MICHIGAN STATE UNIVERSITY | Entomology

Bugged

FROM

MSU DEPARTMENT OF ENTOMOLOGY

Spring 2015

Image: Bill Ravlin, MSU

FROM THE CHAIR

I've spent quite a bit of time with Gordon Guyer over the last few months and anyone that's been around Gordon quickly learns the story of DDT and how it impacted MSU Entomology. Elm trees were infested with bark beetles, communities responded with insecticides, earthworms and other organisms consumed the chemicals, robins consumed the earthworms, and, to cut a "long story" short, the challenge or opportunity to address this issue was given to Entomology. The result was many excellent studies on benefits, costs, environmental impacts, resistance, toxicology, behavior, policy, and much more. For MSU Entomology, it attracted dollars, faculty, students, staff and a building, the Pesticide Research Center, later to be called the Center for Integrated Plant Systems (CIPS).

This scenario of need and response has been replayed many times. A few examples include: Mackinaw Island flies (Merritt and Kennedy), Colorado potato beetles (Szendrei), cereal leaf beetles (Haynes et al.), *Anopheles mosquitos* (Dong, Walker, Kaufman) and onion maggots (Miller et al.). Our most recent "opportunity" relates to pollinators and their precipitous decline over the last five to 10 years. Many would immediately point a finger at insecticides, and they may well play a role, but there are many more stresses that come into play and interestingly, Stuart Gage's acoustic ecology framework is useful. In Stuart's framework, he cites three sources for sound: biophony (biological), anthrophony (human or technology) and geophony (environmental). In the pollination world, this equates to biological factors including parasites (*Varroa* mite), diseases (*Nosema*) and even the honey bee genome are implicated. Technological factors such as "transportation stress" are important particularly with the long distance, mass transit systems used today. And, there are many environmental factors that impact pollinators, not the least of which is climate change.

Insect pollinators by the numbers

100 Number of US crops pollinated by bees.

1/3 Proportion of the human diet coming from insect-pollinated plants.

2.5M Number of managed honeybee hives in the United States.

$24B Contribution of pollinators to the US economy.

$9B Contribution of native pollinators to US crop value.

Thus, there is no shortage of entomological issues and over the next few months we will be organizing ourselves around pollinators and seize yet another "opportunity." Carpe diem!

On another front, I mentioned in the Fall *Bugged* newsletter that Entomology is going through a review process. We are nearing completion of the first phase of fact finding and thoughtful analysis. Early in February we held a two-day, facilitated retreat with 40 faculty members, students and staff. This resulted in copious discussions, issues and answers; we are after all academics. Most importantly, we began a discussion regarding the future of our programs, and like the pollinator issue, we hope to seize even more opportunities going forward. The second phase of the process will take place this fall with an external review that will provide feedback and validate our directions and plans. Don't be surprised if we contact you for input.

One of the necessary things we do during reviews is gather numbers. I found it interesting that we're often characterized as a small department, but when you take faculty, students, staff and many others into account, we number over 350 people! Not bad for a "small department." Behind

these numbers is the support we get from MSU, AgBioResearch and MSU Extension. Of special note is the $10 million or so that comes from granting activities of Entomology faculty. Exceptional!

Enough for now. I hope you find many interesting stories in this issue of *Bugged* and please enjoy being *Bugged*!

All the best,

Bill Ravlin,
chairperson

RESEARCH & PROJECTS

Eric Benbow has been awarded a National Institute of Justice grant to study postmortem microbiology in human cadavers. Along with collaborators Heather Jordan (Mississippi State University) and Carl Schmidt (Wayne County Medical Examiner's Office), Benbow was awarded a three-year grant ($843,000) to expand studies of the postmortem microbiome by partnering with Detroit's medical examiner's office. With more study the microbial communities may provide crucial details such as geographical location of death, gender, race, socioeconomic relations and more, said Benbow.

