



MSCI-260, Evolution

Spring 2015

Department of Mathematics and Science, School of Liberal Arts and Sciences, Pratt Institute

Course Description:

This course provides a background in the fundamental principles of evolution, including natural selection, adaptation, population genetics, coevolution, speciation, and macroevolution. Using historical texts as well as cutting-edge research papers, we will explore the ongoing development of Darwin's theory of evolution. Through the readings, activities, and dialogue supported by the course, students will learn to apply evolutionary concepts to both the natural and human-mediated world around them.

Upon completion, this course is worth three (3) credits.

Meeting Time: Wednesdays, 9:30 am to 12:20 pm, Engineering 111

Instructor: Dr. Christopher Jensen
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Office Hours: Tuesdays and Fridays from 2:00 to 3:30 pm, *or by appointment*

Course Goals:

- To appreciate the historical events which have led to the science of evolution.
- To understand the mechanisms by which evolution occurs.
- To explore the diversity of species and understand their evolutionary origin and relatedness.
- To discover the evidence amassed in favor of evolutionary theories.
- To understand human evolution and our current impact on evolutionary processes.
- To apply evolutionary theories to the modern world.

Learning Outcomes: Students who successfully complete *Evolution* will be able to...

- Explain the historical context in which the theory of evolution has been developed.
- Describe how natural selection operates to produce adaptation.
- Chronicle a diversity of adaptations and explain their function(s).
- Depict the diversity of life and explain the origin of this diversity.
- Analyze biological evidence relevant to evolution in the past and present.
- Assess the degree to which scientific evidence favors different evolutionary theories.
- Explain how evolutionary knowledge can be applied to human society and culture.
- Complete a research paper that explores evolutionary hypotheses explaining a particular trait.

Assessment Criteria:

Below is a summary of how you will be graded in this course. All grades will be posted on the *LMS*, so please take advantage of the fact that you can always know how you are doing in the course.

Contribution to Grade	Category	Description
20%	Homework	After each class I will post a series of short-form Follow-Up Questions on the <i>LMS</i> . If you emerge from class with a good understanding of the major ideas discussed, you should be able to complete these questions in very little time. The <i>LMS</i> actually allows you to correct wrong answers on these questions, although at the cost of some credit. You are free to use any resource <i>other than another person</i> to complete all homework assignments: your notes, books/articles, the internet, and other media are all allowed (see Open Information Policy and Honor Code below). Unlike other assignments, late Follow-Up Questions will not be accepted. There are also two SimUText labs to complete for homework as well as a few smaller homework assignments due throughout the semester. See the <i>LMS</i> for all homework deadlines.
40%	Classwork	You will be given a fifteen (15) minute Quiz at the beginning of each class session. Based on the assigned readings for each day, these quizzes will provide you with the opportunity to demonstrate that you understood the material. As per the <i>Open Information Policy</i> , you may use anything but another person to complete Quizzes . After the quiz, we'll be discussing course readings in light of our own particular concerns. I'll have questions for you; I will expect you to have questions for me. Come to class having read and thought about assigned readings, ready to actively engage in dialogue. To receive participation credit you need to be present in class; to receive full participation credit you need to be actively engaged in class discussions and work. Based on your participation during each regular class session, I will assign you a specific grade and occasionally make comments on the strengths and weaknesses of your contribution. You will also complete assignments in class. Some of these assignments will be done individually, others will require group cooperation. I will be grading your work on each assignment based on its clarity of thought, level of insight, and contribution to class dialogue.
10%	Midterm Exam	During Week 07 of class, a Midterm Exam will be taken in class on the <i>LMS</i> . This midterm will cover all material from Weeks 01 through 06. Please make sure to bring your Pratt I.D. to class on the day of your Midterm Exam , as we will be taking this exam in a Pratt computer lab. The midterm will be in an "open notes/open book/open internet" format and will focus on broad concepts regarding how cooperation evolves rather than the regurgitation of biological facts.
30%	Final Exam	This course ends with a cumulative Final Exam that will be taken in class on the <i>LMS</i> . Please make sure to bring your Pratt I.D. to class on the day of your Final Exam , as we will be taking this exam in a Pratt computer lab. The final will focus on broad concepts learned in the course rather than the regurgitation of scientific facts. As per the <i>Open Information Policy</i> , you may use anything but another person to complete the Final Exam .

