Bugged

MSU DEPARTMENT OF ENTOMOLOGY

MICHIGAN STATE UNIVERSITY

Photo by Bill Ravlin, MSU Entomology

FROM THE CHAIR

To say the least, it's been an interesting spring and summer! Like many other universities, MSU was planning to use a mixed model for fall courses. The original targets were 50% of the courses would be delivered online, 25% face-to-face and another 25% delivered hybrid, a combination of the two. We also knew that if there were any significant virus events, all courses would be forced to go online.

From the Department's perspective, we pretty much decided to plan on the online outcome and that's indeed where we are today, except for one graduate level course with a limited number of students. Needless to say, no one is happy with this result, but we feel good that the decision was made before we had tens of thousands of students on campus. While this is not our preferred outcome, I suspect we'll discover some real benefits to remotely delivering courses, Extension programs, meetings, etc. In fact, our Extension meetings are attracting more participants than ever. At any rate, we're adapting—very Darwinian!

The pandemic has also impacted our department chairperson search. After interviewing three excellent candidates and being on the verge of finalizing an offer, coronavirus events took over with virtually all (university wide) position processes coming to a screeching halt. The result is that I will continue as department chair for another year and we will revisit the situation in the spring, i.e., it's "paused." Stay tuned.

On a positive note, we were approved to establish the Pollinator Performance Center along with making significant changes to improve two positions (Meghan Milbrath and Ana Heck) focused on pollinators. The Center, located on south campus across from the MSU Dairy Farm, will provide extensive indoor and outdoor facilities and become a focal point for pollinator research, Extension and teaching; a great addition to MSU programs and capabilities. For more information, please see "Commitments to Michigan Bees and Beekeepers" in this issue of Bugged.

Virus or no virus, MSU Entomology continues to attract great students, staff and faculty, we're expanding our capabilities and we enjoy excellent support from alumni, industry partners, students and anyone impacted by insects. Enjoy being Bugged!

Like many people, I spent more time than normal outdoors this summer. Here's a recent shot of a great two-stripped planthopper nymph complete with honey dew.

Bill Ravlin,
Chairperson

RESEARCH & PROJECTS

Be Noble Photography for MSU Ent.

New study shows increased antioxidant consumption slows pesticide resistance in fruit flies. MSU Foundation Professor **Barry Pittendrigh** is studying the role dietary antioxidant consumption through plants has on mitigating evolution of pesticide resistance in insects. His study, published recently in Pesticide Biochemistry and Physiology, determined increasing the dietary intake of vitamin C significantly decreased DDT resistance in Drosophila, or fruit flies. It is a first step to determine if increasing antioxidant levels in plants slows evolution of pesticide resistance in insects.

A study from the Integrated Crop Pollination Project (coordinated by **Rufus Isaacs**' lab) **published in the journal Proceedings of the Royal Society B: Biological Sciences found crop production would be higher if crop flowers received more pollination.** Managing habitat for native bees and/or stocking more honey bees would boost pollination levels and could increase crop production. Scientists collected data at 131 farms across the U.S. and in British Columbia, Canada, on insect pollination of crop flowers and yield for apples, highbush blueberries, sweet cherries, tart cherries, almond, watermelon and pumpkin. Of those crops, apples, sweet cherries, tart cherries and blueberries showed evidence of production limited by pollination,

Joy Landis, MSU Entomology

Seeds in a Michigan blueberry indicate the flower was not fully pollinated.

indicating yields are currently lower than they would be with full pollination. Wild bees and honey bees provided similar amounts of pollination for most of the crops, though almond was highly dependent on honey bees. The study included Michigan farms sampled over multiple years. Several MSU entomologists, including graduates and former employees, contributed to this comprehensive study: **David Biddinger, Julia Brokaw, Jason Gibbs, Knute Gundersen, Larry Gut, Keith Mason, Nikki Rothwell, Logan Rowe and Julianna Wilson.**

CHEMICAL ECOLOGY

PLANT CHEMICALS A TRICK OR TREAT FOR INSECTS

Plants contain hundreds of unique chemicals that can attract or repel pests like caterpillars. For the caterpillar, this means they can choose from a buffet of tasty plants with varying phytochemicals. Some choices are a beneficial treat while others are a trick with toxic effects. For researchers, it offers potential to manipulate the chemicals in a mix of crop varieties to create plantings less attractive to pests.

