

# ENTOMOLOGY, BS

Entomology is the study of insects, which have dominated the terrestrial planet for more than 350 million years. While entomologists have recognized and named more than one million different species of insects, experts vary widely on the true number of insect species – with estimates ranging from three million to 30 million unique species. At any given moment, 200+ million insects live for every human on Earth; over 70% of all animal species are insects. They have achieved something that has eluded humans – sustainable development. Insects are the primary consumers of plants, yet they are also the dominant pollinators, thus ensuring plant reproduction. They play a critical role in disease transmission yet the service they provide to ecological maintenance is unparalleled.

Entomologists conduct insect-based research in numerous areas ranging from general biology, natural history, systematics, ecology, and behavior, to molecular biology, physiology, and development, to medical and agricultural entomology. Emerging areas include invasive species, biodiversity, pollination ecology, forensics, global health, and genomics. Entomology is a very specific discipline, yet at the same time, an immensely broad and diverse field of study touching a wide array of other subjects. As such, entomological training provides many choices and opportunities for those interested in the diversity of nature. While some entomologists work in the field, others work in the laboratory, classroom, or museum settings.

Students majoring in entomology study in a variety of fundamental and applied fields. Graduates find employment in college and university teaching, community education, research and extension work, state and federal government service, industry, and research institutes.

## LEARN THROUGH HANDS-ON, REAL-WORLD EXPERIENCES

Entomology students learn in many field and lab courses, including classes that focus on taxonomy, physiology, parasitology, insects and human culture, issues in global health, and medical entomology. Students can complete their capstone requirement as part of a summer field course. There are also numerous internships and research opportunities available both on and off campus.

## BUILD COMMUNITY AND NETWORKS

The UW–Madison Entomology Department is committed to the UW System’s (<http://www.wisconsin.edu/campuses/>) goal to provide Wisconsin’s citizens with opportunities to benefit from and contribute to the state’s growing “knowledge economy” through the land-grant university three-fold mission of teaching, research and public service.

In the spirit of The Wisconsin Idea (<http://www.wisconsinidea.wisc.edu/>), Entomology Department faculty and students fulfill the public service mission through entomology outreach engagement. Entomology Department interactions with the surrounding and statewide community encompass a wide range of insect and human affairs from human medical issues such as West Nile Virus and Lyme disease, to forest products and natural resources entomology, integrated pest management programs for agriculture, turf and ornamental and household settings, K-12 primary and secondary school education, and more.

## CUSTOMIZE A PATH OF STUDY

Students are often able to customize their program of study by exploring a double major and/or undergraduate certificates based on their unique areas of interest. Both faculty and staff advisors are available to help students choose electives based on their educational and professional goals.

## MAKE A STRONG START

Freshmen who are interested in Entomology are encouraged to participate in a First-Year Interest Group (<https://figs.wisc.edu/what/>) (FIG) program. During fall semesters, the department has historically offered a fascinating FIG titled “Global Biodiversity and the 6th Mass Extinction” where students explore what the immense richness of biodiversity means not only to the human species but to the very health of the planet. This program includes field trips, a museum experience, and other hands-on and experiential learning opportunities to bring concepts and classmates together for an eye-opening journey.

## GAIN GLOBAL PERSPECTIVE

The Entomology major is a great choice for students who wish to participate in a study abroad experience. Students can choose from a multitude of destinations worldwide and can travel abroad during summer, spring, or fall terms. Students can explore studying abroad as an Entomology major by utilizing the Entomology Major Advising Page. Students work with their advisor and the CALS study abroad office to identify appropriate programs.

## HOW TO GET IN

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To declare this major, students must be admitted to UW–Madison and the College of Agricultural and Life Sciences (CALS). For information about becoming a CALS first-year or transfer student, see Entering the College (<http://guide.wisc.edu/undergraduate/agricultural-life-sciences/#enteringthecolletext>).

