ANIMAL BEHAVIOR

IB 144–ESPM C126
FALL 2020
COURSE SYLLABUS

This course is intended to provide an overview of the diverse conceptual and analytical approaches used to study animal behavior. Animals display an amazing variety of behaviors – no question about that! No doubt many of you are taking this course simply because you enjoy animals and want to learn more about them. That's great and we want to encourage that enthusiasm.

At the same time, we do have some intellectual and academic goals for the course. These include:

1. **Understanding fundamental concepts**. While behavior is incredibly diverse, there are some fundamental concepts that apply to most if not all species. One of our goals is to make sure that you understand and can apply these concepts to specific animal examples, thereby providing you with the tools needed to study and to interpret behavior from a scientific perspective.

2. **Applying critical thinking**. An essential, related goal is to help you hone your skills as critical thinkers. When given information about a behavior, it's often easy to develop a possible explanation why an animal does what it does. But, how did you arrive at that explanation? What information did you use and what data did you have to interpret to propose an explanation for a given behavior? The ability to logically and deliberately evaluate scientific data and draw conclusions is a critical skill that extends well beyond animal behavior.

3. **Employing essential methods**. Understanding the conceptual bases for behavior is important, but so is knowing how to put those ideas into practice. While this is not a methods course, you will be introduced to some of the common methods used to study behavior and you will use those experiences to complete a short behavioral study of your own.

LECTURE SYLLABUS

There are three faculty lecturers for this course. Although all lecturers in the course study behavior, they do so from different perspectives and using different toolkits. To capitalize on this expertise and to allow you access to faculty with detailed understanding of these diverse approaches, the course is team-taught. Lectures are divided into three sections, each one corresponding to a different lecturer. The first part of the courses emphasizes natural selection and evolutionary studies of behavior. The second part focuses on genetic, endocrine, and neurobiological mechanisms of behavior. The third part brings these themes together to examine several critical aspects of behavior including reproduction and communication.

UNIT 1: SELECTION AND BEHAVIOR

Natural selection is – hands down – the primary mechanism of evolutionary change used to explain animal behavior. Natural selection is a deceptively simple idea. However, to really understand how natural selection works it is necessary to master the key elements of this concept, including the necessary conditions for selection to operate, the source of selective pressures, and the metrics used to determine when selection occurs. This first 5 lectures will ensure that you master these fundamentals and are prepared to think critically about how natural selection acts to shape animal behavior.

DATE	LECTURER	TOPIC	DISCUSSION
W Aug 26	Lacey	What is behavior?	
F Aug 28	Lacey	Natural selection 1: selection & behavior	
M Aug 31	Lacey	Natural selection 2: genes & heritability	1: Tinbergen
W Sep 2	Lacey	Natural selection 3: behavioral variation	
F Sep 4	Lacey	Natural selection 4: measuring selection	

Sexual selection focuses on the behaviors and other adaptations (e.g., morphological traits) that animals use to attract, to compete for, and to choose reproductive partners. Developed to explain striking examples of sexual dimorphism in animals, sexual selection theory argues that differences in male and female behavior have their foundations in the differences between eggs and sperm. The next 5 lectures will cover the conceptual framework for classic sexual selection theory, after which we will consider ways in which behavior appears to differ from predictions based on this theoretic framework.

M Sep 7		**NO LECTURE: LABOR DAY HOLIDAY**	2: Experiments
W Sep 9	Lacey	Sexual selection 1: male & female strategies	
F Sep 11	Lacey	Sexual selection 2: models of female choice	

M	Sep 14	Lacey	Sexual selection 3: why the redundancy?	3: Project intro
W	Sep 16	Lacey	Sexual selection 4: challenging the dogma	

Kin selection is a critical concept in behavioral biology that is thought to explain many examples of altruistic behavior. As the name suggests, kin selection requires knowledge of the degree of genetic relatedness among individuals and an ability to use kin relationships to predict the fitness consequences of specific patterns of behavior. The next 4 lectures will introduce the fundamentals of kin selection, including the methods used to estimate genetic relatedness among individuals.

F	Sep 18	Lacey	Kin selection 1: Hamilton's equation	
M	Sep 21	Lacey	Kin selection 2: kin recognition	4: Kinship
W	Sep 23	Lacey	Kin selection 3: when r = 0	
F	Sep 25	Lacey	Kin selection 4: eusociality	
M	Sep 28	Lacey	Research lecture	5: Review
W	Sep 30	GSIs	Research lectures	
F	Oct 2	Lacey	**MIDTERM 1**	

Upon completion of this first unit of the course, you will have all of the fundamental tools required to understand how selection (natural, sexual, kin) acts to shape the behavior of animals.



UNIT 2: DEVELOPMENT, LEARNING AND NEUROBIOLOGY

The second part of the course focuses on some of the mechanisms that underlie the production of behavioral. In other words, what goes on within the "black box" of an animal's body that shapes the behaviors that we can observe. The first 5 lectures in this part of the course explore the role of ontogeny in shaping behavior by asking how early life experiences contribute to the behaviors displayed by adult organisms. This includes detailed explorations of two aspects of behavior – bird song and parasite manipulation of hosts – that have strong ontogenetic effects on individuals.

