

BIOL490S-01: Solving Problems with Ecology and Evolution Spring 2020

Instructor	Lauren Carley PhD candidate, Duke University Program in Ecology
Email	lauren.carley@duke.edu
Phone	919-668-6590 (office)
Class time	Tu/Th 1:25-2:40p
Location	FFSC 4233
Office	FFSC 3335 (inside FFSC 3332)
Office hours	TBA (listed on Sakai)

OVERVIEW

How do organisms overcome the challenges they face in their environments? Through evolution, nature has devised a variety of mechanisms to allow species and communities to persist despite stressful and ever-changing environments. Many of these mechanisms have implications for problems that we face in human society. In this seminar course, we will explore how fundamental concepts in ecology and evolution have influenced our approaches to solving human and environmental problems, drawing from primary literature describing case studies in human disease, agriculture, environmental remediation, biotechnology, and more.

LEARNING OBJECTIVES

By the end of this course, you should be able to:

- Identify and describe ecological and evolutionary processes and their applications to human society.
- Critically evaluate and discuss primary literature in ecology and evolutionary biology.
- Synthesize information from multiple primary sources to develop a deep understanding on a topic of choice related to ecology/evolution and human society.

TEXTS

We will focus our discussions on primary literature articles, which will be shared on the course webpage (<https://sakai.duke.edu/>).

There will be two required readings per class. Additional supplemental papers for each topic covered are posted on the detailed reading list and will be updated with new information, when relevant, on Sakai.

STRUCTURE

This seminar course is discussion-based and is driven by your active engagement in reading and discussing the assigned papers. In addition to covering basic and applied topics in ecology and evolution, we will work together throughout the semester to improve skills for reading, understanding, and discussing scientific publications in biology.

For the first half of the semester, I have pre-selected readings that provide both ecological and evolutionary perspectives on core themes of human health, agriculture, environmental remediation, and ecosystem services. I will lead the first few discussions; after that, one student per class period will be in charge of leading the discussion. As discussion leader, you will be responsible for delving a bit deeper into the background information to contextualize the assigned papers; see the complete reading list for some recommended supplements, or do a literature search of your own and see what you find. Your goal is to foster a productive and critical discussion of the motivation, methods, and conclusions of the assigned papers.

In the second half of the semester, each student will sign up lead discussion on a topic of their choice. This may be an in-depth follow-up to a previously covered topic, or something new. As discussion leader, you are required to (1) choose a primary literature paper for discussion and distribute it to the class at least a week in advance, (2) give a brief overview contextualizing the focal paper with other research and background material, and (3) lead discussion on the paper of your choice. Each leader will have ~35 minutes in charge.

ASSIGNMENTS

During the second half of the course, all students must select and distribute **two primary literature papers** via Sakai at least one week prior to the presentation date.

By midnight prior to each class period, you must complete the assigned reading and submit a brief **reading response** via Sakai. These responses should be no longer than 1 page and should contain a description of the following items:

- 3 (minimum) things you learned from the readings
- 2 (minimum) questions you still have that could be discussed in class
- 1 (minimum) common theme you found among the readings

These reflections should help you prepare for active participation in the class discussions.

In addition, this course has one **written assignment**. Building upon the papers that you led your presentation on, you should search literature databases to find four or more additional papers related to that topic, and critically review those papers. Your paper should answer:

- What is an outstanding problem in human society and/or the environment?
- How has ecology and/or evolution informed approaches to solving that problem?
- To what extent, if any, has implementation of these approaches been successful?
- What next steps would move us forward toward solving this problem? These could include developing new methods, alternative approaches, research to address a knowledge gap, etc.

EVALUATION

Throughout the semester, you will be graded on completion (complete/incomplete) of your reading reflections. You will also be evaluated on your active participation in class discussions. You must complete 20 of the 22 reflections and be present and participate at least 26 of the 28 class periods (not counting excused absences/STINF) to receive full credit for homework assignments and class participation, respectively.

When the time comes, you will also be evaluated on your ability to lead classroom discussion

and present on the topic of your choice.

Your final grade will be determined by:

- Completion of reading reflections (20% of grade; 1% for each of 20 reflections);
- Thoughtful, active, and respectful participation in class discussions (40% of grade; 2% for each of 20 non-lead discussions);
- Successful leading of group discussions (20%; 10% for each of 2 leads); and
- Completion and quality of the final paper (20%).

See supplementary rubrics for more details about how these components will be evaluated.

There will also be several opportunities for evaluation that will not contribute to your grade, and are just in place to help you learn. You will give and receive peer feedback on each week's discussion, peer edit each other's paper drafts/outlines, and have your paper draft reviewed by me before you submit your final version for grading.

ACADEMIC INTEGRITY

My class exists specifically to help you learn and grow as a person and scholar. You should approach the learning experience with integrity and honor, both because I expect it of you and because it will serve you best in the long term. At a minimum, these expectations include producing original, independent work for the assignments in this class, referencing appropriate citations for any outside sources that you use, completing assignments in a timely fashion, and contributing to lively discussion that benefits all students. Beyond those minimum expectations, I hope you will take pride in your work.