Andrea Glassmire, **Luke Zehr** and **Will Wetzel** have manipulated phytochemical diversity using 16 genotypes of tomatoes and measured the response of a common caterpillar, the cabbage looper, *Trichoplusia ni* (Hübner). Their findings were recently published in the journal Ecology.

"Individual plants have hundreds of chemicals and each has a unique biological effect on interacting organisms, such as herbivores. It has been difficult for scientists to manipulate the dimensions of chemical complexity and test its consequences on insect pests," said Andrea Glassmire, post-doctoral researcher and lead of the project. "Our methods allowed us to disentangle the dimensions of diversity – the total number of unique chemicals (alpha diversity) compared to the turnover between chemicals (beta diversity)."

Glassmire (center) and crew collect data in 2018.

The researchers found plants with different chemical properties could be grouped so that some slowed or deterred feeding. For example, some plants contained acyl sugars that stuck to the caterpillar mouth parts and caused them to eat less. Others were biologically toxic and after tasting those plants, caterpillars moved on to a different plant that could alleviate the toxic effect by feeding on one that balanced with less toxic chemicals. The chemical diversity between the plants, not plant genetic diversity, determined whether caterpillars were deterred or performed better.

Read the full publication, "Disentangling dimensions of phytochemical diversity: Alpha and beta have contrasting effects on an insect herbivore."

Be Noble Photography for MSU Ent.

Entomology doctoral student Rachel Osborn wrote an extensive article for the Lansing State Journal (LSJ) explaining how the Albert J. Cook Arthropod Research Collection is used to gain insight into present-day problems, from understanding invasive pests to declining bee populations. Osborn interviewed several Department members and worked with an LSJ photographer to illustrate the story. Read "At MSU, a 153-year-old insect collection is being used to solve modern problems."

Allen Bridgman, SC Dept of Natural Resources, Bugwood.org

Chairperson emeritus Mark Scriber recently published "Assessing ecological and physiological costs of melanism in North American *Papilio glaucus* females: two decades of dark morph frequency declines" in the open access Wiley Online Library. Scriber says the paper represents a 40-year career summary, which may have inadvertently captured the impact of climate warming impacts on dark morph females in North American tiger swallowtail populations.

Book of Black entomologists' memoirs shows young people entomology's possibilities

"Memoirs of Black Entomologists: Reflections on Childhood, University, and Career Experiences" includes three entomologists who studied or worked at Michigan State University. One of them, **Willye Bryan**, was part of the book's editorial team. Bryan says young Black people need to see individuals who look like them in the field of entomology as an incentive to choose the field as a career.

Bryan in the Pesticide Alternatives Lab with 2014 MAP students.

"When I first went to the annual Entomological Society of America (ESA) meeting in the early 80s, there weren't many Black people attending, probably about 10 or 12," Bryan said.

About 2011, Eric Riddick, a research entomologist at the USDA Agriculture Research Service in Stoneville, Mississippi, suggested collecting the stories of Black entomologists for publishing in an inspirational book. Riddick pitched the idea to ESA and the Society agreed to publish it.

The book is a resource people can use to encourage more diversity in the field of entomology. It showcases careers of over 20 Black entomologists. Along with Bryan, others with MSU ties include **Professor Oscar Liburd** (University of Florida) and **Lincoln Morris Moore** (deceased). The memoirs include tips for students from the entomologists.

Bryan has for years made her own efforts to promote entomology to young Black people. In 2004, she began managing MSU's Pesticide Alternatives Laboratory for **Professor Emeritus Mark Whalon** and was pleased to find when she arrived that Whalon hosted high school students in the College of Agriculture and Natural Resources' Multicultural Apprenticeship Program (MAP). The four-week summer program brings students of color to campus research labs and culminates in students presenting their research to friends and families at a celebratory dinner.

