

Foundations of Animal Behavior

Instructor: Emily Levy

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Time & location: Tuesdays from 5:30-7 at The Bishop's House at Duke

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Course description: Do you love watching nature documentaries but wish David Attenborough would tell you more? If so, this class is for you. This survey course will cover the foundations of animal behavior – from bees to baboons, mechanisms to evolution. We'll tackle some of the most fun and intriguing questions in the field: How can cooperation evolve? Why do male birds tend to be flashy and females 'drab'? How do animals find food and evade predators? And what *is* behavior, anyway? Classes will be a mix of lecture, discussion, and activities. We will focus on a different topic every week, and you will have the opportunity to suggest topics that you'd like to learn about. Topics will include how behavior evolves, mechanisms of behavior, learning, how to eat but not get eaten, sexual selection, mating systems, and social behavior. Soon, *you'll* be narrating the nature documentaries...to the awe and/or woe of your friends and family.

Learning objectives

Gain general knowledge of the foundations of animal behavior

Discuss animal behavior in the context of evolution, ecology, and mechanisms

Increase science literacy skills (e.g., interpret tables and figures from primary literature)

Generate hypotheses related to animal behavior and develop studies to test them

Class structure and readings: Classes will incorporate short lectures, student-led discussions, and activities. There will be 1-2 assigned readings each week. Most readings will be from the primary literature. I will provide electronic and paper copies of the pages from this textbook as well as all other readings.

Contacting the instructor: I will make myself available for questions and concerns both in via email and in person before or after class.

Diversity, equity & inclusion: We do our best learning when we feel safe, welcome, and part of the community. I will work to create a welcoming community that values diversity of ideas, abilities, backgrounds, and identities. Likewise, I will not tolerate any behavior that disrespects others. If you have any questions, concerns, or comments, please email me or come to office hours. If you want me to know anything about your identity (e.g., pronouns, anxiety speaking in class), please let me know in person or by email.

Schedule

1. What is behavior and how do we study it? (January 14)

Reading: None

Discussion: Tinbergen's Behavior-or-Not?

Activity: Planet Earth behavioral observations: Step aside, Sir David Attenborough!

2. Evolution & Mechanisms of Animal Behavior (January 21)

Reading:

Gould, S. J., & Lewontin, R. C. (1979). The spandrels of San Marco and the Panglossian paradigm: a critique of the adaptationist programme. *Proceedings of the Royal Society of London. Series B. Biological Sciences*, 205(1161), 581-598.

- Dantzer, B., Newman, A. E., Boonstra, R., Palme, R., Boutin, S., Humphries, M. M., & McAdam, A. G. (2013). Density triggers maternal hormones that increase adaptive offspring growth in a wild mammal. *Science*, 340(6137), 1215-1217.
- Zipple, M. N., Grady, J. H., Gordon, J. B., Chow, L. D., Archie, E. A., Altmann, J., & Alberts, S. C. (2017). Conditional fetal and infant killing by male baboons. *Proceedings of the Royal Society B: Biological Sciences*, 284(1847), 20162561.

Discussion: The 'Adaptationist programme'

Case study: Infanticide & feticide in baboons and other animals

3. Social behavior (January 28)

Reading: Assigned excerpts from Alexander (1974) as well as the paper below corresponding to your number

Alexander, R. D. (1974). The evolution of social behavior. *Annual review of ecology and systematics*, 5(1), 325-383. **Read p 325-331, to end of Why Does Social Behavior Evolve Within Groups?)**

#1: Blumstein, D. T., Williams, D. M., Lim, A. N., Kroeger, S., & Martin, J. G. (2018). Strong social relationships are associated with decreased longevity in a facultatively social mammal. *Proceedings of the Royal Society B: Biological Sciences*, 285(1871), 20171934.

#2: Chetty, R., Stepner, M., Abraham, S., Lin, S., Scuderi, B., Turner, N., ... & Cutler, D. (2016). The association between income and life expectancy in the United States, 2001-2014. *Jama*, 315(16), 1750-1766.

#3: Pruitt, J. N., Riechert, S. E., & Jones, T. C. (2008). Behavioural syndromes and their fitness consequences in a socially polymorphic spider, *Anelosimus studiosus*. *Animal Behaviour*, 76(3), 871-879.

#4: Tung, J., Archie, E. A., Altmann, J., & Alberts, S. C. (2016). Cumulative early life adversity predicts longevity in wild baboons. *Nature Communications*, 7, 11181.

