

Syllabus

Course Description:

Examination of major evolutionary events of the arthropod tree of life, including insects, millipedes, spiders and close relatives. Review arthropod morphology. Identification of specimens to family taxonomic level. Current approaches for taxonomy and how new species are named and classified. Curating an insect collection and best practices of natural history museums. Pre: Graduate standing (2H, 1L, 3C)

Instructor:

Dr. Paul Marek
503 Latham Hall
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Course Information:

ENT-6004, CRN 20239
Lecture W F 10:10 - 11:00 AM, Price Hall 301A; Lab R 9:00 - 11:45 PM, Price Hall 221

Websites:

Course homepage: <https://canvas.vt.edu/courses/68892>

Learning objectives:

Having completed this course, students will be able to:

- Diagram the evolutionary history of the phylum Arthropoda, with a special emphasis on insects and terrestrial arthropods
- Compare major events in the evolution of insects associated with high levels of species diversification
- Carry out identifications of terrestrial arthropod specimens to the family level
- Compare and contrast species concepts and modern techniques for how species are named and classified
- Discriminate between phylogenetic techniques to estimate evolutionary history
- Curate an insect collection, and examine best practices to collect, preserve, and care for insect collections
- Argue the importance of natural history collections and how to voucher research specimens

Course materials:

Insect Biology & Diversity, 3rd ed. (≥ 3rd printing) by Whitfield & Purcell, optional
Evolution of the Insects by Grimaldi & Engel, optional
Laptop computer, recommended for laboratory

Honor System:

The 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

Course Schedule:

<i>Week</i>	<i>Date</i>	<i>Topic</i>
Week 1	January 17, 19	<i>Lecture:</i> Overview of the course, arthropods and systematics <i>Lab:</i> Introduction to the lab, and discussion of projects <i>Reading & discussion:</i> Edgecombe (2017) The cause of jaws and claws
Week 2	January 24, 26	<i>Lecture:</i> Brief introduction to systematics and arthropod phylogeny <i>Lab:</i> Introduction to phylogenies, Mesquite <i>Reading & discussion:</i> Baldauf (2003) Phylogeny for the faint of heart
Week 3	January 31, February 2	<i>Lecture:</i> The superphylum Ecdysozoa and arthropod groundplans <i>Lab:</i> Ecdysozoa and non-hexapod terrestrial arthropods <i>Reading & discussion:</i> Dunn et al. (2008) Broad phylogenomic sampling improves resolution of the animal tree of life
Week 4	February 7, 9	<i>Lecture:</i> Dawn of the insects and wingless hexapods <i>Lab:</i> Non-insect Hexapoda, apterygote insects, and Paleoptera <i>Reading & discussion:</i> Regier et al. (2010) Arthropod relationships
Week 5	February 14, 16	<i>Lecture:</i> Paleoptera and the evolution of wings <i>Exam 1:</i> February 16 <i>Lab:</i> Basic phylogenetic methods: tree building & parsimony <i>Reading & discussion:</i> Misof et al. (2014) Insect phylogenomics
Week 6	February 21, 23	<i>Lecture:</i> α -taxonomy <i>Lab:</i> orthopteroid insects/Polyneoptera <i>Reading & discussion:</i> Turney et al. (2015) Non-repeatable science: assessing the frequency of voucher specimen deposition reveals that most arthropod research cannot be verified
Week 7	February 28, March 2	<i>Lecture:</i> β -taxonomy (systematics) <i>Lab:</i> hemipteroid insects/Condylognatha, Psocodea <i>Reading & discussion:</i> Suarez & Tsutsui (2004) Value of collections
	March 5 - 9	Spring Break, No Classes
Week 8	March 14 March 16, no class, ESA Eastern Branch Meeting	<i>Lecture:</i> Parsimony and distance methods <i>Lab:</i> Phylogenetic methods: Mesquite and Chromaseq software <i>Reading & discussion:</i> Homology, the Hierarchical Basis of Comparative Biology, Chapter 1

<i>Week</i>	<i>Date</i>	<i>Topic</i>
Week 9	March 21, 23	Lecture: Coleoptera & Neuropteroidea <i>Exam 2: March 23</i> <i>Lab: neuropteroid insects/beetles</i> <i>Reading & discussion: McKenna et al. (2015) The beetle tree of life reveals that Coleoptera survived the end-Permian mass extinction to diversify during the Cretaceous terrestrial revolution</i>
Week 10	March 28, 30	<i>Lecture: Diptera</i> <i>Lab: Mecopteroids I (scorpionflies, fleas, and flies)</i> <i>Reading & discussion: Wiegmann et al. (2011) Episodic radiations in the fly tree of life</i>
Week 11	April 4, 6	<i>Lecture: Models of DNA sequence evolution, maximum likelihood</i> <i>Lab: Fieldtrip</i>
Week 12	April 11, 13	<i>Lecture: Lepidoptera & Mecopteroidea</i> <i>Lab: Mecopteroids II (leps),</i> <i>Reading & discussion: Derkarabetian & Hedin (2014) Integrative taxonomy and species delimitation in harvestmen: A revision of the Western North American genus <i>Sclerobunus</i> (Opiliones: Lanitores: Travunioidea)</i>
Week 13	April 18, 20	<i>Lecture: Hymenoptera</i> <i>Lab: Hymenoptera</i> <i>Reading & discussion: Johnson et al. (2013) Phylogenomics Resolves Evolutionary Relationships among Ants, Bees, and Wasps</i>
Week 14	April 25, 27	<i>Lecture: Project Presentations</i> <i>Lab: Project Presentations</i>
Week 15	May 2	<i>Exam 3</i>

Reading Assignments:

Each week will highlight an assigned reading. Students should read the article or chapter prior to the week's lecture. Readings are posted to the course website on Canvas.

Assessments:

A variety of assessment techniques will be used in order to determine whether this course meets its objectives. These will include 3 exams, an individual student project, labs, and ongoing class participation. For the participation grade, you will be evaluated relative to your colleagues' quantity and quality of participation. I am here to help and I am interested your academic success. I hope to inspire by demonstrating how fascinating insects and systematics 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:

February 16	Exam 1	160 points
Ongoing	Labs	100 points
March 23	Exam 2	160 points
Ongoing	Class participation	120 points*
May 2	Exam 3	160 points
May 4	Project	300 points

Total: 1000 points

*Class participation is based on attendance (35%) and active involvement in discussions in class (65%).

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.

- Students are required to take assessments on the scheduled date unless excused by (1) the instructor at least 24 hours before the quiz or exam is administered, or (2) by 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 5pm on the due date. Weekends count as one day. Late assignments will not be accepted more than one week after their due date.

I am committed to fostering an inclusive learning atmosphere and providing appropriate services and accommodations to allow access to succeed. Any students with disabilities or other special circumstances are encouraged to meet with me after class, or schedule an appointment to meet in my office (503 Latham).

If we and the rest of the backboneed animals were to disappear overnight, the rest of the world would get on pretty well. But if [the invertebrates] were to disappear, the land's ecosystems would collapse. The soil would lose its fertility. Many of the plants would no longer be pollinated. Lots of animals, amphibians, reptiles, birds, mammals would have nothing to eat. And our fields and pastures would be covered with dung and carrion. These small creatures are within a few inches of our feet, wherever we go on land - but often, they're disregarded. We would do very well to remember them.

- David Attenborough
Life in the Undergrowth, BBC