BIOLOGY 185-20 — EVOLUTIONARY PROCESSES
SUMMER SESSION II 2018
4 CREDITS

TEACHING STAFF

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PRE-REQUISITE COURSEWORK

BIOL-104, Foundations in Biology II (or an equivalent introductory evolution/ecology course)

TEXTBOOK

Bergstrom CT, Dugatkin LA. 2016. *Evolution.* 2nd edition. W.W. Norton & Company.
ISBN-13: 978-0393601046 | ISBN-10: 0393601048
(n.b. There are several other fine textbooks on the market, and if you can get them cheaper, I invite you to do so. The Bergstrom and Dugatkin text is the one I'll refer to throughout this course, but I think you can get by with one of the others, which cover much of the same ground.)

ASSIGNMENTS & ASSESSMENTS (and point values)

Exams 1,2,3 – 15 each. Exams will involve short-answer and problem-solving questions, mostly.
Final Exam – 20. The final exam is cumulative, i.e., it will cover the entire semester. This exam will be administered on the last day of class.
Participation during in-class and on-line discussions – 10. Several meetings will be devoted to the analysis and discussion of readings drawn from the primary literature, which readings I will provide. Students will lead these discussions.
Additional work – 25. This is a grab-bag of activities and assignments. There will be three quantitative problem sets, one lab-like activity with data, one critical essay, and one literature-review project.

ABOUT THIS COURSE

Next to nothing in the living world has remained unaltered since its inception. Life has evolved. Every organism has a past; every pattern in the living world, a process that produced it. In this course, we will review the major patterns that evolution has produced and examine each of the processes responsible. Students are assumed to have completed foundational (introductory) coursework in both topics prior to this course. The topics, roughly in the order they will be covered, are:

Unit 1 - Foundations
History of biological thought, evidence for evolution, evolution and genetics basics
Unit 2 – Microevolution
Variation, population genetics, quantitative genetics, neutral evolution, molecular evolution, adaptation, the adaptive landscape, genome evolution
Unit 3 – Macroevolution
Diversification, species concepts, speciation, extinction, paleobiology, phylogenetics, comparative methods, adaptive radiations, phylogeography
Unit 4 – Synthesis (where we bring all of our new conceptual tools to some fun topics)
History of life on earth, the major transitions, evo-devo, sexual reproduction, social evolution, life history theory, etc.

LEARNING GOALS:
The Department of Biology at Georgetown has developed a set of learning goals for all biology majors. These goals guide the organization of the curriculum in our department and communicate to students the knowledge and intellectual skills that form the foundation of your education as biologists. You can access a detailed description of the learning goals here:
https://biology.georgetown.edu/about/pedagogy

These learning goals emphasize our belief that a biology education demands a strong understanding of basic concepts (6–10) and should enable students to make creative, careful use of their knowledge (1–5). Only then will they be biologists. Below, I have bolded the learning goals that this course emphasizes:

Insight into the Process and Product of Science

1. **Integration of New Knowledge into Existing Intellectual Frameworks**
2. **Engagement with Scientific Inquiry**
3. Representing and Interpreting Data in Quantitative and Statistically Meaningful Forms
4. Communicating Scientific Understanding in Oral and Written Forms
5. **Appreciating the Epistemology of Science**

Fundamental Biological Concepts

6. Organization of Molecular, Cellular, Organismal and Ecological Systems
7. **Evolution as a Framework for Understanding Biological Systems**
8. **The Flow of Biological Information**
9. Flow of Energy and Matter in Biological Systems
10. **Interdependence and Interactions within Biological Systems and their Emergent Properties**

Goals relevant more specifically to the field of evolutionary biology include the following:

- understanding and using the vocabulary of evolutionary biology
- distinguishing pattern and process in evolution and using analysis of pattern to infer process
- understanding the various causal evolutionary mechanisms that lead to variation, diversity, and change in organisms
- testing and distinguishing alternative hypotheses for evolutionary change
- phylogenetic analysis

All of our assessments are designed to measure your progress toward these goals.

