

INSECT BIODIVERSITY AND EVOLUTION (ENT 432)

Department of Entomology, Pennsylvania State University

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| Lecture: | T Th 12:05–1:20 PM | 110 ASI Building |
| Lab: | T Th 1:30–3:20 PM | 131 Headhouse III |

This course is designed to teach students about insect taxonomy, evolutionary relationships, collection and preservation techniques, morphology, and natural history. We'll focus mostly on adult forms and emphasize insects found in Pennsylvania. In the lab, students will learn how to handle specimens, use diagnostic keys, and identify insects by sight. Collection techniques will be honed during field trips.

Learning Outcomes

Upon completion of this course students should be able to:

- Label a generalized hexapod diagram with external anatomy terms
- Name and sight-identify all local hexapod orders and several common local families
- Solve taxonomic problems and describe how species and other taxa are named and described, *i.e.*, understand the fundamentals of taxonomic practice
- Draw a phylogenetic tree of relationships between hexapod orders
- Teach others how to read a phylogenetic tree and know what kinds of data are used to estimate trees, how those data are analyzed, and what it means to be monophyletic
- Describe key innovations and life history strategies of major hexapod lineages
- Teach others how to collect, preserve, and transport hexapod specimens and describe why this process is important
- Teach others about the natural history of insects more generally

To realize these educational outcomes students are expected to:

- Attend every lecture and lab
- Participate in discussions
- Ask questions

Logistics

Office Hours: Wednesdays, 1:30–4:30pm, in 131 Headhouse III.

Course Website: <http://deanslab.org/ent432/> Note that source files for teaching materials are available through our GitHub repo - <https://github.com/OpenEntomology/InsectBiodiversityEvolution> - which also provides a mechanism for submitting issues: <https://github.com/OpenEntomology/InsectBiodiversityEvolution/issues>

Textbook: There is no required textbook. Instructors will discuss and make available resources that facilitate specimen diagnosis and learning about the evolution of these organisms.

Organization: The course content is partitioned across 15 units, each of which has its own (more or less) structured curriculum, including lecture/discussion components and lab exercises:

1. What are arthropods? What is systematics?
2. Understanding arthropod phenotypes
3. Systematics and Evolution, past and present
4. Early arthropods, fossils, terrestrialization
5. Non-hexapod Arthropoda
6. Non-pterygote Hexapoda
7. Paleoptera, Plecoptera, origin of wings
8. Polyneoptera
9. Acercaria
10. Holometabolous development, Hymenoptera
11. Neuropterida
12. Coleoptera, Strepsiptera
13. Antliophora
14. Amphiesmenoptera **[lab practical 3]**
15. Natural History Collections

Dispersed across these units are topics (“phenomena”) that transcend taxa—*i.e.*, they will be discussed at multiple points during the semester, as appropriate. Examples include leaf mining and other herbivory strategies, galls, mimicry/aposematism, sound production, weapons, and parasitism.

Grading Policy: Letter grades follow the usual scale: A = 93–100%, A- = 90–92.9%, B+ = 87–89.9%, B = 83–86.9%, B- = 80–82.9%, C+ = 76–79.9%, C = 70–75.9%, D = 60–69.9%, F <60%.

Graded Components:

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|----------------------------------|-----------------|
| Discover your inner Darwin | 350 pts. |
| Lab practicals (n=3) | 150 pts. |
| Lab notebook | 100 pts. |
| Final exam | 100 pts. |
| Participation ^a | 100 pts. |
| Total | 800 pts. |

^aBased on attendance (35%) and participation in lecture discussions and quizzes (65%)

»»»»» Note that fabricated specimen data and natural history observations will result in a *ZERO* (0) for the Discover your inner Darwin exercise. There are *NO EXCEPTIONS* to this rule. «««««

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In order to receive consideration for reasonable accommodations, you must contact the appropriate disability services office at the campus where you are officially enrolled, participate in an intake interview, and provide documentation: <http://equity.psu.edu/ods/guidelines>. If the documentation supports your request for reasonable accommodations, your campus disability services office will provide you with an accommodation letter. Please share this letter with your instructors and discuss the accommodations with them as early in your courses as possible. You must follow this process for every semester that you request accommodations.

Tentative dates for activities and exercises:

| Date | Lecture | Lab | Handout/ reading |
|-------------|--|---|------------------------------------|
| 8/23 (T) | Introduction to the course | Walk to Arboretum to discover your inner Darwin | syllabus, collection, oath, Unit 1 |
| 8/25 (Th) | History of insect classification | Begin insect morphology | Unit 2 |
| 8/30 (T) | Finish insect morphology (meet in 131 Headhouse III) | | Unit 2 |
| 9/1 (Th) | Systematics history and data types | Wrap up morphology, begin systematics | Unit 3 |
| 9/2 – 9/5 | Field trip, Powdermill Nature Reserve | | |
| 9/6 (T) | Phylogenetics | Finish systematics | Unit 3 |
| 9/8 (Th) | Fossils, early arthropods, terrestrialization | Fossils, begin non-insect arthropods | Units 4, 5 |
| 9/13 (T) | Non-insect arthropods | Non-insect arthropods | Unit 5 |
| 9/15 (Th) | Non-apterygote insects | Non-apterygote insects | Unit 6 |
| 9/20 (T) | Origin of wings, Paleoptera | Paleoptera, Plecoptera, lab practical 1 | Unit 7 |
| 9/22 (Th) | Polyneoptera | Polyneoptera | Unit 8 |
| 9/27 (T) | Work on natural history narrative, collection; no class, but lab is open | | |
| 9/29 (Th) | Work on natural history narrative, collection; no class, but lab is open | | |
| 10/4 (T) | Polyneoptera | Polyneoptera | Unit 8 |
| 10/6 (Th) | Polyneoptera | Polyneoptera | Unit 8 |
| 10/11 (T) | Acercaria | Acercaria | Unit 9 |
| 10/13 (Th) | Acercaria | Acercaria | Unit 9 |
| 10/18 (T) | Acercaria, holometabolous development | Acercaria | Units 9, 10 |
| 10/20 (Th) | Hymenoptera | Hymenoptera | Unit 10 |
| 10/25 (T) | Hymenoptera | Hymenoptera | Unit 10 |
| 10/27 (Th) | Neuropterida | Neuropterida, lab practical 2 | Unit 11 |
| 11/1 (T) | Coleoptera | Coleoptera | Unit 12 |

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| Date | Lecture | Lab | Handout/ reading |
|-----------------|--|--|-----------------------------|
| 11/3 (Th) | Coleoptera | Coleoptera | Unit 12 |
| 11/8 (T) | Coleoptera, Strepsiptera | Coleoptera, Strepsiptera | Unit 12 |
| 11/10 (Th) | Antliophora | Antliophora | Unit 13 |
| 11/15 (T) | Antliophora | Antliophora | Unit 13 |
| 11/17 (Th) | Antliophora | Antliophora | Unit 13 |
| 11/21– 11/25 | Thanksgiving break – No classes | | |
| 11/29 (T) | Amphiesmenoptera | Amphiesmenoptera | Unit 14 |
| 12/1 (Th) | Amphiesmenoptera | Amphiesmenoptera | Unit 14 |
| 12/6 (T) | Amphiesmenoptera | Amphiesmenoptera, lab practical 3 | Unit 14 |
| 12/8 (Th) | Natural history collections, wrap-up, review | | Unit 15 |