★ **Under no circumstances will personalized extra-credit work be offered to any student** ★

Lateness and Absence:

Of Students: I expect you to arrive to all class sessions on time. Students who arrive more than 15 minutes late will receive a zero for the day's quiz. In addition, lateness and absence can adversely affect your participation and assignments grades.

Of Assignments: Late **Follow-Up Questions** will not be accepted. Other late assignments will be penalized by 10% per day.

How to submit documentation for an excusable absence and/or missed deadlines:

There are very few legitimate reasons to miss all or part of a class session or for submitting assignments after the stated deadlines. Valid excuses include family emergencies and personal health issues. The following reasons do not excuse lateness or absence: oversleeping, excessive work load in other classes, inability to use the *Learning Management System*, or “forgetting”. If you believe that you missed a class for a legitimate reason, please submit documentation that:

1. establishes a clear reason why you could not complete work and/or attend class; and
2. clearly delineates the period of time during which you were incapacitated.

Documentation should come from an appropriate source (*for example*: health care provider, employer, clergy) and include contact information that will allow your instructor to validate your excuse. Your instructor makes the final determination on what is and what is not a legitimate reason for missing class and/or submitting assignments after stated deadlines.

Readings and Lab Materials:

You will be assigned a series of reading materials from books, popular science periodicals, and the scientific literature. Your main textbook will be:

Zimmer, Carl. (2014). *The Tangled Bank: An Introduction to Evolution, Second Edition*. Roberts and Company, Greenwood Village, Colorado. (ISBN #978-1936221448). List price = \$80.00.

This book is required and can be purchased from Pratt’s online bookstore (<http://www.pratt.bkstr.com>) or via any other retailer. All other readings will be posted on the LMS. You are encouraged to save paper by viewing these readings electronically (as opposed to printing them out). In addition to this book, you will be required to purchase two SimUText labs at a total cost of \$10.00 (please see <https://lms.pratt.edu/mod/page/view.php?id=94469> for purchasing information).

Open Information Policy and Honor Code:

You will never be required to memorize anything in this class: we maintain an “open information environment”, so you may use your notes, books/articles, the internet, and other media to complete homework, in-class assignments, and quizzes.

HOWEVER: Unless specifically stated otherwise, all work in this class is to be completed on your own. You may not and should not obtain help from any other person to complete any of your work: this includes all homework, all quizzes, and individual assignments. You should also not share any of your individual work with other students. “Studying together”, discussing material outside of class, and any other processing of the course materials prior to completing coursework is allowed and encouraged, but you need to do your own work. Students are asked to sign an oath to uphold and honor this code at the beginning of the semester, and are expected to take this commitment seriously even when violating the code would likely escape detection. Any violations of this policy will be considered cheating and reported as appropriate (see ***Classroom Civility and Academic Honesty*** below).

Learning Management System (LMS):

During the course of the semester, we will make extensive use of Pratt’s *Learning Management System (LMS)*. I recommend that you use the *Firefox* browser to access the LMS via this page: <https://lms.pratt.edu/> (I discourage you from using the *my.pratt.edu* entrance point, as it is not always working). Use your ONEKEY username and password to log in. I expect you to check the LMS several times a week for announcements, reading assignments, and updates to your class grade (note that you can also set the LMS to send you email messages every time our class page is updated). I will be using the LMS to send email announcements throughout the semester, so please make sure that you check the email address listed under your LMS profile regularly. “I forgot to check my Pratt email” is an invalid excuse.

I try to make the assignments, announcements, and other documents I post on the LMS as universally-readable as possible. The only proprietary program you will need to have loaded onto your computer is *Acrobat Reader*, which can be downloaded here: <http://www.adobe.com/products/acrobat/readstep2.html>. I strongly recommend that you use *Acrobat Reader*, rather than another program, to read all of the PDF’s provided in this class.