DATE	LECTURER	TOPIC	DISCUSSION
M Oct 5	Bentley	Development 1: ontogeny	6: Neuroplasticity
W Oct 7	Bentley	Development 2: learning & imprinting	
F Oct 9	Bentley	Development 3: fixed action patterns	
M Oct 12	Bentley	Bird song	7: Dogs & scent
W Oct 14	Bentley	Parasite manipulation of host behavior	

Neural systems, including brains, control almost all aspects of behavior. As a result, it is critical to understand how neurobiology contributes to behavior. This includes consideration of how animals perceive their surroundings, how the nervous system processes that information, and how that information is translated into activity. The next 4 lectures explore these themes to provide members of the class with a basic framework for understanding the brain-behavior connection.

F Oct 16	Bentley	Neural bases 1: stimulus detection	
M Oct 19	Bentley	Neural bases 2: escape behavior	8: Imprinting
W Oct 21	Bentley	Neural bases 3: central pattern generators	
F Oct 23	Bentley	Neural bases 4: stimulus filtering	

When a given behavior occurs is not random. Birds sing most in the early morning. Bats fly at night. Some species of locusts emerge from the ground every 13 years. In short, almost all biological processes follow temporal rhythms and behavior is no exception. The final 3 lectures in this part of the course examine the temporal patterning of behavior, including the environmental cues used to set the timing of behavior and the neural and endocrine mechanisms that maintain these temporal patterns.

M Oct 26	Bentley	Temporal organization 1	9: Parasites rule
W Oct 28	Bentley	Temporal organization 2	
F Oct 30	Bentley	Classical and operant conditioning	
M Nov 2	Bentley	Research lecture	10: No discussion
W Nov 4		**MIDTERM 2**	

Upon completion of this part of the course, you should understand how ontogeny and neurobiology intersect to contribute to the variation in behavior that we observe in animals.



UNIT 3: COMMUNICATION, REPRODUCTION

The final part of the course integrates the material covered in the previous two sections to examine diversity of several key aspects of behavior, including how individuals communicate with each other, how they acquire mates, and how they care for offspring. This section of the course will allow you to apply the fundamentals covered in Units 1 and 2 while expanding your knowledge of the hypotheses used to explain these species aspects of behavior. The first lecture covers optimality models, which are a critical tool for evaluating the costs and benefits of specific behaviors.

DATE	**LECTURER**	**TOPIC**	**DISCUSSION**
F Nov 6	Elias	Optimality models	
M Nov 9	Elias	**NO CLASS: VETERANS DAY HOLIDAY**	11: Costs & benefits

Communication is critically important to nearly all animal social interactions. The next 3 lectures in this part of the course explores two topics that crystalize much of our understanding of communication: signal honesty and signal evolution. How do individuals interpret the signals that they detect? What prevents signalers from providing false information to others? How do interactions between signalers and receivers differ in different habitats? This set of lectures will cover the fundamentals of the conceptual approaches used to study animal communication.

W	Nov 11	Elias	Communication 1	
F	Nov 13	Elias	Communication 2	
M	Nov 16	Elias	Communication 3	12: Human effects

From an evolutionary perspective, producing offspring is the most important thing that an individual can do. Mating systems encompass themes discussed during the series of lectures on sexual selection (locating, attracting, competing for mates) plus how those individual-level patterns of behavior are organized spatially and temporally and how they are influenced by the environment. The next 3 lectures in this unit will examine the factors that shape mating systems as well as how adults care for the offspring that they produce.

W	Nov 18	Elias	Mating systems 1	
F	Nov 20	Elias	Mating systems 2	
M	Nov 23	Elias	Mating systems 3	13: No sections
W	Nov 25		**NO CLASS: THANKSGIVING HOLIDAY**	
F	Nov 27		**NO CLASS: THANKSGIVING HOLIDAY**	
M	Nov 30	Elias	Parental care 1	14: Mating & caring
W	Dec 2	Elias	Parental care 2	
F	Dec 4	Elias	Research lecture	



DISCUSSION SECTIONS:

A separate syllabus for discussion sections in posted on bcourses.

GRADING:

The grading scheme for the course is provided in a separate document on course policies that is posted on bcourses.

IMPORTANT EXAM INFORMATION:

The course includes two in-class midterms and a final exam. The two in-class midterms will occur on:

Friday, 2 October. 100 points. (Dr. Lacey's lectures and discussion sections)
Wednesday, 4 November. 100 points. (Dr. Bentley's lectures and discussion sections)

In class midterms will take place during the regular lecture time; midterms will not be offered at alternative times. Midterms for DSP students will take place at the same time as the general midterm but will begin earlier or continue later as allowed by individual accommodations. Anyone wishing to use their DSP accommodation for the midterms must confirm these arrangements with the relevant lecturer **AT LEAST ONE WEEK** prior to the midterm.

The final exam will consist of a third midterm (100 points) covering Dr. Elias' lectures and discussion sections plus a cumulative section (100 points) that will cover material from all portions of the course. The final exam will take place on the official date and time assigned to the course:

FINAL EXAM:
Thursday 17 December, 7-10 pm.
The final exam **MUST** be taken during this time slot