

Behavior & Evolution

BIOL724.6, Graduate, 3 Credits

Wednesdays 6:30-9:20 pm, Room TBA

CUNY Graduate Center

Prof. David Lahti (office Queens College Science Building E120, lab E141)

I welcome visits!—make an appointment:

(718) 997-3422, David.Lahti@qc.cuny.edu

In this advanced graduate seminar course, we work together to understand the way in which behavior evolves. Behavior by its very definition is highly condition-dependent, meaning that its expression relies heavily on cues from an organism's environment, so there can always be multiple behavioral phenotypes for a given genotype at a given time. Thus, behavioral traits are considered to be the furthest removed from the genes, and so have been the most challenging traits to study from an evolutionary perspective. Some prominent biologists have even questioned whether behavior evolves by natural selection, whether behavioral differences can be underlain by differences in genes, and whether we can know anything about the evolutionary history of a behavior! We are at an exciting time in evolutionary biology, however. Recently, careful field research, phylogenetic analyses, and investigations of behavioral control at physiological and molecular levels have resulted in an exponential rise in our understanding of the mechanisms of behavioral evolution.

Our goal in this course is to integrate the various conclusions from this new research with insights from thinkers throughout the history of evolutionary biology, in an effort to address fundamental questions about behavioral evolution. How does natural selection operate on behavior? In what ways can a genetic change lead to behavioral change? What kinds of behavioral change count as evolution? Is the evolution of behavior faster or slower than the evolution of other kinds of traits? How does behavioral evolution compare with the evolution of morphological traits on various timescales? Are there *modes* of behavioral evolution? Can a learned trait evolve?

The format of this course is a hybrid between a discussion group, journal club, graduate lecture course, and a focused think tank. Each class session is 170 minutes. After the first introductory session on 9/1 which will be comprised of lecture and preliminary conversation, each evening begins with a lecture by the instructor (about 30 min), followed by two periods of critical discussion and integration of the literature (about 60 min each) with a break in between (15 min). The first session is student-run, and the second is instructor-run. Students are encouraged to bring food and drink to share during class.

Assigned readings will be distributed by email. Following are the requirements:

- 1. Participation** in class (35%). You should explain any absence to me before or (if unexpected) during the week after class. Participation includes attention and vocal interaction with the material and each other. Every student must participate in every attended class session. Students have a variety of backgrounds and levels of understanding of behavior and evolution—all ideas and perspectives are welcome!
- 2. Quizzes** (10%). On 5 occasions throughout the term, a brief (15 minute, short answer) quiz will be administered at the start of the class session. The quizzes cover basic concepts presented in the short lectures. The quizzes are cumulative but will focus on the most recent material. The first quiz is on week 2 (9/15), and following quiz dates will be announced during class.
- 3. Reading literature** in preparation for each class. I will assign two or three particular papers for the entire class to read in preparation for each week's discussion. In addition, each student will find and read one additional paper or book chapter per week that relates directly to the class topic (see me if you do not know how to find scientific literature). Each student will write a brief (<1 page) **summary and reflection** (25%) of this extra article each week and email it to me *before class begins*. The summary and reflection should be separate sections of this paper. The summary should describe the paper's results and conclusions objectively, or according to the claims of the authors, whereas the reflection should be your critical account of the paper's importance and quality, including any ideas that may have occurred to you about the paper or the topic while reading. During the week after each class, I will assemble your papers and email them to the entire class so you may have an annotated bibliography of each week's topic. Do not purposely choose a paper a classmate as chosen. Please raise any relevant thoughts on this paper during our discussion.
- 4. Synthesis brainstorm**s (10%). No readings are assigned for the last two class sessions. Instead, we will use these sessions collectively to discuss a total of four (two per session) topics of conceptual importance to the study of the evolution of behavior. In preparation for these sessions, each student should think about the topics and write a brief (<1 page) list of ideas or questions for discussion. These brainstormers should be informed by the literature and previous lectures and discussions. Students are encouraged to consult additional literature, especially review articles, to help stimulate thought on these topics. These brainstormers should be emailed to me *before class begins*.
- 5. Concluding prospectus** for research on behavioral evolution (30%). Each student will write a commentary on the current state of research on the evolution of behavior, presenting the student's opinion as to the most important questions or areas that should be addressed in future research. Please include a title that captures the theme of your paper.

The prospectus should be between 1500-2000 words, and contain at least 15 cited references of the academic literature, including studies read for class as well as other literature. Citations of magazines, news, or web-based material (except for internet academic journals) are inappropriate. Write the paper to professional evolutionary biologists and animal behaviorists, as if it were to be published as a commentary in the journal *Evolution*. Headings and subheadings may be used at your discretion. Guidelines for formatting and style (including bibliography) may be found at <http://www.wiley.com/bw/submit.asp?ref=0014-3820&site=1>. This paper is due by midnight, Wednesday 12/22.

Class schedule:

9/1	Overview of evolution and behavior
9/8	Graduate Center closed: No class
9/15	What is behavior and behavioral evolution?
9/22	Mechanisms of behavioral evolution
9/29	Phylogenetic analyses of behavioral change 1. invertebrates
10/6	Phylogenetic analyses of behavioral change 2. vertebrates
10/13	Microevolution of behavior in the wild: 1. invertebrates
10/20	Microevolution of behavior in the wild: 2. vertebrates
10/27	Quantitative genetic studies of behavioral evolution 1. invertebrates
11/3	Quantitative genetic studies of behavioral evolution 2. vertebrates
11/10	Artificial selection of behavior
11/17	Experimental evolution of behavior
11/24	Extended phenotypes resulting from behavior Evolution of interactions among individuals
12/1	Synthesis 1: Interbehavioral comparisons—trends in polyethnic evolution Synthesis 2: Trait suite evolution—behavior in morphological context
12/8	Synthesis 3: Evolution of learning and learned behavior Synthesis 4: Modes of behavioral evolution
12/15	Reading Day: No class
12/22	Concluding prospectus due (No class)