***Important*:** If you experience any problems with the LMS, you should:

1. Report the problem to the **Service Desk** and receive a “ticket number” by one of four means:
 - a. visiting their office in the basement of the ARC Building; or

- b. calling (718) 636-3765; or
 - c. emailing services@pratt.edu; or
 - d. using the “Computers & Technology Services” section of the “Get Help With” tab of my.pratt.edu.
2. Receive an email from the **Service Desk** assigning your problem a “ticket number”.
 3. Forward this email from the **Service Desk** to me.

In order for me to verify claims of *LMS* outages, you must contact the **Service Desk** when the LMS problem occurs, not hours or days later.

Reduced-Paper-Use Classroom:

Whenever possible, we will reduce the amount of paper that this course consumes. All of your out-of-class assignments, including the two-dimensional components of your two projects, must be submitted electronically via the *LMS*. Your work will be graded and returned electronically. Please do your best to reduce the amount of printing that you do for the course.

Extra-Credit American Museum of Natural History Assignment:

All students have the opportunity to complete an extra-credit assignment based on a trip to the *American Museum of Natural History* in Manhattan. The trip is self-guided, and you can complete this assignment any time before the due date of May 11th. The extra credit earned for completing this assignment can be applied to either *Homework* or *Classwork*; you indicate your preference based on where you upload your assignment. To receive credit for this assignment, you must also submit your original museum ticket to your instructor. Please see the *LMS* for the *Guidelines* to this assignment and a place where you can upload your assignment.

Classroom Civility and Academic Honesty:

I expect you to maintain the civility and integrity of our course in and out of the classroom. In class, this means arriving on time, turning off cell phone ringers and refraining from sending text messages, maintaining focus on class discussion, respecting the right of others to speak, and leaving the classroom in good condition (among other things). Out of class, this means properly citing all work that is not your own (in other words, not plagiarizing).

Plagiarism means presenting, as one’s own, the words, the work, information, or the opinions of someone else. It is dishonest, since the plagiarist offers -- as his/her own -- the language, or information, or thought for which he/she deserves no credit. Types of plagiarism include: (1) The use of any material from any source other than yourself in a paper or project without proper attribution. This includes material from the Internet, books, papers or projects by other students, and the media; (2) The extensive use of the ideas of others in your work without proper attribution; and (3) Turning in work done by another person, downloaded from the web, purchased from any agency or supplier, as one’s own. Plagiarism occurs when one uses the exact language of someone else without putting the quoted material in quotation marks and giving its source. The method for documenting sources and references is established by a number of standards: I prefer the *Chicago Manual of Style* (http://www.chicagomanualofstyle.org/tools_citationguide.html). Any paper submitted that does not use proper referencing will not be marked. Plagiarized assignments receive no credit, and all cases of plagiarism will be referred to the Registrar. For more information on avoiding plagiarism, please see: <http://www.christopherxjensen.com/teaching/for-students/#no-plagiarism>.

Any disruptive, disrespectful, or dishonest behavior will be promptly reported to the appropriate campus authority. Students must adhere to all Institute-wide policies which include policies on attendance, academic integrity, plagiarism, computer, and network use. Please see <https://www.pratt.edu/student-life/student-affairs/office-of-the-vice-president-for-student-affairs/student-policies/> (click on *Student Handbook*) for policies and procedures for handling academic conduct issues.

Rights of Students with Disabilities:

If you have a physical or learning disability, ADD/ADHD, chronic disease, or physical condition that we should know about, please contact Disability Services at 718-636-3711 to discuss your needs and how we can best serve you. In order to receive classroom accommodations and other services, you must have documentation of your disability on file in the Disability Services office. Your records will be kept completely confidential. For more information, please see the Pratt webpage for Disability Services (<https://www.pratt.edu/student-life/student-affairs/disability-resource-center/>).

