

## Term Information

Effective Term Spring 2020

## General Information

Course Bulletin Listing/Subject Area Evol, Ecology & Organismal Bio  
Fiscal Unit/Academic Org Evolution, Ecology & Org Bio - D0390  
College/Academic Group Arts and Sciences  
Level/Career Graduate, Undergraduate  
Course Number/Catalog 5490  
Course Title Insect Behavior: Mechanisms and Function  
Transcript Abbreviation Insect Behavior  
Course Description Understanding the mechanisms and evolution of insect behavior and communication. Course will address behavioral physiology and ecology, sociality, learning and cognition, as well as applied aspects of insect behavior.  
Semester Credit Hours/Units Fixed: 3

## Offering Information

Length Of Course 14 Week, 12 Week  
Flexibly Scheduled Course Never  
Does any section of this course have a distance education component? No  
Grading Basis Letter Grade  
Repeatable No  
Course Components Lecture  
Grade Roster Component Lecture  
Credit Available by Exam No  
Admission Condition Course No  
Off Campus Never  
Campus of Offering Columbus

## Prerequisites and Exclusions

Prerequisites/Corequisites Junior standing or permission of the instructor  
Exclusions Entomology 642, Entomology 5420, Entomology 5490  
Electronically Enforced No

## Cross-Listings

Cross-Listings Entomology 5490

## Subject/CIP Code

Subject/CIP Code 26.0708  
Subsidy Level Doctoral Course  
Intended Rank Junior, Senior, Masters, Doctoral

## Requirement/Elective Designation

The course is an elective (for this or other units) or is a service course for other units

## Course Details

### Course goals or learning objectives/outcomes

- Appreciate the extraordinary diversity of behaviors and signaling mechanisms that insects have evolved to adapt to their environment.
- Recognize the physiological and ecological pressures that both drive and constrain the evolution of behavior in insects.
- Understand the proximal mechanisms that allow insects to encode information and respond in an appropriate manner at the morphological, neuronal, and hormonal levels.
- Be able to evaluate critically contrary positions in unresolved questions and recognize how personal philosophy and background inform those positions.
- Become familiar with the experimental methodologies used to study insect behavior.
- Be aware of the ways in which understanding behavior is used to control populations of pest and beneficial insects.

### Content Topic List

- Response to signals
- Behavioral physiology
- Learning and cognition
- Behavioral ecology
- Applied insect behavior

### Sought Concurrence

Yes

## Attachments

- 2019 5420 Insect Behavior Syllabus.pdf: Syllabus for 2019 offering in Entomology  
*(Syllabus. Owner: Hamilton, Ian M)*
- ConcurrenceEntomology.pdf: Entomology concurrence  
*(Concurrence. Owner: Hamilton, Ian M)*
- EEOB Curriculum Maps Feb 2019.xlsx: Curriculum Maps for E&E and Zoology Majors  
*(Other Supporting Documentation. Owner: Hamilton, Ian M)*
- 2020 EEOB Insect Behavior Syllabus- RMMA.pdf: Syllabus for 2020 EEOB offering  
*(Syllabus. Owner: Hamilton, Ian M)*

## Comments

- Course will be cross listed with ENTO 5490. Currently, Insect Behavior is offered in Entomology as 5420. Entomology is in the process of changing the course number of their offering. Entomology will also be changing prerequisites from current introduction biology and entomology courses to junior standing. *(by Hamilton, Ian M on 02/16/2019 02:43 PM)*

**COURSE REQUEST**  
5490 - Status: PENDING

Last Updated: Haddad,Deborah Moore  
02/16/2019

**Workflow Information**

Status	User(s)	Date/Time	Step
Submitted	Hamilton,Ian M	02/16/2019 02:50 PM	Submitted for Approval
Approved	Hamilton,Ian M	02/16/2019 02:51 PM	Unit Approval
Approved	Haddad,Deborah Moore	02/16/2019 03:13 PM	College Approval
Pending Approval	Nolen,Dawn Vankeerbergen,Bernadette Chantal Oldroyd,Shelby Quinn Hanlin,Deborah Kay Jenkins,Mary Ellen Bigler	02/16/2019 03:13 PM	ASCCAO Approval

**INSECT BEHAVIOR:  
Mechanisms and Function**  
ENTMLGY 5420

**Instructor:** P. Larry Phelan, Thorne Hall, OARDC (Wooster Campus)  
Phone: 5-3728 from Columbus Campus or 330-263-3728  
Email: phelan.2@osu.edu

The behavior of insects mediates all aspects of their ecological interactions and evolution. This course will describe the multitude of amazing behaviors expressed by insects and explore how behavior determines their survivorship and fitness. We will discuss the selective forces and constraints driving the evolution of behaviors and the proximal mechanisms that make possible complex expression within the comparatively simple insect nervous system.

