

Syllabus

Course Description:

Over 75% of animals known on the planet are insects—more than 1 million species with an estimated 3-5 million more awaiting discovery. Insect Biology Laboratory provides a collections-based introduction to the study of this most diverse group of organisms that have ever lived on Earth. This course surveys the diversity of insects and provides a practical understanding of insect identification, morphology, field collecting and care for entomological collections.

Instructor:

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Course Information:

ENT-3024/BIOL-3024, Tuesday, 2:00 - 4:45, Price Hall 221

Website:

Course homepage: <https://canvas.vt.edu/courses/94834>

Objectives:

- (1) Collect, preserve and care for insect collections
- (2) Label anatomy of the insect groundplan
- (3) Understand major events in the insect evolutionary history
- (4) Identify common orders of insects
- (5) Identify common families of insects found in Virginia on sight

Required Materials:

Insect Biology & Diversity, 3rd ed., by Whitfield & Purcell,
≥ 3rd printing (on page iv, you should see "Printing number: 9 8 7 6 5 4 3")
OPTIONAL: Collecting kit (contains net, pins, forceps, and other equipment to collect and curate an insect collection): From Bioquip—
<https://www.bioquip.com/search/DispProduct.asp?pid=1138>

Honor System:

The Undergraduate Honor Code pledge that each member of the university community agrees to abide by states:

"As a Hokie, I will conduct myself with honor and integrity at all times. I will not lie, cheat, or steal, nor will I accept the actions of those who do."

Students enrolled in this course are responsible for abiding by the Honor Code. A student who has doubts about how the Honor Code applies to any assignment is responsible for obtaining specific guidance from the course instructor before submitting the assignment for evaluation. Ignorance of the rules does not exclude any member of the University community from the requirements and expectations of the Honor Code. For additional information about the Honor Code, please visit: www.honorsystem.vt.edu

Each student is responsible for assembling an insect collection according to the guidelines of the course, and without assistance from other individuals. Specimens that were collected in previous years of this course (or any similar course, e.g. Aquatic Entomology) may not be used. Specimens purchased from the Internet or elsewhere cannot be used. However, trading with your classmates is permitted, and $\leq 10\%$ of your collection may be collected by other individuals in this year's Insect Biology Lab, as long as they are labeled properly.

Course Schedule:

| <i>Date</i> | <i>Topic</i> |
|--------------|--|
| August 27 | Collecting, preserving & preparing insects Field trip to Hahn Botanical Garden & insect preparation demo. |
| September 3 | Biology and identification of non-insect arthropods Use of lab equipment, basic insect morphology, dissection |
| September 10 | Survey of insect orders and the Insect Tree of Life Using dichotomous keys and identification of insect orders |
| September 17 | Biology of non-insect hexapods, the apterygote insects, and Ephemeroptera & Odonata (Quiz 1) Identification of non-insect hexapod and apterygote orders & Paleoptera (Odonata and Ephemeroptera) |
| September 24 | Field trip: Terrestrial |
| October 1 | Biology of Blattodea, Mantodea, Dermaptera, Plecoptera, Orthoptera, Phasmatodea, and other Orthopteroidea Identification of orthopteroid insects |

| <i>Date</i> | <i>Topic</i> |
|-------------|--|
| October 8 | Biology of Psocodea, Thysanoptera & Hemiptera Identification of hemipteroid insects |
| October 15 | Field trip: Aquatic |
| October 22 | (Quiz 2) Collection work day |
| October 29 | Biology of Megaloptera, Raphidioptera, Neuroptera & Coleoptera Identification of neuropteroid insects |
| November 5 | Biology of Mecoptera, Siphonaptera & Diptera Identification of the mecopteroids |
| November 12 | Biology of Trichoptera & Lepidoptera Identification of mecopteroids, cont. |
| November 19 | Biology of Hymenoptera (Quiz 3) Identification of Hymenoptera |
| November 26 | <i>Thanksgiving Holiday, no class</i> |
| December 3 | Final Lab Practical |
| December 11 | Collections due at 5:00 PM |

Assessments:

A variety of assessment techniques will be used in order to determine whether this course meets its objectives. Grades will be earned on the basis of three quizzes, laboratory identifications, one final lab practical, and the collection.

