

Department of Entomology Newsletter

Events from 2014

Bradbury Receives ISU Alumni Award

Steve Bradbury received the Henry A. Wallace Award for Outstanding Leadership to National and International Agriculture from the College of Agriculture and Life Sciences. He has an M.S. (1981) and Ph.D. (1985) in Toxicology and Entomology from ISU.

In July, Steve joined the ISU Entomology faculty as a Visiting Professor. While in the department, he is contributing to several efforts in environmental and agricultural science and policy initiatives. In addition to providing lectures in entomology, toxicology, sustainable agriculture and resource economics classes, he is contributing to several university-wide efforts, including pesticide resistance management, pollinator protection, and the role IPM practices can play in developing and implementing productive crop systems that also meet a diverse array of environmental protection goals.

Prior to joining the faculty, Steve worked in the Environmental Protection Agency (EPA). While at EPA's laboratory in Duluth, MN (1985–2002), Steve served in many roles, including the Director of the facility from 1999–2002. During his tenure in the Office of Research and Development,



he led research efforts in predictive toxicology, ecological risk assessment and environmental monitoring and assessment of the Great Lakes and Great Rivers, among others.

Continued on page 5

Department Launches Mobile Website

The Department of Entomology's website got a facelift in 2014, www.ent.iastate.edu. The new look has a lot of technological changes behind it. "More people are using phones and other mobile devices to get information from the internet, so we wanted to do a mobile-first design that scales up to the desktop," said **John VanDyk**, Systems Analyst. "We also wanted to improve search."

The platform underneath the website is something that VanDyk and fellow developers Michael Hofmockel, Ryan Frahm, and **John Rearick** have been working on for a year and a half. The code is open source and available from public reposi-

tories on Github, <https://github.com/isubit/>. Others on campus, such as Extension IT, are adopting the platform as well.

The same code also underlies websites for individual faculty and other departments and programs supported by the collaborative Biology IT group (see page 6). "Adopting a standard platform across the websites we support – more than 100 of them – was the only way we could reasonably provide service with a small team," said VanDyk. Each site comes with its own analytics so that traffic reporting is easy, and backups are made nightly in case of disaster.

Gassmann Promoted to Associate Professor

Aaron Gassmann was promoted to Associate Professor in 2014. He has research and teaching responsibilities in integrated pest management, insect resistance management, and plant-insect interactions. His research focuses on interactions between insect pests and corn. Gassmann joined the faculty at ISU in 2008. Prior to that, he completed postdoctoral training in the Department of Entomology at the University of Arizona, and the Department of Entomology at the University of California, Riverside. He has a Ph.D. in Ecology and Evolution (2003) from the State University of New York at Stony Brook, and a B.A. in Biology (1997) from the University of Saint Thomas in St. Paul, MN. Gassmann has 38 peer-reviewed publications, presented 30 invited seminars and symposia, co-authored 70 presentations at professional meetings, and contributed to more than 120 outreach publications and presentations. Aaron received the DuPont Young Professor Award in 2011, and the ISU College of Agriculture and Life Sciences Early Achievement in Research Award in 2012.



Aaron Gassmann

ISU Participates in Honey Bee Summit

Although Iowa is not known for agriculture that requires honey bee pollination, ISU has a growing research program that is addressing honey bee health and conservation. Reflecting this growth was the participation by two ISU entomologists, **Amy Toth** and **Matt O'Neal** at the Honey Bee Forage and Nutrition Summit hosted by the USDA and held on 20-21 October in Alexandria, VA. The summit brought multiple stakeholder groups and scientists to discuss issues related to the quality and quantity of forage for honey bees. Contributing to this discussion were Toth's presentation, "Honey bee nutritional

stress: interactions between individual physiology, disease, and landscape" and O'Neal's, "How the agricultural landscape is used by pollinators, and how their abundance and diversity in field crop systems can be improved."

Notable participants were representatives from the American Beekeeping Federation, Project Apis m., Pollinator Partnership, the Xerces Society, and several organizations within the USDA. Over the course of this two-day summit, speakers and stakeholders participated in break-out sessions to develop recommendations to help reverse the national trend in honey bee declines. These recommendations will be shared with USDA and with the science advisor to the White House for future policy on pollinator conservation.



Honey bee photo by Susan Ellis.

Did you know?

In 2014, Bryony Bonning and Russell Jurenka celebrated twenty years in the Entomology Department at ISU. Bryony and Russell are Full Professors with active research and teaching programs. Congratulate them both for all their dedication and hard work!

Entomology Year in Review

We began the year in a rush, planning for the ESA North Central Branch meeting in Des Moines in March, which was hosted by the ISU Entomology Department (see pages 23-24 for photos). The Dream Team consisted of **Erin Hodgson**, Local Arrangements; **Matt O'Neal**, Program Chair; and I served as the 2014 President. We had a record-breaking meeting with over 350 attendees, 11 great symposia, wine tasting and a 6k Hexapod Scurry fun run. **Larry Pedigo** and his Dixieland band provided entertainment at the Welcome Reception. The weather also cooperated, reaching a balmy 50°F! The record crowd was impressed by the high quality and diversity of the meeting program. It could not have been the success that it was without the contributions of **Donald Lewis**, **John VanDyk**, **Adam Varenhorst**, **Kelly Kyle**, and many others.

The Entomology Department had a much overdue external review in October with Dave Ragsdale (Texas A&M), Angela Douglas (Cornell University), David Margolies (Kansas State University), and Gary Felton (Pennsylvania State University). The faculty are reviewing the recommendations and implementing changes.

Entomology faculty have been one of six departments involved in planning a new biosciences building on the ISU campus. The resulting new building, Advanced Teaching and Research Building (ATRB), an addition to Bessey, and future addition for Science II, will provide the six departments much needed upgraded research,



Sue Blodgett

teaching and extension facilities and space to grow. The ATRB is planned for the corner of Pammel and Stange Avenues and will eventually require the demolition of the Insectary and Genetics Buildings; as the department external review team stated, these buildings have passed their 'sell-by' date. As 2015 begins, we are well into the building's design phase with the selection of SLAM (architecture) and OPN (engineering) firms. Planned completion is early 2018 and we will keep you posted.

A search committee, headed by **Bryony Bonning**, was established to recruit a vector biologist. The search committee has worked hard to identify a replacement that will be announced soon. This new hire will continue to build on the success of Wayne Rowley and Lyric Bartholomay's vector/medical entomology research and teaching, an important part of the department's strategic plan.



Sue Blodgett was presented an award for serving as the 2014 NCB ESA President by ESA President, Frank Zalom.

Jurenka Receives BARD Grant

Russell Jurenka was funded for the fourth time by BARD, which is a Binational Agriculture Research Development fund between the U.S. and Israel. The funded research is titled “Evolution of resistance to mating disruption in the pink bollworm moth – evidence and possible mechanism.” Mating disruption using pheromones has been the primary control tactic for pink bollworms in Israel for over 20 years but recently it has failed in some fields. Israeli collaborators, Ally Harari, Ada Rafaeli, and Victoria Soroker, all from the Agricultural Research Organization of the Ministry of Agriculture, will collect moths and establish behavioral changes in moth colonies. Jurenka’s role is to elucidate the changes occurring in the sex pheromone biosynthetic pathway.



*Pink bollworm on cotton.
Photo by Peggy Greb, USDA-ARS.*

CAMTech Off to a Strong Start

In 2014, the National Science Foundation Industry/University Cooperative Research Center (I/UCRC), the Center for Arthropod Management Technologies (CAMTech) entered its second year with a second round of research projects funded at ISU and at the sister institution, the University of Kentucky. The industry advisory board (IAB), comprised of representatives from the eight member companies, met in Chicago in April to review research progress and to discuss additional research areas of interest. There is considerable enthusiasm among the industry representatives about the opportunities provided by CAMTech to network, to follow research progress and to liaise with graduate students and postdoctoral researchers as potential future employees.