"Work hard, do not get discouraged, and seek help and advice when needed. Your hard work will pay dividends later."

KEY ADVICE FOR STUDENTS FROM OSCAR E. LIBURD. QUOTE FROM MEMOIRS.

"People can share the book, get it into the hands of those who make decisions, including hiring and managing student programs," Bryan said. "Be intentional with your efforts to encourage people, because unless you are intentional, you don't get the change you want to see."

Download the book for free at the ESA website: bit.ly/ESA-memoirs

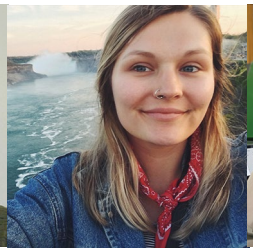
OUTSTANDING 2020 STUDENTS AND STAFF

The pandemic restricted our method of celebrating with you, but hasn't dampened our cheers for you. - **CONGRATULATIONS!**


Zavalnitskaya


Hauri


Appenfeller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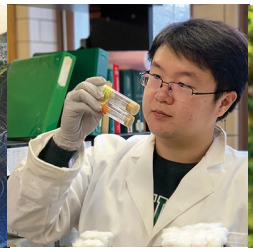

Wang


Larson

Rhodes (Gene) Thompson Endowed Fellowship

Jennifer Zavalnitskaya (MS, Szendrei) is researching the overwintering biology of asparagus beetles and how sustainable control measures can be developed to manage their populations.

Outstanding Masters Award

Kayleigh Hauri (MS spring 2020, Wetzel) examined how plant diversity affects predator-prey interactions in tomato with a focus on genetic monocultures versus polycultures. She is now a PhD student with Zsofia Szendrei.

Outstanding Student Award in Extension

Logan Appenfeller (MS spring 2020, Szendrei) developed management practices that impact pest dynamics in organic cucurbit agriculture.

Robert R. Dreisbach Endowed Fellowship

Nicole Wonderlin (PhD, White) is exploring the role of moths as nocturnal pollinators in urban environments.

Eugenia McDaniel Award

Zinan Wang (PhD, Chung) is investigating the evolution of cuticular hydrocarbons, their role in desiccation resistance, and how they function as pheromones in insect communities.

Outstanding Doctorate Award

Courtney Larson (PhD, Benbow) is studying how headwater stream communities of macroinvertebrates are impacted by different sources of organic matter impact.

Roger and Barbara Hoopingarner Endowed Graduate Fellowship

Jenna Walters (MS, Isaacs) is studying the role of heat stress on pollination of blueberries and native flowering plants.

Paul Wooley Endowed Fellowship

Brianna Alred (MS, Szűcs) is exploring the potential of a newly-approved biological agent to control invasive weeds, pale and black swallow-worts.

Outstanding Staff Award

Luke Zehr is a lab manager and research technician in Will Wetzel's lab. He manages the day-to-day operations of the lab and assists with multiple research projects.

Gordon E. Guyer Endowed Fellowship in Aquatic Entomology and Merritt Endowed Fellowship in Entomology

Joe Receveur (PhD, Benbow) is evaluating the microbial communities of various aquatic habitats and how these communities influence the development and behavior of aquatic insects.

Outstanding Undergraduate Award

Connor Sturr received his BS in entomology spring semester 2020 and will pursue an MS in entomology at Purdue University.

Hutson Research Proposal Winners

Master of Science recipients

- **Jenna Walters** for the proposal titled: Influence of extreme heat conditions on blueberry pollination and bee nutrition.
- **Jennifer Zavalnitskaya** for the proposal titled: Investigating the impacts of surrounding landscapes on the overwintering of asparagus beetles (Crioceris asparagi).

