featured Alums: Jacobson and Curler

Dr. Amanda Jacobson (M.S. 2006) is the Global Sample Services Leader at Dow AgroSciences in Indianapolis, IN, and **Dr. Greg Curler** (M.S. 2005) is a world expert on the systematics of psychodid flies, affiliated with Mississippi Entomological Museum (Miss. State University) and the Smithsonian Institution.



Amanda and Greg sampling aquatic flies.

After graduating from ISU, Amanda and Greg moved to the University of Tennessee, in Knoxville, TN to pursue doctoral research on morphological and molecular systematics of flies, focusing on families Blephariceridae and Psychodidae. Upon finishing their degrees, they moved to Illinois in 2011, where Amanda began working with Dow AgroSciences. This was followed by oppor-

tunities with Dow in Indiana, Argentina, and Mississippi. Her research in agricultural entomology and other activities within the company have involved the characterization of new Bt traits, testing efficacy of new insecticides and leading one of two ag chem field stations in the U.S. She has been instrumental in research involving SmartStax, PowerCore, next generation Bt traits, Transform, and new insecticides in discovery and pre-development. Recently, Amanda accepted a new role as Global Sample Services Leader, for which she will assume people leadership responsibilities in the Sample Services facilities in Indianapolis and the United Kingdom.

Greg has continued research on fly systematics and morphology. His work on biodiversity inventories, primarily in the U.S., Central and South America and Asia, is complimented by opportunities to advise students from multiple countries and travel in pursuit of research specimens. He also maintains collaborations with personnel from the Courtney lab at ISU and occasionally visits Ames to work on various projects.

When there is free time, both Greg and Amanda prefer to spend it outdoors. In particular, she enjoys cycling and hiking while he has developed a passion for fly tying and fishing. They made their commitment to each other official in 2012, being married on ISU campus near where they first met.

Patrick Wagner (B.S. 2014) is an Entomology Field Specialist with South Dakota State University in Rapid City, SD. He worked in the O'Neal Lab for several summers.

Dr. Adam Varenhorst (M.S. 2011 and Ph.D. 2015) is an Assistant Professor and Extension Entomologist at South Dakota State University in Brookings, SD. He worked with **Dr. Matt O'Neal** for his graduate degrees.



Patrick Wagner

Dr. Bob Peterson (B.S. Entomology and Pest Management 1987) was elected ESA Vice President-Elect. He is a Professor at Montana State University in Bozeman, MT.

Erick Hernández-Chacón (B.S. 2012) is a Research Assistant for Insect Resistance Management and Durability for DuPont Pioneer. He was named "Young Alum of the Month" by the ISU College of Agriculture and Life Sciences Career Services.



*Bob Peterson.
Photo by Kelly Gorham.*

Dong Gives the Dahm Lecture for 2016

In April, we hosted Dr. Ke Dong to present the 25th Annual Paul A. Dahm Memorial Lecture, speaking on “Can mosquitoes and flies smell pyrethroid insecticides?” Professor Dong is from the Department of Entomology at Michigan State University where she has been on the faculty since 1995. She also participates in the Neuroscience Program and the Genetics Program at MSU. She received her Ph.D. at Cornell University with Dr. Jeff Scott, who presented the Dahm memorial Lecture in 1999.

Dr. Dong’s group has studied cockroach sodium channels expressed in *Xenopus* oocytes and characterized sodium channels from *Drosophila melanogaster*, *Varroa destructor*, *Aedes aegypti*, and *Bombus impatiens*. Her research has contributed greatly to the mechanistic understanding of the mode of action, receptor sites and resistance of sodium channel-targeting insecticides, including pyrethroids and sodium channel blocker insecticides, as well as naturally occurring neurotoxins that act on insect sodium chan-



Joel Coats and Ke Dong.

nels (e.g., scorpion venoms). Recently, she has launched a new research initiative to understand the molecular mechanism of spatial repellency of pyrethroids, which could play an important role in the control of disease-transmitting vectors, especially mosquitoes. Numerous ISU students and faculty benefited from her lecture and other discussions.