A call for research proposals resulted in 20 pre-proposals, of which six were selected for presentation at the fall meeting, held at the University of Kentucky. Research within the center is pre-competitive in nature, but provides fundamental information needed by industry for optimal use and development of arthropod and nematode management tools. The projects selected for funding are 1) Establishment of midgut cell lines from select pest insects (PI Cindy Goodman, USDA-ARS), 2) A toolkit to explore soybean cyst nematode genomic diversity (PI Thomas Baum, ISU), and 3) Enveloped porous nanoparticles for RNA delivery to insects (PI Barbara Knutson, UK).



Bryony Bonning, Jan Seibel, Puru Lomate, Mariah Kemmerer and other CAMTech researchers flew via ISU flight services to the fall IAB meeting in Kentucky.

Remarkably, seven NSF I/UCRCs are now represented on the ISU campus and center directors, affiliates and support staff meet once per semester to benefit from the combined local I/UCRC expertise. Five of the centers are based within the College of Engineering, while the Center for Bioplastics and Biocomposites, and CAMTech are based in the College of Agriculture and Life Sciences. For more information about CAMTech, see www.ent.iastate.edu/camtech.

Distinguished Faculty: Carl Drake

Russ Jurenka writes: Carl Drake (1885–1965) was a Professor of Entomology at Iowa State College starting in 1922 when he became department head of the Entomology and Zoology Department. He was Department Head until 1946 when he was asked to step down. More on that later. During his career he published about 518 papers mostly on the systematics of Hemiptera: Tingidae. He also described about 1,480 new species, the great majority in the Tingidae. He was a student of Professor Herbert Osborn who was at Iowa State College until 1900 when he moved to The Ohio State University. Drake was a graduate student under Professor Osborn from 1913–1917 and received his Ph.D. from Ohio State in 1921. In addition to leading the department, Drake was also Entomologist of the Experiment Station and State Entomologist, all at the same time. During his career Drake published at least 105 papers in some aspect of applied entomology. The chinch bug outbreak of the 1930's, the introduction of the European corn borer in the 1940's, and periodic grasshopper outbreaks kept the entomologists busy. In 1946, DDT was first tested in Iowa, introducing the modern era of synthetic insecticides. But Drake essentially devoted his career to his primary passion of Hemiptera systematics.

Drake never married and essentially worked all the time. He wanted to “keep the lights on longer than the Chemistry Department.” After 24 years as Department Head, upper administration decided it was time for a change and wanted to remove Drake as Department Head but apparently he did not want to step down. The rumor is that Drake went to lunch and when he came back the locks on the department office had been changed. Professor Harris, his former student, became department Chair. Essentially Drake and Harris had a falling out sometime prior to this event, and Drake would no longer make his collection available to Harris for systematic work. The atmosphere in the department was acrimonious to the point where Harris and Drake would not acknowledge each other in the hallway.

Drake worked at Iowa State College for another 11 years before moving to Washington, DC to work at the Smithsonian. As one obituary stated “The final years at Ames, beginning a little prior to his retirement, had been marked by some deterioration in the pleasantness of his personal associations, so the move to Washington was



Carl Drake

the start of a period when undivided attention could be given to the Hemiptera, amid basically congenial surroundings.” He continued working at the Smithsonian until a few weeks before his death in 1965. To illustrate the importance of Drake's work on Hemiptera systematics, his Google Scholar record shows that his work had 391 citations from 2009–2014.

Continued from cover page

In 2002, Steve moved to Washington, DC and joined EPA's Office of Pesticide Programs, where he first led a division responsible for assessing ecological risks of pesticides. He continued to advance and served as the Director of EPA's Pesticide Program from 2010–2014.

Steve has authored over 70 peer-reviewed journal articles and book chapters, and has served on numerous national and international bodies formulating science and policy approaches on a wide range of risk assessment and management issues. He is a three-time recipient of EPA Scientific Achievement Awards for Research and five-time recipient of EPA Medals for innovating environmental risk assessment.

Bonning and Liu Publish in Nature Biotechnology

The results of a long term collaborative project between the labs of **Bryony Bonning** and Allen Miller, Plant Pathology and Microbiology, were published in the journal Nature Biotechnology in January 2014. The authors demonstrated that the coat protein of a plant virus (Pea enation mosaic virus; a luteovirid) can be used to deliver a toxin that acts within the aphid hemocoel, to the detriment of the aphid. Luteovirids are transmitted between plants by aphids. Virions are ingested, cross the gut epithelium and are released into the hemocoel. Some virions then penetrate the accessory salivary gland and are released on subsequent feeding by the aphid. Expression in transgenic Arabidopsis of the luteovirid coat protein fused to an insect-specific neurotoxin provided protection against the green peach aphid, *Myzus persicae*. The work was featured by the netcast "This Week in Virology" (TWIV 272) in a program entitled "Give peas a chance."

Greg VanNostrand took the picture of soybean aphids on soybean that ended up on the cover of the January 2014 issue of Nature and Biotechnology (see right).



Entomology Embraces Big Data

Entomology is a key part of a collaborative effort to better provide computational support to the biological sciences. The new group, Biology IT (www.biology-it.iastate.edu) spans the College of Agriculture and Life Sciences and the College of Liberal Arts and Sciences.

Two recent additions to the computational resources provided by the group are the servers Biocrunch and Bigram. Biocrunch is a server with 80 CPU cores, 768GB of RAM, and 6.4 terabytes of solid state storage. Its purpose is to provide high-speed, multithreaded computation for those who have outgrown the capabilities of a desktop computer but are not ready to make the leap to one of the university clusters. It is also useful for problems that cannot be parallelized, like small de novo genomic assemblies and certain R jobs.

Sijun Liu, Associate Scientist in Bryony Bonning's Lab, is using Biocrunch to work on insect virus discovery from next-generation sequencing data. "The new Biocrunch server makes my work much faster. I can now run assembly pro-

grams with much larger data sets. By combining multiple sequencing data sets for assembly, more and longer contigs derived from novel viral sequences can be assembled. I have recently identified two more novel viruses from the NGS data," said Sijun.

The other server is Bigram. Its claim to fame is 1.5 terabytes of RAM: enough to complete assembly of larger genomes. Matt Hufford of Ecology and Evolutionary Biology is using the machine to study how the maize genome has changed during domestication. Bigram has 10 terabytes of local storage. Both Bigram and Biocrunch connect the Isilon, ISU's central storage which provides hundreds of terabytes of long-term storage.

John VanDyk administers the servers, which live in the server room in the basement of Science II. Michael Hofmockel, Research IT Director for LAS, works closely with researchers to connect them with the resources they need to do their work.

Featured Staff: Sijun Liu

Sijun Liu, who has worked with Bryony Bonning since 2004, was promoted this year to the position of Associate Scientist in recognition of his research accomplishments, his active role in pursuing new research directions, and serving as mentor to students and trainees in Bryony Bonning's Lab. Sijun received his B.S. and M.S. in Plant Protection and Entomology respectively from Fujian Agricultural University in China. He conducted his doctoral research on molecular plant virology at the University of East Anglia, in England, and came to the U.S. in 1997 to work with Keith Perry at Purdue University on aphid transmitted plant viruses. He joined W. Allen Miller's Lab in the Department of Plant Pathology at ISU in 1999 and worked on a collaborative project with Bonning's Lab, the culmination of which was published this year (see page 6).

Since joining the department, Sijun has been co-PI on two major grants, the first from the USDA-NRI on aphid-luteovirus molecular interactions, and the second from the Monsanto Company Corn Rootworm Knowledge Research program on corn rootworm virus discovery. In addition to numerous publications, he is co-author on two ISU patents and was instrumental in developing methods for isolation of aphid gut binding peptides that served to 1) impede the movement of aphid-vectored plant viruses into the aphid hemocoel thereby reducing plant

virus transmission, 2) facilitate identification of a plant virus receptor in the aphid vector, and 3) provide attachment sites for a *Bacillus thuringiensis* (Bt)-derived toxin such that the toxin gained aphicidal activity.