Doctor of Philosophy recipients

- **Dan Turner** for the proposal titled: Investigating the interactions between intraspecific


Walters


Alred


Zehr


Receveur

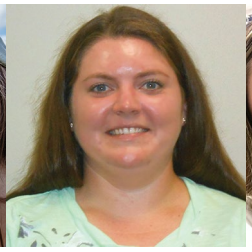

Sturr


Turner


Cong


Savage


Zahorec


Wheeler


Eschedor


Jeffs


Mbewe


Hernandez

diversity, priority effects and the timing of plant-herbivore interactions.
- **Haosu Cong** for the proposal titled: Mechanisms underlying exaggerated sexually dimorphic traits.

Scriber Scholar Proposal

Brianna Alred for the proposal titled: The importance of prior experience and competition for selection of a lethal host plant in monarch butterflies.

J.E. and Jean M. McPherson Travel Awards

Travel supported to the 2019 Annual Entomological Society Meeting held in St. Louis, Missouri.
- Ben Savage
- Zinan Wang
- Ali Zahorec
- Celeste Wheeler

Bug House Fellows

This honor is awarded to students for volunteer work in the Entomology Bug House.
- Osten Eschedor
- Brenna Jeffs
- Rex Mbewe
- Nicole Wonderlin
- Ali Zahorec
- Ariana Hernandez
- Jennifer Zavalnitskaya

CHEERS FOR NEW GRADS

Spring 2020 graduates
- **Logan Appenfeller** (MS, Zsofia Szendrei) has returned to Kansas where he is working with USDA-NIFA.
- **Erin Biggs** (MS, Anthony Cognato) is now an agriculture inspection specialist with the State of Nebraska.
- **Sarah Dietrich** (MS, Larry Gut) is seeking employment.
- **Kayleigh Hauri** (MS, Will Wetzel) is a PhD student with Zsofia Szendrei.
- **Colin O'Neil** (MS, Dave Smitley) is seeking employment.
- **Toby Petrice** (PhD, Bill Ravlin) is working with the US Forest Service.
- **Gabriela Quinlan** (PhD, Rufus Isaacs) has started a post-doc position at Penn State University.
- **Patrick Stillson** (MS, Zsofia Szendrei) has begun PhD studies at the University of Texas - Austin.
- **Celeste Wheeler** (MS, John Wise) is working at MSU's Trevor Nichols Research Complex in Fennville, Michigan.
- **Meghan Andrews** (Entomology major), is enrolled in an MS program with Larry Gut and Matt Grieshop.
- **Connor Sturr** (Entomology major) is beginning graduate studies at Purdue University.
- **Shelby Christensen** (Entomology minor)
- **Nadiya Tarabara** (Entomology minor)

Toby Petrice celebrates remotely.

- **Katelyn Smiles** (Entomology minor)

Summer 2020 graduates
- **Courtney Larson** (PhD, Eric Benbow) will begin a post-doc in Minnesota after graduation.
- **Ben Savage** (MS, Matt Grieshop) continues working in the Grieshop lab.
- **Josh Snook** (MS, Zsofia Szendrei and Will Wetzel) is working in the Wetzel lab.

FEATURED STUDENTS

MICHAEL KALWAJTYS
UNDERGRAD STUDENT

Hometown:
Elmwood Park, Illinois
Future plans:
Pursue graduate studies

Tell us about the forest entomology work you did with Cook County in Illinois. I worked as a collections assistant for the Cook County Forest Preserve. I helped with surveys of dragonfly and damselfly species, identified insects, fed and maintained monarch caterpillars.

Why an entomology major? Entomology is a very unique major. There are plenty of opportunities to go outside and learn hands-on. Some insects, like ants or bees, have their own little civilizations that I was never even aware of. I can't think of many other majors where I could have learned such interesting things about the world around me.

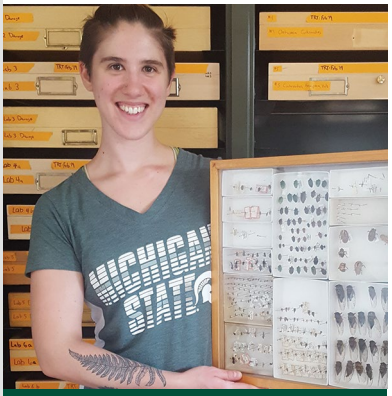
What has been your best experience with entomology? Last semester, I got a job in the **Wetzel Lab**. It was a great opportunity to get experience with insect identification, and I got to meet really cool people.