Bessin Presents Gunderson Seminar

Dr. Ric Bessin was the presenter of the 2016 Harold Gunderson Memorial Lecture. He is a professor at the University of Kentucky with a 100% extension appointment and has responsibilities for insect pest management in field crops, specialty crops and greenhouses. He develops and evaluates integrated pest management (IPM) decision guidelines and management strategies for specialty and field crop insect pests. Dr. Bessin provides education to a wide audience, from Master Gardeners to youth to the commercial agriculture industry. Recent research includes evaluation and implementation of alternative treatments for control of Oriental fruit moth and codling moth in commercial apple orchards; evaluation of reduced-risk and organic controls for cucumber beetle, bacterial wilt, squash bug, and yellow vine decline control in melons and squash; manipulation of wild pollinators in cucurbit production systems; evaluation of alternative insecticide seed treatments for corn on secondary soil insect pests; evaluation of control exerted on brown marmorated stink bug by natural enemies; and management of sugarcane aphid on sweet sorghum. He provides the entomology expertise to address economic pest man-

agement and ecological issues surrounding the deployment of genetically modified Bt corn in Kentucky. Dr. Bessin also serves as the Kentucky IPM Coordinator and Kentucky Liaison to the IR-4 Project which helps to register pesticides for minor uses and minor acreage crops. Dr. Bessin got his B.S. (1981) from University of California (Berkeley) in Agricultural Pest Management and spent some time in the Peace Corps as a beekeeper in Tunisia before going to graduate school. His M.S. (1989) and Ph.D. (1990) are from Louisiana State University in Experimental Statistics and Entomology, respectively. He has been at the University of Kentucky since 1991.



Ric Bessin

Featured Student: Eric Clifton

Eric Clifton was raised in the suburbs north of Chicago, where he explored any forest or marsh within biking distance if he wasn't playing video games. Eric attended Augustana College in Rock Island, IL where he completed a B.S. in biology in 2010. During his senior year at Augustana, Eric proctored a lab for an entomology course and cooperated on the creation of an online field guide for flora and fauna in the Quad Cities area. After graduation, Eric interned as a field specialist for the Bureau of Land Management in Needles, CA where he collected seeds for native plants, surveyed bat populations, and helped with outreach events to the public.



Eric Clifton at Blank Park Zoo.



Eric Clifton on the Chicago River.

In 2011, Eric joined ISU and the labs of **Drs. Aaron Gassmann** and **Erin Hodgson**. He studied entomopathogenic fungi in farmland soils and completed an M.S. in entomology in 2013. In 2013, he began his Ph.D. with Drs. Aaron Gassmann and Erin Hodgson studying the management of soybean aphid and soybean cyst nematode with host plant resistance, entomopathogenic fungi and pesticidal seed treatments. Eric's future career interests are to continue applied research on how IPM and biological control can help to lessen pest injury on agriculture and human populations. Highlights of his time here at ISU:

- Traveling solo to Sidney, MT early on in his M.S. degree having a flight back to Iowa cancelled due to fog. He ended up cat-sitting and crashing at a USDA scientist's home for two days before the next flight back. Went back to Sidney three years later for more training but took a rental car from North Dakota and avoided the smaller planes.

- Watching the news unfold after the first "big" paper on Bt-resistant rootworm in the Gassmann lab was published in 2011. There was even a piece in *The Onion* about it!

- Organizing outreach events like the EGSO Insect Film Festival, and meeting with dozens of visiting scientists as EGSO president.

- Winning prizes for talks and research posters at ESA conferences. One of his posters mysteriously disappeared from the exhibit hall at the Austin, TX conference.

- One week of training at Cornell University with other insect pathologists and the group's hike and picnic near Ithaca Falls.

- Travelling to France for the Society of Invertebrate Pathology conference and drinking wine with people that were once familiar names on journal papers.

Outside of work, Eric enjoys hunting morel mushrooms in the spring, playing online video games with his old friends, preparing tacos for a hypothetical food truck, and dancing at the clubs with a minimal amount of shame and a great deal of self-awareness.



Eric Clifton and Joel Coats at the Holiday Party.

EGSO Sponsors Gardiner Seminar

The Entomology Graduate Student Organization (EGSO) has several new officers for the 2016-2017 school year. President **Rebekah Reynolds**, Vice President **Coy St. Clair, III**, Treasurer **Edmund Norris**, Secretary **Kenneth Masloski**, and GPSS representative **Erika Rodbell** are excited for the upcoming year. Many of the EGSO students attended the International Congress of Entomology conference in Orlando Florida this fall, which was an excellent opportunity to share their research, establish collaborations, and learn more about their prospective fields.

The annual Insect Film Festival was held at Reiman Gardens in November. EGSO members provided activities for the children and their fam-



EGSO can't win the battle against faculty and staff.

ilies such as insect related crafts, a showing of the movie Epic, a display from the Insect Zoo, and tours of the Christina Reiman Butterfly Wing. Members of EGSO are excited for next year's Insect Film Festival!