THE FINE PRINT

Advice: Little of what I ask you to do will be new to you (exams, papers, discussions, attendance/listening, etc.). But the material is not simple, and the exams and assignments will be challenging. To do well in this course you will have to read with purpose and come to lectures and discussions prepared to engage with the material.

The textbook: As a student, I never liked buying a textbook only to discover that success in the course required attendance at lectures alone, rendering my textbook a 100$ doorstop. I also didn't like having the material from the book rehashed for me in class—I can read a book on my own, thank you very much, Professor. Somewhere in between these two extremes is the target I'm shooting for. My lectures will draw from the reading, especially in the trickier passages, but will also at times diverge from it and build on it. I intend lecture time to be used to clarify certain concepts, explore some others in more detail, signal to you what are the most important topics, and to give you a different perspective on the same topics that the book covers.

Late policy: Late assignments are penalized at a rate of 5% per day up to one week, after which the grade becomes a 0.

Grades: In a class like this in the Department of Biology at Georgetown, it is typical to see ~40% A/A- grades, ~50% B+/B/B- grades, and 10% "other" grades at the end of the semester. To me, this feels about right. This distribution, which is approximate, ensures that letter grades retain some meaning. Average scores >93.33% earn an A, > 90% an A-, >86.67% a B+, > 83.33% a B, >80% a B-, etc.

Illnesses and absence: Drink eight glasses of water a day, eat a balanced diet, exercise regularly, and try to sleep when it's dark outside. Do this and you won't get sick, and we won't have to worry about how to have you make up missed work. But if illness strikes any of you, this is a small enough course that we can forgo an official policy and just work around any problems as they arise.

Continuity: I will do my best to follow my advice above, but unlike you I am old and frail, and my body might betray me at any moment. (By the way, there is a good explanation for this, grounded in evolutionary theory.) If something keeps me from class for a single day, we will scramble to make up the lost time (you might read ahead or I might put together a recorded lecture). If something keeps me away longer, I am planning to use Zoom, which is a videoconferencing tool that facilitates remote lectures and discussions and is freely available to you as a member of the Georgetown community.

Honor code: All students are expected to maintain the highest standards of academic and personal integrity in pursuit of their education at Georgetown. Academic dishonesty in any form is a serious offense, and students found in violation are subject to academic penalties that include, but are not limited to, failure of the course, termination from the program, and revocation of degrees already conferred. All students are held to the Georgetown University Honor Code. For more information about the Honor Code see: http://honorcouncil.georgetown.edu/. In a nutshell, Georgetown's honor code applies to everything you do in this class. If you are worried you might run afoul of it or suspect that someone else has, you must let me know.

Sexual Misconduct: Please know that I am committed to supporting survivors of sexual misconduct, including relationship violence, sexual harassment, and sexual assault. However, university policy also requires me to report any disclosures about sexual misconduct to the Title IX Coordinator, whose role is to coordinate the University's response to sexual misconduct. Georgetown has a number of fully confidential professionals who can provide support and assistance to survivors of sexual assault and other forms of sexual misconduct. More information about campus resources and reporting sexual misconduct can be found at http://sexualassault.georgetown.edu

Special accommodations: If you believe that you have a disability that will affect your performance in this class, please contact the Academic Resource Center (arc@georgetown.edu) for further information. The center is located in the Leavey Center, Suite 335. The Academic Resource Center is the campus office responsible for reviewing documentation provided by students with disabilities and for determining reasonable accommodations in accordance with the Americans with Disabilities Act (ADA) and University policies.

Diversity and inclusivity: We will devote a significant portion of our time in this course to discussion. While none of the topics strike me as particularly controversial, there is always the chance that our conversation will take us into a related topic, which may be. For example, a discussion of why there are two sexes (not a hot-button issue) might lead us to a discussion of gender (a hot-button issue). If we are to have fruitful discussions of these topics, everyone must recognize that their point of entry is not the only one, nor is their opinion the best, and that a diversity of viewpoints makes for the best discussion. I welcome any and all discussions and trust that no one will attempt to limit these by the intimidation or belittlement of others.