Students who attend Student Orientation, Advising, and Registration (SOAR) with the College of Agricultural and Life Sciences have the option to declare this major at SOAR. Students may otherwise declare after they have begun their undergraduate studies. For more information, contact the advisor listed in the Contact Box for the major.

## REQUIREMENTS

### UNIVERSITY GENERAL EDUCATION REQUIREMENTS

All undergraduate students at the University of Wisconsin–Madison are required to fulfill a minimum set of common university general education requirements to ensure that every graduate acquires the essential core of an undergraduate education. This core establishes a foundation for living a productive life, being a citizen of the world, appreciating aesthetic values, and engaging in lifelong learning in a continually changing world. Various schools and colleges will have requirements in addition to the requirements listed below. Consult your advisor for assistance, as needed. For additional information, see the university Undergraduate

General Education Requirements (<http://guide.wisc.edu/undergraduate/#requirementsforundergraduatestudytext>) section of the *Guide*.

General Education	<ul style="list-style-type: none"> <li>Breadth—Humanities/Literature/Arts: 6 credits</li> <li>Breadth—Natural Science: 4 to 6 credits, consisting of one 4- or 5-credit course with a laboratory component; or two courses providing a total of 6 credits</li> <li>Breadth—Social Studies: 3 credits</li> <li>Communication Part A &amp; Part B *</li> <li>Ethnic Studies *</li> <li>Quantitative Reasoning Part A &amp; Part B *</li> </ul>
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\* The mortarboard symbol appears before the title of any course that fulfills one of the Communication Part A or Part B, Ethnic Studies, or Quantitative Reasoning Part A or Part B requirements.

## COLLEGE OF AGRICULTURAL AND LIFE SCIENCES REQUIREMENTS

In addition to the University General Education Requirements, all undergraduate students in CALS must satisfy a set of college and major requirements. Courses may not double count within university requirements (General Education and Breadth) or within college requirements (First-Year Seminar, International Studies, Science, and Capstone), but courses counted toward university requirements may also be used to satisfy a college and/or a major requirement; similarly, courses counted toward college requirements may also be used to satisfy a university and/or a major requirement.

### COLLEGE REQUIREMENTS FOR ALL CALS BS DEGREE PROGRAMS

Code	Title	Credits
Quality of Work: Students must maintain a minimum cumulative grade point average of 2.000 to remain in good standing and be eligible for graduation.		
Residency: Students must complete 30 degree credits in residence at UW–Madison after earning 86 credits toward their undergraduate degree.		
	First year seminar ( <a href="http://guide.wisc.edu/undergraduate/agricultural-life-sciences/#CALSThirdYearSeminarCourses">http://guide.wisc.edu/undergraduate/agricultural-life-sciences/#CALSThirdYearSeminarCourses</a> )	1
	International studies ( <a href="http://guide.wisc.edu/undergraduate/agricultural-life-sciences/#CALSIInternationalStudiesCourses">http://guide.wisc.edu/undergraduate/agricultural-life-sciences/#CALSIInternationalStudiesCourses</a> )	3
	Physical science fundamentals	4-5
	CHEM 103 General Chemistry I	
	or CHEM 108 Chemistry in Our World	
	or CHEM 109 Advanced General Chemistry	
	Biological science	5
	Additional science (biological, physical, or natural)	3
	Science breadth (biological, physical, natural, or social)	3

CALS Capstone Learning Experience: included in the requirements for each CALS major (see "major requirements") (<http://guide.wisc.edu/undergraduate/agricultural-life-sciences/#CALSCapstoneRequirement>)