Sijun also took the lead on sequencing of the gut transcriptome of the soybean aphid. This task involved the dissection of some 3,000 soybean aphid guts over the period of about four months.

During the course of this work, Sijun identified viral sequences in the soybean aphid transcriptome. Multiple viruses were subsequently identified from this and from other aphid species including one that represents a new viral family. Sijun optimized the bioinformatics work flow for efficient discovery of insect virus sequences from Next Gen Sequencing data. This virus sequence discovery system has now been applied to not only aphids, but also to corn rootworm, plant hoppers, and snails among others resulting in identification of over 20 invertebrate viruses.



Sijun Liu

BugGuide Reaches One Million Submissions

BugGuide is an online community of naturalists that share observations, images of insects known and unknown from around North America. The project is centered on a natural history database that continues to grow as contributors submit and identify specimens and create or revise encyclopedic guide pages. BugGuide is an example of crowdsourcing; the current website of over 48,000 taxon-specific guide pages was created by 27,283 individual contributors. Each guide page may have images associated with it. To date, the site contains 776,489 images with 3,447 awaiting identification and placement.

The screenshot shows the BugGuide website interface. At the top, it says "BugGuide Identification, Images, & Information For Insects, Spiders & Their Kin For the United States & Canada". There is a search bar and links for "Your Images", "Your Account", and "Log Out". Below the header is a navigation menu with "Home", "Guide", "ID Request", "Recent", "Frass", "Forums", "Donate", and "Help". Under "Guide", there are sub-menus for "Clickable Guide", "Taxonomy", "Browse", "Info", "Images", "Links", "Books", and "Data". The "Clickable Guide" menu is open, showing a grid of insect icons. The "Images" sub-menu is selected, displaying a list of taxonomic categories: "Home » Guide » Arthropods (Arthropoda) » Hexapods (Hexapoda) » Insects (Insecta) » Beetles (Coleoptera) » Water, Rove, Scarab, Long-horned, Leaf and Snout Beetles (Polyphaga) » Long-horned and Leaf Beetles (Chrysomeloidea) » Long-horned Beetles (Cerambycidae) » Flower Longhorns (Lepturinae) » Rhagolini » Stenocorus » Stenocorus vittiger". The main content area shows a large photograph of a longhorned beetle on a yellow flower. The photo number "Photo# 1000000" is circled in red. Below the photo, it says "Stenocorus MER" and "© Marlin E. Rice (1500x880)". At the bottom, it says "longhorned beetle - Stenocorus vittiger".

Marlin Rice's photo of a longhorned beetle was the one-millionth submission on BugGuide!

Krell is ESA Science Policy Fellow

Rayda Krell writes: I never would have predicted my current career path. I was in graduate school in Larry Pedigo's Lab in the late 1990's (M.S. 1999, Ph.D. 2002). My current job depends on remote communication with collaborators, so it's easy to forget that Google was not launched until 1998! I work as an independent consultant in entomological and agricultural communications and I depend on the internet for research and web conferences. My primary client is Dow AgroSciences and I work for their Global Technology Transfer group to develop online training for their employees.

As a graduate student, I wanted to work in extension, and essentially my current job fulfills that goal. I always enjoyed writing, and it is a major component of my work. On occasion I have edited entomology research manuscripts and one time I worked with a children's book publisher to fact-check a book about "gross bugs." I enjoy the diversity of what I do and I am lucky to work with outstanding people.

Another aspect of my work has been entomology outreach. I taught an after school entomology class, I have done several programs for girl scouts, and I often do short visits in classrooms. Over the past few years, I have amassed my own outreach supplies including a population of approximately 60 Madagascar hissing cockroaches, an insect racetrack, and a dozen insect nets. A theme in any of my success has been



Rayda Krell promoting insects to Girls Scouts.

staying highly involved with the ESA by attending the annual meeting and serving on various committees. Because I work independently, my contact with entomologists through ESA is key to learning about research trends and expanding my entomological network.

I also serve on the board of the Entomological Foundation. I recently was accepted into ESA's Science Policy Fellows program to receive training about how to advocate for entomological policy with policy makers. I look forward to this new opportunity to contribute to entomology.

Other Alum News

Phil Mulder (Ph.D. 1984) is Professor and Department Head of Entomology and Plant Pathology at Oklahoma State University. In 2015, he will serve as ESA President.

Paula Davis (M.S. 1986, Ph.D. 1990) works for DuPont Pioneer and is serving as President for the ESA North Central Branch meeting in 2015.

Von Kaster (M.S. 1980, Ph.D. 1983) is a senior project manager for Syngenta in Slater, IA. He is co-Chair of the Program Committee (along with **Tom Sappington**) for the 2015 ESA Meeting in Minneapolis, MN.

Steve Longwell (B.S. 2011) is the new staff entomologist and sales representative for Precision Chemical & Equipment in Baton Rouge, LA.

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 and social events. Also, find updates and hear about fun entomological news by "liking" us on our Facebook page, www.facebook.com/ISU.Entomology.

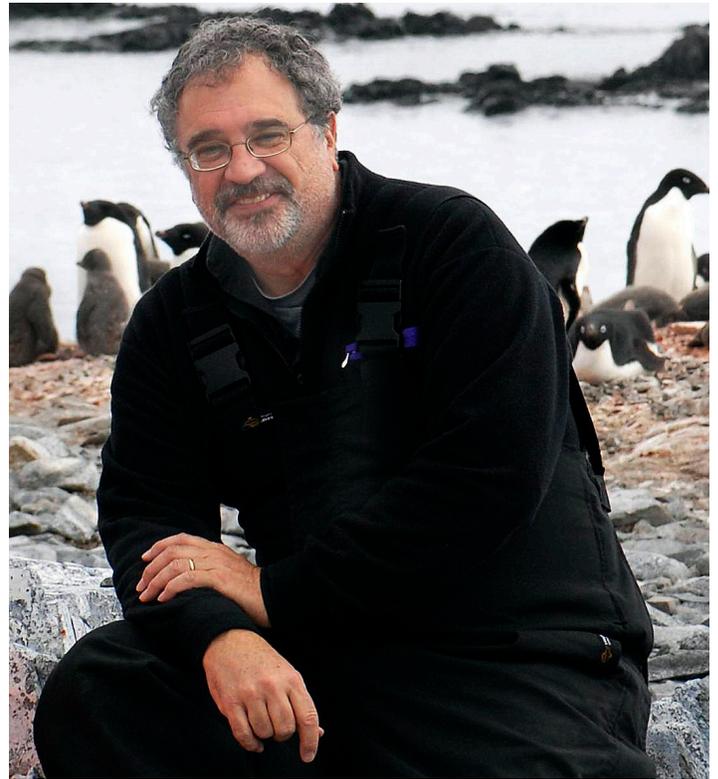
The Facebook logo, consisting of the word "facebook" in white lowercase letters on a blue rectangular background.

Denlinger Invited Presidential Seminar Speaker

David Denlinger, Distinguished University Professor at The Ohio State University, and member of the National Academy of Sciences, presented a department seminar in September titled "Surviving Antarctica: an insect perspective." Although insects are among the dominant forms of life on most continents, only one insect, a wingless midge, *Belgica antarctica*, is endemic to Antarctica. The midge is locally abundant but has a patchy distribution along the Antarctic Peninsula. This insect has a remarkable set of adaptations allowing it to survive not only low temperatures, but also desiccation, UV radiation, and extremes of salinity and pH.

The seminar highlighted the environment of the midge and the field site at Palmer Station. Denlinger discussed experimental results demonstrating the physiological and molecular adaptations used by the midge to survive in this hostile environment. A recent sequencing project indicated that this midge has the smallest genome yet described for an insect which opens new doors for discovery of the mechanisms used by the midge for survival.