MSU's Integrated Pest Management (IPM) Program has secured $1.7 million for IPM programming in Michigan and the North Central Region. The IPM Program has been awarded a three-year $770,000 USDA NIFA IPM extension grant to deliver resources and advice to farmers and gardeners practicing IPM. The Department of Entomology's **Joy Landis** and **Larry Olsen** are co-project directors of the grant that includes collaborations with MSU Extension's IPM educator Erin Lizotte and IPM/cover crops educator Dean Baas, **Mallory Fournier**, **Beth Bishop** and evaluation specialist Steve Miller. MSU's proposal was ranked in the top five of the 48 projects selected for funding.

In a second award, **Larry Olsen** and **Lynnae Jess** have joined with the University of Illinois for the 14th year to manage the North Central IPM Center. Nearly $1 million annually are awarded competitively by USDA NIFA to coordinate the North Central Region (NCR) information system and fund multi-state priority projects.

Former Entomology Chairperson and Professor Emeritus Mark Scriber reports he was invited to submit and publish the first commentary paper for the British Ecological Society. Commentaries are a new addition to publishing for the society, which has a 100-year publishing history.

See: Scriber, J.M. 2015. Invasive species, disrupted chemical community dynamics and future adaptations: Commentary on Chabaane et al. 2015. Journal of Ecology. 103: 118-120. doi: 10.1111/1365-2745.12348

Zsofia Szendrei, Jason Schmidt and Matt Grieshop received $124,847 for two years from USDA-NIFA-Crop Protection and Pest Management Competitive Grants Program to study sustainable pest management methods in asparagus.

Doug Landis recently presented an invited seminar and graduate student workshop in the Netherlands on "Redesigning Agricultural Landscapes for Multiple Ecosystem Services." The seminar was sponsored by the Wageningen University Evolution and Ecology Seminar series. He also visited colleagues at The Netherlands Institute of Ecology (NIOO-KNAW), as well as the Department of Entomology, Center for Crop Systems Analysis, and ALTERRA, a "green-living" research institute associated with Wageningen UR.

The MSU IPM Program published four new bulletins with MSU Extension specialists and educators: Integrated Pest Management: A Guide to Resources from MSU (E. Lizotte); Cole crops Integrated Pest Management (L. Rodriguez Salamanca); Organic Raspberry

Bee expert Zachary Huang applies his skill as a photographer to his science. Here he's shared with us a comparison of one flower filtered to show human vision, ultra-violet and insect vision. Zach says, "Bugs always see a better picture than us!"

1) Human view. 2) Ultraviolet. 3) Emulates insect vision: visible light with reduced red light, combined with ultraviolet.

Production in Three-Season High Tunnels (E. Hanson et al.); Diseases and Insect Pests of Asparagus (W. Morrison et al.). Print copies can be purchased or free PDF files downloaded at shop.msu.edu.

PEOPLE

MSU Department of Entomology Research Associate **Christie Bahlai** taught a two-day workshop in data management and analysis to support open science at the University of Michigan in January. The workshop, organized by Software-Carpentry.org, was targeted at Women in Science and Engineering. Says Bahlai "Science is increasingly collaborative and the data we generate are getting larger and more complex. It's critical that young scientists develop the skills to rapidly share their data and analysis with others, allowing science to advance more efficiently." Bahlai maintains a blog about data management and open science at Practical Data Management for Bug Counters: https://practical-datamanagement.wordpress.com/.

The work of three entomologists was featured in the 2014 Annual Report of MSU's AgBioResearch. The featured faculty were **Rufus Isaacs** and his work to shield Michigan's fruit industry from the invasive species spotted wing Drosophila, **Doug Landis** on re-envisioning agricultural landscapes to optimize ecosystem services, and **Ned Walker's** work on understanding West Nile virus in urban populations. See the full report at: http://bit.ly/AgBioRes2014.

