BIOL620 Graduate Evolution

Instructor: Dr. Phillip Barden
E-mail: barden@njit.edu
Office: CKB 428B
Office Hours: Mon, Weds: 2:00-3:00pm; by appointment

Course Website: http://canvas.njit.edu
Course Schedule: Mon, Weds 11:30-12:50
Course Location: CULM 110

Course description: This course is an in-depth survey of patterns and processes in evolutionary biology through a comparative organismal lens. The comparative approach leverages diversity among biological lineages to answer core questions that we will discuss such as:

- What is the history of life on earth?
- What factors govern the generation, maintenance, and extinction of biodiversity?
- How are phenotypes generated by molecular mechanisms?
- How does selection and non-selective evolution act on genotypes and phenotypes?
- What are species and how are new species generated over time?
- How does complexity and social behavior arise in certain lineages?

While the first weeks of the course will set a general foundation for all students, some course material will be tailored to student interests as the semester progresses. Students will read and synthesize peer reviewed academic literature across disciplines to gain a first-hand understanding of evolutionary biology research. To gain experience with modern methodology, students will also recreate and expand upon published research using publicly available data.

Learning objectives
This course will introduce students to topics in evolution and to the scientific method as applied to evolutionary biology research. Students will:

- Learn how to understand and evaluate scientific publications in evolutionary biology;
- Learn how to ask evolutionary questions using modern methods and real-world data;
- Gain an understanding of the structure of knowledge in evolution, biology, and the natural sciences in general;
- Gain in-depth understanding of foundational and contemporary topics in evolutionary research.

Prerequisites: Undergraduate-level familiarity with evolutionary biology, either through prior coursework or personal interest.
Required Materials: None.

Instructor:
Phil Barden, Assistant Professor, Department of Biological Sciences
Office hours: Monday, Wednesday: 2:00-3:00pm; by appointment
Office location: Online; 973-596-5863; barden@njit.edu

Grading Policy: Grades will be determined by weekly class participation and assignments, exams, and a final project comprising a written submission and class presentation. There will

be two take-home exams, together these will comprise 40% of your grade. Assignments and participation will comprise 30% of your grade while a final project will make up the remaining 30%.

Grading Scale	
A	90 – 100
B+	85 – 90
B	80 – 85
C+	75 – 80
C	70 – 75
D	60 – 70
F	0 – 60
Assignment	**Percentage**
Assignments & Participation	30%
Final Project	20%
Mid-term Exam	20%
December Exam	30%

Attendance & Participation: As a graduate student I expect that you will be fully engaged in this course and your graduate work in general. Failure to attend class and participate fully may result in failure in the class.

Assignments: Reading assignments will be posted on Canvas prior to class. It is your responsibility to read all assigned materials before class meets and be fully prepared to discuss them in class. It is entirely OK and in fact expected that you will not understand substantial components of your assigned reading. We will go-through readings together as a

group in class, however this is only possible if you make an earnest attempt to read assignments on your own beforehand. You are strongly encouraged to take notes and write out questions as you read. Remember: not every scientific paper is a good one, many are confusing and can be frustrating. One goal for the class is to help you gain the skills to navigate academic literature.

Take-home exam grading: Students will have an opportunity to revise take-home exams one time each after an initial round of grading.

In-person course format: This course is set to run as face-to-face, meaning we will all meet during our scheduled class time in Cullimore Hall 110. University-wide updates regarding the pandemic are here: https://www.njit.edu/coronavirus

Final Project: Over the course of the semester, you will work toward completing a final project which will culminate in a final presentation and written report. In the lead up to the final presentation, we will meet to discuss your project and troubleshoot any problems. A timeline will be posted to Canvas as the semester progresses.

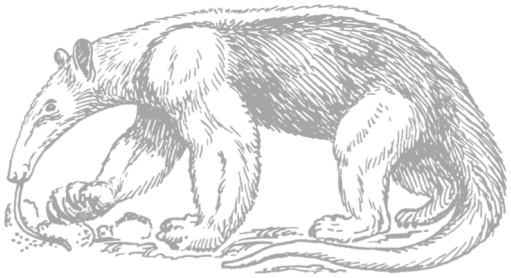
Academic integrity: Academic Integrity is the cornerstone of higher education and is central to the ideals of this course and the university. Cheating is strictly prohibited and devalues the degree that you are working on. As a member of the NJIT community, it is your responsibility to protect your educational investment by knowing and following the academic code of integrity policy. Please note that it is my professional obligation and responsibility to report any academic misconduct to the Dean of Students Office. You may access the academic code of integrity policy
here: http://www5.njit.edu/policies/sites/policies/files/academic-integrity-code.pdf.

Any student found in violation of the code by cheating, plagiarizing or using any online software inappropriately will result in disciplinary action. This may include a failing grade of F, and/or suspension or dismissal from the university. If you have any questions about the code of Academic Integrity, please contact the Dean of Students Office at dos@njit.edu

Canvas: We will be using Canvas for our class website (http://canvas.njit.edu). To use Canvas students must have an NJIT UCID. If you are matriculated at NJIT you should already have a UCID. If you are a Rutgers student you may already have one. You can check by following the directions here: https://ist.njit.edu/ucid/. If you do not have one you can request one at the same page or call the NJIT helpdesk for assistance (973 596 2900).

Key Dates:
Sept. 7: First day of this class.
Sept. 12: Last day to add/drop a class.
Sept. 19: Last day to withdraw with 90% refund.
Nov. 14: Last day to withdraw.

Dec. 14: Last day of classes.



Week	Date	Topic	Assignment
1	9/7/22	*Introductions*	
2	9/12/22	*Evolutionary pattern and process*	Curtsinger, J. *Darwin in the Pumpkin Patch or Bay Area Travels with Charlie. In* Losos, J.B. ed., 2011. In the Light of Evolution: Essays from the Laboratory and Field.
	9/14/22	*What evolution is, isn't*	Lynch, M., 2007. The frailty of adaptive hypotheses for the origins of organismal complexity. PNAS
3	9/19/22	*Phylogenetics and inferring history*	Thewissen et al. 2007. Whales originated from aquatic artiodactyls in the Eocene epoch of India. Nature
	9/21/22		
4	9/26/22	*Phenotype, genotype, and adaptation*	Bendesky et al. 2017. The genetic basis of parental care evolution in monogamous mice. Nature
	9/28/22		
5	10/3/22	*Molecular evolution*	Shen, X., Song, S., Li, C. and Zhang, J., 2022. Synonymous mutations in representative yeast genes are mostly strongly non-neutral. Nature, pp.1-7.
	10/5/22		
6	10/10/22	*Selection*	TBD student interest
	10/12/22		

7	10/17/22	*Selection cont'd*	TBD student interest
	10/19/22	***Take home midterm***	
8	10/24/22	*Speciation and populations*	TBD student interest
	10/26/22		
9	10/31/22	Evolutionary developmental biology	TBD student interest
	11/2/22		
10	11/7/22	*History of life on Earth*	TBD student interest
	11/9/22		
11	11/14/22	*Guest Lecture 1*	
	11/16/22	*Guest Lecture 2*	
12	11/21/22	*Evolution of complexity*	TBD student interest
13	11/28/22	*Social evolution*	TBD student interest
	11/30/22		
14	12/5/22	***Final project due: Student Presentations***	
	12/7/22	***Student Presentations & take-home exam***	
15	12/12/22	***Student Presentations***	
	12/14/22	***Student Presentations***	

*Course schedule is tentative and subject to change. Please see Canvas for updates, reading assignments, and online meeting place information.