BIOLOGY 659:
SEMINAR IN EVOLUTIONARY BIOLOGY

"THE EVOLUTIONARY SYNTHESIS & ITS DISCONTENTS"

Course Information & Policies
Fall 2019

I. Course Logistics

Meeting time:	Thursday 2:00-4:00 PM
Meeting location:	108 Wilson Hall
Instructor:	David Pfennig 320 Wilson Hall dpfennig@unc.edu
Office hours:	by appointment

II. Course Description

Evolutionary biology seeks to discover the history of life, the causes of the diversity and features of living things, and the mechanisms that underlie evolutionary change. Our current understanding of evolution traces to Darwin's book, *On the Origin of Species*, published in 1859, which presented two major hypotheses: first, all organisms have descended, with modification, from common ancestral forms of life, and second, that the primary cause of evolution is natural selection. The first hypothesis quickly became established as fact. By contrast, the second hypothesis was not broadly accepted until the 1930s and 1940s when Darwin's ideas were united with Mendelian genetics. This 'evolutionary synthesis' has been loosely codified into a set of principles that most scholars now accept as being true. Occasionally, however, some have called these principles into question. In this seminar, we will explore: the historical development of the evolutionary synthesis; describe what its main principles are; discuss the ideas and data behind these principles; examine some of the historical and current critiques of aspects of the evolutionary synthesis; and ask where things stand today.

III. Learning Objectives

By fully engaging with the material and class assignments, by the end of the semester you will be able to:

- Explain what the evolutionary synthesis is, how it was developed, and why understanding it is important.
- Critically evaluate and interpret some of the historical and current critiques of aspects of the evolutionary synthesis.
- Combine factual material with deductive reasoning to address these critiques.

IV. Course Prerequisites

The course is open to graduate students and advanced undergraduates in the biological sciences. Undergraduates must be participating in research and have completed 201, 202 and 205 and taken at least one advanced (400 level and above) ecology or evolution course. Undergraduates MUST have permission of the instructor to enroll (or remain) in the class.

V. Course Format

The class will consist of student-led discussions of the evolutionary literature. The class will culminate in a final exam, in which the class as a whole discusses the patterns that emerged from the readings throughout the semester.

VI. Assignments: Student-led Discussions:

NOTE: Because we may have more weeks in the semester (11) than students, each student may be asked to lead more than one discussion. If that happens, you can team up with another student to lead each discussion.

A. Responsibilities of Discussion Leader(s):

On weeks when you are leading a discussion, you will be engaged in three types of activities:

First, select the readings to discuss. To structure our discussions, I have already selected the topics, and, in most cases, provided a key background reading. However, I would like you, as the discussion leader, to provide an additional reading or two for each week's discussion (including, data papers, where appropriate). **Please select papers that**: (1) you're personally interested in reading and discussing; (2) will likely have broad appeal; and (3) will stimulate a lively discussion.

The paper(s) for a given week MUST be uploaded to the appropriate folder on the course Sakai site by 5pm MONDAY preceding the Thursday discussion.

Second, on the actual day of your presentation, you should spend no more than 30 minutes at the outset of the class period presenting an overview of the reading material. During this time, you should tell the class why the material is important and what the central messages of the reading(s) were. In doing so, you should use Powerpoint; you may also wish to use the chalkboard and/or handouts.

Finally, after the overview, the remainder of the class period should focus on your classmates' questions and leading a discussion of these questions. Some pointers on how to lead a discussion are listed in the box on the next page.

B. Responsibilities of Discussion Participants:

For the days when you are not leading a discussion, you should come to class prepared to participate actively in the discussion. It's important that you read the material carefully and be prepared to discuss it in class, as 60% of your final course grade will be based on your class participation; this means that you will need to speak up in every discussion. To help you prepare, and to assist the discussion leader(s), you will be asked to post at least two questions based on each week's reading assignment on the Sakai Forum no later than 5 pm the day before the discussion (***to post your questions, go to the Sakai Forum, click 'Start a New Conversation', and insert your questions in the open text box***).

Note: To keep everyone on their toes, I may call on discussion participants at random.