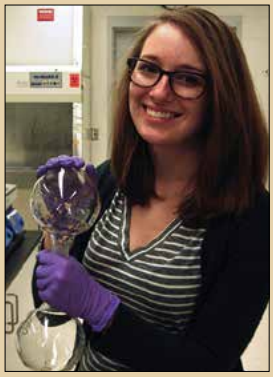
Jen Pechal has joined the Department as an assistant professor. She arrived at MSU as part of the Benbow Lab and was promoted this winter. Her research interests are focused on insect-microbe interactions and decomposition ecology. Specifically, identifying microbial communities associated with aquatic and terrestrial insects using next generation sequencing, which allows for better understanding of microbial community interactions, the influence of microbes on insect community assemblages, microbe-insect interactions and overall ecosystem dynamics. From an applied perspective, utilizing the molecular and physiological responses of microbial communities is a novel concept being applied to vertebrate carrion to better elucidate species interactions of the necrobiome and mechanisms regulating decomposition, which is ultimately important for advancing forensic sciences.

Rufus Isaacs along with doctoral student **Knute Gundersen** and postdoc **Jason Gibbs** attended the first Bee Molecular Methods Workshop in Logan, Utah in February. Supported by the SCRI-funded Integrated Crop Pollination project, the three joined 12 others in a week of learning about the background, theory and application of microsatellite analysis to bee ecological research. The group included people from eight universities in the US and Canada, from undergraduates to professors. The workshop combined the lectures with hands-on experience with PCR of bumble bee legs, sequencing data, and the analysis of the outputs to determine the relatedness of individual workers to determine whether they come from the same or different colonies. This molecular analysis approach has various applications, but is being specifically applied in current research to the assessment of wildflower plantings for enhancing wild bee populations.

Andrew Potter

Meghan Milbrath has recently joined the Department of Entomology as the coordinator of the newly formed Michigan Pollinator Initiative. She will be coordinating MSU's pollination-related research. Another key role will be to strengthen the network between researchers, Extension educators and specialists, policy makers, land managers and growers to raise awareness and better protect pollinators in Michigan. Meghan has a doctorate in environmental health sciences with focus in environmental risk assessment, and has collaborated in projects examining environment toxicological and infectious disease hazards in both humans and honey bees. She has been a beekeeper all her life, and is currently the owner/operator of the Bending Sickle Community Farm queen-rearing operation, the president of the Ann Arbor Backyard Beekeeper Club, the District 2 representative for the Michigan Beekeepers Association and the founder of the Northern Bee Network.

FEATURED UNDERGRADUATE STUDENT



Name: Jessica Kansman
Hometown: Lowell, Michigan
Future study plans: Currently applying to Entomology graduate programs researching tri-trophic interactions and semiochemcials to be utilized in IPM.

Why study entomology? The major is incredibly diverse and has real world impacts and applications. There are so many insects in the world and so many research opportunities with them.

What or who inspired your interest in entomology? I started looking into the major after taking the insect-centered ISB course with Gabe Ording. It was while sitting in ENT 404, when Chris DiFonzo prefaced her lecture with "These images may be a little gross to some of you, but I am an entomologist so I poke dead things all the time," that I knew I was in the right place.

What has been your best experience with entomology? Last summer I was working on an independent field research project on a commercial celery farm with Zsofia Szendrei. While checking my traps, Zsofia had me check the grower's onions for thrips and communicate with him directly about thresholds. It was great to experience extension work first-hand and to directly help a grower.

What do you wish other people understood about entomology? Most people don't understand the role entomologists have in agriculture or human medical research, and I have to explain "what can you even do as an entomologist" in most introductions.

What is your opinion on entomophagy (eating insects) as practiced in other world cultures? I am so for this! Entomophagy is a great answer for sustainable agriculture. I am planning to experiment with cricket flour this semester, and I fully advocate eating insects.

What is your favorite activity/way to spend your time outside of Entomology? I am the president of the graduate/undergraduate secular and science registered student organization "Center for Inquiry." Outside of this, I play the ukulele and participate in a campus choir.

FEATURED GRADUATE STUDENT

Name: Courtney Larson
Hometown: Plymouth, Minn.
Major professor: Eric Benbow

What are you researching? I am interested in the effect of outside sources of organic matter on headwater stream communities of macroinvertebrates and microbes. I'm particularly interested in the effect of the emerald ash borer invasion and subsequent ash tree death on the stream community.

Future study or career plans: After earning my PhD, my goal is to work in academia doing research and teaching in aquatic entomology and invasive species ecology. This will ultimately further the science of aquatic ecology and benefit society by giving insight on better protection of aquatic resources.