What is your favorite insect? I think assassin bugs are really cool. Some of them wear the remains of other insects as camouflage while they wait to strike their prey. They really earn the name.

What is your favorite way to spend time outside of your studies? I like to hang out with friends, play video games, listen to music and read.

What is your favorite thing about MSU? I love being around such a wide variety of people. I've made lots of friends who have different beliefs, cultures and ideas than me. It's given me a lot of perspective.

Do you have advice for anyone interested in an entomology major? Get a job in a lab as soon as you can. It's a lot of fun and you'll get hands-on experience that you won't always get in a classroom.



LOUISE LABBATE
GRADUATE STUDENT

Hometown:
Traverse City, Michigan
Previous education:
Associate's degree at Northwestern Michigan College. Bachelor's of science from Michigan State University.

What are you researching? I am researching an invasive insect that entered Michigan in 2015 called the Asian chestnut gall wasp (*Dryocosmus kuriphilus*), which attacks and causes damage to chestnut trees. I am monitoring this pest's phenology and its interactions with the chestnut trees and an introduced natural enemy. I have been working towards an integrated pest management strategy to limit yield loss while minimizing costs to the growers and negative effects on the environment.

What or who inspired your interest in entomology? My first exposure to entomology was in a required class for my degree program taught by my current adviser, **Deb McCullough.** In that class I met Sara Tanis, the McCullough lab manager and the person who would ultimately guide me to pursuing a master's degree. Sara's genuine passion and enthusiasm for entomology drove my interest and desire to learn more. She was, and continues to be, not only a mentor but a friend, and I would not be where I am today without her.

What is your favorite activity or responsibility as part of your graduate studies? Definitely the field work. I have always loved being outside and I feel like I really got to enjoy my summers because my job was outside. An added bonus was that my field sites were really close to Lake Michigan so after a long day in the field, I got to relax on the beach.

What is your favorite thing about MSU? At MSU, at least in the Department of Entomology, student life is easily accessible and widely encouraged. There are many opportunities to meet and interact with other students. Even in the last few months while we have all been socially distancing, the organization of virtual events and encouragement to remain social has been ever present.

ALUMNI PROFILES: JOHN M. CLARK

The MSU Department of Entomology is pleased to honor **John M. Clark** with its 2020 Entomology Distinguished Alumnus Award. Clark is a professor of environmental toxicology and chemistry and director of Massachusetts' Pesticide Analysis Laboratory at the University of Massachusetts in Amherst.

In a cover letter nominating Clark, Barry Pittendrigh noted how prolific Clark has been as a leading figure in insect molecular biology and toxicology. "He is an editor, or on the editorial board of over 11 journals, has received over $18 million in funding, has over 480 peer-reviewed articles in academic journals, 12 published books, 38 book chapters, 160-plus keynote presentations and has organized 23 national and international symposia. He has played an active role in the training of over 60 graduate students and 20 postdoctoral researchers," wrote Pittendrigh. He also describes Clark as a driving force in louse molecular biology and toxicology, a leader in elucidating the molecular basis of polygenic pesticide resistance.

Unfortunately, due to the COVID-19 pandemic restrictions, we were unable to host Clark at a celebration at MSU. I called him recently for the interview below and found him in his lab, which has an essential mission.

When did you graduate from MSU? Why did you choose entomology? I graduated with my PhD in 1981. My path to entomology was very indirect. I earned my BS in zoology and MS in entomology at the University of Wisconsin-Madison. Fumio Matsumura was my adviser for my master's and I followed him to MSU when he was hired as director of the Pesticide Research Center. With Matsumura, I researched the mode of action of pyrethroid insecticides on squid nerve using biochemical and electrophysiology techniques, spending summers at the marine Biology Laboratory in Woods Hole, Massachusetts. We looked at whether a similar approach worked on the cockroach nervous system, it did and was my first entomology paper.

