

Monday -- 21 Jan

Topic: Overview of course goals and requirements

Reading assignment: Chapt. 1 of Dugatkin

Focus questions:

1. Consider Tinbergen's four "major problems" of ethology – how do they illustrate the integrative nature of this area of study? (Hint: consider how the goals of each question match different fields within and outside biological science) Think of an example of a behavioral study that addresses one of the problems and propose ways that consideration of the others might lead to greater understanding.
2. Are the three "foundations" of the study of ethology mutually exclusive? Give an example to support your answer.
3. What is the difference between a conceptual and theoretical approach to studying behavior? Are either of these useful without an empirical approach? Support your answer with an example.

Wednesday – 23 Jan

Topic: Evolution of behavior by natural selection

Reading assignments:

- Excerpt from Darwin's *On the origin of species* (webpage) and
- Chapt. 2 of Dugatkin

Focus questions:

1. Summarize the logic of Darwin's argument for the *fact* of evolution, based on the excerpt. Summarize his logic for the process of natural selection as a mechanism of evolution. How does he treat behavior traits compared to other organismal traits?
2. How are the requirements for natural selection to operate verified in studies of animal behavior?
3. Is the "heritability" for a behavioral trait the same as finding the "gene for" that behavior? Describe how these approaches might be complimentary.
4. Is Dugatkin's definition of "adaptation" satisfactory? Why or why not? How does the wood duck brood parasitism example illustrate the problems with assuming traits are adaptations?

Friday 25 Jan

Topic: Primary literature article – heritability of a complex behavior

Reading assignment:

- Drent et al. 2003. Realized heritability of personalities in the great tit (*Parus major*). *Proc. Biol. Sci.* 270: 45-51. [link on class web page]

Pay attention to the experimental design and analysis. Why do the authors think that there exists heritable variation in personality in natural populations?

Please email a question for discussion before 12:01 am (then go to bed!).

Lab activities for the week (Tuesday or Thursday 1:15-4:05)

Topic: Describing and quantifying animal behavior

Reading assignments:

- Please read through the lab handout before class.
- Review the statistical sections of *Investigations*, particularly those on descriptive statistics, correlation, regression, and the t-test.

Monday 28 Jan

Topic: Proximate and ultimate causation; neurological underpinnings

Reading assignment: Chapt. 3, pp. 73-87.

1. Hill's study of pigmentation differences between sexes of house finches demonstrates the potential interaction between studies of proximate and ultimate explanations of a trait. Explain how understanding the ultimate explanation of female choice behavior required an understanding of the proximate cause of male/female coloration differences.
2. The discussion of "flight or flight" responses and influence of testosterone of behavior illustrate that hormone release does have influences on behavior and vice versa. Discuss how this can complicate our understanding of what *causes* behavioral differences among individuals or sexes. How can this be remedied?
3. Describe how the examples of sensory exploitation of one species by another illustrate the mechanisms that trigger behavior in the target species.

Wednesday 30 Jan

Topic: The influence of sensory structures on evolution

Reading assignment: Ryan, M.J. 1998. [Sexual selection, receiver biases, and the evolution of sex differences. Science 281:1999-2003.](#)

Assignment: Please submit a question for discussion by 12:01 AM. Then go to sleep.

Friday Feb 1

Topic: Biochemical and environmental influences

Reading assignment: Chapt. 3, pp. 87-104.

1. If an individual's sex is determined by an environmental cue, does that mean that sex-limited behaviors or sex differences aren't influenced by genes? Does that mean that nature of sex determination can't evolve in response to selection?
2. Are genes and gene products best thought as proximate or ultimate explanations for behavior? Why?
3. By ignoring some potential information (through stimulus filtering and biased data analysis), animals are able to focus on the biologically relevant information in their environment. Use an example presented in lecture to explain why some animals have different perceptual abilities than we (humans) do.

Lab activity (Tues/Thurs) – Continue with JWatcher activities (review Chapter 15 handout).

Monday Feb 4

Topic: Learning

Reading assignment: Chapt. 4 pp. 110-121

1. Describe the relationships between the terms *phenotype*, *phenotypic plasticity*, and *learning*.
2. Why are *habituation* and *sensitization* a problem for experimental studies of learning. How can they be avoided?
3. Do studies of instrumental (operant) conditioning provide proximate or ultimate explanations of animal learning? How are they relevant to understanding adaptation?