The Entomology graduate students challenged the faculty and staff to bowling yet again in February. For too many years to count, the students accumulated fewer points but still seemed to have fun. The students are hopeful they will be able to defeat the returning champions in 2017.

Every spring, EGSO sponsors a seminar speaker and they selected Dr. Mary Gardiner for 2016. Mary is an Associate Professor at the Ohio State University. Her seminar examined the conservation value of vacant land for arthropod biodiversity and how conversion of this habitat to address environmental concerns influences these species and the services they support.



Mary Gardiner

Kemmerer Receives Richardson Grant

Mariah Kemmerer was awarded the Henry and Sylvia Richardson Research Incentive Grant in December 2015 to extend her current research that focuses on virus and protein transcytosis across the midgut of the lepidopteran pest, *Spodoptera frugiperda*. The funded project was titled "Identification of surface receptors for proteins that transcytose across the fall armyworm gut epithelium." The goal of the project is to identify the midgut receptor used by the lepidopteran-specific parvovirus, Junonia coenia densovirus (Densoviridae). She is currently conducting 2-dimensional ligand blots with JcDNV virus particles or coat proteins followed by amino acid sequencing of putative receptor proteins, to identify receptor proteins. This densovirus uses innate cellular mechanisms to cross the midgut epithelium without replicating in the midgut cells, in order to avoid sloughing of infected midgut

cells and to establish infection within the hemocoel of the host insect. The structural proteins of such viruses have potential to mediate delivery of insect-specific neurotoxins to their target sites within the hemocoel. This project complements Mariah's CAMTech-funded research to investigate the efficacy of proteins as potential toxin delivery agents.



Mariah Kemmerer

Graduations

Mike Dunbar received his Ph.D. in Entomology with Dr. Aaron Gassmann in the spring of 2016. His dissertation was titled “Effects of diversity on beneficial and pest arthropods.” Mike was a Postdoc at South Dakota State University for a few months before accepting a Postdoc at Emory University in Atlanta, GA, studying insecticide resistance of mosquitoes.

Joshua Parsons received his non-thesis M.S. in Seed Technology and Business with Dr. Aaron Gassmann in the summer of 2016. Joshua is a Senior Research Associate in a high-throughput genotyping lab for DuPont Pioneer in Johnston, IA. He manages the Data Analysis group focusing on SNP data for corn and soybean.



Aaron Gassmann and Joshua Parsons.

Mariah Kemmerer received her M.S. in Entomology with Dr. Bryony Bonning in the fall of 2016. Her thesis was titled “Virus protein trans-

port across the gut epithelium of *Spodoptera frugiperda* (Lepidoptera: Noctuidae).” Read more about Mariah’s research on page 13. Mariah continues to work for Bryony.

Aubrey Paolino received her M.S. in Entomology with Dr. Aaron Gassmann in the spring of 2016. Her thesis was titled “Inheritance and fitness costs of field derived resistance to Cry3Bb1 corn by western corn rootworm.” Aubrey is working as an entomologist with the Dallas County Health and Human Services in Texas. She is focused on mosquito control, and monitoring for West Nile Virus and local Zika Virus transmission.



Aubrey Paolino

Angela Rovnyak received her M.S. in Entomology with Drs. Tom Sappington and Aaron Gassmann in the fall of 2016. Her thesis was titled “Effect of female flight activity on reproduction in the navel orangeworm (*Amyelois Transitella*).”

Undergrad Club Going Strong in 2016

The Undergraduate Entomology Club had many interesting and fun club meetings this year. We held an insect catching day where we went out to McFarland Park and taught the members different ways to catch insects. We had an insect preservation day to show members how you can pin insects, preserve them in alcohol and even acrylic. The last meeting before the holiday break was a tour of the Insect Zoo at ISU. Josh Byrne showed the club members many different types of insects and arthropods. The President is Taylor Best, Vice President is Andrew Guinness, Secretary and Outreach Officer is Elizabeth Maack, Treasurer is Jacob Smithburg, and Event Coordinator is Emily Gamble.



Insect Zoo member, Josh Byrne, showing off a rhinoceros beetle to the club.

ISU Student Awards Announced at Holiday Party

In December at the Holiday Party, the following student scholarships and grants were presented by the Awards Committee:

The Wayne A. Rowley Scholarship in Entomology, which provides \$3,500 to students with preference given to applicants concentrating on medical entomology, was awarded to **Rebekah Reynolds**. She is mentored by Dr. Ryan Smith.



Rebekah Reynolds and Joel Coats.