## MAJOR REQUIREMENTS

Code	Title	Credits
<b>Mathematics</b>		
Select one of the following (or placement exam):		5-6
MATH 112 & MATH 113	Algebra and Trigonometry	
MATH 114	Algebra and Trigonometry	
MATH 171	Calculus with Algebra and Trigonometry I <sup>1</sup>	
Select one of the following:		5
MATH 211	Survey of Calculus 1	
MATH 217	Calculus with Algebra and Trigonometry II	
MATH 221	Calculus and Analytic Geometry 1	
STAT 371	Introductory Applied Statistics for the Life Sciences	
<b>Chemistry</b>		
Select one of the following:		5-9
CHEM 103 & CHEM 104	General Chemistry I and General Chemistry II	
CHEM 109	Advanced General Chemistry	
<b>Biology</b>		
Option 1:		
BIOLOGY/ BOTANY/ ZOOLOGY 151 & BIOLOGY/ BOTANY/ ZOOLOGY 152	Introductory Biology and Introductory Biology	
Option 2:		
ZOOLOGY/ BIOLOGY 101 & ZOOLOGY/ BIOLOGY 102 & BOTANY/ BIOLOGY 130	Animal Biology and Animal Biology Laboratory and General Botany	
Option 3:		
BIOCORE 381 & BIOCORE 382 & BIOCORE 383 & BIOCORE 384	Evolution, Ecology, and Genetics and Evolution, Ecology, and Genetics Laboratory and Cellular Biology and Cellular Biology Laboratory	
Select 12 additional credits from any biological or physical science course (at least 8 credits must be 300-level or 200-level courses with the intermediate-level designation). <sup>2</sup>		
<b>Physics</b>		
Select one of the following:		3-5
PHYSICS 103	General Physics	
PHYSICS 107	The Ideas of Modern Physics	
PHYSICS 109	Physics in the Arts	

PHYSICS 115	Energy and Climate	
PHYSICS 201	General Physics	
PHYSICS 207	General Physics	

**Entomology Core**

ENTOM/ZOOLOGY 302	Introduction to Entomology	4
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Select 11 credits as follows: 11

Must select at least 3 credits from at least two subsets (organismal, suborganismal, or applied)

May select up to 3 credits from subset called "other"

**Capstone**

ENTOM 468	Studies in Field Entomology <sup>3</sup>	3
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**Total Credits 36-43**

<sup>1</sup> If MATH 171 is taken, student must take MATH 217.

<sup>2</sup> Suggested courses/subjects include GENETICS 466, CHEM 341, CHEM 342 CHEM 343, CHEM 344, CHEM 345, PHYSICS 104, PHYSICS 202, PHYSICS 208, ENTOM not used elsewhere, BOTANY, ZOOLOGY, F&W ECOL, MICRO, PL PATH.

<sup>3</sup> ENTOM 468, taken after the junior year, is the recommended capstone course (can double count in Core Courses). ENTOM 681 Senior Honors Thesis, ENTOM 682 Senior Honors Thesis, ENTOM 691 Senior Thesis, ENTOM 699 Special Problems can be substituted in special circumstances (and can double count up to 3 credits in Core Category); see advisor.

**SUBSET COURSES****ORGANISMAL**

Code	Title	Credits
ENTOM 331	Taxonomy of Mature Insects	4
ENTOM 432	Taxonomy and Bionomics of Immature Insects	4
ENTOM 450	Basic and Applied Insect Ecology <sup>1</sup>	3
ENTOM 451	Basic and Applied Insect Ecology Laboratory (requires enrollment in ENTOM 450) <sup>1</sup>	1
ENTOM 468	Studies in Field Entomology	3
ENTOM/BOTANY/ZOOLOGY 473	Plant-Insect Interactions	3
The following three courses:		3
ENTOM 632		
ENTOM 633		
ENTOM 634		
ENTOM 701	Advanced Taxonomy	3

<sup>1</sup> ENTOM 450 Basic and Applied Insect Ecology and ENTOM 451 Basic and Applied Insect Ecology Laboratory can count toward either the organismal or applied categories, not both

**SUBORGANISMAL**

Code	Title	Credits
ENTOM 321	Physiology of Insects	3
ENTOM/BOTANY/PL PATH 505	Plant-Microbe Interactions: Molecular and Ecological Aspects	3

