

Behavior Journal Club Syllabus

Fall, 2006

Ecology, Evolution and Behavior Graduate Program
University of Minnesota

Coordinator: Mark Bee, 312 Ecology, mbee@umn.edu

Week 1 (September 4) Introduction and Organization

Welcome to the Behavior Journal Club! As one of the most interdisciplinary fields in all of biology, Animal Behavior requires an understanding of cell biology, physiology, genetics, development, ecology, endocrinology, evolution, learning theory, and even physics and economics! The readings selected for this semester were chosen to reflect this breadth while focusing on current “hot topics” in the field. Animal behaviorists attempt to answer what on the surface appears to be a very simple question: “Why is that animal doing that?” Throughout the readings, you should focus on addressing four key questions about animal behavior that were originally put forth by Niko Tinbergen, who shared the Nobel Prize for Medicine or Physiology in 1973 for his pioneering work on animal behavior: 1) What are the proximate causes of the behavior? 2) How does the behavior develop? 3) What is the function (adaptive value) of the behavior? 4) How did the behavior evolve (i.e., what is its phylogenetic history)? The readings will review current topics such as behavioral genetics, animal learning and cognition, behavioral syndromes, animal communication, sexual selection, and how behavioral ecology applies to human sexual behaviors.

Readings and Discussion. For each week, I have identified a set of “core readings” that should be read and discussed by all students. In general, these core readings include at least one overview of the topic and at least one recent research paper. In addition to these core readings, I have included a list of “suggested further readings” for students who may wish to dig deeper into a topic. I also list possible faculty mentors who would be able to join the weekly discussions. At the end of the syllabus, I’ve included a sample email (courtesy C. Neuhauser) that you might consider using when contacting faculty to invite them to your discussion. For each meeting, you should elect one person to take notes of the discussion and to write a ¼-½ page summary of the discussion which is to be emailed to me at mbee@umn.edu.

The Mini-paper / Mini-presentation Assignment. In order to broaden your appreciation of modern behavioral biology, you will each read, summarize, and give a brief presentation on a recent paper in animal behavior during the last week of the semester. Look through the past three-years worth of the following journals: *Animal Behaviour*, *Behavioral Ecology*, *Behavioral Ecology and Sociobiology*, *Behaviour*, *Ethology*, *Journal of Comparative Psychology*, *Proceedings of the Royal Society Series B* and *Trends in Ecology and Evolution* (focus on the behavior content in the last two journals, please). Pick a paper that interests you, write a 1-2 page summary of it (including why it’s important), and give a 5-minute presentation to the group. Papers and presentations will be due the last week of class, but you should start browsing journals early during the semester. **Talk with each other to be sure that you’re not duplicating papers (i.e. you should each focus on a different paper).** If you want to do a paper from a different journal than those listed above, feel free to run it by me.

Condensed List of Core Readings

Week 2 (September 11) - Animal Behavior: Introduction & History

1. Alcock J (2006) In: *Essays in Animal Behaviour* (eds Lucas JR, Simmons LW). Amsterdam: Academic Press. pp. 5-21.
2. Owens IPF (2006) *Trends in Ecology & Evolution* 21: 356-361
3. Tinbergen N (1963) *Zeitschrift für Tierpsychologie* 20: 410-433.

Week 3 (September 18) - Behavioral Genetics

1. Robinson GE (2006) In: *Essays in Animal Behaviour* (eds Lucas JR, Simmons LW). Amsterdam: Academic Press. pp. 101-113.
2. Pennisi E. (2005). *Science* 307: 30-32.

Week 4 (September 25) - Behavioral Genetics (continued)

1. Ben-Shahar Y et al (2002) *Science* 296: 741-744.
2. Whitfield C et al (2003) *Science* 302: 296-299.

Week 5 (October 2) - Behavioral Syndromes

1. Sih A, Bell A, Johnson JC, Ziemba R (2004) *Quarterly Review of Biology* 79: 241-277.
2. Neff BD, Sherman PW (2004) *Trends in Ecology and Evolution* 19 (12): 621-622.
3. Sih A, Bell AM, Johnson JC (2004) *Trends in Ecology and Evolution* 19 (12): 622-623.

Week 5 (October 2) - Behavioral Syndromes (continued)

1. Johnson JC, Sih A (2005) *Behavioral Ecology and Sociobiology* 58: 390-396.
2. Dingemanse et al (2004) *Proceedings of the Royal Society of London Series B* 271: 847-852.