The Entomology Alumni Scholarship for undergraduates or graduates in entomology was presented to **Eric Clifton**. This \$2,000 scholarship was awarded based on promise for a career in entomology. Eric is co-advised by Drs. Aaron Gassmann and Erin Hodgson. Read more about Eric on page 12.

The Larry Pedigo Graduate Scholarship in Entomology was awarded to **Edmund Norris**. This scholarship of \$2,500, established to honor the many contributions of Dr. Larry Pedigo to the department and college, recognizes scholarly performance. He is advised by Dr. Joel Coats.

The Jim Oleson Scholarship in Entomology, which provides \$1,500 to students who demonstrate academic promise and initiative, was awarded to **Teresa Blader**. She is advised by Dr. Steve Bradbury.

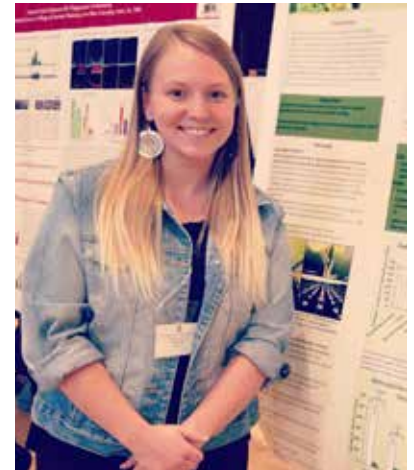


Teresa Blader and Jim Oleson.

The Jean L. Laffoon Memorial Scholarship for \$1,000 was presented to **Coy St. Clair, III**. This scholarship was established in 2012

in memory of Dr. Laffoon, who was a systematist and faculty member in entomology from 1946–1973. Coy is mentored by Dr. Aaron Gassmann.

At the 2016 ESA North Central Branch meeting in June (Cleveland, OH), many ISU students participated in the competition, including one winning presentation. **Shelby Pritchard**, third place for a P-IE Field Crops Session B.S./M.S. paper "*Effect of soybean trichome density on biotype-1 soybean aphid and its natural enemies.*" Shelby is advised by Dr. Matt O'Neal.



Shelby Pritchard

Colin Wong was awarded the ISU Brown Graduate Fellowship. The program is to be used to strategically advance ISU research in the areas of study that are governed by the Valentine Hammes Family and Leopold Hammes Brown Family Trust, including science, agriculture, and space science. Colin is advised by Dr. Joel Coats.



Colin Wong

Edmund Norris received a travel award to attend the American Chemical Society National Meeting. He also got first place poster in the AGRO Division, "*Exploring the relationship between PaOA1 receptor modulation and the insecticidal character of monoterpenoids.*"



Edmund Norris and Joel Coats.

New Hope for Soybean Aphid Control

In 2016, a new natural enemy of soybean aphid was introduced to central Iowa. **Dr. Matt O'Neal** and a new predoc in his lab, **Matt Kaiser**, released the aphid parasitoid *Aphelinus glycinis* at eleven ISU-affiliated research farms, as part of a USDA-backed project aiming to combine biological control and host-plant resistance to provide area-wide suppression of soybean aphid.

The parasitoid is a specialist attacking soybean aphid, originally collected in the aphid's native range in northeastern China. After extensive host-range testing at the USDA Beneficial Insect Introductions Research Unit in Newark, DE, it was cleared for release in 2013. Small scale releases occurred in Minnesota in 2014 and 2015, but



Parasitized (black) and healthy (yellow) soybean aphids. Photo by Matt Kaiser.

2016 saw the first releases in Iowa and the largest releases to date, with an estimated 126,000 wasps released in Iowa alone. The wasps successfully attacked aphids in the field and were recovered up to five weeks after release. Next spring and summer, O'Neal and Kaiser will look for the wasps in soybean fields to determine if they survived the winter. External collaborators on the project include Drs. Keith Hopper with USDA-ARS, George Heimpel and Kelton Welch at the University of Minnesota, and Andy Michel at Ohio State University.



Aphelinus glycinis attacking soybean aphids. Photo by Matt Kaiser.

Emerald ash borer, continued from cover

Three species of wasps were used in the EAB biocontrol project:

- *Tetrastichus planipennisi*, a larval endoparasitoid from China, completes 3-4 generations per year and overwinters as a larva within its host. One parasitized EAB larva can produce 127 wasps.

- *Oobius agrili*, an egg parasitoid from China, completes 2 generations during the EAB oviposition period and overwinters as a larva in a host egg. One adult will lay 60 eggs.

