MSU Molecular and Chemical Ecology Core Facility

MSU Entomology retools its laboratories for today's dynamic research environment.

Agriculture and natural resource systems are facing unprecedented insect-mediated challenges ranging from invasive and native pest species to the provisioning of adequate pollination. For example, the invasive spotted wing *Drosophila* and brown marmorated stink bug impact fruit and vegetable growers and disrupt existing Integrated Pest Management (IPM) programs. Growers also need science-based pollination management programs to reduce the impact of declining managed (honey bees) and native pollinators. These two challenges are related, as intensive pesticide applications threaten the effectiveness and sustainability of native and managed bees. In addition, research areas including molecular biology and chemical ecology provide platforms to answer fundamental biological and ecological questions and to develop new tools to address applied problems.

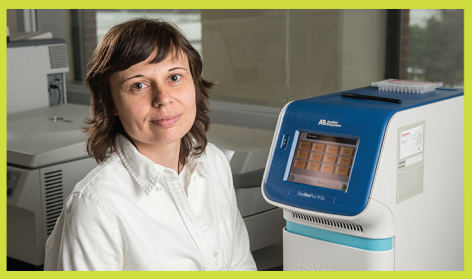
Michigan State University's Department of Entomology faculty have consistently responded to these types of challenges and opportunities. However, recent advances in molecular biology have profoundly changed the way they investigate basic and applied questions. For example, advances in PCR (polymerase chain reaction) and next generation sequencing allow scientists to ask questions about fundamental processes that could only be guessed at in previous decades. Utilizing these approaches, however, requires that modern biological research labs continually retool to remain competitive in an increasingly dynamic research environment.

In response, the Department of Entomology established the *Molecular and Chemical Ecology Core Facility* (MACE). Since its inception in 2014, this facility has grown to include a substantial suite of contemporary tools and techniques including: real time PCR, regular PCR, 2 large and 2 small centrifuges, gel-doc and electrophoresis equipment, a gel visualizer, customized volatile collection equipment, a gas chromatograph/mass spectrometer, 1 Qubit, 1 rotary evaporator, a spectrophotometer, a microbalance and a pH meter. MACE also maintains preparation and storage equipment such as -80 and -20 freezers, fume hoods, shakers, heaters and a biological safety cabinet. New additions to this core facility are constantly being made with competitive grants and contracts, and investments by MSU's AgBioResearch.

Michigan State University AgBioResearch

MICHIGAN STATE UNIVERSITY | Extension

with the **MSU College of Agriculture and Natural Resources**



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Examples of MACE Applications

- Real-time PCR machine allows faculty, students, and staff to study gene expression, effectiveness of biological control organisms, insect pathogens and biological diversity.
- A spectrophotometer quantifies proteins, DNA, RNA and secondary plant metabolites.
- The microbalance measures small insect growth, insect eggs, pollen, and quantifies induced plant metabolites.
- Gel visualization equipment is essential to measure insect predation rates in the field and to diagnose infection rates of insects carrying pathogens.
- Volatile collection systems allow collection of pheromones and plant semiochemicals from living subjects.
- The GC-MS can elucidate insect and plant semiochemicals.
- A biological safety cabinet provides protected space for techniques requiring aseptic conditions.
- The -80°C freezer offers safe storage for sensitive biological materials (e.g., DNA, RNA).

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The **Michigan State University Department of Entomology** excels in research, extension and teaching to address the issues that confront the people of Michigan, our nation and the world. MSU's entomologists look for systemic solutions across disciplines to address critical issues related to health, natural resources, food production and more.

People

275 faculty, staff, students

9 MSU Distinguished faculty

Teaching

1,400 undergrads take an entomology course each year

Students from **15 countries** since 2009

Research

Multi-year grants

with continuous funding (years = length of commitment):

- 15 years National Institutes of Health
- 9 years National Science Foundation
- 8 years U.S. Department of Energy
- 10 years Bill/Melinda Gates Foundation
- 10 years U.S. Agency for International Development
- Continuous funding from USDA including 5 year SCRI

$10 million annual research expenditures

Outreach & Extension

5,000 visitors to the Bug House each year

$1.4 million increased Michigan fruit sales for growers using MSU Enviro-weather's online pest/crop decision tools

MICHIGAN STATE UNIVERSITY | Entomology

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Proud to be a part of: AgBioResearch, MSU Extension, the College of Agriculture and Natural Resources, the College of Natural Science.