**Learning Outcomes:**

1. understand the mechanisms underlying insect behavior and their interaction with their environment,
2. understand the evolution of behaviors and their ecological function,
3. learn methods used for the study of insect behavior both in the field and the laboratory,
4. explore the practical applications of insect behavior for pest management and the study of higher systems, and
5. develop critical thinking skills and the ability to evaluate primary research articles.

Philosophically, I place higher value on conceptual understanding than on memorization. Conceptual understanding is verified by the ability to apply a concept to a new situation. I also highly value class participation, particularly asking questions, which improves understanding not only for the individual but the rest of the class.

**Instructional Methods:**

Instruction will be achieved through a combination of traditional lectures and participatory learning. Lectures will rely on PowerPoint presentations and auditory or video recordings of behavior. All course materials, including PowerPoints, handouts, readings, and lecture recordings, will be available through Carmen. Recordings are intended to reinforce or supplement personal notes, not substitute class attendance and participation. Also recognize that technology and the instructor's skills are fallible, so that some classes may not be recorded.

**Readings:**

There is no assigned text. Reading assignments (some required, some optional) will be made periodically to supplement the lectures. Required readings are fair game for exams, even if not directly covered in lecture.

## Course Outline

### **A. INTRODUCTION**

1. Course Objectives
2. Conceptual Framework for Understanding Behavior
  - a. Tinbergen's Four Questions
  - b. Understanding behavior as information flow
3. Communication

### **B. BEHAVIORAL FUNCTION AND FITNESS**

1. Mating and Reproduction:
  - a. Ultimate causality & selection forces
    - i. Sexual selection
    - ii. Mating strategies
  - b. Proximate mechanisms & modalities
    - i. Chemical modality
    - ii. Auditory modality
    - iii. Visual modality
2. Phytophagy & Host-plant Finding/Selection:
  - a. Ultimate causality & selection forces
  - b. Proximate mechanisms & modalities
    - i. Chemical modality
    - ii. Visual modality
3. Zoophagy & Prey-/Host-finding
  - a. Ultimate causality & selection forces
  - b. Proximate mechanisms & modalities
    - i. Active v. passive strategies
4. Defense
  - a. Ultimate causality & selection forces
  - b. Proximate mechanisms & modalities

### **C. PROXIMAL MECHANISMS OF MOVEMENT**

1. Local Search
  - a. Orientation mechanisms
  - b. Orientation to odor sources
2. Non-Source-Directed Movement
  - a. Dispersal vs. migration
  - b. Navigation

### **D. BEHAVIORAL PHYSIOLOGY**

1. Neural Organization of Behavior - Sensory Inputs
2. Behavioral Endocrinology
  - a. Hormones & neuromodulators
  - b. Endogenous rhythms
3. Input Integration & Information Encoding
  - a. Directionality

- b. Odor quality
- c. Polarized light & color vision
- 4. Neural Organization of Behavior - Motor Outputs

**E. COMPLEX BEHAVIORS**

- 1. Behavioral Plasticity & Learning
- 2. Cognition
- 3. Behavior of Social Systems

**F. APPLICATIONS OF BEHAVIOR**

- 1. Managing Insect Populations- Agriculture & Human Health

**Grading Criteria:**

Midterm Exam	30%
Critical paper reviews (top 2 of 3)	30%
Final Exam	30%
Class attendance and participation	10%

**Late Policy:**

Critical reviews are due prior to the start of class on the date assigned. A review that is submitted late without a legitimate, documented excuse (see below) will be reduced in grade by 10% during the first hour, with additional 10% deductions for every additional hour that it is late.

**Academic Misconduct:**

Academic misconduct is prohibited by the university. Any student who engages in academic misconduct is subject to disciplinary action. Academic misconduct is defined in the Code of Student Conduct (<http://studentaffairs.osu.edu/csc/>) as any activity that tends to compromise the academic integrity of the university, or subvert the educational process. Alleged cases of academic misconduct will be forwarded to the University's Committee on Academic Misconduct (<http://oaa.osu.edu/coam.html>). A more comprehensive discussion on academic misconduct can be found in the Code of Student Conduct.

**Students with Disabilities:**

If you need an accommodation based on a disability, please contact the course instructor privately. The Office for Disability Services (<http://www.ods.ohio-state.edu/>) is available to assist students with disabilities with services and programs, (614) 292-3307.

