Image: Bill Ravlin, MSU Entomology

FROM THE CHAIR

It's hard to believe it's been five years since I returned to MSU Entomology – lots of changes along the way. Over that period we had four new tenure system and six fixed term faculty members join the department. On the departure side, we had four retirements, one departure and one death of a faculty member.

Along with these human resource changes came space adjustments where we made at least 10 programmatic moves. With each hire and each move, we improved our space by investing well over a million dollars throughout the Natural Science Building, Giltner Hall, CIPS, the Insectary, and Plant and Soil Science. The Gordon Guyer Conference Room and the Hoopingarner Room were notably created through generous donations.

Our annual Awards Celebration will be held April 25, when we will recognize student, faculty, staff and alumni excellence distributing over $40,000 in fellowships and awards, thanks in part to the generosity of the Guyers, Hoopingarners, Merritts, McPhersons, Olsens and Scribers. Their contributions past and present are much appreciated!

We've been recognized nationally and internationally through awards, too numerous to list here; however, of special note are Drs. Miller, Landis and Delfosse who became Entomological Society of America Fellows. Doug Landis joins Dean Haynes and Rich Merritt as an MSU University Distinguished Professor. Barry Pittendrigh became an MSU Foundation Professor. Jim Smith is now an AAAS Fellow and Karim Maredia was presented with the International Leadership Award from the Indian Council of Food and Agriculture.

It is not surprising that MSU Entomology was ranked sixth in the world by the Center for World University Rankings based on quality of education, alumni employment, quality of faculty, publications, influence, citations, broad impact and patents.

Last but not least, my five-year appointment as department chairperson will end this year and I've decided to make the transition to retirement. We plan to post the position this summer and hopefully will welcome a new chairperson by fall 2020. I want to ensure a smooth transition and build in flexibility should there be a delay, hence, I will remain in my position until the new person arrives. It's been a great ride! All the best,

Bill Ravlin,
Chairperson

Ravlin awarding the 2017 Distinguished Alumnus Award to Jay McPherson.

RESEARCH & PROJECTS

Derrick Turner, MSU Photography

Marianna Szűcs has been awarded a $300k grant from the state's $3.6 million Michigan Invasive Species Grant Program earmarked to battle invasive species. Swallow-worts are an invasive plant species that release biochemicals into the soil, preventing other plant species from establishing. Large monocultures of swallow-worts replace native and other plants that contribute to diversity. They are also toxic or bad tasting to animals. They can kill the caterpillar stage of monarch butterflies and are toxic to livestock, deer and other animals. Szűcs and her team are testing a newly approved biological control agent, Hypena opulenta, a moth from the Ukraine whose larvae primarily feed on invasive black and pale swallow-wort vines. Whether or not the moth can flourish and help manage this toxic plant in Michigan is yet to be determined. Szűcs' study is the first classical biocontrol program against invasive swallow-worts in Michigan and will test the moths' ability to establish, reproduce and help control these vines.

In early March, MSU Entomology faculty Ruth Mbabazi, David Mota-Sanchez, Barry Pittendrigh and **Karim Maredia** joined four other specialists from Africa, India and Mexico to present a workshop on managing armyworm. Fall armyworm has become a new and significant agricultural pest on maize and other crops in

Southeast Asia. The workshop was held in Myanmar for government officials, agribusiness and NGO representatives. The team also met with growers during field visits. The events were initiated by Duncan Boughton, MSU professor and director of a USAID-sponsored Myanmar Food Security and Agricultural Development Project. The group hopes to engage MSU Extension in the future in developing farmer training, information delivery and information management systems for early warning.

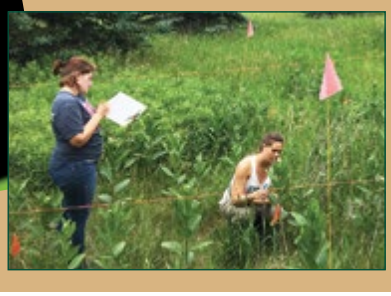
MOWING FOR MONARCHS MORE HELP THAN DISRUPTION?

You might think that mowing fields wouldn't benefit monarch butterfly populations. New research from **Doug Landis**' lab, however, shows that disturbances like mowing milkweeds – at key times – might help boost the iconic butterfly's numbers.