Week 7 (October 16) - Cognitive Ecology, Animal Learning & Memory

1. Shettleworth SJ (2000) *Animal Behaviour*, 61:277-286.
2. Dally JM, Emery NJ, Clayton NS (2006) *Science*, 312: 1662-1665

Week 8 (October 23) - Honesty and Dishonesty in Signaling Behavior

1. Greenfield MD (2006) In: *Essays in Animal Behaviour* (eds Lucas JR, Simmons LW). Amsterdam: Academic Press. pp. 281-300.
2. Backwell PRY et al. (2000) *Proceedings of the Royal Society of London Series B* 267: 719-724

Week 9 (October 30) - Sexual Selection in Plants

1. Skogsmyr, I, Lankinen, A (2002) *Biological Reviews* 77: 537-562
2. Bernasconi G, et al.(2004) *Science* 303: 971-975
3. Krauss, SL (2000) *Proceedings of the Royal Society of London Series B*, 267:1925-1929.

Week 10 (November 6) - Birdsong

1. Doupe AJ, Kuhl PK (1999) *Annual Review of Psychology* 22:567-631.
2. Nottebohm F (2005) *PLOS Biology* 3:759-761.
3. Nick TA, Konishi M (2005) *Journal of Neurobiology* 62: 469-481

Week 11 (November 13) – Birdsong (continued)

1. Nowicki S, Searcy WA (2004) *Annals of the New York Academy of Sciences* 1016: 704-723.
2. Spencer KA, Buchanan KL, Goldsmith AR, et al (2003) *Hormones and Behavior*, 44: 132-139

Week 12 (November 20) - No Class: Thanksgiving Break

Week 13 (November 27) - Evolutionary Perspectives on Human Sexual Behavior

1. Shackelford TK, Schmitt DP, Buss DM (2005) *Personality and Individual Differences* 39: 447-458
2. Geary DC, Vigil J, Byrd-Craven J (2004) *Journal of Sex Research* 41: 27-42

Week 14 (December 4) - Evolutionary Perspectives on Human Sexual Behavior (cont'd)

1. Baker RR, Bellis MA (1993) *Animal Behaviour* 46: 861-885
2. Baker RR, Bellis MA (1993) *Animal Behaviour* 46: 887-909

Week 15 (December 11) - Student Mini-presentations

Week 2 (September 11)
Animal Behavior: Introduction & History

The readings for Week 2 provide an introduction to the field by examining the history of behavioral biology. The chapter by Alcock provides a unique and concise review that explores the history of the field by examining historical shifts in the topics covered in major Animal Behavior textbooks over the years. The recent article by Owens focuses on the more recent developments in and the future of Behavioral Ecology. The paper by Tinbergen is one of the most influential pieces of work in all of behavioral biology. In this paper, he outlines what have become known as “Tinbergen’s Four Questions”. (The brief 2003 paper by Dewsbury under Suggested Further Readings also makes for an interesting read....Was a founder of modern Ethology really a Nazi sympathizer?!?)

Core Readings:

1. Alcock J (2006) A textbook history of animal behavior. In: *Essays in Animal Behaviour* (eds Lucas JR, Simmons LW). Amsterdam: Academic Press. pp. 5-21.
2. Owens IPF (2006) Where is behavioural ecology going? *Trends in Ecology & Evolution* 21: 356-361
3. Tinbergen N (1963) On aims and methods of Ethology. *Zeitschrift für Tierpsychologie* 20: 410-433.

Suggested Further Readings:

- Dewsbury DA (2003) The 1973 Nobel Prize for physiology or medicine - Recognition for behavioral science? *American Psychologist* 58: 747-752.
- Dewsbury DA (1999) The proximate and the ultimate: past, present, and future. *Behavioural Processes* 46:189-199
- Vuorisalo, T. (1995). The evolution of plant behavioural ecology. *Trends in Ecology & Evolution*, 10: 122-123. [*This is a response to Gross 1994.*]

Possible Mentors:

Any of the Behavior faculty. Mark Borrello and Susan Jones might be interested in this topic too.

Weeks 3 & 4 (September 18 & 25)
Behavioral Genetics

Early in the history of animal behavior research – i.e., early in the 20th century! – there was a stark contrast between American and European approaches to behavior. The American approach, which had its roots in comparative psychology, emphasized the role of learning and focused on laboratory studies with model systems. The European approach gave rise to the field of Ethology and emphasized the mechanisms, functions, and evolution of instinctive behaviors and focused primarily on field studies of animals in their natural habitats. The differences between the American and European schools of thought can be (overly) simplified to reflect the well-known Nature-vs-Nurture debate. At the heart of this issue was the relative role of genes in determining an individual animal’s behavior. We now know, of course, that all behaviors (like other phenotypes) are the product of gene x environment interactions. With the explosion of genetic techniques in the last few decades, the field of behavioral genetics has come into its own. The papers for Week 3 cover some recent developments in this field.

Core Readings (Week 3):

1. Robinson GE (2006) Genes and social behavior. In: *Essays in Animal Behaviour* (eds Lucas JR, Simmons LW). Amsterdam: Academic Press. pp. 101-113.
2. Pennisi E. (2005). A genomic view of animal behavior. *Science* 307: 30-32.