What or who inspired your interest in entomology? I grew up taking trips with my family to our cabin in northern Minnesota. The opportunity to explore the lakes and streams with a net in one hand and a field guide in the other inspired me to continue to study these systems.

What has been your best experience with entomology?The relationships I've built with other entomologists. The innovative research that other entomologists are doing, especially at MSU, inspires me to become a better scientist.

What do you wish other people understood about entomology? That entomology really isn't just about bugs. Insects are important in our changing society. They have implications toward sustainability, health, globalization, economics and the well-being of our planet. When we study bugs, we are actually studying much, much more.

If you could be an insect, which insect would you be and why? A dragonfly because they are fast and get to live by beautiful lakes and streams.

What is your favorite way to spend your time outside of Entomology? Enjoying the outdoors, especially at U.S. National Parks. My lifelong goal is to visit every national park in the United States.

AWARD-WINNING DEPARTMENT

Congratulations to these student winners at the 2014 Entomological Society of America (ESA) meeting in Portland, Oregon:

- Undergraduate Student 10-Minute Presentation Competition: **Ryan Paul**, second place.
- Graduate Student 10-Minute Presentation Competition: **Nicole Quinn** (MS, Szendrei), first place.
- Graduate Student 10-Minute Presentation Competition: **Kristin Deroshia** (MS, Grieshop), second place.
- Graduate Student Poster Competition: **Keith Mason** (PhD, Isaacs), first place.

Rich Merritt received the Life Time Achievement Award in Forensic Science from the Pathology/ Biology Section of the American Academy of Forensic Sciences (AAFS) at their meeting in February 2015 in Orlando, Florida. **Eric Benbow** introduced Rich at the meeting and spoke on his behalf for his achievements in the field.

Nicole Quinn (MS, Szendrei) received the North Central Sustainable Agriculture Research and Education's graduate student grant in support of her research on enhancing pollinators with flowers in cucurbits. The ~$10,000 will go towards undergraduate support in the field season, supplies and travel.

Michigan State University Extension recently hosted its awards banquet to honor partners and staff. **Zsofia Szendrei** received the Michigan Association of Extension Agents' Outstanding Extension Specialist Award for her work as vegetable entomologist. A specialist in organic pest management, **Matt Grieshop** was recognized by the MSU Extension specialists association for his outreach program. **Joy Landis** and **Mallory Fournier** were part of the Smart Gardening Team that was awarded the Institute Team Award by their Extension colleagues for promoting environmentally wise gardening practices including integrated pest management. **Gordon Guyer** was present at the banquet to award the first Gordon Guyer Cross-Institute Team Award to the Michigan Fresh Team.

Entomology undergraduate **Katie Demeuse** won the Agriculture and Animal Science Section poster competition at MSU's 2014 Undergraduate Research and Arts Forum (UURAF). She presented her work on the genetic regulation of insecticide resistance in Colorado potato beetles.

Christie Bahlai, Entomology alumnus Matt O'Neal and **Doug Landis** along with collaborators from Wageningen University published in Ecological Applications using data from the Long Term Ecological Research project at the Kellogg Biological Station. The team showed populations of the multicolored Asian lady beetle (Harmonia axyridis "HA") fluctuate in three distinct patterns corresponding to: (1) generally moderate HA populations prior to soybean aphid arrival as in 2000, (2) a distinct two-year cycle in peaks of HA during the acute phase of soybean aphid invasion (2001-07) and, (3) a return to moderate HA populations in 2008-13. They further argue this is a regional pattern and likely caused by use of seed treatment insecticides reducing soybean aphid populations (just enough and at the right time) in the years since their registration and widespread adoption. For more, see "Shifts in dynamic regime of an invasive lady beetle are linked to the invasion and insecticidal management of its prey" at: http://www.esajournals.org/doi/abs/10.1890/14-2022.1

MSU OUTSTANDING FACULTY: Ned Walker

Edward "Ned" Walker was awarded a 2015 William J. Beal Outstanding Faculty Award from MSU President Lou Anna Simon at a Feb. 11, 2015, ceremony. Ned is internationally known in the field of insect vector-borne diseases, particularly pathogens transmitted by mosquitoes and ticks. He has conducted field research in the United States, Honduras, the Philippines, Puerto Rico, Kenya and Malawi. His basic research emphasizes insect/microbe interactions and microbial mediation of decomposition of organic matter in the aquatic habitats of larval mosquitoes, leading to the production of the adult stages. Read more about Walker's work at MSU Today (http://bit.ly/2015BealAward).