Duke University also has a formal academic integrity statement, called the Community Standard, which you must uphold. It states:

“Duke University is a community dedicated to scholarship, leadership, and service and to the principles of honesty, fairness, respect, and accountability. Citizens of this community commit to reflect upon and uphold these principles in all academic and non-academic endeavors, and to protect and promote a culture of integrity. To uphold the Duke Community Standard:

- I will not lie, cheat, or steal in my academic endeavors;
- I will conduct myself honorably in all my endeavors; and
- I will act if the Standard is compromised.”

If you are so inclined, you can read much more about the Community Standard here: <https://studentaffairs.duke.edu/conduct/about-us/duke-community-standard>

If any of my expectations or those of the Community Standard are unclear, or you are not sure how to actualize them, please talk to me during office hours or via email. Any suspected incidents of academic misconduct will be reported to the Office of Student Conduct.

DISABILITY STATEMENT

If you may need accommodations for a disability during this class, please contact the Student Disability Access Office (<http://access.duke.edu/students/index.php>) at 919-668-1267 or disabilities@as.duke.edu. I will work with you and the SDAO to make sure that appropriate accommodations are implemented in a timely fashion. In addition (or instead), you may also reach out to me personally via email, during office hours, or via appointment to discuss any concerns you have about your ability to succeed in my class.

PROPOSED SCHEDULE

Week	Date	Topic	Lead	Reading(s)	Assignments Due
1	Jan 9	Intros, syllabus overview, ground rules, etc.	Lauren	Syllabus and rubrics	Presentation topic sign-ups
2	Jan 14	**No class!**			Reflection 1 (syllabus and goals)
	Jan 16	Overview and introduction to concepts	Lauren	Carroll et al. 2014 Hobbs et al. 2009	Reflection 2
3	Jan 21	Ecological models of disease transmission	Yen	Fergusun et al. 2016 Ostfeld et al. 2018	Reflection 3
	Jan 23	Evolutionary medicine	Lindy	Dudley et al. 2012 Voskarides 2017	Reflection 4
4	Jan 28	Pharmaceutical discovery from natural products	Jeffrey	Dančik et al. 2010 De Luca et al. 2012	Reflection 5
	Jan 30	Evolution of plant secondary metabolites	Jack	Agrawal et al. 2012 Karaš et al. 2018	Reflection 6
5	Feb 4	Breeding and engineering better crops	Annie	Jia et al. 2017 Wang et al. 2015	Reflection 7
	Feb 6	Biocontrols, natural enemies, and trophic interactions	Floey	Dassou & Tixier 2016 Mody et al. 2017	Reflection 8
6	Feb 11	Evolution of plant-microbe interactions	Amanda	Berendsen et al. 2012 Haney et al. 2015	Reflection 9
	Feb 13	Engineering microbes for crop improvement	Rinchen	Aparna et al. 2014 Rolli et al. 2015	Reflection 10
7	Feb 18	Natural adaptations to extreme environments	Hannah	Alvarez et al. 2018 Selby & Willis 2018	Reflection 11
	Feb 20	Forests: managing carbon, timber, and biodiversity	Anna	Hu et al. 2015 Kline et al. 2016	Reflection 12; Presentation sign-ups
8	Feb 25	Species interactions and invasion dynamics	Varsha	Byun et al. 2017 Vasquez et al. 2008	Reflection 13
	Feb 27	Evolution of increased competitive ability	Jillian	Uesugi & Kessler 2013 Zheng et al. 2015	Reflection 14
9	Mar 3	Freshwater management and ecosystem services	Peter	Bodoque et al. 2017 Meli et al. 2014	Reflection 15
	Mar 5	Bioremediation and restoration	Brittany	Oliveira et al. 2014 Shim et al. 2013	Reflection 16
10	Mar 10 Mar 12	Spring break; no class!			
11	Mar 17	Guest panel with Q&A	Everyone	N/A	Reflection 17
	Mar 19	Natural products & pharma; Plant stress responses	Amanda Jack	TBA	Reflection 18
12	Mar 24	Marine pollution; bioremediation	Anna Hannah	TBA	Reflection 19
	Mar 26	Population ecology & disease; TBA	Rinchen Brittany	TBA	Reflection 20
13	Mar 31	Disease eco-evo; Disease-host coevolution	Yen Lindy	TBA	Reflection 21
	Apr 2	Writing workshop 1	Lauren	TBA	Paper outline due for peer edit
14	Apr 7	Freshwater systems; Conservation strategies	Peter Jeffrey	TBA	Reflection 22
	Apr 9	Crop diversity and agroeco; Evolution of ag pests	Annie Floey	TBA	Reflection 23
15	Apr 14	Writing workshop 2	Lauren	N/A	Paper draft due for peer edit
	Apr 16	Virus evolution; Antibiotic resistance	Jillian Varsha	TBA	Reflection 24
16	Apr 21	Wrap-up	TBA	TBA	Course evaluations; Paper draft due to Lauren

Due date for revised final paper: Monday, April 27, 11:59p, via Sakai