Wed Feb 6

Topic: Adaptive value of learning

Reading assignment: Chapt 4 pp. 121-132.

1. Explain how Garcia's interpretations of his rat learning experiments constituted an adaptationist approach to understanding details of learning.
2. Why might there be an "optimal" ability to learn for a species? What disadvantages might exist for longer memory span or greater learning abilities?
3. Describe how studies of population variation in learning are interpreted. What can they say about evolution in the ability to learn? The cues used in learning?

Fri Feb 8

Topic: Habitat stability and learning

Reading assignment:

[Lucy Odling-Smee and Victoria A. Braithwaite. 2003. The influence of habitat stability on landmark use during spatial learning in the three-spined stickleback. *Animal Behaviour* 65: 701-707.](#)

Send in a question for class discussion by email by 12:01 am. Then go to sleep.

Mon Feb 11

Topic: Social Learning

Reading: pp. 146-164 in Dugatkin

1. What are the benefits and problems with using the term “animal culture” in the way Dugatkin defines? How does this compare with our understandings of human culture?
2. If one of the distinguishing factors of cultural evolution is its speed, what ramification does that have for understanding the role of culture in the evolution of adaptive behavior?
3. What is the distinction between local enhancement and social facilitation? How could they be discriminated in any particular case?
4. What benefits does Dugatkin suggest are responsible for the evolution of “teaching?” Can you think of other benefits?
5. How could one test the idea that the ability to learn socially is heritable?

Wed Feb 13

Topic: Cultural transmission

Readings: pp. 164-173

Questions about inheritance of mtDNA, hitchhiking and brain size

Friday Feb 15

[Rendell, LE and Whitehead, H. 2003. Vocal clans in sperm whales. Proc. R. Soc. Lond. B, 270:225-231.](#)

Please send in a question for discussion by 12:01 am.

Lab activities – Continuation of time budget projects.

Upcoming! Exam I on Friday Feb 22.

Monday Feb 18

Topic: Foraging

Reading: Dugatkin pp. 340-360.

1. What are the assumptions of optimal foraging theory? Are they good ones? What sort of predictions does the theory make that are testable (empirically)?
2. What similarities does the marginal value theorem have with the optimal foraging theory of diet breadth? Could the two be combined?
3. Explain how the addition of nutrient constraints and risks complicates the predictions of foraging theory. How might they be combined (since the “currencies” are different)?
4. What does the “relational theory of learning” imply about food preferences in nature? Is such a method of learning adaptive? If not, what might explain its persistence?

Wednesday Feb 20

Topic: Foraging in Groups

Reading: Dugatkin 360-370

1. What distinguishes an advantage of foraging in groups from *cooperation* in foraging? How would you measure the difference?
2. Explain how Lefebvre’s pigeon studies discriminate between learning and social learning in foraging techniques. What might be the consequences of behavioral strategies like scrounging? Should scrounging be common? rare?

Friday Feb 22

Exam I -- Covers material considered through Feb 15.

Note: I will be leaving town around 11 am on Thursday to attend a review of the Costa Rica OTS program. Please see me before then to ask any questions about preparing for the exam.

Advice for studying for the Exam -- The best way to prepare for success at performing a task is to practice -- to perform the task repeatedly. Since a quiz requires you to write about your understanding of the ideas we’ve discussed, *the best way to study for the quizzes is by writing*. If you can write clear answers to the focus questions and discussion questions for papers, and interpret data we’ve looked at or generated, and describe experiments that test hypotheses, you will do well on the exam.

Monday February 25

Topic: Public information and foraging behavior

Reading:

[Julie W. Smith, Craig W. Benkman, and Kimberly Coffey. 1999. The use and misuse of public information by foraging red crossbills. Behav. Ecol. 10: 54 - 62.](#)

Please send a question for discussion by email by 12:01 am. Then go to sleep.

Wednesday February 27

Topic: Antipredator behavior

Reading: Dugatkin Chapt. 11, pp. 380-395.

1. Explain how predation risk might alter the predictions of optimal foraging theory. Provide an example.
2. Why does the “intentionality” of alarm calls matter to understand why animals give them? How is “intentionality” demonstrated?
3. Is it possible for “tail flagging” or other signals to predators to have multiple functions? How have these been demonstrated?