I am here to help and I am interested your academic success. I hope to inspire by demonstrating how fascinating insects are. I strive to create a positive, respectful atmosphere for learning and I hope that you will contribute positively to an enjoyable classroom environment.

Total Points:

| | | |
|--------------|---------------------|------------|
| September 17 | Quiz 1 | 15 points |
| October 22 | Quiz 2 | 15 points |
| November 19 | Quiz 3 | 15 points |
| All semester | Identifications | 80 points |
| December 3 | Final Lab Practical | 75 points |
| December 11 | Collection | 300 points |

Total: 500 points

- Students are required to take quizzes and exams on the scheduled date unless excused by (1) the instructor the day before the quiz or exam is administered, or by (2) written verification from a medical doctor documenting the illness preventing the student from taking the exam or quiz.
- Late assignments will lose 10% of their value each day after 5 pm on the due date. Weekends count as one day. Late assignments will not be accepted more than one week after their due date.
- Feel free to ask me questions about class, entomology, etc. Please use proper etiquette when writing emails: <http://goo.gl/GZq4CJ>

Grading scale:

IF >93 = A; >89 = A-; >86 = B+; >82 = B; >79 = B-; >76 = C+; >72 = C; >69 = C-; >66 = D; >62 = D; >59 = D-; <60 = F

Insect Collection:

The centerpiece of Insect Biology Lab is the collection. It is 300 points and 60% of the course grade. Each student is required to assemble an insect collection composed ≥ 100 pinned insect specimens, prepared according to best practices of museum curation. (See chapter 47 of the textbook for proper curation technique). Briefly, pinned specimens must have two labels: (1) the upper label has the collection locality, date of collection, and name of collector and (2) the lower label provides identification details, i.e. order and/or family. The top left hand corner of the label (with the text reading left to right) should be oriented at the anterior (head-) end of the specimen. Alcohol specimens should have these two labels inside the vial; in contrast with pinned specimens, the top left hand corner of the alcohol label should be oriented at the bottom of the vial.

Collection requirements

(1) Specimen level (minimum) requirements:

- 100 properly pinned & labelled specimens
- 16 orders (see checklist below)
 - 13 must be adults
 - 3 may be millipedes (Diplopoda) or immature insects (aquatic only), which should be preserved in alcohol (no specimens from the course Aquatic Entomology will accepted).
 - Absolutely no terrestrial immature insects (e.g., caterpillars), spiders, centipedes, or crustaceans
 - Immatures, non-insect hexapods, apterygote insects & millipedes should never be pinned.
 - The 13 adults should be identified to family; in contrast, the identification of immatures and millipedes to family is optional.

(2) Diversity level requirements:

- 60 families of adult insects/hexapods, with no family represented by more than 4 specimens
- No more than two insects of any one species may be submitted for credit.
- It is in your best interest to submit more than 1 specimen in each taxon because it will reduce your score less so if you identify the specimen incorrectly, and yet still have a correctly identified specimen as a back-up to fulfill the category requirement.

(3) Ecology level requirements:

- Insects representing 15 (maximum) ecological categories must be included in the collection. Any specimen can be used as long as it's correctly identified to order.
- Ecological categories, printed on yellow paper that we will provide to you, should be included on a third, bottom-most label (beneath the locality and identification labels).
- An individual specimen may not be used for more than 2 ecology categories.
- Specimens with ecological categories can simultaneously be used for the regular collection:

| | | |
|----------------|----------------|------------------|
| decomposer | mimic | parasite |
| aquatic | aposematic | parasitoid |
| blood feeding | cryptic | wood infesting |
| household pest | dung feeder | fruit pest |
| seed feeder | leaf feeder | chemical defense |
| predator | carrion feeder | eusocial |
| scavenger | pollinator | soil nesting |

Layout of the Collection

Specimens should be neatly arranged in the collection box in columns, beginning with the upper left hand corner moving downwards and then to the right of the box. The order and family sequence should follow the listing in the contents of *Insect Biology & Diversity* (pg. v). Labels indicating order and family should precede the specimens belonging to that group, and be pinned to the bottom of the collection box. Label alcohol vials with numbers, and if the vials are not with the pinned insects then a placeholder label should be placed in the appropriate location for these alcohol specimens (e.g. "see vial 2").

