

# The Insect Biocontrol Laboratory

## Taking Research

### from Molecular...

Research at the Insect Biocontrol Laboratory runs the gamut from examining DNA sequences and individual proteins to complex ecosystems such as those found in row crops, coffee plantations and forests.

Within these broader categories of research, specific studies focus on diverse topics. In the molecular arena, some of our scientists are performing DNA sequence analyses on pathogens that infect insects, such as viruses and fungi.



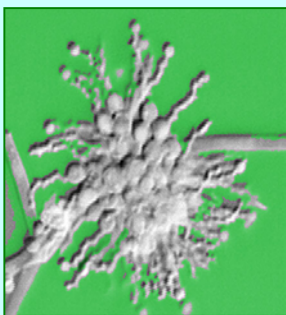
**Insect virus**

These are not obscure scientific investigations. Understanding the genetics of these organisms can help us identify genes that make them

successful biological control agents.

Additionally, some of this work can result in tools for manipulating the genetics of other organisms.

Certain studies are directed at determining the toxic components of bacteria that are pathogenic to insects. Once identified, we can look for bacterial



**Insect pathogenic fungi**

strains that make more of the material and make sure it is safe for non-target organisms. More effective pest control may be obtained by our research on discovery and modification of plants genes that respond to pest insect attack.

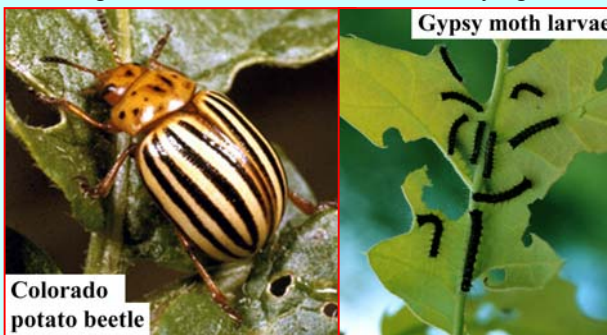
We are developing new tools for producing insect pathogens, such as establishing insect cell cultures for production and study of insect-pathogenic viruses.



**Bacteria for insect control**

### ...through Insects...

Beyond the microscopic and submicroscopic, our studies also include research on the effects of microorganisms on insects as well as identifying and



**Colorado potato beetle**

**Gypsy moth larvae**



**Coffee berry borer**

**Silverleaf whitefly**

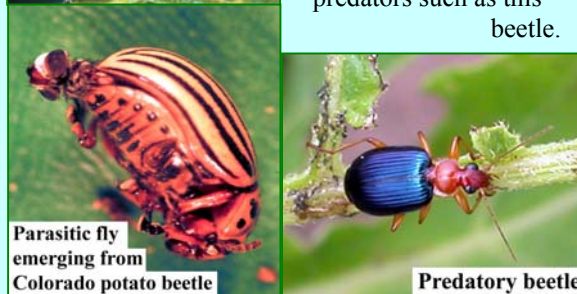
researching factors such as hormones and regulators of insect development. Much of this research focuses on specific pest insects such as those pictured here.

Scientists in the Insect Biocontrol Laboratory are also studying insects and other arthropods that prey on or parasitize key pest insects. As part of this work, we are



**Parasitic wasp**

developing molecular methods for the detection of predation and parasitism in the field. Examples include the parasitic wasp and fly pictured here and predators such as this beetle.

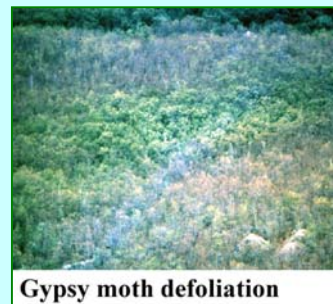


**Parasitic fly emerging from Colorado potato beetle**

**Predatory beetle**

### ...to Ecosystems

Our ultimate goal in the Insect Biocontrol Laboratory is to create new tools for management of pest insects in a variety of ecosystems.