The results are published in *Biological Conservation*, and they show that strategic grassland management benefits monarchs in two ways. First, monarchs lay more eggs on young milkweed – new growth after mowing – the sole food source for the butterfly larvae. Second, fewer predators visit immature milkweed; more come during its mature stages, such as when it flowers.

Most eggs are eaten within the first 24 hours by katydids, ants, stink bugs, spiders and other predatory insects. To help monarchs survive this critical window, post-doc **Nate Haan** and a team of scientists partnered with the Michigan Department of Transportation, a handful of public land managers and some private landowners to explore potential solutions.

Zachary Huang, MSU Entomology



Nate Haan, MSU Entomology

"The habitat for monarchs is shrinking; it used to include corn and soybean fields but now it's restricted in many places to pastures, parks and right of ways along highways and interstates," said Haan. "We found that if we mow small amounts of these areas in June or July, we see increases of anywhere from 3 to 10 times more eggs per stem on the regrowth, with fewer predators around to eat them."

The next steps for this research will be to scale up the application of strategic mowing and hopefully gain enough insight to make management recommendations for public and private properties to increase monarch survival.

FORENSIC RESEARCH WHEN REALITY TV BRINGS AN OPPORTUNITY

Eric Benbow was invited to apply his forensic entomology skills to help with an unsolved crime as part of Oxygen Network's Smiley Face Killers: The Hunt for Justice series. In this case the body was found in a lake with little algal growth and no evidence of insects despite other indications the body was in the water for as long as 21 days.

Benbow offered to test the conditions to learn more about microbial growth on the body and shirt fabric and what may have occurred with the aquatic conditions and insects. The microbial studies characterized when certain microbes colonized and how their communities developed over decomposition. With this information, researchers can create a "microbial clock," an indicator of the passage of time, in this case how long the body was submerged in water.

"The lack of insects in the reports is highly unusual and therefore suspect. I don't know if the medical examiner found insects, but did not report them, but I did examine the photos and couldn't see any evidence of insects or eggs in them," Benbow said.

The findings have been sent to the district attorney and the research team is finishing manuscripts for submitting to scientific journals. Read details about the research and crime at MSUToday "MSU Forensic entomologist is helping solve a cold case."

PEOPLE

Three students received J.E. and Jean M. McPherson Graduate Travel Awards to attend the North Central Branch (NCB-ESA) meeting in Columbus, Ohio, in March. Congratulations to:

- **Logan Appenfeller** (MS, Szendrei)
- **Joshua Snook** (MS, Wetzel and Szendrei)
- **Patrick Stillson** (MS, Szendrei)

Also at the meeting Entomology Chairperson **Bill Ravlin** concluded his year as president of NCB-ESA.

Ali Zahorec (PhD, Landis) has received a Kellogg Biological Station (KBS) Long-Term Ecological Research Summer Fellowship for her proposal titled: "Evaluating Microarthropod Community Structure Across a Gradient of Agricultural Intensification." Zahorec will be studying shifts in the communities of collembolans and soil mites after 30 years of managing a corn/soybean/wheat rotation under conventional, reduced-input and organic treatments. In addition, she will collect initial data on soil arthropod community assembly processes as the Landis lab initiates a new perennial prairie strip manipulation in low-input treatments.

Professor emeritus **Rich Merritt** reports the fifth edition of "An introduction to the aquatic insects of North America" by R.W. Merritt, K.W. Cummins and M.B. Berg is now for sale. The book is the lead guide of immature and adult stages of aquatic and semiaquatic insects in North America. Learn more and order: he.kendallhunt.com/AquaticInsects.

Larry Gut with Joseph Birgirimana.

Congratulations to **Joseph Bigirimana** who successfully defended his doctoral dissertation via video conferencing from his home country in Rwanda with his major professor **Larry Gut** alongside him. This winter, Bigirimana learned he would need to return to Rwanda and would miss the opportunity to walk at an MSU graduation ceremony. Gut made sure to celebrate the degree completion with appropriate Spartan gear. Well done, Dr. Bigirimana.

ALTERED TOUR: BROAD MUSEUM MASH-UP OF ART, MUSIC, ENTOMOLOGY

Joy Landis, MSU Entomology

MSU Entomology joined with the MSU Broad art museum to host a unique evening at the museum, bringing together an artist, musician and entomologist to share inspiration from ant communication.