ALUMNI PROFILES: Kirsten Pelz-Stelinski

Kirsten Pelz-Stelinski and **Lukasz Stelinski** are faculty at the University of Florida's Citrus Research and Education Center in central Florida. We asked them about their experiences at MSU, work and life in Florida.

Kirsten, when did you graduate from MSU? I earned my masters with Rufus Isaacs and Larry Gut in 2004 and my doctorate with Mike Kaufman and Ned Walker in 2008.

Why did you choose entomology? You can do a lot of different types of science all within entomology, from the smallest molecular interactions to observing insect behavior. As a researcher, you can also manipulate your host more than in many other types of science.

What are your best memories as an entomology student? I can't say enough about the Department - the people were fabulous, particularly my professors. I have great memories of field seasons travelling all over Michigan and interacting with growers and the staff at the research stations. George Ayers influences how I teach, he was a great teacher. Rich Merritt's aquatic entomology and Jim Miller's Nature and the Practice of Science were highlights.

What is your current appointment and work at the University of Florida? I'm an associate professor with a 15 percent teaching/ 85 percent research split. My program focuses on insect microbial ecology, particularly the microbiome of the Asian citrus psyllid (ACP), which transmits pathogen responsible for citrus greening disease. Currently, we are investigating the use of insect endosymbionts, such as *Wolbachia*, to reduce pathogen transmission by ACP.

What keeps you engaged in your work? I enjoy exploring nature from the smallest molecular scale up to the big scale to discover how and why something happens; for example, determining how a bacterium can manipulate an insect for its benefit. It is also fulfilling to work on something the growers urgently need. Our work on citrus greening has immediate direct impact for the $9 billion citrus industry in Florida.

Any advice for current students? Make sure you have a broad understanding of biology, from ecology to the molecular basis of physiology. You never know when those skills will be helpful.

What is it like when a marriage includes two entomologists? Overall, it is really positive and we certainly enjoy sharing ideas with each other, although it can at times present challenges. You may be experiencing the same stresses but you are also uniquely positioned to understand what the other person is going through. That is very valuable.

Last comments? Having a breadth of knowledge has been really important for me. I didn't intend to do applied science but delved into that with my masters' study. I focused on insect vectors and medical entomology throughout my doctoral studies. But then it made sense to be in Florida and here I am, working on a pathogen in citrus in a way that brings all my experience together. I'm an advocate for cultivating as many tools as you can in your scientific toolbox.

ALUMNI NEWS

Aaron Smith (PhD 2014, A. Cognato) joined the faculty of the Department of Biological Sciences at Northern Arizona University as a tenure-track assistant professor. He is also a curator of the Colorado Plateau Museum of Arthropod Biodiversity. His research on beetle systematics is summarized at: http://insectbiodiversitylab.org/.

Jason Schmidt, (Postdoc, M. Grieshop, Z. Szendrei) has accepted a tenure-track assistant professor position at the University of Georgia. He will work on biological control of pest insects in various crops.

Rob Morrison (PhD 2014, Z. Szendrei) is now a postdoc with the USDA in West Virginia.

Remember the excitement and anticipation of starting the field season? Coming soon here at MSU! Enjoy your spring.

Lukasz Stelinski

Lukasz, when did you graduate from MSU? I finished my masters with Oscar Liburd about 2001 and continued with doctoral studies and a post-doc with Larry Gut and Jim Miller. I left MSU for the University of Florida in 2006.