How to lead a discussion:

1) Use the submitted questions to get the discussion rolling and to keep it rolling. It's a good idea to put these questions into your Powerpoint so everyone can read them. It also helps to put basic questions first and the most interesting questions just after them, leaving other questions to the end if time permits.

2) Once the discussion gets started, ease up and let your classmates talk. You do not need to respond to everything that others say; in the best discussions, everyone is speaking to each other rather than solely to the discussion leaders. Be prepared to redirect the conversation if it becomes bogged down on meaningless argumentation, but don't be too eager to shift topics if the class is confused.

3) Be fair to the author's arguments. Present the author's position first before voicing your opinion.

4) Avoid jargon. If it's necessary to use special terms, make sure you define them (a glossary in your presentation is a good idea).

5) Be prepared to support your arguments. The best way to do so is to read the material carefully. It also helps to consult additional, outside readings for opposing views or to clarify points made in the assigned reading. If you find useful outside readings, provide these additional references in your presentation.

VII. Grade Determination

A. Grade Composition

Your final course grade will be determined as follows:

- Attendance and participation in class discussions: **40% of final grade**
- Discussion questions: **20% of final grade**
- Performance as discussion leader: **30% of final grade**
- Final exam: **10% of final grade**

(Because the aim of the class is for everyone to learn from each other's insights, successful discussions depend on everyone's attendance *and participation,* including weekly submission of questions. If you must miss a class, please let me know).

B. Grading Scale

Your course grade will be determined as follows:

Final average	Course grade*
93+	A/H
92-90	A-/P
89-87	B+/P
86-83	B/P
82-80	B-/P
79-77	C+/L
76-73	C/L
72-70	C-/L
69-67	D+/L
66-63	D/L
62-60	D-/L
<60	F/F

*undergraduate/graduate student grading scheme

SYLLABUS

Date	**Topic**	**Readings** (leaders: supplement if needed)
Section 1: Background		
Aug. 22	Introductions & overview of the course	None
Aug. 29	History of evolution & of the evolutionary synthesis	Ch. 1 in Futuyma & Kirkpatrick (2017)
Section 2: Key Elements of the Evolutionary Synthesis		
Sept. 5	The evolutionary synthesis: genetics	Lewontin chapter in Mayr & Provine (1998)
Sept. 12	The evolutionary synthesis: paleontology	Sepkoski (Ch. 1) in Sepkoski & Ruse (2009)
Section 3: Cracks in the Evolutionary Synthesis?		
Sept. 19	Is something amiss with evolution?	Welch (2017)
Sept. 26	Is something amiss with evolution? Reply	Tanghe et al. (2018) (Reply to Welch)
Section 4: Case Studies of Specific "Challenges" to the Evolutionary Synthesis		
Oct. 3	A challenge from paleontology: punctuated equilibrium	Eldredge & Gould (1972) + Ch. 3 in Turner (2011)

Oct. 10	A challenge from paleontology: can microevolution explain macroevolution?	Ch. 8 in Turner (2011)
Oct. 17	A challenge from developmental biology: developmental plasticity & bias	Laland et al. (2015) + Charlesworth et al. (2017)
Oct. 24	A challenge from genetics: directed mutation?	Beatty (Ch. 3) in Pigliucci & Muller (2010)
Oct. 31	A challenge from genetics & ecology: nongenetic inheritance	Ch. 5 in Bonduriansky and Day
Nov. 7	A challenge from ecology: can selection act on levels other than on individual organisms?	Ch. 6 in Godfrey-Smith (2009) + Ch. 5 in Turner (2011)
Nov. 14	A challenge from ecology: niche construction	Odling-Smee (Ch. 8) in Pigliucci & Muller (2010) + Gupta et al. (2017)
Section 5: Wrap up		
Nov. 21	FINAL EXAM discussion: What (if anything) is missing from the evolutionary synthesis?	None

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Green: I (David) lead; blue: individual (or pairs of) students lead; red: everyone leads

UNFORESEEN EVENTS MAY REQUIRE ME TO MAKE CHANGES TO THIS SYLLABUS.
CHECK SAKAI FOR ANY CHANGES.