Artist Kuia Shen contributed an exhibit exploring the functioning and communication within ant colonies as metaphors for human society. In developing the exhibit, the Broad's Brian McLean contacted Entomology's **Henry Chung**, whose research includes chemical ecology. Chung doesn't work with ants but followed up arranging for Adrian Smith from the North Carolina Museum of Natural Sciences to speak at what became an "Altered Tour" event at the Broad museum.

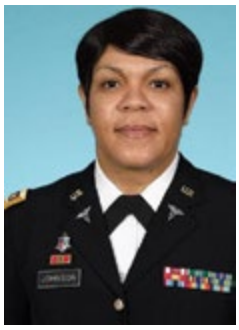
The evening began with interactions and discussion related to the Shen exhibit. After touring the exhibit, Smith, who is an outstanding science communicator as well as an entomologist, spoke and shared video clips from his studies of social chemical communication within ant colonies. To conclude the evening, composer and MSU alumni Charlie Cooper brought to life Shen's notion of interspecies communication in a live musical performance with ant recordings.

Eric Benbow has been promoted to the status of Fellow in the Pathology/Biology Section of the American Academy of Forensic Sciences.

ALUMNI NEWS

Rebeca Gutierrez-Moreno (PhD 2017, David Mota-Sanchez) is a postdoctoral researcher studying the effect of pesticides in pollinators and monarchs in Vera Krischik's lab at the University of Minnesota.

Maj. Jaree Johnson (MS 2008, Rich Merritt) serves as a medical entomologist with the U.S. Army. She helps to ensure soldiers and civilians are protected from health threats from vector-borne diseases and pests, and also works to minimize development of pesticide resistance. Mosquitoes are a frequent focus as diseases such as malaria, Zika, West Nile virus and others can lead to what the military calls "disease and nonbattle injuries."



Courtesy photo

Johnson was interviewed in MSU's *In the Field* last spring.

2018 Entomology graduate Elizabeth Bandason has been awarded a fellowship by the Organization for Women in Science for the Developing World's Early Career Women Scientists fellowship program. She was awarded the full amount for her research into a biological control of the diamondback moth. The moth is a major vegetable crop pest in Bandason's home country of Malawi, where it causes crop losses in the range of 50-100 percent and is being treated intensively with insecticides.

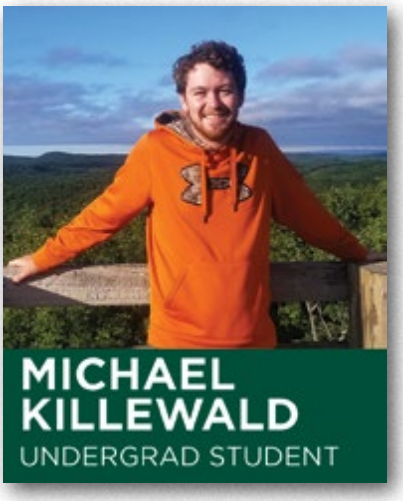
Bandason was a doctoral student in **Ke Dong**'s lab at MSU and is now a lecturer in entomology at Lilongwe University of Agriculture and Natural Resources in Malawi. She was presented her award by Luc Mougeot, a senior program specialist at the International Development Research Centre (IDRC) of Ottawa, Canada. IDRC funds the award to support women with doctoral degrees who wish to continue research at international standards in their home countries. In conversation at the awards ceremony, Bandason and Mougeot were pleased to learn they both obtained their doctorates at MSU. Mougeot is an alumnus of the MSU Department of Geography.

Courtesy photo

Bandason with Mougeot at the awards.

James Zablotny (PhD 1999, Cathy Bristow) received a Top 20 recognition in the 2019 photo competition held by the North American Nature Photography Association (NANPA). Zablotny's winning photo, "Goldenrod Soldier Beetles" won Best in Show Macro/Micro/All Other Wildlife. More than 3,600 images were submitted to by nearly 400 NANPA members. Zablotny works for USDA APHIS PPQ as an entomologist/identifier in Romulus, Michigan. See a gallery of his images at jim-zablotny.pixels.com

FEATURED STUDENTS



Hometown: Alpena, Michigan
Future plans: PhD studies in entomology with Jason Gibb, University of Manitoba.
Major: Fisheries and wildlife

Why add a minor in entomology to your major? I took AP biology in high school, which included a large section on insect diversity and it peaked my interests in entomology. My fisheries and wildlife degree requires taking electives. I decided to complete a minor in entomology so I could fulfill my fisheries and wildlife degree, better my chances at being accepted for an entomology position and continue to study my interests.