**Excused Absences:**

Legitimate excused absences include the following: participation in an activity of an official University organization, verifiable illness, verifiable family emergencies, subpoenas, jury duty, military service, and professional development (e.g., grad school visits). It is the student's responsibility to notify the instructor of any expected, excused absence as far in advance as possible.

**Course Communications:**

If you have questions during the course, feel free to email me directly at any time or send me a message via Carmen. If you need face time with the instructor, contact me to schedule either an in-person or videoconference meeting.

## **INSECT BEHAVIOR: Mechanisms and Function**

ENTMLGY/EEOB 5490

*Spring 2020 3 credit hours*

Room ### XYZ Hall Wed. and Friday (9:35-10:55am)

### **Instructor:**

Rachelle M. M. Adams, Department of Evolution, Ecology and Organismal Biology, Museum of Biological Diversity (rm 1500), 1315 Kinnear Road, Columbus, OH 43212

Phone: 614-292-6980

Email: [adams.1970@osu.edu](mailto:adams.1970@osu.edu) *\*Email to schedule a meeting.*

Website: <https://megalomyrmex.osu.edu/>

### **Course description:**

The behavior of insects mediates all aspects of their ecological interactions and evolution. This course will describe the multitude of amazing behaviors expressed by insects and explore how behavior determines their survivorship and fitness. We will discuss the selective forces and constraints driving the evolution of behaviors and the proximal mechanisms that make possible complex expression within the comparatively simple insect nervous system.

### **Learning Outcomes:**

1. Appreciate the extraordinary diversity of behaviors and signaling mechanisms that insects have evolved to adapt to their environment.
2. Recognize the physiological and ecological pressures that both drive and constrain the evolution of behavior in insects.
3. Understand the proximal mechanisms that allow insects to encode information and respond in an appropriate manner at the morphological, neuronal, and hormonal levels.
4. Be able to evaluate critically contrary positions in unresolved questions and recognize how personal philosophy and background inform those positions.
5. Become familiar with the experimental methodologies used to study insect behavior.
6. Be aware of the ways in which understanding behavior is used to control populations of pest and beneficial insects.

Philosophically, I place higher value on conceptual understanding than on memorization. Conceptual understanding is verified by the ability to apply a concept to a new situation. I also highly value class participation, particularly asking questions, which improves understanding not only for the individual but the rest of the class.

### **Instructional Methods:**

Instruction will be achieved through a combination of traditional lectures and participatory learning. Lectures will rely on PowerPoint presentations and auditory or video recordings of behavior. All course materials, including PowerPoints, handouts, readings, and lecture recordings, will be available through Carmen/Canvas. Recordings are intended to reinforce or supplement

personal notes, not substitute class attendance and participation. Also recognize that technology and the instructor’s skills are fallible, so that some classes may not be recorded.

**Readings:**

There is no assigned text. Reading assignments (some required, some optional) will be made periodically to supplement the lectures. Required readings are fair game for exams, even if not directly covered in lecture.

**Critical Review:**

The objective of the critical review assignment is for students to develop critical thinking, strengthen one’s ability to evaluate research papers, and develop the ability to write in a scientific style with greater clarity. Concise reviews should be no longer than 1.5 pages.

**Important Dates**

Critical Review #1	Feb 1*
Midterm Exam	Feb 22
Spring Break	Mar 11-15
Critical Review #2	Mar 22**
Critical Review #3	Apr 10***
Final Exam	Apr 24 (Wed) 10:00-11:45am

**Course Outline**

Wk	Date	<i>A. INTRODUCTION</i>
1	9-Jan	1. Course Objectives
		2. Conceptual Framework for Understanding Behavior
		a. Tinbergen’s Four Questions
	11-Jan	b. Understanding behavior as information flow
		3. Communication
		<b><i>B. BEHAVIORAL FUNCTION AND FITNESS</i></b>
		1. Mating and Reproduction:
		a. Ultimate causality & selection forces
2	16-Jan	i. Sexual selection
	18-Jan	ii. Mating strategies
		b. Proximate mechanisms & modalities
3	23&25-Jan	i. Chemical modality
4	30-Jan&1-Feb*	ii. Auditory modality
5	1&6-Feb	iii. Visual modality
		2. Phytophagy & Host-plant Finding/Selection:
	8-Feb	a. Ultimate causality & selection forces
6	13-Feb	b. Proximate mechanisms & modalities
		i. Chemical modality
		ii. Visual modality
		3. Zoophagy & Prey-/Host-finding