ENTOM/GENETICS/ ZOOLOGY 624	Molecular Ecology	3
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**APPLIED**

Code	Title	Credits
ENTOM/M M & I/ PATH-BIO/ ZOOLOGY 350	Parasitology	3
ENTOM 351	Principles of Economic Entomology	3
ENTOM/ ZOOLOGY 371	Medical Entomology: Biology of Vector and Vector-borne Diseases	3
ENTOM 450	Basic and Applied Insect Ecology <sup>1</sup>	3
ENTOM 451	Basic and Applied Insect Ecology Laboratory <sup>1</sup>	1
ENTOM 500		2

<sup>1</sup> ENTOM 450 Basic and Applied Insect Ecology and ENTOM 451 Basic and Applied Insect Ecology Laboratory can count toward either the organismal or applied categories, not both

**OTHER**

Code	Title	Credits
ENTOM 375	Special Topics	1-4
ENTOM 399	Coordinative Internship/ Cooperative Education	1-8
ENTOM 681	Senior Honors Thesis	2-4
ENTOM 682	Senior Honors Thesis	2-4
ENTOM 691	Senior Thesis	2
ENTOM 699	Special Problems	1-4

**UNIVERSITY DEGREE REQUIREMENTS**

**Total Degree** To receive a bachelor's degree from UW-Madison, students must earn a minimum of 120 degree credits. The requirements for some programs may exceed 120 degree credits. Students should consult with their college or department advisor for information on specific credit requirements.

**Residency** Degree candidates are required to earn a minimum of 30 credits in residence at UW-Madison. "In residence" means on the UW-Madison campus with an undergraduate degree classification. "In residence" credit also includes UW-Madison courses offered in distance or online formats and credits earned in UW-Madison Study Abroad/Study Away programs.

**Quality of Work** Undergraduate students must maintain the minimum grade point average specified by the school, college, or academic program to remain in good academic standing. Students whose academic performance drops below these minimum thresholds will be placed on academic probation.

## LEARNING OUTCOMES

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1. Define and explain major concepts in the biological sciences focusing on insects.
2. Knowledge of laboratory and/or field methodology.
3. Explain and apply scientific methods including designing and conducting experiments and testing hypotheses.
4. Recognize relationships between structure and function at all levels including molecular, cellular, organismal and ecological.
5. Demonstrate a style appropriate for communicating scientific results in written and oral form.
6. Integrate math, physics, and technology to answer biological questions using the scientific method.

## FOUR-YEAR PLAN

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#### SAMPLE ENTOMOLOGY FOUR-YEAR PLAN

Students must complete at least 120 total credits to be eligible for graduation.

#### Freshman

Fall	Credits Spring	Credits
CHEM 103 or 109	4-5 CHEM 104	5
MATH 112, 113, 114, or 171	3-5 MATH 113, 211, 217, or 221	3-5
COMM A or Elective	3 Electives (to reach ~15 credits)	5-8
First Year Seminar	1	
Additional Elective Course <sup>1</sup>	3	
<b>14-17</b>		<b>13-18</b>

#### Total Credits 27-35

#### Sophomore

Fall	Credits Spring	Credits
MATH 211, 217, 221, or STAT 371	3-5 ZOOLOGY/BIOLOGY/BOTANY 152 or BOTANY 130	5
ZOOLOGY/BIOLOGY 101 & ZOOLOGY/BIOLOGY 102 (or ZOOLOGY 151)	5 Electives	10
Electives	4-6	
<b>12-16</b>		<b>15</b>

#### Total Credits 27-31

#### Junior

Fall	Credits Spring	Credits
ENTOM/ZOOLOGY 302	4 Biological or Physical Elective	3
PHYSICS 103, 107, 109, 115, 201, or 207	4-5 Breadth Course in Core	3