What has been the most challenging aspect of adding an entomology minor to your degree? Scheduling classes. Since most of the classes are only offered every few years or during one particular time, they often overlap with my required fisheries and wildlife classes. However, I was able to complete an independent study with Rufus Isaacs, which has ultimately led to my first publication, which will be featured in the Great Lakes Entomologist.

How has working in an entomology lab helped your college career? I have worked in the Isaacs lab for roughly three years, and through this position I have proposed and executed two independent research projects related to the pollen use of different groups of bees. These research projects have helped me gain experience that you cannot gain in a traditional classroom, such as bee and pollen identification skills. This position has also allowed me connections to get into an entomology PhD program at the University of Manitoba.

Who inspired your interest in entomology? My high school teacher, Peter Doubek, taught an advance biology class that had a large section on insect diversity and biology. Through this class I learned just how much fun it is to catch insects, even when the only tools I had available were an old mason jar and my own two hands.

Favorite activities outside of your studies? I like to spend most of my time outside when I can.

Hometown: Des Moines, Iowa
Previous education: Undergraduate at Georgetown University
Major professor: Will Wetzel

What are you researching? The effect of plant chemical defense diversity on insect predator-prey interactions in tomato.

What or who inspired your interest in entomology? I started working with insects and arthropods as an undergraduate in Dr. Gina Wimp's lab at Georgetown, where I studied the effect of disturbance on salt marsh arthropod food webs. I enjoyed doing fieldwork and I loved learning how different behaviors by particular arthropods could stabilize or destabilize the food web. After graduating, I worked at the USDA Agricultural Research Service station in Sidney, Montana, where I worked on a project investigating the interaction between wheat stem sawfly, a parasitoid wasp and drought; that was when I saw how relevant entomology could be to everyday people's lives and decided I wanted to pursue it as a career path.

What do you like best about graduate studies? I love planning and executing my summer field projects. It's very satisfying to take a project from start to finish and get a chance to observe my study system outside in a more natural setting.

What is your favorite thing about MSU? There is such a wealth of resources at MSU, from physical resources like the Kellogg Biological Station to a great collection of professors and graduate students who can help answer questions and develop ideas.

What is your favorite insect? *Podisus maculiventris*, the spined soldier bug. This is the predator I use in my research. It's so fun to watch it hunt!

What is your favorite way to spend your time outside of your studies? I love exploring Michigan by camping and hiking with my lab mates as well as going to trivia nights and playing board games.

ALUMNI PROFILES: ABDULWAHAB HAFEZ

Moving from the date palms, sand and oil of Saudi Arabia to Michigan's Great Lakes, snow and orchards certainly requires an open mind. "The only thing I really didn't like was the snow," said Abdulwahab Hafez about his time with MSU Entomology.

During a video call, Hafez discussed his experiences with doctoral studies at MSU, his work in Saudi Arabia and how he is bringing what he valued most at MSU into his own lab as a professor at King Saud University.

Abdulwahab Hafez (center) with colleagues in his lab.

What brought you to MSU? King Saud University (KSU) is the lead university in our region for studies in my field. A high percent of its professors graduated from universities in the United States. I selected several universities and asked around where I should go for doctoral studies. Everyone said apply to MSU. After talking to several MSU Entomology faculty, the best fit for an advisor was **John Wise**. John's work aligned with some of the challenges I wanted to address at home. We have the Saudi Food and Drug Authority (SFDA) in charge of food safety and they are making significant progress, but there is still so much to do. Alongside research in pesticide toxicology, I wanted to work on building capacity for analytical chemistry in pesticide residue analysis.

At MSU, I worked on resistance of obliquebanded leafroller in apple and cherry orchards. Cherry growers complained that leafrollers were surviving and being found in their crops, especially with the high risk for load rejection due to the USDA zero-tolerance mandate, but no one had researched to understand why. We tested chemical classes of insecticides and did various chemical analyses and bioassays. With that work, we were the first to document that obliquebanded leafrollers in cherry orchards have developed significant resistance to several insecticides. Also we were the first to provide a scientific explanation of the unexpected synergistic impact of esterase inhibitor DEF on indoxacarb toxicity in *C. rosaceana*.