Why did you choose entomology? I always had an inclination for biology and for some reason insects. At first I thought medicine, but then while at Kalamazoo College I was fortunate to take entomology and ethology courses with Dr. David Evans. After that, I knew what I wanted to do. For my senior thesis, I contacted Larry Gut and he, along with Oscar Liburd and John Wise, agreed to let me work on my project at Trevor Nichols Research Center. That was my introduction to MSU.

Anyone with special impact on you and your career? Along with my graduate committee mentors, there was George Ayers. I worked with George over several years assisting and co-instructing courses. He had a big impact on me personally and how I teach. I also had the opportunity to briefly interact with Ke Dong as one of my committee members. I never thought my career would include toxicology; however, three of my former post-docs are now industry toxicologists.

What are your best memories of MSU? I was amongst a great cohort of peers, who are all very successful. We built lasting friendships. Also, every time I go back I have to get a burger at Crunchy's!

Describe your current work. My appointment is 80 percent research, 20 percent extension. I love my job. I typically have a large lab with two or three students, four or five postdocs, two or three permanent staff scientists and a bunch of undergrads. People enjoy coming to work and collaborating on serious challenges. I never thought I'd be working on insect pathogen interactions and toxicology – it's been transforming. I enjoy working with citrus growers. It's great to see my work in high impact journals, but seeing growers implement my findings is also rewarding.

How does your work impact people's lives? Citrus is a huge part of the Florida economy. Economists tell me some of our low volume pesticide treatment methods are saving the industry $40 million per year.

Any advice for current students? I would tell every student to be as broad as possible and take some molecular biology. Right now it is hard to exist as a biologist without the ability to apply molecular techniques to your science. My lab routinely does research that involves molecular techniques from simple PCR to next generation pyro-sequencing. I've had to learn many aspects of applying molecular biology from scratch. Also, if you've found a place where you are succeeding, don't be pressured to go to multiple institutions. It made my life more normal to stay at MSU and I don't regret it.

Any comments about how you've juggled dual careers and a family? Every time Kirsten and I finished one degree there was opportunity for the other. We felt fortunate to have someone offer us funding. There's nothing we complain about being in dual careers. The tricky part is we can become saturated with what is happening professionally and then need to be careful not to burden one another with that at home.

Szendrei lab

Smitley lab

Benbow-Pechal lab

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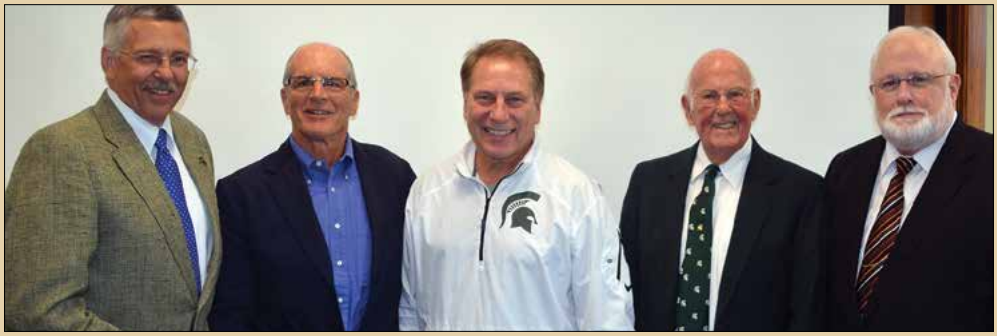
CONFERENCE ROOM DEDICATION: Celebration honored Gordon Guyer

Gordon Guyer honored for gift and inspiration to the Entomology Department

More than 100 people helped celebrate with MSU's Department of Entomology on Nov. 2 in honor of Gordon Guyer, an esteemed alumni and entomologist. A significant lead gift by Gordon and Mary Guyer inspired faculty, alumni and friends to join them in contributing a total of $80,000 to upgrade the department's conference room. Some of Guyer's memorabilia is displayed in the new conference room. If you'd like to give to Entomology, contact Chairperson Bill Ravlin or visit: http://bit.ly/entGive.



Guyer's accomplishments as MSU President included hiring Tom Izzo as MSU head basketball coach. Above, Bill Ravlin, Rich Merritt, Tom Izzo, Gordon Guyer, Fred Poston.

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