Denlinger received his B.S. degree in Zoology from the Pennsylvania State University and his Ph.D. in Entomology from the University of Illinois in 1971. He was a postdoctoral associate with Professor Jan de Wilde at Wageningen University (1971–72), a Research Scientist



David Denlinger in Antarctica

at the International Centre of Insect Physiology and Ecology in Nairobi, Kenya (1972–74), and a Research Associate at Harvard University (1974–76) before starting at OSU. His research is supported by the National Institutes of Health, the USDA, and the National Science Foundation.



Belgica antarctica, photo by Richard E. Lee, Jr.

Did you know?

Our department has the second largest collection of entomology-related papers in the Digital Commons Network. The Digital Commons Network provides free access to full-text scholarly articles and other research from hundreds of universities and colleges worldwide. To see a pie chart with all contributing institutions, visit <http://network.bepress.com/institutions/life-sciences/entomology/>



Digital Commons Network™

Open Access. Powered by Scholars. Published by Universities.™

Chambers Gives Dahm Lecture for 2014

The 2014 Paul A. Dahm Memorial Lecture was presented by Janice Chambers from Mississippi State University in April. Chambers is a William L. Giles Distinguished Professor and Director of the Center for Environmental Health Sciences in the College of Veterinary Medicine. She received her B.S. in Biology from the University of San Francisco and her Ph.D. in Animal Physiology from Mississippi State University.

Her seminar was titled "Novel neuroprotectants for organophosphate toxicity: saving lives and saving brains." Neurotoxic organophosphate (OP) insecticides and nerve agents arose from the same chemical technology about the time of World War II. Both groups of insecticides exert toxicity by inhibiting the critical nervous system enzyme acetylcholinesterase that normally rapidly hydrolyzes the neurotransmitter acetylcholine. When acetylcholinesterase is persistently inhibited by OPs, hyperexcitability in cholinergic pathways results in potentially life-threatening signs of poisoning. Some of the OP insecticides are highly toxic and are also a con-

cern for deliberate or accidental poisonings of humans. Chambers' Lab has invented a series of novel nucleophiles that have antidotal potential against the toxic effects of some OP compounds. These novel nucleophiles demonstrate two mechanisms of antidotal action that are distinct from currently approved antidotes, and have the potential to be developed into more effective therapeutics.

Chambers' current research activities involve health disparities of legacy pesticides with the prevalence of type 2 diabetes, as well as the development of novel antidotes to OP anticholinesterase insecticides and nerve agents.



Janice Chambers

Groves Presents 2014 Gunderson Lecture



Russell Groves

What do big data, potatoes and aphids have in common? This is not a set up for a really esoteric joke, but the premise of Russell Groves' seminar "Using grower-driven and publicly held data to resolve IPM problems in agricul-

ture." Groves is Vegetable Extension Specialist and Associate Professor at University of Wisconsin-Madison. His seminar in November was a bit of a homecoming, as he received his B.S. in Forestry in 1989 at ISU. During the introduction of his seminar, he reflected fondly about his experiences with forest entomologist **Elwood 'Woody' Hart**. He completed his M.S. at the University of Arkansas and Ph.D. at North Carolina State University. Groves focuses on insect vectored diseases of vegetables. He shared part of his

research program with our department in which climate data and the aphid suction trap network help potato farmers in Wisconsin grow virus-free seedling potatoes. By combining these two data sets, Groves developed a model to predict when to apply insecticide to limit aphid-vectored virus transmission. Although potato production in Iowa is not a substantial part of our agricultural system, producing IPM programs that employ models to predict pest outbreaks is something we have in common with Groves' research and extension.

Did you know?

Some of our departmental seminars are recorded and posted online on our departmental YouTube Channel. Anyone can watch the videos free of charge from a computer or tablet. Visit the ISU Entomology seminar website www.youtube.com/user/iowastateentomology, to see the topics and speakers.

EGSO Sponsors Hiltpold Seminar

As part of the Entomology seminar series, the Entomology Graduate Student Organization (EGSO) sponsored Ivan Hiltpold from University of Missouri. Ivan is a native of Switzerland where he completed his M.S., Ph.D., and a post-doc at the University of Neuchâtel. He moved to the U.S. in 2012 for additional Postdoctoral research with Bruce Hibbard's Lab at the University of Missouri. Hiltpold's research combines entomology, nematology, sustainable agriculture and chemical ecology to better understand belowground tritrophic interactions – or what he described as a “black box” in crop science.

The seminar included results from both lab and field studies, including one which showed an induced fitness cost in Bt-resistant western corn rootworm exposed to entomopathogenic nematodes. Another study showed that some varieties of corn can produce volatiles upon herbivory that can serve as nematode attractants, and thereby increasing the odds of pest suppression. Similar root exudates can simultaneously induce plant-pathogenic nematodes into quiescence while exciting the entomopathogenic nematodes to seek prey.



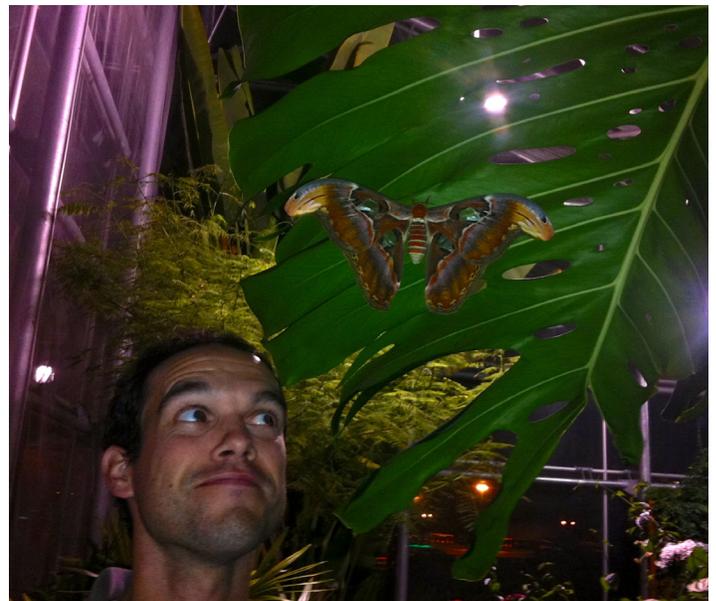
Ivan Hiltpold

Summary of EGSO Activities

The Entomology Graduate Student Organization (EGSO) established officers for the 2014-2015 academic year. The current officers are the following: Eric Clifton (President), Vurtice (Vic) Albright (Vice President), Edmund Norris (Treasurer), Kenneth Masloski (Secretary), and Aubrey Paolino (GPSS representative). The roster for the next year will be put to a vote in May 2015.

One goal for EGSO is to host a seminar speaker every spring. We propose nationally-recognized entomologists often noted at ESA meetings, and students end up taking a vote. The 2014 speaker was Ivan Hiltpold (see above). The sponsored speaker for 2015 will be Joe Spencer from University of Illinois, who will share his research on western corn rootworm and interact with graduate students during his visit.

We also coordinate an annual Insect Film Festival to promote insect education in Ames every fall. The event was in October at Reiman Gardens. In addition to showcasing the movie “Ant Bully,” EGSO members showcased larger-than-life arthropod specimens from the Insect Zoo,



Mike Dunbar providing tour of the Butterfly Wing.

helped visitors with bug-themed crafts, and gave tours of the Christina Reiman Butterfly Wing. Attendance was fantastic again this year, with more than 80 attendees.

ISU Student Awards

Three graduate students won ISU Research Excellence Awards in 2014. **Mike McCarville** in Entomology, **Aaron Gross** in Toxicology, and **Diveena Vijayendran** in Genetics. The purpose of these awards is to recognize graduate students for outstanding research accomplishments as documented in their theses and dissertations. These students are also expected to be academically superior and able to not only do research, but develop a well written product. The intent of this program is to recognize “the best of the best” graduating students who have submitted theses and dissertations.