What is your current work? I graduated from MSU in 2017 and am now an assistant professor of pesticide toxicology in the Plant Protection Department, College of Food and Agriculture Sciences at King Saud University. Similar to tenured positions in the U.S., I teach and am establishing a research lab. I have three technicians, and two master's students and an assistant professor from Pakistan will join my lab soon. I will collaborate with other organizations or businesses including representing the university on the nationwide committee of the Safety of Agricultural Chemicals.

My work also includes two consulting agreements: one with the Ministry of Environment, Water and Agriculture (MEWA) and another with the National Center for Academic Accredita-tion and Assessment. When I met with the MEWA, I realized that MEWA has a whole new approach to work on pesticide issues, everything from pesticide registration, evaluation, application and recommendations. This is a huge undertaking, which is why I'm building a team with international collaborations.

Now that you are back in Saudi Arabia, what do you think about your experience at MSU? I had a very good scientific life in the U.S. I learned about preparing proposals for grants and thought at the time it was too much bureaucracy. Now, I miss some of that system. Even though Saudi Arabia has a similar grant/fund system, with big projects it is quite hard to convince funders about the importance of this area of science. The U.S. government understood the value of our work with pesticides and crops. While in an oil country like Saudi Arabia, agriculture issues do not come first to authorities' minds. It is a challenge to get recognition for this area of science and policy. Along with doing the science, I have to sell "a vision" of what I'm passionate about: crop protection and food safety.

I also noticed while at MSU, some people had worked and studied in a variety of countries and had a very open vision about how things could be done. Others had a narrow vision with zero experience beyond the U.S. I am an open-minded guy because I've experienced studying abroad and have collaborated with people from around the globe. That openness means I'm open to more solutions.

One summer in John Wise's lab, we talked about hanging up flags representing our countries, like the United Nations. We were Md Wahiduzzaman Akon (Bangladesh), Zalinda Raja Jamil (Malaysia), Srdjan Acimovic (Serbia), Anthony VanWoerkom and Charles Coslor (USA) and myself from Saudi Arabia. I miss all those people and want to build my lab to be globally diverse like the Wise lab. I believe in that!

In late February, **David Mota-Sanchez** made the trek into Mexico's mountains where he has been researching the arrival and departure of monarchs from the sanctuaries with the help of local residents for several years. As he predicted, the 2018/19 monarch population looks much better than the past season. The butterflies covered about 6.05 ha (CONANP-WWF 2019). This year, **Zachary Huang**, a photography buff, stopped in to visit Mota-Sanchez in the field and they shared these two images.

MSU TODAY STUDENT PERSPECTIVE: WORKING THE NIGHT SHIFT

MSUToday *publishes student perspectives and recently featured this one from MSU Entomology's* **Andrew Myers.**

There's a maxim that nothing good happens after midnight. Like most things in life, it depends on your perspective. If you're a tasty monarch butterfly egg, it probably holds true. However, if you happen to be a hungry earwig or tree cricket, the party is just getting started. And if you're an entomology graduate student studying monarch predators, sometimes good research results only happen when you stay up with the nighttime bugs.

The topic of my doctoral dissertation research in Professor Doug Landis' lab is determining how we can improve breeding habitat for declining monarch butterfly populations. Monarchs have been disappearing across their range for the past 20 years, prompting great concern among those who love this beautiful, interesting insect. One suspected reason for the monarch decline is the elimination of their primary food as caterpillars — common milkweed — from croplands through modern weed management practices.

An everyday observer may notice that milkweed is still a common sight along roadsides, in gardens and in other grassy areas. But compared to 20 years ago, milkweed is now limited to a significantly smaller area. If we want to increase monarch numbers, we have to increase their breeding productivity in these remaining habitats, which is a major challenge for conservationists.

One way that we can potentially produce more monarchs from smaller areas is by increasing their survival during their egg and young caterpillar life stages. Only about 5 percent of the hundreds of eggs laid by each female monarch survive to become butterflies. Most are eaten by other insects and spiders. This brings me back to late night research.