I took many entomology courses and served as a teaching assistant for Matsumura, Jim Miller, and Matt Zabic. When I got to Massachusetts, I relied heavily on knowledge from from them as well as Ring Carde', Rich Merritt and Herold Newson. I made many decisions based on what they taught me.

Currently, I run a toxicology lab best known for mode of action studies and mechanisms of pesticide resistance. I've worked extensively with Colorado potato beetle, mosquito, drosophila and on the current project, human head and body lice.

Best memories as an entomology student? MSU was very social. Alice Ellis, who was head secretary at the Center, is a good friend and we still communicate. Matt Zabic would take some of us canoeing on the Two Hearted River or out in his sailboat. I've stayed in touch with many of my classmates and collaborate on projects with some of them, including Dick Beeman and Jeff Scott.

Thoughts for current students? Don't get hung up thinking your first job out of school is your last job. Matsumura told me that to stay active in science, about every 10 years regardless of your project's success, drop it and do something totally different. Sometimes I chose to move to something new, other times ideas came from colleagues, like in my work with lice.

John Edman at UC-Davis thought I should explore why homeowner products for treating head louse infestations were no longer working. At first I wasn't very interested. I suspected it was knock down resistance and that was what we eventually found in head lice populations around the world. With Barry Pittendrigh and Si Hyeock Lee, we sequenced the genes involved, identified the mutations causing resistance and have developed a number of DNA diagnostics to monitor louse populations. Now I'm working with companies looking for products that are exploiting unique target sites, products that will be less likely to impact non-target species and can be alternated with other products in a resistance management format.

NEW COMMITMENTS TO MICHIGAN BEES AND BEEKEEPERS

The apiculture and pollination program at Michigan State University is expanding, as MSU Extension and the Department of Entomology show their continued support to the industry through two new positions.

Meghan Milbrath, previously an academic specialist at MSU, is now an assistant professor in the Department of Entomology with a 50% Extension and 50% research appointment. She will remain the coordinator of the Michigan Pollinator Initiative and will expand her research programs. Milbrath's research focuses on various aspects of honey bee and pollinator health including disease management and pesticide risk assessment.

MSU Extension has hired **Ana Heck** as a new apiculture Extension educator. Heck will develop and deliver programming and education for small scale beekeepers, growers and pesticide applicators. She will also collaborate in helping Adam Ingrao administer MSU's Heroes to Hives program.

Ana Heck, new MSU Extension apiculture educator.

These new personnel appointments will be strengthened by an agreement to assign 15 acres plus several buildings on MSU's south campus for a pollination performance center. The vision for the center is to provide a home base for pollinator research, Extension and teaching that will accommodate collaborations and interactions with beekeepers and pollinator enthusiasts.

Milbrath and Heck mask up to explore the site committed to a pollination performance center on south campus.

To ask a bee or pollinator question, reach Milbrath and Heck through MSU Extension's "Ask an Expert" portal. To support pollinator related research and outreach at MSU, visit links at the Michigan Pollinator Initiative website: pollinators.msu.edu

ALUMNI NEWS

Congratulations to our alumni, Pochubay and Blaauw, who are being honored by Fruit Growers News and Vegetable Growers News with their **Fruit + Vegetable 40 Under 40 Awards for 2020**. The publications note the recipients represent the best the agriculture industry has to offer. **Emily Pochubay,** who earned her masters with Matt Grieshop in 2012, is being honored for her work as an MSU Extension Tree Fruit IPM Educator.

Brett Blaauw, who earned his doctorate in 2013 with Rufus Isaacs, has distinguished himself with the fruit industry as an assistant professor and extension specialist with the University of Georgia.

Lesley Schumacher (MS, George Bird) has accepted a USDA/ARS Research Scientist position at the USDA/ARS Laboratory in Jackson, Tennessee. Lesley will be responsible for the USDA/ARS Soybean Cyst Nematode Genetics/Host Plant Resistance Research.