**Gypsy moth defoliation**

The Insect Biocontrol Laboratory has had a long-term effort in the management of the gypsy moth in urban settings and a close collaboration with colleagues in the Forest Service for control of the pest on a wider scale. The

laboratory is currently intimately involved in the national Slow the Spread of the Gypsy Moth Program designed to reduce the rate of gypsy moth advancement into uninfested areas.

The Colorado potato beetle is also a major focus in the laboratory. In addition to pursuing biocontrol agents, new crop management practices are also being researched, such as mulching to improve effectiveness of natural enemies against this pest.



**Potato field with mulch**

While coffee is a relatively minor agricultural crop in the U.S., it is the second most widely traded commodity in the world and has a major financial impact on the



**Coffee grown under shade in Puerto Rico**

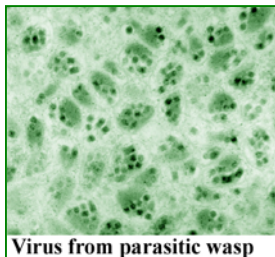
U.S. economy. The coffee berry borer has caused substantial production losses as it has spread to new areas, and the IBL is working to develop new management practices utilizing biological methods.



## *Useful Products and Insect Control Measures Under Development in the Insect Biocontrol Laboratory*

A variety of useful biocontrol products are currently under development. These include:

- Microbial insecticides containing living pathogens (bacteria, fungi, and viruses), such as a novel insecticidal species of *Chromobacterium*.



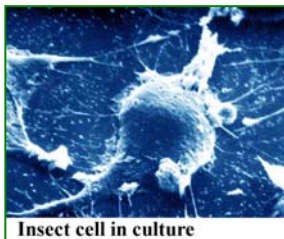
- Beneficial insects, such as parasites and predators of pest insects and new crop management systems for their use.

- Natural bio-based products and their formulations, such as feeding attractants and deterrents of pest insects and sex pheromones to disrupt mating.



- Products enabling research and discovery, such as specialized artificial insect diets for pest insect species, and a large number of continuous cell lines from more than a dozen species of insects developed for use in protein expression systems or in testing of biologically active materials.

- Modern research systems, such as new methods to modify insect cells and a method to detect transgenic proteins.



- Methods for selecting insect-resistant plant varieties including crops producing pathogen-derived insecticidal compounds.

### *Collaborations*

We encourage inquiries from potential partners from industry and university for initiating cooperative research and development agreements regarding any of these items.

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### **Insect Biocontrol Laboratory**

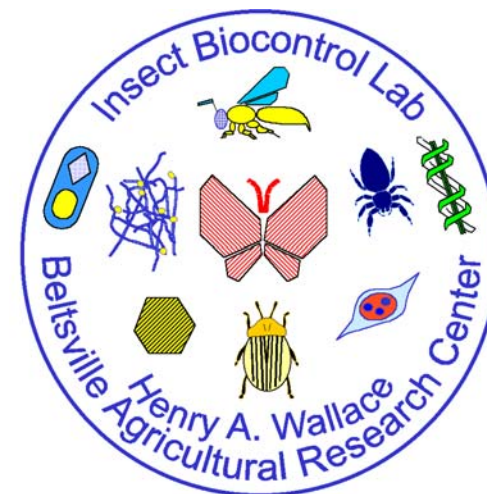
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## *Insect Biocontrol Laboratory*



*Plant Sciences Institute*

*Beltsville Agricultural Research Center*

*United States Department of Agriculture*

*Agricultural Research Service*

*Beltsville, Maryland*

### OUR MISSION

The Insect Biocontrol Laboratory develops selective and environmentally compatible methods for controlling insect pests of trees, ornamentals, and agricultural crops. Our goal is to contribute to sustainable pest management programs that incorporate naturally derived biological control agents and reduced reliance on chemical insecticides. These programs will benefit the American public by providing a healthy, safer food supply and cleaner air, water, and soil.

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