Friday February 29

Topic: Antipredator behavior

Reading: Dugatkin, pp. 395-409

1. Explain how Magurran’s study of antipredator behavior in populations of minnows with different levels of predation risk examined both the effects of natural selection on “innate” responses and learning (experience).
2. Alfieri’s guppy experiments demonstrate the value of learning about predation risk. How would you follow up on his experiments to determine (a) how a naïve fish benefits from having an experience partner and (b) how a naïve fish *recognizes* an experienced partner?
3. Why is it important to determine the length of the “cultural transmission chain” for a behavior? Would we expect these lengths to be similar for different behavior in the same species? Same behaviors in different species?

LAB ACTIVITIES: Oral presentations -- Each research team should prepare a 10-15 minute oral presentation about their time-budget study. The presentation should follow the guidelines in *Investigations*. You should introduce the ideas behind your particular question, your specific question/hypothesis and why it is relevant to the organism, background on the biology/behavior of the organism, how you did your experiment, your results and your interpretation/conclusions. You’ll be graded using the following rubric:

Weekly Assignment Sheet
Biology 295 – Animal Behavior – Spring 2008

Evaluation of Oral Presentation

Bio 150 -- J. Brown

I. Introduction. The study's rationale was

Rating	Examples
1. not clearly evident.	Failed to clearly outline question/hypothesis.
2. evident but not developed effectively.	Stated specific hypothesis/question, but motivation for question ignored. Inadequate or inappropriate background on study organism.
3. stated clearly and developed with appropriate background.	Specific hypothesis/question linked with more general question. Rationale for using study organism included.
4. stated and developed elegantly.	Used previous research to link hypothesis to larger question. Succinct justification for study species, including necessary details of its biology.

II. Methods. The study's methods and design were

Rating	Examples
1. inadequate and/or inappropriate.	Mistakes made in describing study design. Improper analyses used for study design.
2. adequate.	Design described, but not clearly related to question or hypothesis.
3. clear and efficient.	Study design described, including analysis.
4. elegant.	Level of detail appropriate to understand design and analysis. Clearly related design to question/hypothesis.

III. Results. Data analysis and presentation were

Rating	Examples
1. inadequate and/or inappropriate.	Improper analysis or no presentation of data.
2. adequate.	Date presented, but hard to follow.
3. clear and efficient.	Data presented in clear figures.
4. elegant.	Appealing figures with concise indications of analytical results.

IV. Data interpretation (Discussion & Conclusions)

Rating	Examples
1. was inappropriate and/or inadequate.	Derived conclusions that are not justified by outcome.
2. was explained and justified.	Correctly interpreted meaning of results.
3. was clearly related to the question.	Explained how results addressed the question/hypothesis
4. demonstrated intellectual creativity by placing conclusions in a larger context and proposing very <i>interesting</i> directions for further research.	Linked results to other published studies and suggested how further studies could extend or clarify specific conclusions or general relevance of the question.

V. Visual aids were

Rating	Examples
1. not clear and/or helpful.	Spelling errors. Distracting graphics/effects, Text too small.
2. adequate.	Layout of slides clear.
3. clear and efficient.	Good balance between text and graphics.
4. elegant.	Appealing design of slides drew attention to important elements.

VI. Overall quality of speaking (eye-contact, volume, clarity, organization)

Rating	Examples
1. Poor	Unrehearsed. Disorganized. Not understandable or audible.
2. Adequate	Clear, but too dependent on notes. Relied on audience to follow slides.
3. Good.	Explained all slides clearly and confidently.
4. Engaging and entertaining	Poised. Eye-contact with audience. Answered questions confidently.

Monday March 3

Topic: Antipredator behavior

Reading: Dugatkin, pp. 395-409

1. Explain how Magurran's study of antipredator behavior in populations of minnows with different levels of predation risk examined both the effects of natural selection on "innate" responses and learning (experience).
2. Alfieri's guppy experiments demonstrate the value of learning about predation risk. How would you follow up on his experiments to determine (a) how a naïve fish benefits from having an experience partner and (b) how a naïve fish *recognizes* an experienced partner?
3. Why is it important to determine the length of the "cultural transmission chain" for a behavior? Would we expect these lengths to be similar for different behavior in the same species? Same behaviors in different species?

Wednesday March 5

Topic: Habitat selection

Reading: Dugatkin, pp. 448-454

1. The "resource matching rule" predicts that the behavior of populations should match distributions of populations. Explain how this can be generated by optimal behavioral decisions of individuals.
2. What are the resources that drive habitat selection decisions? Provide some examples in different organisms.
3. What are the assumptions of the IFD model? Under what conditions are these assumptions violated and what are the consequences?