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

The Entomology Alumni Scholarship for undergraduates or graduates in entomology was presented to **Eric Clifton**. This \$1,000 scholarship was awarded based on promise for a career in entomology. Eric is co-advised by Aaron Gassmann and Erin Hodgson. Read more about Eric’s research on page 16.

The Jean L. Laffoon Memorial Scholarship for \$1,000 was presented to **Coy St. Clair**. 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 Aaron Gassmann.

The Larry Pedigo Graduate Scholarship in Entomology was awarded to **Mike Dunbar**. This scholarship of \$2,000, established to honor the many contributions of Larry Pedigo to the depart-

ment and college, recognizes scholarly performance. Mike is co-advised by Aaron Gassmann and Matt O’Neal.

The Wayne A. Rowley Scholarship in Entomology, which provides \$2,500 to students with preference given to applicants concentrating on medical entomology, was awarded to **Edmund Norris**. Edmund is supervised by Joel Coats.

The Henry and Sylvia Richardson Research Incentive Grant was awarded to **Isai Madriz**. This grant provides \$1,500 towards a research experiences beyond those available in the student’s degree program. Isai is supervised by Greg Courtney.

The Jim Oleson Scholarship in Entomology, which provides \$1,500 to students who demonstrate academic promise and initiative, was awarded to **Adam Varenhorst**. Adam is advised by Matt O’Neal. Read more about Adam’s research on page 15.

At the ISU Graduate and Professional Student Research Conference in April, **Cody Kuntz** was awarded best presentation in his session and third place overall. Cody is advised by Matt O’Neal. **Adam Varenhorst** also received best presentation in his session.



Cody Kuntz



Eric Clifton



Mike Dunbar



Coy St. Clair



Isai Madriz

ESA Student Awards

Mike McCarville was the 2014 recipient of the ESA North Central Branch J. H. Comstock Graduate Student Award. The Comstock Award is given to one graduate student from each branch to promote interest in entomology at the graduate level.

At the 2014 ESA North Central Branch meeting in March (Des Moines, IA), ISU students were awarded the most student competition prizes of any institution, including the following students:

Mike Dunbar, third place for a P-IE Session Ph.D. paper "Effect of crop management on root injury, adult abundance, and susceptibility to Bt toxins on western corn rootworm."

Lisa Fraser, second place for SysEB-MUVE Session Ph.D. paper "An *in vivo* RNAi approach to disrupt development in the filarial worm, *Brugia malayi*." Lisa is advised by Lyric Bartholomay.

Aaron Gross, first place for PBT Session Ph.D. paper "The southern cattle tick tyramine receptor: a potential target of biopesticides." Aaron was advised by Joel Coats.

David Ingber, first place for P-IE Session M.S. paper "Inheritance and fitness costs of Bt resistance in field-derived strains of western corn rootworm." David was advised by Aaron Gassmann.

Mike McCarville, second place for a P-IE Session Ph.D. paper "Is pyramiding resistance the answer for soybean aphid management?"

Edmund Norris, third place for a SusEB-MUVE Session Ph.D. paper "Using natural compounds to control mosquito populations: efficacy of plant essential oils against the African malarial and the yellow fever mosquito."

Michael Rausch, first place, for a SysEB-MUVE-PBT Session M.S. paper "Bt toxin engineering to promote protoxin activation in the aphid gut." Michael was advised by Bryony Bonning.

Megan Harrison, third place, for B.S. poster "Transmission of *Polistes* vibrational signals across the nest." Megan is advised by Amy Toth.

Kate Russell, first place for a B.S. paper "Evaluation of a natural product for protection of roses from Japanese beetles." Kate was co-advised by Matt O'Neal and Russ Jurenka.

Adam Varenhorst, second place for P-IE Session Ph.D. paper "Do biotype-1 soybean aphids benefit from the presence of biotype-2 on resistant soybean?"

At the 2014 National ESA meeting (Portland, OR) in November, two ISU students received paper competition prizes:

Adam Varenhorst, first place for P-IE Session paper "Does induced susceptibility occur between virulent and avirulent soybean aphids on resistant soybean?"

Mike Dunbar, runner up for P-IE Session paper "Effect of crop management on root injury and adult abundance of western corn rootworm."



Top (L to R): Angela Rovnyak, John Wheelock, Edmund Norris, David Ingber, Michael Rausch, Adam Varenhorst, and Kate Russell.
Bottom (L to R): Aubrey Paolino, Lisa Fraser, Cody Kuntz, Mike Dunbar, Vurtice Albright, Tyler Stallman, and Mike McCarville.

Graduations

Mike McCarville received his Ph.D. in Entomology with Matt O'Neal in the spring of 2014. He also earned a minor in Plant Pathology. His dissertation was titled "Integrating soybean aphid and soybean cyst nematode management." Mike is currently a seed growth and technical service representative for Bayer CropScience in Iowa.

Diveena Vijayendran received her Ph.D. in Genetics with Bryony Bonning in the spring of 2014. Her dissertation was titled "Aphid small RNAs and viruses." Diveena is now working as a Postdoc at Harvard Medical School in RNA interference with immortal jellyfish.

Aaron Gross received his Ph.D. in Toxicology with Joel Coats in the summer of 2014. He also earned two minors in Entomology and Neuroscience. Aaron's dissertation was titled "Botanical pesticides: identification of a molecular target and mode of action studies." Aaron is currently a Postdoctoral Research Associate at the University of Florida in Gainesville, FL.

David Ingber received his M.S. in Entomology with Aaron Gassmann in the summer of 2014. His thesis was titled "Characterization of Cry3Bb1 resistance in field-derived strains of western corn rootworm (Coleoptera: Chrysomelidae).

Cody Kuntz received his M.S. in Entomology with Matt O'Neal in the fall of 2014. His thesis was titled "Investigating effects of surrounding landscape composition and complexity on populations of two polyphagous insect pest groups in Iowa soybean." Cody is a production scientist in the High Throughput Quality Control unit at Integrated DNA Technologies in Coralville, IA.



Mike McCarville, Diveena Vijayendran, and Aaron Gross

Michael Rausch received his M.S. in Microbiology with Bryony Bonning in the fall of 2014. His thesis was titled "Modification of the Bt toxin Cry4Aa for improved toxin processing in the gut of the pea aphid (*Acyrtosiphon pisum*)."

Michael Joseph Wheelock received his M.S. in Sustainable Agriculture and Entomology with Matt O'Neal in the fall of 2014. His thesis was titled "Insect pollinators in corn and soybean agricultural fields."

Andrew Fasbender received his Ph.D. in Entomology with Greg Courtney in the fall of 2014. His dissertation was titled "Phylogeny and diversity of the phantom crane flies (Diptera: Ptychopteridae)." Andrew is currently working for Rhithron Associates, Inc, an environmental consulting firm in Missoula, MT.

Keep in touch! Send your best insect photographs and entomology inspirations for our next newsletter.

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 and staff. This newsletter and previous issues are available online at www.ent.iastate.edu/alumni.

For the *Events of 2015* issue, we hope to highlight some of your best insect photographs. We will also post your photos on our departmental Facebook page. In addition, it would be great if you could send your "entomology inspiration" to be included as well. See page 22 for some examples.

Featured Graduate Student: Adam Varenhorst

Adam Varenhorst writes: My interest in entomology began during my childhood on my family's farm in northwest Iowa and further developed while I was working on my undergraduate degree at Briar Cliff University. While at Briar Cliff, I conducted a summer research project under the supervision of my advisor Dr. Ted Wilson. The summer project and assisting Dr. Wilson with the lab portion of his entomological course helped me decide to continue following my interest in entomological research. After graduating with my B.S. in Biology in 2009, I started my graduate student career in the Entomology Department at ISU. I completed my M.S. in Entomology in 2011 in Dr. Matthew O'Neal's Lab, and I stayed with O'Neal to begin working on my Ph.D. The focus of my research has always been the management of the soybean aphid, but the methods of managing the soybean aphid have changed between my M.S. and my Ph.D. research.