- *Spathius galinae*, a larval ectoparasitoid from Russia, completes 2 generations per year and overwinters as a pupa in cocoons on its host. Females will deposit 5 to 15 eggs per larva.



Spathius galinae ovipositing through ash bark. Photo by Liu, USDA.

Zika Research in Iowa

With threats from Zika virus and renewed interest in West Nile virus (WNV), 2016 proved to be an interesting year for the Medical Entomology Lab (led by **Dr. Ryan Smith**) and the mosquito surveillance program that it runs for the state of Iowa.

Through a collaborative effort supported by the Iowa Department of Public Health, the University Hygienic Lab, and local county public health agencies, the program was able to extend its efforts into 16 counties and municipalities in the state. As previously, a major goal of the program was to examine mosquito populations for the presence of WNV across the state. We identified a total of 46 WNV+ mosquito pools, indicative of the 37 human cases of WNV in the state, the highest number of WNV+ pools and human cases in the state since 2013.

A second major effort was to survey the state for the presence of *Aedes aegypti* and *Aedes albopictus*, potential vectors of Zika and other mosquito-borne viruses. After trapping and identifying nearly 180,000 mosquito samples, not a single *A. aegypti* or *A. albopictus* mosquito



Mosquitoes collected from a single trap night in the summer near Des Moines.

was found, arguing that these mosquito vectors have yet to establish themselves in the state and minimizing the risk of local transmission of Zika virus in Iowa.

Planning for the 2017 mosquito season has already begun, as the program continues to expand its footprint in the state to further explore aspects of WNV transmission and the potential invasion of *Aedes* vectors in the state of Iowa.

PIDC Goes Molecular

This was a molecular year in the Plant and Insect Diagnostic Clinic (PIDC)! Our plant disease diagnosticians, Dr. Lina Rodriguez Salamanca and Ed Zaworski, succeeded in implementing DNA-based diagnostic techniques for the oak wilt pathogen and bacterial leaf streak, a new corn disease.

The PIDC clinic received 1,420 samples in 2016. Popular samples included ticks, bed bugs, carpet beetles, and foreign grain beetles. We confirmed 12 samples of emerald ash borer and Iowa is now up to 39 infested counties. As usual, spruce was a common sample as they suffer from several plant diseases and also from spruce spider mites, spruce bud scales, and pine needle scale.

The PIDC works with a wide range of commercial producers, professional and citizen groups. This past year we spoke at a variety of meetings, including the Iowa Fruit and Growers Association annual meeting, Shade Tree Short Course, Crop Scout School, Integrated Crop Management Conference, Turfgrass field day, Greenhouse Vegetable Production workshop, Tomato Production workshop, redefining Prison Environments pro-

gram, an Amish field day, and Master Woodland Manager. Next year the clinic will be in charge of the Morel Mushroom Identification workshop for certification.

To learn about common disease and insect problems in Iowa, please visit the **Hort and Home Pest News** website (www.ipm.iastate.edu/ipm/hortnews/), PIDC website (www.ent.iastate.edu/pidc/) or PIDC Facebook page (www.facebook.com/ISUPIDC).



PIDC staff: Laura Jesse, Ed Zaworski, and Lina Rodriguez Salamanca.

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, 124 Science II, Ames, IA 50011. Alternatively, donations can be made online at www.foundation.iastate.edu/entomology.

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
- _____ 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.



Insect Zoo Hosts the Bug Chef

Ginny Mitchell writes: Greetings from the Insect Zoo! We have had an exciting year with 355 events and displays in 2016, more than the Insect Zoo has ever held!

We visited 52 Iowa libraries this summer for the 2016 Bug Olympics. The Peruvian jumping sticks showed off their jumping skills, 10.25 times their body length for a jump record of 41 inches! The Madagascar hissing cockroaches pulled their weight during the exhibit and kids learned that they really aren't as strong as a cockroach. The American cockroaches left the kids in the dust, running faster than Usain Bolt himself. We had a great time visiting libraries all over Iowa and showing off some pretty awesome bug athletes. Our 2017 summer program is *The Buildings of Bugs*. We will be crisscrossing Iowa visiting libraries, extension offices and fairs with our Buildings of Bugs exhibit to show off the architecture of bugs and how they help build a better world. Check out our Facebook page for a list of dates: www.facebook.com/ISUInsectZoo/.



Bug Village 2016.