Electives (to reach ~15 credits)	4-8 Electives (to reach ~15 credits)	6-9
	<b>12-17</b>	<b>12-15</b>

#### Total Credits 24-32

#### Junior

Summer	Credits
ENTOM 468 (Capstone, even #'d summers)	3
<b>3</b>	

#### Total Credits 3

#### Senior

Fall	Credits Spring	Credits
Biological or Physical Elective Course	3 Biological or Physical Elective	6
Breadth Course(s) in Core	3-6 Breadth Course in Core	3
Electives (to reach ~15 credits)	6-9 Electives	6
<b>12-18</b>		<b>15</b>

#### Total Credits 27-33

<sup>1</sup> When choosing electives, students should first consider UW and CALS requirements (ethnic studies, humanities, social science, international studies, etc.)

For additional Biological or Physical Science courses students may want to choose from the following depending on interest

\* Health/graduate school: CHEM 343/CHEM 344/CHEM 345, PHYSICS 104 or PHYSICS 207, GENETICS 466, MICROBIO 303/MICROBIO 304, BIOCHEM 501

\* Ecology: F&W ECOL/ENVIR ST/ZOOLOGY 360, BOTANY/F&W ECOL/ZOOLOGY 460, F&W ECOL 550, ZOOLOGY/ANTHRO/BOTANY 410, BOTANY 400 or BOTANY 401.

\* Agriculture: PL PATH 300, AGRONOMY 300, SOIL SCI 301

Students may reduce the number of required courses via:

- Testing out of Comm-A
- Using ZOOLOGY/BIOLOGY/BOTANY 152 Introductory Biology to satisfy Comm-B
- Testing out of Quantitative Reasoning, Part A
- Earning AP/IB credits
- Using ENTOM/ZOOLOGY 371 Medical Entomology: Biology of Vector and Vector-borne Diseases for International Course

## ADVISING AND CAREERS

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#### ADVISING

Undergraduate students are assigned to the Entomology undergraduate faculty advisor Dr. Dan Young and academic staff advisor Allee Hochmuth, MS. However, since the vast majority of Entomology BS students conduct independent research during their undergraduate career, it is important to meet with other entomology faculty members (<https://>

entomology.wisc.edu/people/faculty/) to learn about all of the research possibilities.

Undergraduates in Entomology are strongly urged to meet with their advisor before they enroll for the upcoming term. If you have questions about advising or declaring the major, please contact Allee Hochmuth by making an appointment in Starfish.

For more information about the Entomology BS or the department in general, please contact Dr. Dan Young (dkyoung@wisc.edu).

## CAREER OPPORTUNITIES

Entomologists from all educational levels are able to seek employment in a variety of areas. Graduates find employment in college and university teaching, community education, research and extension work, state and federal government service, industry, and research institutes. Some examples include:

- college and universities
- biotechnology companies
- state and federal agencies
- international agricultural research centers
- nurseries, greenhouses, and garden centers
- non-governmental organizations
- golf courses, public parks, and landscape maintenance companies
- agricultural companies
- a variety of private consulting firms

For more information on careers available to Entomology students, please visit our Internship & Job Resources (<https://entomology.wisc.edu/graduate-study/internships-and-job-resources/>) page. For more information on other academic, co-curricular, financial aid, and career opportunities and services available to Entomology BS students, please visit the CALS Career Services (<https://cals.wisc.edu/academics/undergraduate-students/career-services/>) page. Students in the major are welcome to make an individual appointment with their advisor to discuss a number of career-related topics such as career exploration, search strategies, graduate school, and review of application materials (resume, CV, letters, etc.).