	15-Feb	a. Ultimate causality & selection forces
7	20-Feb	b. Proximate mechanisms & modalities
		i. Active v. passive strategies
	<b>22-Feb</b>	<b>Midterm</b>
8	27-Feb	4. Defense
		a. Ultimate causality & selection forces
		b. Proximate mechanisms & modalities
		<b>C. PROXIMAL MECHANISMS OF MOVEMENT</b>
		1. Local Search
	1-Mar	a. Orientation mechanisms
		b. Orientation to odor sources
		2. Non-Source-Directed Movement
9	6-Mar	a. Dispersal vs. migration
	8-Mar	b. Navigation
	11-15 Mar	<b>Spring Break</b>
		<b>D. BEHAVIORAL PHYSIOLOGY</b>
10	20-Mar	1. Neural Organization of Behavior – Sensory Inputs
		2. Behavioral Endocrinology
		a. Hormones & neuromodulators
	<b>22-Mar**</b>	b. Endogenous rhythms
		3. Input Integration & Information Encoding
11	27-Mar	a. Directionality
	29-Mar	b. Odor quality
12	3-Apr	c. Polarized light & color vision
	5-Apr	4. Neural Organization of Behavior – Motor Outputs
		<b>E. COMPLEX BEHAVIORS</b>
13	<b>10-Apr***</b>	1. Behavioral Plasticity & Learning
	12-Apr	2. Cognition
14	17-Apr	3. Behavior & Origins of Social Systems
		<b>F. APPLICATIONS OF BEHAVIOR</b>
	19-Apr	1. Managing Insect Populations- Agricult & Human Health

**Grading Criteria:**

Midterm Exam	30%
Critical paper reviews (top 2 of 3)	30%
Final Exam	30%
Class attendance and participation	10%

## Grading scale:

93% - 100% A	87.0-89.99% B+	77.0-79.99% C+	67.0-69.99% D+
90.0 - 92.99% A-	83.0-86.99% B	73.0-76.99% C	63.0-66.99% D
	80.0-82.99% B-	70.0-72.99% C-	< 59.9 E

## Late Policy:

Critical reviews are due prior to the start of class on the date assigned. A review that is submitted late without a legitimate, documented excuse (see below) will be reduced in grade by 10% during the first hour, with additional 10% deductions for every additional hour that it is late.

## Excused Absences:

Legitimate excused absences include the following: participation in an activity of an official University organization, verifiable illness, verifiable family emergencies, subpoenas, jury duty, military service, and professional development (e.g., grad school visits). It is the student's responsibility to notify the instructor of any expected, excused absence as far in advance as possible.

## Course Communications:

If you have questions during the course, feel free to email me directly at any time or send me a message via Carmen. If you need face time with the instructor, contact me to schedule either an in-person or videoconference meeting.

**Sustainability:** I wish to reduce the ecological footprint of this course and encourage you to do the same. I provide lecture images and other course materials digitally; I encourage you to store and use them in that format. Please suggest ideas on how I might further decrease the ecological impact of the course.

**Academic Misconduct:** OSU has a strict code of academic misconduct that requires us to report any and all cases of suspected misconduct to the OSU Committee on Academic Misconduct for adjudication (Faculty Rule 3335-5-487). You should understand the nature and consequences of plagiarism (and of anti-plagiarism sites like [www.turnitin.com](http://www.turnitin.com)).

I adhere to the following policy:

It is the responsibility of the Committee on Academic Misconduct to investigate or establish procedures for the investigation of all reported cases of student academic misconduct. The term "academic misconduct" includes all forms of student academic misconduct wherever committed; illustrated by, but not limited to, cases of plagiarism and dishonest practices in connection with examinations. Instructors shall report all instances of alleged academic misconduct to the committee (Faculty Rule 3335-5-487). For additional information, see the Code of Student Conduct <http://studentlife.osu.edu/csc/>.

**Students with Disabilities:** I use a Universal Design for Learning approach in this course to accommodate different learning styles. I also accommodate the needs of students with varied disabilities. Should you need accommodation or have concerns about possible disabilities affecting your progress in my (or any) course, please contact me.

I adhere to the following policy:

The University strives to make all learning experiences as accessible as possible. If you anticipate or experience academic barriers based on your disability (including mental health, chronic or temporary medical conditions), please let me know immediately so that we can privately discuss options. To establish reasonable accommodations, I may request that you register with Student Life Disability Services. After registration, make arrangements with me as soon as possible to discuss your accommodations so that they may be implemented in a timely fashion. SLDS contact information: [slds@osu.edu](mailto:slds@osu.edu); 614-292-3307; [slds.osu.edu](http://slds.osu.edu); 098 Baker Hall, 113 W. 12<sup>th</sup> Avenue.

