

Genes and Behavior

Spring 2018 • 5390/6390 • Tuesday & Thursday 1:30-2:45 pm • max enrollment: 12

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Office hours: Tuesday & Thursday 12:00-1:30 or by appointment

Website: CANVAS

Course Objectives

Animal behavior is one of the most fascinating fields of biology, largely due to the fact that it involves some of the most complex and malleable phenotypes found in nature. In this class, we will use a combination of classic and cutting-edge primary literature to develop a foundational understanding of the molecular basis of behavior, and use this to evaluate current hypotheses about how behavior evolves. In doing so, you will develop necessary skills for future careers in science. The semester will be divided into three units: (1) molecular principles of behavioral evolution, (2) methods and techniques used to study the molecular and evolutionary basis of behavior, (3) case studies in animal behavior.

| Genes and Behavior Objectives | IDEA Student Rating of Instruction Objectives |
|--|--|
| Learn the principles of genetics and their application to the study of behavior | ✓ Gaining factual knowledge (terminology, classifications, methods, trends) ✓ Learning fundamental principles, generalizations, or theories |
| Understand how the major behavioral genetics theories have developed and the evidence that supports them | ✓ Learning fundamental principles, generalizations, or theories |
| Evaluate research in light of behavioral genetics theory, and draw conclusions about evolutionary and molecular processes | ✓ Learning to analyze and critically evaluate ideas, arguments, and points of view ✓ Learn to apply course material (to improve thinking, problem solving, and decisions) |
| Communicate this evaluation through written critiques, group discussion, and formal presentations | ✓ Developing skills in expressing oneself orally or in writing ✓ Acquiring skills in working with others as a member of a team |

Materials

Assigned reading

Reading will come exclusively from the primary literature. We will read and discuss review papers and empirical studies to explore the material covered in this class. PDFs of the assigned reading will be posted on CANVAS. If you are unfamiliar with terms or concepts presented in these papers, feel free to discuss them with me or with the class.

Assessment

You will have the opportunity to demonstrate and reinforce your understanding of the principals covered in class with a variety of assessment activities throughout the semester. I have designed the assessment activities to improve your understanding of the material and build your skillset for future endeavors in the sciences.

Critiques [150 points possible]

Written evaluation of primary literature is a highly effective way to improve understanding of the rationale and experimental methods used in a study, and to assess how well the results support the conclusions drawn by the authors. In critiquing a research article, you may identify confounding factors or flaws in experimental design. It is important to identify these, and in doing so also explain the effect this has on conclusions or how it may have been done differently. Critiques are meant to provoke careful consideration of the described research. In doing so, it is important to identify the strengths of a paper and the role it plays in advancing the field. This is an especially important skill to develop for those pursuing careers in research, because it is the basis for peer-review. To help you improve these skills, I will write the first critique and we can evaluate it as a class. You will write 5 critiques throughout the semester. I will provide written feedback on each critique. Each subsequent critique will be worth more points, to allow room for improvement.

Critique 1 – 10 points

Critique 2 – 20 points

Critique 3 – 30 points

Critique 4 – 40 points

Critique 5 – 50 points

Discussion Facilitation [50 points possible]

Oral communication is an essential skill in all fields of science. It is imperative that researchers are able to talk with one another about current research. You will have the opportunity to develop these skills by facilitating discussions of research articles five times throughout the semester. I will provide guidance on how best to facilitate discussions, and I will demonstrate by leading the first several discussions.

Discussion Participation [100 points possible]

Active discussion of a topic is an excellent way to learn, and discussions are enriched by active participation by all class members. I will assign a participation grade for your overall effort in creating an active learning environment for yourself and your peers.

Presentations [50 points possible]

Peer-teaching is an effective way to learn, and it enhances your communication skills. You will lead the lecture portion of a case study in animal behavior (Unit 3). I will provide guidance on what these presentations should include, and I will demonstrate by presenting lectures in the first two units.

Final grades

Your final grade will be determined based on the percent of total possible points earned out of the total points possible throughout the semester. This percentage will translate to a letter grade based on the scale below. This is the guaranteed scale, but I may adjust this scale in your favor.

| Percent | Letter Grade |
|----------------|---------------------|
| 93-100 | A |
| 90-92 | A- |
| 87-89 | B+ |
| 83-86 | B |
| 80-82 | B- |
| 77-79 | C+ |
| 73-76 | C |
| 70-72 | C- |
| 67-69 | D+ |
| 63-66 | D |
| 60-62 | D- |
| less than 60 | F |

Schedule *Papers are subject to change!