The highlight of 2016 was our second annual Bug Village. We had close to 1,000 visitors come through the Molecular Biology Building where we had over 100 species of arthropods on display. We hosted The Bug Chef, David George Gordon, and he cooked up some delicious bug dishes for everyone to try. National Geographic Explorer was on site filming the cooking of bugs and interviewing people for their reaction. When we find out more information about the show, we will post it on our website. We also debuted our new Roach Race track, but it still needs a name! Suggestions are welcome. We also had Leonardo Di Roachy painting where participants



Bug Village 2016.

could paint their very own Mona Roacha with a roach! Maggot art was a huge hit and so were all of our bug friends that had their own displays, Reiman Gardens, the Toth and Smith labs. Thank you to all of our volunteers! We couldn't have done it without you.

2017 is a big year for the Insect Zoo. WE ARE TURNING 20!!! We are ramping up our collection of living arthropods, increasing the number of programs and gearing up for the best year ever! We hope to have our date for the third annual Bug Village soon, just waiting on that football schedule! Stay tuned for that announcement – you don't want to miss that!

As always, we want to thank the Insect Zoo students. Ashley Reed and Joshua Byrne, both are graduating in May and we will miss them dearly. We wish you the best of luck. We also want to thank Ally Witt, Becky Roberson, Jillian Kurovski, and Bo Rus.



Bug Village 2016.

2016 Arrivals and Departures

Dr. O'Neal's Lab has several new members. **Matt Kaiser** is a Predoc from the University of Minnesota. **Ge Zhang** (co-advised by Dr. Amy Toth) is a new Ph.D. student, and **Erika Rodbell** (co-advised by Dr. Erin Hodgson) is a new M.S. student from St. Lawrence University, NY.

Dr. Aaron Gassmann had staff changes in his lab. **Benjamin Brenizer** is a new research associate and **Eric Yu** is a new M.S. student. Dr. Mike Dunbar, Aubrey Paolino, and Joshua Parsons all graduated in 2016 (see page 14).

Dr. Steve Bradbury's lab is growing, too. **Seth Applegate** is a new agricultural specialist with a recent ISU M.S. degree in agronomy. **Jacqueline Pohl** is a new program coordinator, formally an editor for the Soil and Water Conservation Society. **Dana Schweitzer** is also a new program coordinator, formally with the ISU Farm Energy Initiative. **Kelsey Fisher** is a new Ph.D. student from the University of Delaware.

Dr. Bryony Bonning's lab always has new faces. **Suyog Kuwar** is a Postdoc from the Max Planck Institute in Germany. **Ruchir** is a new Postdoc from the University of Georgia. Three Postdocs also left in 2016: Teresa Fernandez-Luna, Purushottam Lomate, and Sheng Yang.

Dr. John VanDyk is supporting a few more IT personnel. **Nicolas Booher** and **Angela McMahon** are new Systems Analysts.

Dr. Ryan Smith is adding to his research lab. **Kristofer Kovach** is a new research associate and **Jyothsna Ramesh Kumar** is a new Ph.D. student.



Bird cherry oat aphid. Photo by Matt Kaiser.



Greg VanNostrand's picture of pea aphid made the cover of Journal of Virology for February 2016.

2016 Submitted Patents

"Insect toxin delivery mediated by a densovirus coat protein" – **Bryony Bonning** and **Mariah Kemmerer**.

"Insecticidal toxins for plant resistance to Hemiptera" – **Bryony Bonning**, **Nanasaheb Chougule**, **Maria Teresa Fernandez-Luna**, **Michael Blackburn**, and **David Hall**.

"Methods and compositions comprising steroid honey bee feeding inhibitors" – **Russ Jurenka** and **Matt O'Neal**.