## PEOPLE

### PEOPLE FACULTY

Crall, James  
 Gratton, Claudio  
 Groves, Russell (chair)  
 Guedot, Christelle  
 Oberhauser, Karen  
 Oliva Chavez, Adela  
 Paskewitz, Susan  
 Schoville, Sean  
 Steffan, Shawn  
 Trowbridge, Amy  
 Young, Daniel

### ADJUNCT & AFFILIATED FACULTY

Bartholomay, Lyric (Pathobiological Sciences)

Currie, Cameron (Bacteriology)  
 Coon, Kerri (Bacteriology) Zhu, Jun (Statistics)  
 Ives, Anthony (Integrated Biology)  
 Mattson, William (adjunct)  
 Peckarsky, Bobbi (adjunct)

## INSTRUCTIONAL STAFF

Brabant, Craig, Curator Wisconsin Insect Research Collection  
 Liesch, Patrick (PJ), Assistant Faculty Associate Insect Diagnostic Lab

## WISCONSIN EXPERIENCE

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While entomology clearly is “big science,” our department prides itself on a “small campus” feel in which we get to know our undergraduate students during their time with us.

In the classroom, we strive to maintain labs at not more than 15-20 students to maximize individualized and participatory learning. Students are given additional opportunities for deep and engaged learning experiences through honors options that are generally available for most courses and field and/or lab experiences in many of the upper-level courses.

### INTERNSHIPS

Please visit our Internships & Job Resources (<https://entomology.wisc.edu/graduate-study/internships-and-job-resources/>) page for more information on the multitude of internship and employment opportunities available to Entomology students. Research and internship opportunities are also available in the UW Insect Research Collection (WIRC) (<http://labs.russell.wisc.edu/wirc/>), as well as possible participation in WIRC-sponsored collecting expeditions in Wisconsin and around the United States.

### RESEARCH EXPERIENCE

Very nearly all our undergraduate students have opportunities to work alongside our faculty and graduate students in research labs and in the field. Our major accommodates 1-3 credits (of the 15 entomology credits required to major) in the area of directed/independent study and internships to promote extracurricular and outside the traditional classroom learning.

### STUDENT ORGANIZATIONS

Undergraduate students are also involved in service learning and teaching through our departmental “Insect Ambassadors” (<https://entomology.wisc.edu/outreach/insect-ambassadors/>) outreach program to K-12, various clubs, and organizations. We are committed to the UW System goal to provide Wisconsin’s citizens with opportunities to benefit from, and contribute to, the state’s growing “knowledge economy” through the land-grant university three-fold mission of teaching, research, and public service. We also have an active Undergraduate Entomology Society for majors – or any UW-Madison students interested in entomology.

### GLOBAL ENGAGEMENT

Entomology students are encouraged to participate in a study abroad experience. Students can find more information about study abroad on the CALS study abroad advising page (<https://cals.wisc.edu/academics/>)

[undergraduate-students/international-programs/study-abroad-advising/](#)).

## COMMUNITY ENGAGEMENT AND VOLUNTEERING

In the spirit of The Wisconsin Idea (<http://www.wisconsinidea.wisc.edu/>), Entomology Department faculty and students fulfill the public service mission through entomology outreach engagement. Entomology Department interactions with the surrounding and statewide community encompass a wide range of insect and human affairs from human medical issues such as West Nile Virus and Lyme disease, to forest products and natural resources entomology, integrated pest management programs for agriculture, turf and ornamental and household settings, K-12 primary and secondary school education, and more. Please visit our Outreach (<https://entomology.wisc.edu/outreach/>) page for more information.

On campus, the Morgridge Center for Public Service (<https://morgridge.wisc.edu/>) provides resources to help students connect with volunteer opportunities based on their interests and goals.

## RESOURCES AND SCHOLARSHIPS

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Department scholarships are available to Entomology students and fellowships are available to support research work with a professor. Please visit our Awards & Scholarships (<https://entomology.wisc.edu/undergraduate-study/awards-scholarships/>) page for additional details. Students across the College of Agricultural and Life Sciences receive more than \$1.25 million in scholarships annually. Learn more about college scholarships here (<https://cals.wisc.edu/academics/undergraduate-students/financing-your-education/cals-scholarships/>).