Weekly Units:

Week	Date	Major Topic(s)	Key Questions	Readings	Events & Assignments
01	Jan. 21st	The Origin of Evolution	<ol style="list-style-type: none"> 1. What were the earliest theories explaining evolutionary patterns? 2. Who were the prominent scientists who contributed to early evolutionary theory? 3. What led Darwin and Wallace to their theory of natural selection? 	Zimmer Chapters 1 & 2	<ul style="list-style-type: none"> ➔ Syllabus distributed ➔ LMS Warm-up Assignments discussed ➔ Follow-Up Questions due @ 5 pm EST 5 days after your class section meets
02	Jan. 28th	Genes, Traits, & Evolutionary Change	<ol style="list-style-type: none"> 1. What is the genetic basis for traits? 2. Why is heritability a prerequisite for evolution? 3. What are the different patterns inheritance can take? 4. What is the role of mutation in evolutionary processes? 	Zimmer Chapter 5	<ul style="list-style-type: none"> ➔ Class visits a computer lab: remember to bring your Pratt ID!! ➔ Weekly Quiz ➔ Follow-Up Questions due @ 5 pm EST 5 days after your class section meets ➔ LMS Warm-up Assignments due, January 30th @ 11:59 EST
03	Feb. 4th	Natural Selection & Adaptation	<ol style="list-style-type: none"> 1. What is genetic drift and how does it cause evolutionary change? 2. What is natural selection? 3. How does natural selection produce adaptation? 4. Why is genetic diversity needed in order for evolution to occur? 5. How are behaviors adaptive? 	Zimmer Chapter 6 & p. 185-194 & 327-347	<ul style="list-style-type: none"> ➔ Weekly Quiz ➔ Follow-Up Questions due @ 5 pm EST 5 days after your class section meets
04	Feb. 11th	Sex & Reproduction	<ol style="list-style-type: none"> 1. Why do some organisms reproduce sexually? 2. How is sexual selection different from other forms of natural selection? 3. What roles do conflict and cooperation play in reproduction? 	Zimmer Chapter 9	<ul style="list-style-type: none"> ➔ Class visits a computer lab: remember to bring your Pratt ID!! ➔ Weekly Quiz ➔ Follow-Up Questions due @ 5 pm EST 5 days after your class section meets

Week	Date	Major Topic(s)	Key Questions	Readings	Events & Assignments
05	Feb. 18th	Speciation	<ol style="list-style-type: none"> 1. What is a species? 2. How do we identify different species? 3. What is the evolutionary process that generates new species? 4. What drives the patterns of species diversity that we observe across the earth's ecosystems? 	Zimmer Chapter 10	<ul style="list-style-type: none"> ➔ Class visits a computer lab: remember to bring your Pratt ID!! ➔ Weekly Quiz ➔ Follow-Up Questions due @ 5 pm EST 5 days after your class section meets
06	Feb. 25th	The Fossil Record	<ol style="list-style-type: none"> 1. How does geological knowledge contribute to our understanding of evolution? 2. How are fossils used to reconstruct evolutionary histories? 3. What were some of the major evolutionary innovations of early life? 4. What are "fossil intermediates" and why are they important? 	Zimmer Chapter 3	<ul style="list-style-type: none"> ➔ Weekly Quiz ➔ Follow-Up Questions due @ 5 pm EST 5 days after your class section meets ➔ How the Guppy Got Its Spots Lab Report due, February 27th @ 11:59 EST
07	Mar. 4th	Midterm Exam taken <u>in class</u> on the LMS.			➔ Class visits a computer lab: remember to bring your Pratt ID!!
08	Mar. 11th	The Tree of Life 1	<ol style="list-style-type: none"> 1. What is a phylogenetic tree? 2. How do we classify extant organisms based on their evolutionary history? 3. How do changes in genes lead to evolutionary diversification? 	Zimmer Chapter 4 & p. 194-198	<ul style="list-style-type: none"> ➔ Class visits a computer lab: remember to bring your Pratt ID!! ➔ Weekly Quiz ➔ Follow-Up Questions due @ 5 pm EST 5 days after your class section meets
	Mar. 18th	<i>Spring Break, No Class</i>			
09	Mar. 25th	The Tree of Life 2	<ol style="list-style-type: none"> 1. How is DNA evidence used to construct phylogenetic trees and differentiate species? 2. How does horizontal gene transfer complicate our understanding of evolutionary trees? 3. What is evolutionary convergence? 	Zimmer Chapter 7 & p. 198-209	<ul style="list-style-type: none"> ➔ Class visits a computer lab: remember to bring your Pratt ID!! ➔ Weekly Quiz ➔ Follow-Up Questions due @ 5 pm EST 5 days after your class section meets ➔ Choice Video for Week 10 should be registered on the LMS by March 27th @ 11:59 EST