| Week | Date | Topic | Presenter | Reading |
|---|--------|---|-------------|--|
| Unit 1: Molecular principles of behavioral evolution | | | | |
| 1 | Jan 9 | History of behavior genetics & How to read a scientific paper | Kapheim | Tabery & Griffiths 2010; Greenspan 2008; Reading Tips |
| | Jan 11 | Discussion | Kapheim | Caspi et al. 2002 |
| 2 | Jan 16 | Molecular evolution & Gene regulation | Kapheim | Robinson et al. 2005; Carroll 2005; Wray 2007 |
| | Jan 18 | Discussion | Hagadorn | Warner et al. 2017 |
| 3 | Jan 23 | Developmental plasticity & Genomic accommodation | Kapheim | Moczek et al. 2011; Foster 2013; Renn & Schumer 2013 |
| | Jan 25 | Discussion | Pair 1 | Levis et al. 2017 |
| 4 | Jan 30 | Maternal effects & Genomic imprinting | Kapheim | Patten et al. 2014, 2016; Keverne et al. 2013; Allis & Jenuwein 2016 |
| | Feb 1 | Discussion | Pair 2 | Lassi & Tucci 2017 |
| Unit 2: Methods & techniques | | | | |
| 5 | Feb 6 | Forward genetics | Kapheim | Schneeberger 2016; Witte 2010 |
| | Feb 8 | Discussion | Pair 3 | vonHoldt et al. 2017 |
| 6 | Feb 13 | Reverse genetics | Kapheim | Hardy et al. 2010; Gurumurthy et al. 2016 |
| | Feb 15 | Discussion | Pair 4 | Yan et al. 2017 |
| 7 | Feb 20 | <i>No class today. Pretend it is Monday</i> | | |
| | Feb 22 | Choose topics for Unit 3 | | |
| 8 | Feb 27 | Transcriptomics & Neurogenomics | Kapheim | Calisi et al. 2015; Maze et al. 2014; Cardoso et al. 2015 |
| | Mar 1 | Discussion | Pair 5 | Cardoso et al. 2017 |
| 9 | Mar 6 | <i>No class. Spring break.</i> | | |
| | Mar 8 | | | |
| 10 | Mar 13 | Epigenetics | Kapheim | Bock 2012 |
| | Mar 15 | Discussion | Pair 6 | Anreiter et al. 2017 |
| 11 | Mar 20 | Comparative genomics | Kapheim | Grant 2016; Storz 2016 |
| | Mar 22 | Discussion | Pair 7 | Hu et al. 2017 |
| Unit 3: Case studies on the molecular basis for behavior | | | | |
| 12 | Mar 27 | Case Study | Kapheim | TBD |
| | Mar 29 | Discussion | Kapheim | TBD |
| 13 | Apr 3 | Student choice 1 | Presenter 1 | TBD |
| | Apr 5 | Discussion | | TBD |
| 14 | Apr 10 | Student choice 2 | Presenter 2 | TBD |
| | Apr 12 | Discussion | | TBD |
| 15 | Apr 17 | Student choice 3 | Presenter 3 | TBD |
| | Apr 19 | Discussion | | TBD |
| 16 | Apr 24 | Student choice 4 | Presenter 4 | TBD |
| | Apr 26 | Discussion | | TBD |

Possible topics for Unit 3: Animal communication & Speech, Mating and Courtship Behavior, Parental care, Dominance & Social behavior, Aggression & Personality, Anxiety, Depression, & mood disorders, Addiction, Learning & Memory

Policies and Procedures

Attendance

I do not take attendance in class, but you will get the most out of this class by attending and actively participating on a regular basis.

Classroom conduct

All participants in this class are expected to treat one another with the utmost respect during presentations and discussion. Opposing views are welcomed, but must be presented in a respectful manner.

Mobile electronic devices

The use of mobile electronic devices is very distracting to those around you. I would prefer if you did not use these in class at all. If you prefer to take notes on your laptop, please mute the sound.

Academic Integrity - "The Honor System"

Each student has the right and duty to pursue his or her academic experience free of dishonesty. The Honor System is designed to establish the higher level of conduct expected and required of all Utah State University students.

The Honor Pledge: To enhance the learning environment at Utah State University and to develop student academic integrity, each student agrees to the following Honor Pledge: "I pledge, on my honor, to conduct myself with the foremost level of academic integrity." A student who lives by the Honor Pledge is a student who does more than not cheat, falsify, or plagiarize. A student who lives by the Honor Pledge:

- Espouses academic integrity as an underlying and essential principle of the Utah State University community;
- Understands that each act of academic dishonesty devalues every degree that is awarded by this institution; and
- Is a welcomed and valued member of Utah State University.

Plagiarism

Plagiarism includes knowingly "representing, by paraphrase or direct quotation, the published or unpublished work of another person as one's own in any academic exercise or activity without full and clear acknowledgment. It also includes the unacknowledged use of materials prepared by another person or agency engaged in the selling of term papers or other academic materials." The penalties for plagiarism are severe. They include warning or reprimand, grade adjustment, probation, suspension, expulsion, withholding of transcripts, denial or revocation of degrees, and referral to psychological counseling.

Students with Disabilities

The Americans with Disabilities Act states: "Reasonable accommodation will be provided for all persons with disabilities in order to ensure equal participation within the program. If a student has a disability that will likely require some accommodation by the instructor, the student must contact the instructor and document the disability through the Disability Resource Center (797-2444), preferably during the first week of the course. Any request for special consideration relating to attendance, pedagogy, taking of examinations, etc., must be discussed with and approved by the instructor. In cooperation with the Disability Resource Center, course materials can be provided in alternative format, large print, audio, diskette, or Braille."