My current research is focused on investigating the interactions that occur between different soybean aphid biotypes (populations differentiated by their ability to overcome different sources of host plant resistance) on both susceptible and resistant soybean. In addition to conducting research, I have also been a teaching assistant for multiple years for both the Insect Biology course and Entomology and Pest Management course. During the summers of 2013 and 2014, I was the mentor to an undergradu-



Adam Varenhorst

ate student who was interested in conducting a research project in entomology, and a George Washington Carver high school scholar who was interested in learning more about entomology. My future plans include graduating in May 2015, and starting the next chapter of my professional career.

I would like to take this opportunity to thank all of the members of the entomology department for making my time at ISU memorable and helping me to achieve my goals.

Undergraduate Club is Revived (Again)

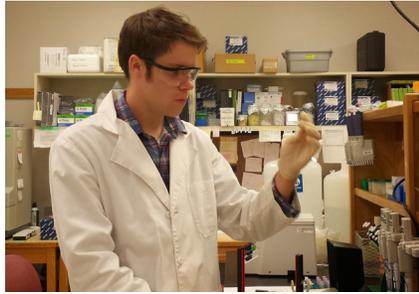
Several undergraduates have restarted the Undergraduate Entomology Club. Despite not offering an undergraduate major in Insect Science anymore, several students wanted to restart the club. There are eleven enthusiastic current club members. Maybe they will make it onto the Tonight Show with Jay Leno? The President is Andrew Guinness, the Treasurer is Brittany Clark, and the Secretary is Taylor Best. The club advisor is Dr. Russell Jurenka. The club has already been active, including hearing about forensic entomology from Dr. Ken Holscher and attending a STEM event in Marshalltown, IA. They have future plans that include attending the NCB-ESA meeting in Manhattan, KS in 2015.



Members of the new Undergraduate Entomology Club.

Clifton Uses Richardson Grant in Montana

Eric Clifton writes: Sidney, MT has changed quite a bit since my last visit four years ago. The oil boom in the region has provided a flood of new business.



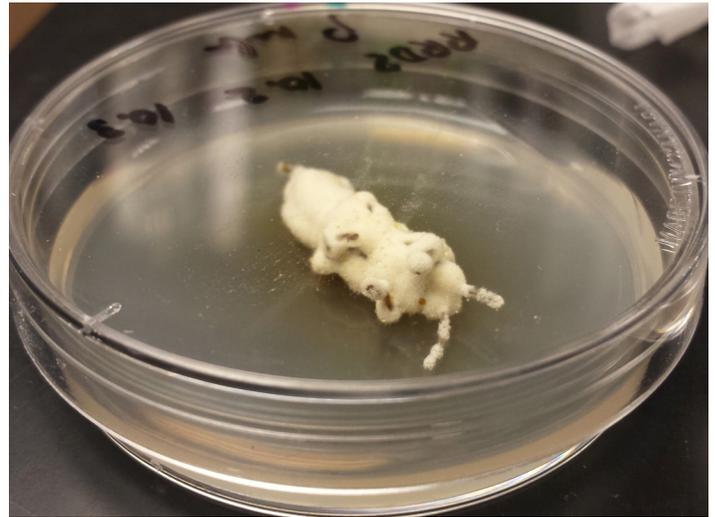
Eric Clifton

The first days in lab focused on DNA extraction and polymerase chain reactions (PCR) with insect-pathogenic fungi. John Gaskin and Kimberly Mann provided patient and attentive instruction at every step. It was quite satisfying to see my gels produce strong bands at the end. Success! We also had an open discussion about the phylogeny of these insect pathogens and the best methods for sequencing samples.

My other days in Sidney were spent with Stefan Jaronski organizing and culturing his growing collection of fungal isolates taken from grasshoppers and wheat stem sawflies. We also worked on liquid cultures of fungal isolates, solid state fermentation, and plant tissue sterilization. Between experiments, the two of us carried out some very critical discussions about potential

research and the outlook of biological control and crop protection with microbes.

The experiences in Sidney were invaluable to my research objectives and helped to broaden my skill set in the fields of entomology, mycology and genetics. I look forward to my future work and feel humbled by the new technologies that will advance some of our deepest scientific curiosities. I'm thankful that the Henry and Sylvia Richardson Research Incentive Grant helped fund this adventure.



Grasshopper killed by Beauveria fungus.

Gross Goes to Texas for Richardson Grant

Aaron Gross writes: I was a fortunate recipient of the Henry and Sylvia Richardson Research Incentive Grant in 2012. This incentive grant afforded me the opportunity to perform research with two collaborating laboratories with the USDA-ARS. Specifically, I was able to travel to the Knipping-Bushland U.S. Livestock Insect Research Laboratory in Kerrville, TX, along with the Cattle Fever Tick Research Laboratory in Edinburg, TX. The goal of the research was to study a nervous system target, using post-transcriptional gene silencing, in the southern cattle tick, *Rhipicephalus microplus*, as a potential target for acaricide development. The Henry and Sylvia Richardson Research Incentive Grant allowed me to have a hands-on experience with the southern cattle tick, which is restricted to a quarantine zone near the Texas-Mexico border, while allowing me to learn new molecular techniques. Additional funds for this research were provided by the USDA-ARS.



Southern cattle tick females with eggs.

Opportunities to Contribute to Entomology

With budget constraints at Iowa State University, the Department of Entomology 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
- Bug Guide: 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 Expands Learning Opportunities

Ginny Mitchell writes: The Insect Zoo had a busy year (like always). We traveled over 11,000 miles this past year! Iowa truly is a beautiful state, and the kids here LOVE big bugs!

We installed a honey bee observation hive on the 4th floor of the Science II this spring. The hive was set up with a webcam that can be accessed by the public. Unfortunately, the bees froze in September – who knew that it would get so cold during that time! The hive will have a new colony spring 2015 and the webcam will be up and running at that time. You can visit the webcam at beecam.ent.iastate.edu the beginning of April.

The Insect Zoo hosted several birthday parties this year. Butterfly wing mosaics have been a real hit with the kids, and moms like them more than the maggot art! We use real butterfly wings donated by Reiman Gardens to make beautiful butterflies. The kids learn about the diversity of colors in butterflies and how the different markings help the butterflies! It is a great addition to our birthday parties, and some schools have requested this art component.

Continued on page 20



Student worker, Ashley Reed, shows off the new shirts.

IWGO Meets in Chicago

For the first time since 1974, the International Working Group on *Ostrinia* and other Maize Pests (IWGO) met in the U.S. when it convened in Chicago during April. This was the 25th meeting of the IWGO, where scientists gather to discuss and present their latest research on corn insects.

This conference was unique in that it included official participation by the NC-205 (main focus on corn borers) and NCCC-46 (main focus on rootworms) technical committees. The *Diabrotica* Genetics Consortium also integrated its 4th international conference within the larger IWGO meeting, as it had in Freiburg (2011) and Munich (2009). The conference was supported by an AFRI Conference grant to **Tom Sappington** which was used to help delegates with their travel. Over 100 scientists attended from 15 countries, and included **Aaron Gassmann, Erin Hodgson, Rick Hellmich, Brad Coates, Sijun Liu, Kyung Seok Kim, and Tom Sappington** from ISU. As an IWGO co-Convenor, and being from the same continent as Chicago, Sappington was in charge of “local” arrangements, which meant the group simply had to attend a major league



Tom Sappington

baseball game (insistently called a “match” by the Europeans) one frosty evening. **Marlin Rice**, while enjoying a beverage just beyond the right field fence, was in the right place at the right time to have a home run ball by White Sox slugger Adam Dunn go through his hands and bounce off his chest! However, No-Hands Rice promptly retrieved it and now the ball sits at his home.