A typed catalog of the specimens in your collection, providing a summary of order and family identification, and the number of specimens for each family must accompany the collection when it is submitted at the end of the semester. The accuracy of your catalog is important as we will use it locate specimens in your collection.

★ Important things to consider

Start your collection as early as possible. Make time to collect as many insects as possible in August and September. As autumn progresses and temperatures fall, insects start to undergo diapause and become very scarce. Begin labeling (and identifying) your specimens early. Label your specimens as you assemble your collection. *The most common mistakes that result in a substantial reduction in points is from procrastination—e.g., not collecting enough insects early in the semester and beginning identification, pinning and labeling too late.*

Grading the Collection

◆ **The accuracy of your identifications is important.** Once your collection is submitted at the end of the semester, we will carefully grade your collection and check your identifications and number of specimens.

The collection is 300 points:

- 1 point for each properly pinned and labeled specimen (100 min.)
 - Misidentified specimens do not count toward the 100 min. requirement
 - To be considered a pinned specimen it must be labelled to order
 - The specimen must be intact and identifiable (e.g., if its head is missing and the antennae are needed to identify it, then no credit is given).
- 2 points per order
- 2 points per family for diversity requirements; 1 point per family otherwise
- 1 point for each alcohol specimen
- 2 points for each ecological category
- 15 points maximum for the quality of curation
- - 2 points for each misidentified order (if you miss the order then it does not count towards the 100 min. requirement).
- - 2 points for each misidentified family
- -1 point for each missing specimen
- -15 points for a missing printed catalog

Name: _____

Collection Checklist

| Specimen requirements | Points | Total |
|------------------------------|---------------|--------------|
| Pinned adults, 100 min. | ___ x 1 pt | |
| Alcohol specimens, 6 max. | ___ x 1 pt | |

| Diversity requirements | # pinned adults | Points | Total |
|--|------------------------|---------------|--------------|
| Ephemeroptera | | 2 points | |
| family (1) | | ___ x 2 pts | |
| Odonata | | 2 points | |
| family (2) | | ___ x 2 pts | |
| Orthoptera | | 2 points | |
| family (3) | | ___ x 2 pts | |
| Blattodea (excl. "Isoptera") | | 2 points | |
| family (1) | | ___ x 2 pts | |
| Blattodea ("Isoptera") | | 2 points | |
| family (1) | | ___ x 2 pts | |
| Hemiptera (Heteroptera) | | 2 points | |
| family (5) | | ___ x 2 pts | |
| Hemiptera (Auchenorrhyncha and/or Sternorrhyncha) | | 2 points | |
| family (3) | | ___ x 2 pts | |
| Neuroptera | | 2 points | |
| family (1) | | ___ x 2 pts | |
| Coleoptera | | 2 points | |
| family (7) | | ___ x 2 pts | |

| Diversity requirements | # pinned adults | Points | Total |
|------------------------------|-----------------|---------------|-------|
| Trichoptera | | 2 points | |
| family (1) | | ___ x 2 pts | |
| Lepidoptera | | 2 points | |
| family (4) | | ___ x 2 pts | |
| Hymenoptera | | 2 points | |
| family (6) | | ___ x 2 pts | |
| Diptera | | 2 points | |
| family (5) | | ___ x 2 pts | |
| Siphon- or Phthiraptera | | 2 points | |
| family (1) | | ___ x 2 pts | |
| Additional orders, 4 min. | | 2 points each | _____ |
| Additional families, 20 min. | | 1 points each | _____ |
| Other orders _____ | | | |
| _____ | | | |
| _____ | | | |
| _____ | | | |
| _____ | | | |

| Ecology and curation | Points | Total |
|--|----------------|-------|
| Number of ecological categories, 15 max. | 2 points each | |
| Collection catalog | 15 points | |
| Curation quality | 15 points max. | |

Total collection points: _____

The naturalist is a civilized hunter. He goes alone into the field or woodland and closes his mind to everything but that time and place, so that life around him presses in on all the senses and small details grow in significance. He begins the scanning search for which cognition was engineered. His mind becomes unfocused, it focuses on everything, no longer directed toward any ordinary task or social pleasantry. - Edward O. Wilson, *Biophilia*