Friday March 7

Topic: Foraging, predation and habitat use

Reading: [Werner, EE and DJ Hall. Ontogenetic habitat shifts in bluegill: the foraging rate-predation risk tradeoff. Ecology 69:1352-13-66.](#)

Please send a question for discussion by email before 12:01 am. Then go to sleep.

Lab activities:

First week of class project on chickadee foraging. See details in handout (to be distributed on Monday March 3).

Monday March 10 -- Territoriality

Reading assignment: pp. 454-464 in Dugatkin

Focus questions:

1. How can territoriality be distinguished from habitat selection? Describe an approach to establishing that members of a species are territorial, using a species of your choice.
2. What are the potential benefits of territoriality? What are the potential costs? What evidence is there that changes in these costs and benefits drives variation in territorial behavior among species or population or at different times?
3. The existence of territorial individuals, and competition for territories, has resulted in many cases of alternative behavioral “strategies.” What determines how successful these strategies are? What determines their frequency in any population?
4. Describe how Stamps’ studies of territoriality in lizards established the (a) resources important to territory quality and (2) the methods by which territories were chosen.

Wednesday March 12 – Migration

Reading assignment: pp. 464-471 in Dugatkin

Focus questions:

1. Moller and Erriztoe’s studies of immune defense suggest a distinct fitness cost to migration. What are other potential costs and benefits? How can we explain why some species migrate and others do not?
2. What types of cues are used by migrating species? Why do these cues vary among species?
3. What are the consequences of studies that show (a) that variation in migratory timing is heritable, or (b) that learning is important for migratory behavior?

Friday March 14 – Exam II

Lab activities for the week: Continuation of bird study on foraging/predation risk tradeoffs. Meet at JRC at 1 pm.

Monday March 31 -- Migration

Reading assignment: pp. 464-471 in Dugatkin

Focus questions:

1. Moller and Erriztoe's studies of immune defense suggest a distinct fitness cost to migration. What are other potential costs and benefits? How can we explain why some species migrate and others do not?
2. What types of cues are used by migrating species? Why do these cues vary among species?
3. What are the consequences of studies that show (a) that variation in migratory timing is heritable, or (b) that learning is important for migratory behavior?

Wednesday April 2 – Sexual selection

Reading assignment: Dugatkin 178-205

Focus questions:

1. What defines the difference between male and female gametes? What explanations are there for why such variation exists?
2. How are male and female sexual function packaged in individuals? Should we use the term "gender" to refer to these categories? How many are there? Should we use the term "gender" for categories such as (a) individuals who produce male gametes but have phenotypes typical of females, and (b) vice versa?
3. Describe an experiment that would discriminate between a 'direct benefits' and "good genes" model of mate choice (by males or females).
4. What are the implications of "mate-choice copying" on the magnitude of sexual selection? Can learning of mate choice have evolutionary implications?

Friday April 4 – Male/male competition

Reading assignment: Dugatkin 206-210

Monday April 6 -- Male dimorphisms and behavioral tradeoffs

[MOCZEK, A. P. and EMLEN D. J. 2000. Male horn dimorphism in the scarab beetle, *Onthophagus taurus* : do alternative reproductive tactics favour alternative phenotypes? *Animal Behaviour* 59: 459-466.](#)

Please send a question for discussion by email before 12:01 am. Then go to sleep.

Wednesday April 8 – Female dimorphisms – sexual conflict or natural selection?

Sirot and Brockman. 2001. Costs of sexual interactions to females in Rambur's forktail damselfly, *Ischnura ramburi* (Zygoptera: Coenagrionidae) *Animal Behaviour*. 61:415-424.

Cooper, I.A. Submitted. Ecological causation of intersexual mimicry in a damselfly.

Please send a question for discussion by email before 12:01 am. Then go to sleep.

Friday April 10 – Mating systems

Reading: Dugatkin pp. 220-235

1. How are mating systems defined? What are the challenges to assigning a mating system to a species?
2. What are the factors that promote evolution of a polygamous mating system? Are they similar for polygyny and polyandry? What are the potential costs of polygyny?
3. The polygyny threshold model suggests that females can “choose” the optimal solution for mating systems. What factors influence optimal female behavior and how has this been tested experimentally?