2014 Arrivals and Departures

Bryony Bonning's Lab has five new members and two departing members. **Yuting Chen** is a Postdoc working on virus discovery. Yuting has an M.S. in Plant Pathology from China Agricultural University and Ph.D. from The Ohio State University. **Biviana Flores-Escobar** is a Postdoc working on Bt toxin engineering. She has an M.S. and Ph.D. in Biochemistry from Universidad Nacional Autonoma de Mexico. **Purushottam Lomate** is a Postdoc working on stink bug physiology. Puru has a B.S., M.S. and Ph.D. from BAM University in India. **Mariah Kemmerer** is a graduate student in Microbiology working on virus movement across the insect gut. **Jan Seibel** is a Program Coordinator I and Center Coordinator for CAMTech. Jan has a background in the biological sciences having worked in several labs across ISU colleges during her career. **Nanasaheb Chougule** was a Postdoc, and now works for Bayer CropScience in Research Triangle, NC. **Divya Sinha** was a Postdoc, and now is a Postdoc at the Waisman Center, University

Wisconsin-Madison on stem cell differentiation and retinal development.

Aaron Gassman's Lab has three new members. **John Doudna** is a Postdoc with a B.S. in Conservation from Muskingum College, M.S. in Ecology and Systematics from San Francisco State University, and Ph.D. in Ecology, Evolution and Organismal Biology from ISU. **Kenneth Masloski** is a graduate student with a B.S. in English from University of Maine and an M.S. from Oklahoma State University. **Coy St. Clair** is a graduate student with an M.S. from Murray State University.

John Rearick (ISU B.S. Management Information Systems 2006) is a new Systems Analyst II with John VanDyk and the IT group.

Lyric Bartholomay, Associate Professor, left the department in August and began working in the Department of Pathobiological Sciences at the University of Wisconsin-Madison.

Yashdeep Phanse was a Postdoc with Lyric Bartholomay, and continues to work with her at the University of Wisconsin-Madison.

In Memoriam: Richard C. Back

From the ESA website: Richard C. Back, 91, died peacefully March 31, 2013, at the Masonic Care Community in Utica, NY. Richard had previously resided in Irvington, NY, Washington, DC, Jacksonville, FL, and Raleigh, NC. Richard was born in Washington, DC in 1921. He attended Cornell University for his B.S. in Entomology, and was in the Delta Sigma Phi fraternity.

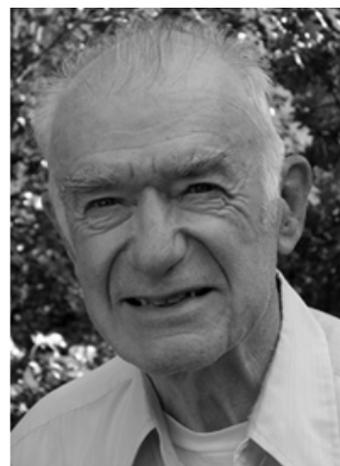
He served for three years in the South Pacific during World War II in the US Navy Reserves as a pharmacist's mate aboard the USS Boötes AK-99, receiving a Battle Star (1944). He continued his Naval service as a medical entomologist in NC and FL, and received his commission as an Ensign, and subsequently as Lieutenant, prior to his honorable discharge. He then returned to the formal study of entomology and insect toxicology, earning an M.S. from ISU (1948) and a Ph.D. from Cornell University (1951).

In a professional career that spanned 35 years, Back worked as an entomologist developing and registering agricultural products first for the Ethyl Corporation at the Boyce Thompson Institute, and then for the Union Carbide Corporation. In recognition of his long service to the latter, he was named a Corporate Development

Fellow in 1974. His long service to the National Agricultural Chemical Association was recognized with his award of "Outstanding Contributor" in 1973.

Away from work, Dick enjoyed gardening, walking, fishing, photography and stamp collecting. He volunteered his time to the Boy Scouts, the Irvington (NY) Presbyterian Church, various PTA's, and the Men's Garden Club of Wake County, NC. He was a Master Gardener in the Men's Garden Club of America. An avid naturalist, he enjoyed sharing trips with his children and grandchildren to zoos, museums, and the North Carolina Coast.

Richard was preceded in death by his wife of 63 years, Laura Anne Heffelfinger Back. He is survived by his four children, seven grandchildren, and most recently one great-granddaughter.



Richard Back

Dunphy Merges Insects and Acting

For the past few years, Research Associate and Medical Entomology Lab manager, **Brendan Dunphy** has been finding ways to merge his lives in entomology and entertainment. In 2011, his relationship with Discovery Communications began, and so did the fulfillment of his childhood dreams to host educational television programs on animals. His work has been showcased on such networks as Animal Planet, Science Channel and BBC.

He is now making the jump to popular publishing as an insect consultant and expert on BUGOPEDIA, an upcoming educational book on insects, targeted for children aged 8-12. It will be released by the Discovery Channel in 2015 and is aimed at getting kids interested in bugs. "It's meant to give children an introduction to

the world of insects (and arthropods), so it highlights some of the more fascinating biological facets of the featured animals. It's also stocked with a bunch of striking photos that showcase the beauty of these creatures, which is important in cultivating an appreciation for them at a young age." This is the fourth installment in the Discovery Channel's recent animal book series that began with SHARKOPEDIA, inspired by the TV network's wildly successful Shark Week.

Brendan started his entertainment career in 2005 when he auditioned for ISU's stage production of James and the Giant Peach and was cast as James; coincidentally, three of John VanDyk's children recently wrapped up the same production with Story Theater Company of Ames. This first play was about a boy surrounded by bugs, and seems to be quite fitting, perhaps even a premonition, of what was to come. Brendan just returned to the stage in December with Goldfinch Theater Company's production of Macbeth in Des Moines, IA. For more information on Brendan and his upcoming performances, visit his website at www.brendandunphy.com.



Brendan in Macbeth.



Brendan on set hosting Insect Dissection: How Insects Work for Science Channel and BBC. Photo by Emilien Leonhardt/Hirox.

Continued from page 18

Micaela Zagar, a senior in animal ecology, was promoted to rearing room specialist. She also attended the Invertebrates in Education and Conservation Conference with me this past July. Together we collected lots of animals and learned even more about rearing our precious arthropods. We even have plans to bring in some giant long-legged katydids in the spring. These guys are huge AND loud!

This past year we lost our student worker Jaclyn Sanchez due to that pesky graduation thing that happens. She will be missed, but we have

five great student workers right now: Micaela Zagar, Jay Walsh, Ashley Reed, Josh Byrne and Drake Falcon. The Insect Zoo could not run without them. Thank you!

The first of six Insect Zoo t-shirts is now available. Josh Byrne is an excellent biological artist and illustrated the insect designs. You can place your order by e-mailing the Insect Zoo at zoo@iastate.edu or stopping into 339 Science II and filling out the order form. All shirts are \$20.

As always, thank you to every one who supports the Insect Zoo.