Week	Date	Major Topic(s)	Key Questions	Readings	Events & Assignments
10	Apr. 1st	Coevolution	<ol style="list-style-type: none"> 1. What is coevolution? 2. What is the connection between symbiosis and coevolution? 3. What ecological interactions produce coevolution? 4. How do we find evidence for coevolution? 5. How does artificial selection differ from natural selection? 	<ul style="list-style-type: none"> ▶ Zimmer Chapter 12 ▶ One CHOICE video 	<ul style="list-style-type: none"> ➔ Weekly Quiz ➔ Follow-Up Questions due @ 5 pm EST 5 days after your class section meets ➔ Flowers and Trees Lab Report due, April 3rd @ 11:59 EST
11	Apr. 8th	Macroevolution	<ol style="list-style-type: none"> 1. Why do extinctions occur? How common is extinction? 2. What causes evolutionary radiations? 3. What are “mass extinctions” and how have they influenced the evolutionary history of the earth? 4. How does the current rate of extinction compare with the past? 	Zimmer Chapter 11	<ul style="list-style-type: none"> ➔ Weekly Quiz ➔ Follow-Up Questions due @ 5 pm EST 5 days after your class section meets
12	Apr. 15th	Selection Beyond the Individual	<ol style="list-style-type: none"> 1. Can selection occur at levels above the individual? 2. How is kin selection different from other forms of natural selection? 3. What is group selection and how is it different from other forms of natural selection? 4. Can cooperation be a product of natural selection? 	<ul style="list-style-type: none"> ▶ Zimmer p. 347-352 ▶ <i>Evolution for Everyone</i> Chapters 18-20 	<ul style="list-style-type: none"> ➔ Weekly Quiz ➔ Follow-Up Questions due @ 5 pm EST 5 days after your class section meets
13	Apr. 22nd	Humans & Cultural Evolution	<ol style="list-style-type: none"> 1. How did humans evolve? 2. How does our evolutionary history compare with other organisms? 3. What is “cultural evolution” and how does it compare with biological evolution? 	<ul style="list-style-type: none"> ▶ Zimmer Chapter 14 & p. 352-357 ▶ <i>TED Talks</i> “Joshua Klein: The amazing intelligence of crows” ▶ <i>National Public Radio</i> “As The Crow Flies, Tokyo Battles Avian Pest” 	<ul style="list-style-type: none"> ➔ Class visits a computer lab: remember to bring your Pratt ID!! ➔ Weekly Quiz ➔ Follow-Up Questions due @ 5 pm EST 5 days after your class section meets

Week	Date	Major Topic(s)	Key Questions	Readings	Events & Assignments
14	Apr. 29th	Prospects for Evolution	1. How can evolutionary knowledge serve humanity? 2. What are some ways that technology may affect the future path of evolution?	Zimmer Chapter 15	<ul style="list-style-type: none"> ➔ Weekly Quiz ➔ Course Evaluations ➔ Bring any questions you have in preparation for the Final Exam ➔ Follow-Up Questions due @ 5 pm EST 5 days after your class section meets
	May 6th	<i>Studio Days, No Class</i>			
15	May 13th	Final Exam taken <u>in class</u> on the <i>LMS</i> .			<ul style="list-style-type: none"> ➔ <i>Extra credit AMNH Assignment</i> due, May 11th @ 11:59 EST ➔ Class visits a computer lab: remember to bring your Pratt ID!!