Lab exercises (Tuesday and Thursday at 1:15 in lab room)

The major activity of this lab will be to explore and analyze the bird feeder data set we have generated over the past three lab periods. In order to prepare for this, you should do the following:

(a) Review the handout on the design and purpose of the study; pay attention to the fact that we've altered some aspects of the study. Bring in a list of questions you think we should “ask” of the data set.

(b) Review *Investigations* descriptions and examples of the X^2 -test. Review tests of differences in means (t-tests and ANOVA), if you need to.

(c) Consider doing some initial literature review, both to give you ideas about the questions you can ask of the data, how others have analyzed such data sets, and what they have concluded from them.

Some tips about literature research in animal behavior:

While we have a good collection of on-line resources for animal behavior journals, we don't have access everything. So getting started now on developing a list of sources for your paper is important. The science reference librarians (especially Kevin Engel) are great at helping you find resources. **Note the very important journal *Animal Behaviour* is NOT available online – however we have years and years of volumes in paper on the shelf in the Science Library. Don't give up if you can't find it on-line!**

Upcoming assignment – Scientific paper (journal style)

You will work in pairs on data analysis and in the development of the Methods and Results sections. I will be happy to review these and give you feedback, *and the Methods and Results sections of your paper may be identical to your partners. However the remainder of your scientific paper on this project should reflect your individual efforts.* You may, of course, obtain advice from me, other students, writing lab staff, etc, as long as they appear in your acknowledgements section. Please treat the *Investigations* manual as the source of all wisdom on proper form of a scientific paper – remind yourself of these principles, if you haven't written a biology paper for a while.

Due date: Submit the paper as Word (*.doc) or Rich text file (*.rtf) by email before 5 pm on 16 April (for Tuesday's lab) or 18 April (for Thursday lab). You may hand in your paper late, but a 10% per 24 hour (or portion thereof) will be applied, except in case of documented illness.

Monday April 14 – EPCs and sperm competition

Reading: Dugatkin pp. 236-244

1. What does the commonness of significant rates of EPC in socially monogamous species suggest about (a) the functions of pair bonds, (b) the control over mating systems? Is this a case of sexual conflict?
2. How should the level of sperm competition be related to mating system variation? Does mating system determine competition levels, or does competition drive mating system evolution?
3. What behavioral and morphological features of males and females are the result of sperm competition?

Wednesday April 16 – Kinship

Reading: Dugatkin, pp. 254-276

1. Describe the distinction between individual fitness and inclusive fitness. How is relatedness measured? How is inclusive fitness measured?
2. Consider the human and non-human case studies that test the predictions of Emlen's evolutionary theory of the family. Do these results help explain the diversity of family structure and behavior among species?

Friday April 18 -- Conflict and kin recognition

Reading: Dugatkin, pp. 276-291

1. How are expectations about parental care altered when considering parent-offspring conflict? How could one test such hypotheses?
2. Based on the parent-offspring conflict model, what differences in weaning behavior would you expect to see between younger and older mammalian mothers?
3. What can explain the different modes of kin recognition found in different organisms or different ages? What are the consequences of such different modes on social behavior? For interactions with other species?

Lab next week – In preparation for lab, please read the following items (found in a file on the project folder for this class):

- Henderson and Jeanne (1990) and Henderson et al. (1992)
- The two posters by Bio 373 students

Monday April 21 – Conflict and kin recognition

Reading: Dugatkin, pp. 276-291

1. How are expectations about parental care altered when considering parent-offspring conflict? How could one test such hypotheses?
2. Based on the parent-offspring conflict model, what differences in weaning behavior would you expect to see between younger and older mammalian mothers?
3. What can explain the different modes of kin recognition found in different organisms or different ages? What are the consequences of such different modes on social behavior? For interactions with other species?

Wednesday April 23 – Cooperation – Game theory and By-product mutualism

Reading, Dugatkin, pp. 296-314

1. For the examples of cooperative behavior, are the costs and benefits easily measurable? Describe how you would do so for an example.
2. In what sorts of contexts would you expect reciprocity to be the mechanism of competition? Would you expect it more often in certain types of animals more than others?
3. How does by-product mutualism differ from reciprocity? Is it a significant difference for predicting when cooperative behavior should be found?

Friday April 25 – Cooperation – Group selection

Reading: Dugatkin, pp. 315-321 and [Wilson, EO. 2008. One giant leap: How insects achieved altruism and colonial life. BioScience 58:17-25.](#)

Please send a question for discussion by email before 12:01 am. Then go to sleep.