**Mental health statement:** As a student you may experience a range of issues that can cause barriers to learning, such as strained relationships, increased anxiety, alcohol/drug problems, feeling down, difficulty concentrating and/or lack of motivation. These mental health concerns or stressful events may lead to diminished academic performance or reduce a student's ability to participate in daily activities. The Ohio State University offers services to assist you with addressing these and other concerns you may be experiencing. If you or someone you know are suffering from any of the aforementioned conditions, you can learn more about the broad range of confidential mental health services available on campus via the Office of Student Life's Counseling and Consultation Service (CCS) by visiting [ccs.osu.edu](http://ccs.osu.edu) or calling [614-292-5766](tel:614-292-5766). CCS is located on the 4th Floor of the Younkin Success Center and 10th Floor of Lincoln Tower. You can reach an on call counselor when CCS is closed at [614-292-5766](tel:614-292-5766) and 24 hour emergency help is also available through the 24/7 National Suicide Prevention Hotline at 1-800-273-TALK or at [suicidepreventionlifeline.org](http://suicidepreventionlifeline.org).

**Diversity and Inclusion:** I share the commitment to diversity and inclusion as stated by the Department of Evolution, Ecology, and Organismal Biology (EEOB) and OSU. The Department of EEOB strives to create and maintain a welcoming climate for our faculty, staff, and students. Diversity enhances all aspects of our academic efforts including our research, teaching, and service. Diversity provides multiple experiences, generates multiple perspectives, and promotes the free exchange of ideas. We make this commitment to enhance our ability, and that of our students, to understand the biological world and apply that understanding to address problems confronting society.

The Ohio State University affirms the importance and value of diversity in the student body. Our programs and curricula reflect our multicultural society and global economy and seek to provide opportunities for students to learn more about persons who are different from them. We are committed to maintaining a community that recognizes and values the inherent worth and dignity of every person; fosters sensitivity, understanding, and mutual respect among each member of our community; and encourages each individual to strive to reach his or her own potential. Discrimination against any individual based upon protected status, which is defined as age, color, disability, gender identity or expression, national origin, race, religion, sex, sexual orientation, or veteran status, is prohibited. For more information on diversity at OSU, please see [OSU diversity resources](#)

**Sexual misconduct/relationship violence:** Title IX makes it clear that violence and harassment based on sex and gender are Civil Rights offenses subject to the same kinds of accountability and the same kinds of support applied to offenses against other protected categories (e.g., race). If you or someone you know has been sexually harassed or assaulted, you may find the appropriate resources at <http://titleix.osu.edu> or by contacting the Ohio State Title IX Coordinator, Kellie Brennan, at [titleix@osu.edu](mailto:titleix@osu.edu)

## Ohio State Department Course Review Concurrence Form

The purpose of this form is to provide a simple system of obtaining departmental reactions to proposed new courses, group studies, study tours, workshop requests, and course changes. A letter may be substituted for this form.

Academic units initiating a request which requires such a reaction should complete Section A of this form and send a copy of the form, course request, and syllabus to each of the academic units that might have related interests in the course. Initiating units should allow at least two weeks for responses.

Academic units receiving this form should respond to Section B and return the form to the initiating unit. Overlap of course content and other problems should be resolved by the academic units before forwarding this form and all other accompanying documentation to the Office of Academic Affairs.

### A. Information from academic unit *initiating* the request:

Initiating Academic Unit: Dept Evolution Ecology Org Bio Date: 2/13/2019

Registrar's Listing: EEOB

Course Number: 5490 Level: U  P  G  Credit Hours: 3

Course Title: Insect Behavior

Type of Request:  New Course  Group Studies  Workshop  Study Tour  Course Change

Academic Unit with related interests asked to review the request (use a separate form for each unit while requesting concurrences from multiple units):

Date responses are needed:

### B. Information from academic units *reviewing* the request:

- The academic unit **supports** the proposal Department of Entomology  
 The academic unit **does not support** the proposal.

Please explain:

Support cross listing with ENTMLGY 5420 for which we are initiating a course change request to be renumbered as ENTMLGY 5490.

- The academic unit suggests:

Carol Anelli

Signature of Department Chair

Signature of Graduate Studies Chair (if applicable)

Carol Anelli