Andrew Myers (2019 PhD, Doug Landis), **Christie Bahlai** (Postdoc, Doug Landis) and **Douglas Landis** have a publication chosen as this year's Reviewer's Choice first runner-up paper for the journal *Environmental Entomology*. The paper, "Habitat Type Influences *Danaus plexippus* (Lepidoptera: Nymphalidae) Oviposition and Egg Survival on *Asclepias syriaca* (Gentianales: Apocynaceae)" was nominated by one of the subject editors, selected by the co-editors-in-chief and then voted on by the journal's reviewers from the past two years.

WE'RE SOCIAL FIND MSU ENTOMOLOGISTS

MSU Bug Talk Podcast

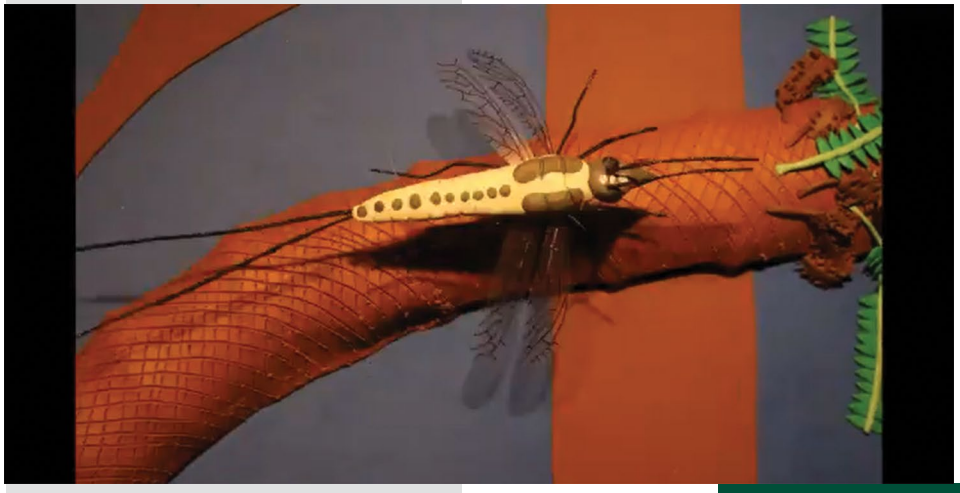
Multiple Department members host these discussions which introduce the person behind the scientist, what inspires them and their interests outside of work. Recent interviews include alumni Mary Gardiner and Rob Morrison, assistant professor Marisol Quintanilla, IT professional Oscar Castaneda, undergraduate Osten Eschedor, graduate students Logan Appenfeller and Brianna Alred, and fellow Spartan scientists Felicia Wu, David Hennessy and Marjorie Weber. Find these and other episodes at: bugtalk.buzzsprout.com

Facebook

Amanda Lorenz-Reaves hosts the Bug House Facebook page and, with Gary Parsons, organizes dedicated students to keep the Bug House outreach and educational efforts running.

YouTube

Search at YouTube for doctoral student Max Helmberger's clay animations. Below is a view from "First in Flight: Insects of the Carboniferous."



Following

MSU Entomology

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Department of Entomology at Michigan State University #SpartanInsects

East Lansing, Michigan ent.msu.edu

Joined March 2009

1,698 Following **7,405** Followers

Twitter and Instagram

Mallory Marienfeld hosts these departmental accounts with news and fun tidbits for insect enthusiasts.

Bugged newsletter

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COMING THIS FALL

NEW VIDEOS ANSWER WHY ENTOMOLOGY

In August, we learned to shoot video and perform research while masking up. It takes some patience, thoughtfulness, and yes, SpartansWill. We're excited to share these stories of promising work and dedicated people with you later this fall. Stay well everyone.

Jen Pechal assists the videographer zooming in on her black soldier fly larvae, a potential source for sustainable animal feed in Malawi and other countries.

Undergraduate student Andrew Jones and masters student Jenna Walters from Rufus Isaacs' lab explained how native bees bolster pollination of fruit.

Doctoral student Joe Receveur examines aquatic insects in our video about disease ecology work by Eric Benbow's lab.

Images by Joy Landis, MSU Entomology