Selected Publications from 2016

- Carrillo-Tripp J, AG Dolezal, MJ Goblirsch, WA Miller, and BC Bonning. 2016. *In vivo* and *in vitro* infection dynamics of honey bee viruses. Scientific Reports. DOI: 10.1038/srep22265.
- Choi M-Y, S-J Ahn, K-C Park, RV Meer, RT Cardé, and R Jurenka. 2016. Tarsi of male heliothine moths contain aldehydes and butyrate esters as potential pheromone components. Journal of Chemical Ecology. DOI: 10.1007/s10886-016-0701-3.
- Coates BS. 2016. *Bacillus thuringiensis* toxin resistance mechanisms among lepidoptera: progress on genomic approaches to uncover causal mutations in the European corn borer, *Ostrinia nubilalis*. Opinion Insect Science. DOI: 10.1016/j.cois.2016.04.003.
- Coates BS, A Alves, H Wang, X Zhou, T Nowatski, H Chen, M Rangasamy, HM Robertson, CW Whitfield, KK Walden, SD Kachman, BW French, LJ Meinke, D Hawethorne, CA Abel, TW Sappington, BD Seigfried, and NJ Miller. 2016. Quantitative trait locus mapping and functional genomics of an organophosphate resistance trait in the western corn rootworm, *Diabrotica virgifera virgifera*. Insect Molecular Biology. DOI: 10.1111/imb.12194.
- Courtney GW and BM Wiegmann. 2016. Editorial overview: Insect phylogenetics: an expanding toolbox to resolve evolutionary questions. Current Opinion in Insect Science. Special Issue. DOI: 10.1016/j.cois.2016.11.001.
- Gassmann AJ and EH Clifton. 2016. Current and potential applications of biopesticides to manage insect pests of maize. In LA Lacey (Ed.), Microbial control of insect and mite pests: from theory to practice. 1st edition. Elsevier, London.
- Gassmann AJ, RB Shrestha, SRK Jakka, MW Dunbar, EH Clifton, AR Paolino, DA Ingber, BW French, KE Masloski, JW Doudna, and CR St. Clair. 2016. Evidence of resistance to Cry34/35Ab1 corn by western corn rootworm (Coleoptera: Chrysomelidae): root injury in the field and larval survival in plant-based bioassays. Journal of Economic Entomology. DOI: 10.1093/jee/tow110.
- Jurenka R, GJ Blomquist, C Schal, and C Tittiger. 2016. Biochemistry and molecular biology of pheromone production, Reference Module in Life Sciences. Elsevier. DOI: 10.1016/B978-0-12-809633-8.04037-1.
- Kaiser MC and GE Heimpel. 2016. Parasitoid-induced transgenerational fecundity compensation in an aphid. Entomologia Experimentalis et Applicata (Special Issue on parasitoid wasps: Mark Jervis Memorial). DOI: 10.1111/eea.12431.
- Koch R, B Potter, E Hodgson, C Krupke, J Tooker, C DiFonzo, A Michel, K Tilmon, T Prochaska, J Knodel, R Wright, T Hunt, K Estes, and J Spencer. 2016. The biology and economics behind soybean aphid insecticide recommendations. Plant Health Progress. DOI: 10.1094/PHP-RV-16-0061.
- Kwon H, M Ali Agha, RC Smith, RJ Nachman, F Marion-Poll, and PV Pietrantonio. 2016. Leucokinin mimetic elicits aversive behavior in mosquito *Aedes aegypti* and inhibits the sugar taste neuron. PNAS USA. DOI: 10.1073/pnas.1520404113.
- Lomate PR and BC Bonning. 2016. Distinct properties of digestive proteases and nucleases in the gut, salivary gland and saliva of southern green stink bug, *Nezara viridula*. Scientific Reports. DOI: 10.1038/srep27587.
- Madriz RI and GW Courtney. 2016. The neotropical tanyderid *Araucoderus gloriosus* (Alexander) (Diptera, Tanyderidae), with description of the egg, larva and pupa, redescription of adults, and notes on ecology. Zootaxa. DOI: 10.11646/zootaxa.4158.3.2.
- Seymour M, OP Perera, HW Fescemyer, RE Jackson, SJ Fleischer, and CA Abel. 2016. Peripheral genetic structure of *Helicoverpa zea* indicates asymmetrical panmixia. Ecology and Evolution. DOI: 10.1002/ece3.2106.
- Smith RC, JG King, D Tao, OA Zeleznik, C Brando, GG Thallinger, and RR Dinglasan. 2016. Molecular profiling of phagocytic immune cells in *Anopheles gambiae* reveals integral roles for hemocytes in mosquito innate immunity. Mol Cell Proteomics. DOI: 10.1074/mcp.M116.060723.

Courtney Leads Field Trip to Pacific Northwest



Field trip stop at Kiger Gorge in Oregon.

In summer 2016, **Dr. Greg Courtney** led a group of seven graduate students on an Ecology and Evolutionary Biology field trip course (EEB 585) to the Pacific Northwest. The trip was co-led by Dr. Fred Janzen, Department of Ecology, Evolutionary and Organismal Biology. The interests of the group were diverse and included entomology, botany, herpetology, phylogeography, community ecology, and geology. The course focused on the landforms, biogeography, flora, and fauna of the Pacific Northwest, with emphasis on the northern Great Basin (southeast Oregon and northern Nevada), and Oregon's Cascade Range.