Selected Publications from 2014

- Bonning, BC, N Pal, S Liu, Z Wang, S Sivakumar, GF King, and WA Miller. 2014. Toxin delivery by the coat protein of an aphid-vectored plant virus provides plant resistance to aphids. *Nature Biotechnology* 32: 102-105. DOI: 10.1038/nbt.2753.
- Carrillo-Tripp, J, EN Krueger, RL Harrison, AL Toth, WA Miller, and BC Bonning. 2014. *Lymantria dispar* iflavirus 1 (LdIV1), a new model to study iflaviral persistence in lepidopterans. *Journal of General Virology* 95: 2285-96.
- Courtney, GW and PS Cranston. 2015. Section VI: Phylum Arthropoda. Chapter 40: Order Diptera, pp. 1043-1058. *In*: JH Thorp and DC Rogers (eds). Thorp and Covich's Freshwater Invertebrates Volume I: Ecology and General Biology. Academic Press, London, UK.
- Dunphy, BM, WA Rowley, and LC Bartholomay. 2014. A taxonomic checklist of the mosquitoes of Iowa. *Journal of the American Mosquito Control Association* 30: 119-121.
- Hellmich, E, T Nusawardani, L Bartholomay, and R Jurenka. 2014. Pyrokinin/PBAN-like peptides in the central nervous system of mosquitoes. *Cell and Tissue Research* 356: 39-47.
- Hodgson, EW, R Wright, M Gray, T Hunt, K Ostlie, and D Andow. 2014. Farmer response to resistance issues in corn rootworm to Bt Corn: qualitative analysis of focus groups. *Journal of Extension*, www.joe.org/.
- Gassmann, AJ, JL Petzold-Maxwell, EH Clifton, MW Dunbar, AM Hoffmann, DA Ingber, and RS Keweshan. 2014. Field-evolved resistance by western corn rootworm to multiple *Bacillus thuringiensis* toxins in transgenic maize. *Proceedings of the National Academy of Sciences USA* 111: 5141-5146.
- Liu, S, D Vijayendran, J Carrillo-Tripp, WA Miller, and BC Bonning. 2014. Analysis of new aphid lethal paralysis virus isolates suggests evolution of two ALPV species. *Journal of General Virology* 95: 2809-19. DOI: 10.1099/vir.0.069765-0.
- McCarville, MT, ME O'Neal, BD Potter, KJ Tilmon, EM Cullen, BP McCornack, JF Tooker, and DA Prischmann-Voldseth. 2014. One gene versus two: a regional study on the efficacy of single gene versus pyramided resistance for soybean aphid management. *Journal of Economic Entomology* 107: 1680-1687.
- Petzold-Maxwell, JL, BD Siegfried, RL Hellmich, CA Abel, BS Coates, TA Spencer, and AJ Gassmann. 2014. Effect of maize lines on larval fitness costs of Cry1F resistance in the European corn borer. *Journal of Economic Entomology* 107: 764-772.
- Rand, TA, DK Waters, SL Blodgett, JJ Knodel, and MO Harris. 2014. Increased area of a highly suitable host crop increases herbivore pressure in intensified agricultural landscapes. *Agriculture, Ecosystems and Environment* 186: 135-143.
- Romine, NM, JM Gallup, RJ Martin, and JK Beetham. 2014. Transcriptomic evaluation of the nicotinic acetylcholine receptor pathway in levamisole-resistant and -sensitive *Oesophagostomum dentatum*. *Molecular and Biochemical Parasitology* 193: 66-70.
- Sappington, TW. 2014. Emerging issues in integrated pest management implementation and adoption in the North Central USA, pp. 65-97. *In*: R Peshin and D Pimental (eds.), *Integrated Pest Management – Experiences with Implementation, Global Overview*, Vol. 4. Springer Science+Business Media, Dordrecht.
- Sappington, TW and CS Burks. 2014. Patterns of flight behavior and capacity of unmated navel orangeworm (Lepidoptera: Pyralidae) adults related to age, gender, and wing size. *Environmental Entomology* 43: 696-705.
- Toth, AL, JT Tooker, SR Radhakrishnan, R Menard, MT Henshaw, and CM Grozinger. 2014. Chemical and transcriptomic signatures of dominance in *Polistes metricus* wasps. *BMC Genomics* 15: 75.

What Was Your Entomology Inspiration?

Joel Coats: I grew up on a farm and was outdoors all the time. One summer in high school I took entomology for my 4-H project. As an undergraduate at Arizona State University, I worked for an Entomology USDA Research Station on lettuce pests.

Matt O'Neal: Insects crept me out until the spring of 1990. Two things came together to get me over this; science and the Peace Corps (PC). As a undergraduate at the University of Illinois, it was required for students to conduct research projects. As others were planning for graduate and med-school, I was hoping to get accepted into the PC. The recruiter at U of I suggested getting a B.S. in science. Thanks to a seminar that paired faculty with undergraduates, I got the opportunity to work with Gene Robinson. He was/is a great teacher, and after a summer and four semesters in his lab, I was fascinated by honey bees and thought I knew enough about beekeeping to think I could do it in West Africa (I didn't). Although I was accepted into the PC, they weren't interested in my beekeeping skills. I taught high school biology in Ghana and watched crops around me suffer from a variety of insects. I thought working with agricultural pests might get me employed faster as a scientist. I'm still fascinated by bees, and recently got the opportunity to study them in soybean. Things have come full circle. If only my passion to play for the U.S. national soccer team would also come full circle.

Brendan Dunphy: A wise man once asked me to define "entomologist." Because I knew that anybody in entomology should be able to answer this question, I confusingly answered, "Someone who studies insects..." He responded, "It's a biologist with a job." How's that for inspiration?! That was Wayne Rowley, former medical entomologist at ISU, around the time of his retirement. Merely obtaining a job with Lyric Bartholomay back in 2006 was certainly an integral part of me specializing in insects through these early professional years, but the interest is certainly what has kept me here. When I learned that mosquitoes are by far the deadliest animals on the planet, even compared to us, I had immediate, unending respect for them. Their highly specialized anatomy and behavior along with their complex life cycles, often in combination with even

more complex life cycles of disease agents that they harbor, is enough to make your head spin... or to at least spend a lifetime studying them!

Bryony Bonning: I have always been interested in animals. During my undergraduate degree in Zoology, my interest in entomology was piqued largely due to an effective instructor - thanks to John H. Anstee! The fact that entomology is the sub-discipline of zoology for which jobs are available was an added bonus.

Tom Sappington: I got hooked on bird-watching in Cub Scouts, and dreamed of being an ornithologist (actually that was my backup plan if being a professional baseball player didn't work out - sigh...). Nevertheless, my first research project was as a Cub Scout, sending a grasshopper up in a small plastic "capsule" on a string dangling from a kite, and writing down the immediate after-effects of high altitude flight on a clipboard. Groggy, disoriented, a lot of tobacco juice on Kleenex were the results. I worked part-time as an undergraduate in the lab of William Peck at Central Missouri State University, sorting through collections of spiders to separate them out by apparent species before he identified them and entered them into his collection. After taking his entomology class (he was a great teacher) and making a collection, I discovered that collecting insects was just as fun as collecting birds for my life list. Realizing that there were way more jobs for entomologists than ornithologists, it was a no-brainer to commit to entomology as a career. I still watch birds though...

Amy Toth: The seed was planted for me to become an entomologist when I was a young girl, spending summers at my grandparents' rural property in Connecticut. There, I spent countless hours with my sister and cousins catching anything that moved - some of our favorites included insects, especially bumble bees and water striders. My focus on insects intensified with education - first, learning about the honey bee dance language as an undergraduate, which led me to pursue graduate studies with honey bees, then collecting and taking graduate entomology courses, and finally the clincher - traveling to Costa Rica where the abundance, diversity, and beauty of insects totally blew me away.

Photos From the 2014 NCB-ESA Meeting in Iowa



Larry Pedigo and the Dixie Slicks performed at the Welcome Reception.



Erin Hodgson and Kelly Kyle serving wine for the local tasting contest at the Welcome Reception.



Adam Varenhorst, Matt O'Neal, Mike McCarville, and Patrick Wagner



Ram Shrestha, Siva Jakka, and Pat Weber



Beginning of the 6K Hexapod Scurry fun run.



6K women's winner, Thelma Heidel-Baker and Ava.

Photos From the 2014 ESA Meeting in Portland



Kris Giles, Laura Weiser Erlandson, and Rayda Krell



Tom Baker, Lamar Buckelew, Denny Bruck, and Tim Nowatzki



Jarrad, Ada, and Patti (Anderson) Prasifka



Mike Gray, Von Caster, Kevin Steffey, Joe Funderburk, and Gary Hein



Todd DeGooyer and Scott Hutchins



Tom Turpin and wife, Chris



Joe Wheelock, Adam Dolezal, and Megan Harrison



Paula Davis and Diane Debinski