Discussion: What does it mean to be 'social'?

Activity: Literature jigsaw

4. Cooperation, altruism, and reciprocity (February 4)

Reading:

Nowak, M. A. (2006). Five rules for the evolution of cooperation. *Science*, 314(5805), 1560-1563.

Mathew, S., & Boyd, R. (2011). Punishment sustains large-scale cooperation in prestate warfare. *Proceedings of the National Academy of Sciences*, 108(28), 11375-11380.

Optional: Langergraber, K. E., Watts, D. P., Vigilant, L., & Mitani, J. C. (2017). Group augmentation, collective action, and territorial boundary patrols by male chimpanzees. *Proceedings of the National Academy of Sciences*, 114(28), 7337-7342.

Optional: Avilés, L. (2002). Solving the freeloaders paradox: genetic associations and frequency-dependent selection in the evolution of cooperation among nonrelatives. *Proceedings of the National Academy of Sciences*, 99(22), 14268-14273.

Case study: Vampire bats

Activity: Evolution of Trust game at <https://ncase.me/trust/>

5. How your past affects your future (February 11)

Reading:

Monaghan, P. (2007). Early growth conditions, phenotypic development and environmental change. *Philosophical Transactions of the Royal Society B: Biological Sciences*, 363(1497), 1635-1645.

Lea, A. J., Altmann, J., Alberts, S. C., & Tung, J. (2015). Developmental constraints in a wild primate. *The American Naturalist*, 185(6), 809-821.

Agrawal, A. A., Laforsch, C., & Tollrian, R. (1999). Transgenerational induction of defences in animals and plants. *Nature*, 401(6748), 60.

Case study: Humans, baboons, and daphnia

6. Communication (February 18)

Reading: Read the paper corresponding to your assigned number

#1: Prather, J. F., Peters, S., Nowicki, S., & Mooney, R. (2008). Precise auditory–vocal mirroring in neurons for learned vocal communication. *Nature*, 451(7176), 305.

#2: Seyfarth, R. M., Cheney, D. L., & Marler, P. (1980). Vervet monkey alarm calls: semantic communication in a free-ranging primate. *Animal Behaviour*, 28(4), 1070-1094.

#3: Riesch, R., & Deecke, V. B. (2011). Whistle communication in mammal-eating killer whales (*Orcinus orca*): further evidence for acoustic divergence between ecotypes. *Behavioral Ecology and Sociobiology*, 65(7), 1377-1387.

#4: Nowak, M. A., & Krakauer, D. C. (1999). The evolution of language. *Proceedings of the National Academy of Sciences*, 96(14), 8028-8033.

Activity: Literature jigsaw

Case study: Honest signals: What do we know and what do we expect?

7. Eating and not getting eaten (February 25)

Reading:

Cowie, R. J. (1977). Optimal foraging in great tits (*Parus major*). *Nature*, 268(5616), 137.

Read article on this website: <https://columbiasciencereview.com/2013/11/19/staying-alive-bizarre-anti-predator-adaptations-in-the-animal-kingdom/>

Discussion: Evolution of anti-predator behavior

Activity: Foraging activity (with connection to natural selection)

8. Mating (March 3)

Reading:

Emlen, S. T., & Oring, L. W. (1977). Ecology, sexual selection, and the evolution of mating systems. *Science*, 197(4300), 215-223.

Kirkpatrick, M., & Ryan, M. J. (1991). The evolution of mating preferences and the paradox of the lek. *Nature*, 350(6313), 33.

Vernasco, B. J., Horton, B. M., Moore, I. T., & Ryder, T. B. (2019). Reduced cooperative behavior as a cost of high testosterone in a lekking passerine bird. *Behavioral Ecology*.

Discussion: Sexual selection and the evolution of birds of paradise

Case study: Baboon sexual swellings and mating behavior

9. Fighting (March 10)

Reading:

Green, P. A., & Patek, S. N. (2018). Mutual assessment during ritualized fighting in mantis shrimp (Stomatopoda). *Proceedings of the Royal Society B: Biological Sciences*, 285(1871), 20172542.

Fields, R. D. (2019) The roots of human aggression. *Scientific American*, May 1, 2019.

Discussion: Human aggression

Activity: Mantis shrimp fights

10. Students' choice (Alternate: Collective action; March 17)

