

## ENTOMOLOGY, B.S.

Insects 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 insects species—with estimates ranging from 3 to 30 million unique species. At any given moment, 200+ million insects live for every human on Earth; over 70 percent 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 or classroom.

Students majoring in entomology study in a variety of fundamental and applied fields. Graduates find employment in college and university teaching, research and extension work, state and federal government service, industry, and research institutes. Undergraduate students interested in continuing their study of insects through an advanced degree should consult the Graduate Guide (<http://guide.wisc.edu/graduate/>).

### HOW TO GET IN

To declare this major, students must be admitted to UW–Madison and the College of Agricultural and Life Sciences (CAL S). For information about becoming a CAL S 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 under the Advising and Careers tab.

### 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/#requirementsforundergraduatetext>) 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> |
|-------------------|--|

\* 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 CAL S 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 CAL S B.S. 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/#requirementsstext">http://guide.wisc.edu/undergraduate/agricultural-life-sciences/#requirementsstext</a> )    | 1       |
|  | International Studies ( <a href="http://guide.wisc.edu/undergraduate/agricultural-life-sciences/#requirementsstext">http://guide.wisc.edu/undergraduate/agricultural-life-sciences/#requirementsstext</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       |
| CAL S Capstone Learning Experience: included in the requirements for each CAL S major (see "Major Requirements") ( <a href="http://guide.wisc.edu/undergraduate/agricultural-life-sciences/#requirementsstext">http://guide.wisc.edu/undergraduate/agricultural-life-sciences/#requirementsstext</a> ) |   |         |

## 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  | Calculus  |         |
| MATH 217  | Calculus with Algebra and Trigonometry II   |         |
| MATH 221  | Calculus and Analytic Geometry I  |         |
| 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  |         |
| PHYSICS 201   | General Physics   |         |
| PHYSICS 207   | General Physics   |         |

| <b>Entomology Core</b>   |  |              |
|--|--|--------------|
| ENTOM/ZOOLOGY 302  | Introduction to Entomology               | 4            |
| 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"  |  |              |
| <b>Capstone</b>  |  |              |
| ENTOM 468  | Studies in Field Entomology <sup>3</sup> | 3            |
| <b>Total Credits</b>   |  | <b>36-43</b> |

- <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/ AGRONOMY/ F&W ECOL/ M&ENVTOX 632 | Ecotoxicology: The Chemical Players   |         |
| ENTOM/ AGRONOMY/ F&W ECOL/ M&ENVTOX 633 | Ecotoxicology: Impacts on Individuals   |         |
| ENTOM/ AGRONOMY/ F&W ECOL/ M&ENVTOX 634 | Ecotoxicology: Impacts on Populations, Communities and Ecosystems                           |         |
| 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/<br>PL PATH 505   | Plant-Microbe Interactions:<br>Molecular and Ecological Aspects | 3       |
| ENTOM/GENETICS/<br>ZOOLOGY 624 | Molecular Ecology   | 3       |

**APPLIED**

| Code                                       | Title   | Credits |
|--|---|---------|
| ENTOM/M M & I/<br>PATH-BIO/<br>ZOOLOGY 350 | Parasitology  | 3       |
| ENTOM 351                                  | Principles of Economic Entomology                           | 3       |
| ENTOM/<br>ZOOLOGY 371                      | Medical Entomology  | 3       |
| ENTOM 450                                  | Basic and Applied Insect Ecology <sup>1</sup>               | 3       |
| ENTOM 451                                  | Basic and Applied Insect Ecology<br>Laboratory <sup>1</sup> | 1       |
| ENTOM/<br>F&W ECOL 500                     | Insects in Forest Ecosystem<br>Function and Management      | 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<br>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**

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****FOUR-YEAR PLAN****SAMPLE ENTOMOLOGY FOUR-YEAR PLAN****Freshman**

| Fall                                       | Credits | Spring                                | Credits      |
|--|---------|---------------------------------------|--------------|
| CHEM 103 or 109                            |         | 4-5 CHEM 104                          | 5            |
| MATH 112, 113, 114, or<br>171              |         | 3-5 MATH 113, 211, 217, or<br>221     | 3-5          |
| COMM A or Elective                         |         | 3 Electives (to reach ~15<br>credits) | 5-8          |
| First Year Seminar                         | 1       |                                       |              |
| Additional Elective<br>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<br>STAT 371                                   |         | 3-5 ZOOLOGY/BIOLOGY/<br>BOTANY 152 or BOTANY<br>130 | 5         |
| ZOOLOGY/BIOLOGY 101<br>& ZOOLOGY/<br>BIOLOGY 102 (or<br>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<br>Elective | 3       |
| PHYSICS 103, 107, 109,<br>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 for International Course

**ADVISING AND CAREERS****UNDERGRADUATE ADVISING IN ENTOMOLOGY**

Undergraduate students are assigned to the Entomology undergraduate faculty advisor Dr. Dan Young and Allee Hochmuth, the Student Services Coordinator. However, since the vast majority of Entomology B.S. students do independent research during their undergraduate career, it is important to meet with other entomology faculty members (<http://labs.russell.wisc.edu/ento/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 at [abhochmuth@wisc.edu](mailto:abhochmuth@wisc.edu).

For more information about the Entomology B.S. or the department in general, please contact Dr. Dan Young ([dkyoung@wisc.edu](mailto:dkyoung@wisc.edu)).

**CAREERS AND PROFESSIONAL DEVELOPMENT**

For more information on careers available to Entomology students, please visit our Internship & Job Resources (<http://labs.russell.wisc.edu/ento/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 B.S. 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****FACULTY**

Crall, James  
 Gratton, Claudio  
 Groves, Russell (chair)  
 Guedot, Christelle  
 Lindroth, Richard  
 Oberhauser, Karen  
 Paskewitz, Susan  
 Schoville, Sean  
 Steffan, Shawn  
 Trowbridge, Amy  
 Young, Daniel  
 Zhu, Jun

**ADJUNCT & AFFILIATED FACULTY**

Bartholomay, Lyric (Pathobiological Sciences)  
 Currie, Cameron (Bacteriology)  
 Coon, Kerri (Bacteriology)  
 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**

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.

Very nearly all our majors 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.

Many of our undergraduate majors are also involved in service learning and teaching through our departmental “Insect Ambassadors (<https://insectambassadors.wiscweb.wisc.edu/>)” outreach program to K–12, various clubs, and organizations. We are committed (<http://labs.russell.wisc.edu/ento/outreach/>) 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. 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.