Pre-trip meetings provided an opportunity for class discussions about Pleistocene geology, regional faunistics and floristics, invasive species, climate change, alpine adaptations, bioge-



Moraine Lake in Alberta, Canada.

ography, and other topics relevant to the Pacific Northwest. The trip occurred during the first two weeks in July, an ideal time for seeing the high desert, alpine mountains, temperate rainforest, and other habitats. Our itinerary had us in the northern Great Basin in two days, after an overnight stop in Wyoming's Flaming Gorge National Recreational Area. Great Basin destinations included Steens Mountain, Malheur National Wildlife Refuge, Sheldon National Wildlife Refuge, and the Alvord Desert. After the xeric scenes of the Great Basin, we traveled farther west to the Cascade Range. Among that area's highlights were Newberry National Volcanic Monument, Crater Lake National Park, Three Sisters Wilderness, and H.J. Andrews Experimental Forest.



Little Lava Lake in Oregon.



Tanypteryx male.

Insect Museum Gets Help From Robots

The Iowa State Insect Collection (ISIC), which is housed in the Department of Entomology, is the only major entomological collection in the state of Iowa. Its holdings include more than 1,000,000 pinned specimens, approximately 20,000 specimens on slides, and a fluid collection with nearly 75,000 vials.

Drs. Greg Courtney and **John VanDyk**, and members of the Courtney laboratory have been active with a variety of collection-improvement projects, including initiation of a database system for the ISIC and a digitization project funded by the National Science Foundation (NSF). The latter includes digitization of the pinned collection through use of a customized robotic image-capture system. The robotics capture high-resolution images of each drawer from five different angles. Software then stitches these images together to make a massive 32,000 x 26,000 pixel final image (2.4GB in size). Depending on the taxon (e.g., for most Diptera but not for most Lepidoptera or other specimens with large wings), this often allows capture of not only details of each specimen but some label data.

The NSF project is a collaborative effort by 22 institutional collections of terrestrial and freshwater aquatic arthropods in the upper Midwestern U.S., with a combined total of ca. 56 million specimens. Goals of the project include digitization of all holdings and access to the image archive via an online virtual museum consisting of a searchable database for drawers of pinned specimens, and for slide specimens or vials.

Thus far, project activities in the ISIC have included entry of specimen and taxonomic data for nearly 20,000 specimens, with approximately 6,500 specimens on slides, >5,300 vials, and nearly 1,000 drawers of digitized pinned specimens. Project participants have included graduate students Andrew Fasbender (Ph.D. 2014) and Isai Madriz, more than ten undergraduates, and three George Washington Carver summer interns. Students and interns have gained experience in not only digitization of the collection, but in curation, database entry, and biological illustration. We hope to complete scanning of drawers by summer 2017, and eventually link data and images with BugGuide.net.

CAMTech Continues to Thrive

The National Science Foundation Industry/University Cooperative Research Center (I/UCRC), the Center for Arthropod Management Technologies (CAMTech) based in the department entered its fourth year in 2016. The center now has 11 industry partners with three research projects completed, six underway and five planned to start in 2017 at ISU and at the sister institution, University of Kentucky. The spring Industry Advisory Board (IAB) meeting was held in May in Atlanta, GA. Progress reports on CAMTech research projects were presented, and the IAB identified areas of particular interest for the spring RFA. The fall IAB meeting was held immediately prior to the International Congress of Entomology (ICE) in Orlando, Florida. Project proposals were presented at this meeting, with the IAB making recommendations for funding to the center directors. CAMTech also hosted a symposium followed by lunch at ICE 2016. The symposium entitled Public-Private Partnerships for Development of Next Generation Pest Management Methods, which featured four speakers



drawn from academia and USDA, and four from industry, was well received.

Although leaving in February 2017 for University of Florida, **Dr. Bryony Bonning** will continue to lead CAMTech through ISU as an affiliate faculty member, until the end of the NSF Phase I funding period in 2018. For further information about the center, see the CAMTech website: <https://camtech.ent.iastate.edu/>.

Photos From the 2016 ICE Meeting in Orlando



Coy St. Clair, Edmund Norris, Eric Clifton, Kris Giles, and Kenneth Masloski.



Clint Pilcher, Luis Gomez, Laura Weiser Erlandson, and Rayda Krell.



Jarrad Prasifka, Patti Prasifka, and Joel Gibson.



Rick Hellmich, Sue Blodgett, and Steve Bradbury.



Tim Johnson, Phil Mulder, and David Shapiro-Ilan.



Von Kaster and Joel Coats.



Richard Edwards and Bill Showers.



Chad Boeckman, Rick Hellmich, Keri Carstens, and Teresa Blader.