As a first step to my project, I wanted to determine monarch predation rates in grasslands and other types of habitats in agricultural regions. To accomplish my goal, I placed potted milkweed plants with monarch eggs in the field and monitored their survival rates. And because monarch eggs are eaten so rapidly, this work required staying up all night to monitor eggs lost every two hours.

Admittedly, at first, checking eggs all night seemed a bit unnecessary. However, the three nights I camped out at my field site were well worth the exhaustion. I found monarch eggs can disappear rapidly during nighttime hours, pointing to nocturnal predators as one of the main limits on monarch production. But a question remained: Which predator species was responsible?

Last summer, I was able to at least partially solve this mystery. By placing security cameras in grasslands to monitor over 100 monarch eggs, I determined that not only are 70 percent of monarch egg predation events at night, but I could identify the actual predators. The nighttime culprits were earwigs, harvestmen, ants, tree crickets and spiders, while the daytime predators included stinkbugs, plant bugs, mites, jumping spiders and milkweed bugs.

I'm currently publishing the results of these studies. My hope is that this information will be helpful to conservation practitioners in their efforts to create habitats that will help secure populations of this beloved insect for future generations to enjoy.

Bugged newsletter

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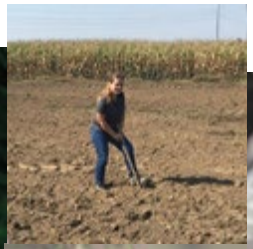
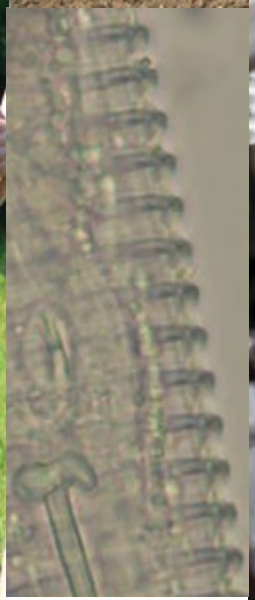
MSU ENTOMOLOGY JUST ANOTHER DAY

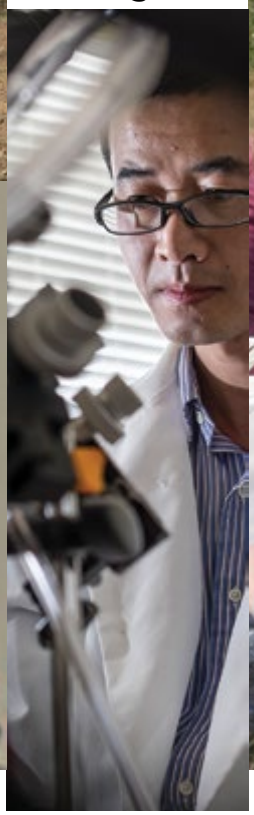
Extension



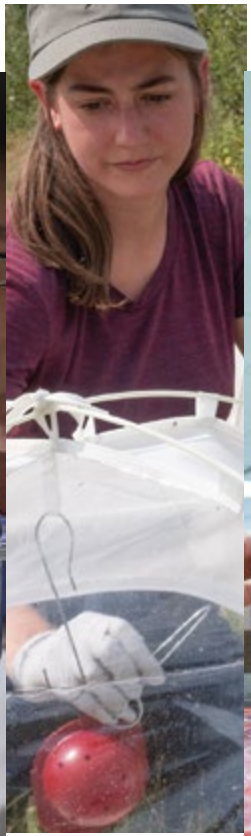


Nematodes

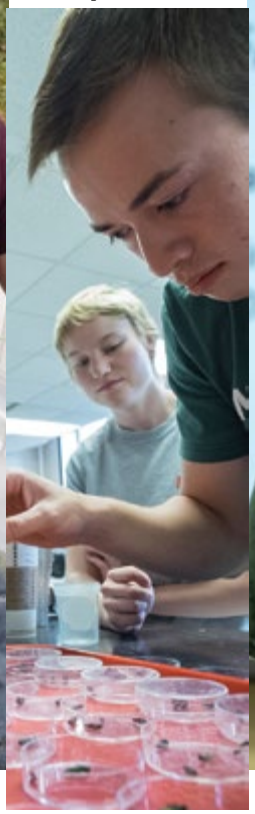
Molecular insight



IPM



Invasive species



Learning