Core Readings (Week 4):

1. Ben-Shahar Y et al (2002) Influence of gene action across time scales on behavior. *Science* 296: 741-744.
2. Whitfield C et al (2003) Gene expression profiles in the brain predict behavior in individual honey bees. *Science* 302: 296-299.

Suggested Further Readings:

- Bastock M (1956) A gene mutation which changes a behavior pattern. *Evolution* 10: 421-439.
- Wahlsten D (1999) Single-gene influences on brain and behavior. *Annu. Rev. Psychol.* 50:599-624.
- Osborne KA et al (1997). Natural behavior polymorphism due to a cGMP-dependent protein kinase of *Drosophila*. *Science* 277: 834-836.

Possible Mentors:

Any of the faculty interested in Behavior or Evolution would be good candidates.

Weeks 5 & 6 (October 2 & 9) **Behavioral Syndromes**

At the recent 2006 annual meeting of the Animal Behavior Society, there was a day-long symposium dedicated to the topic of behavioral syndromes. According to Andy Sih and his colleagues a behavioral syndrome is defined as “a suite of correlated behaviors reflecting between-individual consistency in behavior across multiple (two or more) situations. A population or species can exhibit a behavioral syndrome. Within the syndrome, individuals have a behavioral type (e.g. more aggressive versus less aggressive behavioral types).” In essence, the study of behavioral syndromes brings an evolutionary ecological perspective to the study of animal “personalities”. The topic of behavioral syndromes is emerging as one of the newest “hot topics” in behavioral biology because it seeks to explain why animals may behave adaptively in one context but maladaptively in another. The readings for Week 5 serve as an introduction to behavioral syndromes and some of the controversy surrounding the idea. For Week 6, I've selected two recent empirical studies that illustrate the study of behavioral syndromes in more detail.

Core Readings (Week 5):

1. Sih A, Bell A, Johnson JC, Ziemba R (2004) Behavioral syndromes: an integrative overview. *Quarterly Review of Biology* 79: 241-277.
2. Neff BD, Sherman PW (2004) Behavioral syndromes versus Darwinian algorithms. *Trends in Ecology and Evolution* 19 (12): 621-622.
3. Sih A, Bell AM, Johnson JC (2004) Reply to Neff and Sherman. Behavioral syndromes versus Darwinian algorithms. *Trends in Ecology and Evolution* 19 (12): 622-623.

Core Readings (Week 6):

1. Johnson JC, Sih A (2005) Precopulatory sexual cannibalism in fishing spiders (*Dolomedes triton*): a role for behavioral syndromes. *Behavioral Ecology and Sociobiology* 58: 390-396.

- Dingemanse NJ, Both C, Drent PJ, Tinbergen JM (2004) Fitness consequences of avian personalities in a fluctuating environment. *Proceedings of the Royal Society of London Series B* 271: 847-852.

Suggested Further Readings:

- Sih A, Kats LB, Maurer EF (2003) Behavioural correlations across situations and the evolution of antipredator behaviour in a sunfish-salamander system. *Animal Behavior*, 65: 29-44
- Reale D, Festa-Bianchet M (2003) Predator-induced natural selection on temperament in bighorn ewes. *Animal Behaviour* 65: 463-470.
- Sih A, Watters JV (2005) The mix matters: behavioural types and group dynamics in water striders. *Behaviour* 142: 1417-1431
- Stapley J, Keogh JS (2005) Behavioral syndromes influence mating systems: floater pairs of a lizard have heavier offspring. *Behavioral Ecology* 16: 514-520.

Possible Mentors:

Any of the faculty interested in Behavior or Evolution would be good candidates.

**Week 7 (October 16)
Cognitive Ecology, Animal Learning & Memory**

Cognition refers to the acquisition and processing of information and its use in making decisions. Do animals have cognition? If so, how do we study it and how similar is it to human cognition? In the 90's behavioral biologists started to seriously examine animal cognition with respect to the animal's natural history and ecology and within an evolutionary framework. This has resulted in the development of a sub-discipline known as Cognitive Ecology or Cognitive Ethology. In the late 90's a new journal, *Animal Cognition*, was created to publish research that focused on investigating the cognitive abilities of animals. The review by Shettleworth is an excellent introduction to this topic and the recent paper by Dally et al. illustrates one important context – food caching – in which animal cognition is studied.

Core Readings:

- Shettleworth SJ (2000) Animal cognition and animal behavior. *Animal Behaviour*, 61:277-286.
- Dally JM, Emery NJ, Clayton NS (2006) Food-caching western scrub-jays keep track of who was watching when. *Science*, 312: 1662-1665

Suggested Readings:

- Griffin DR, Speck GB (2004) New evidence of animal consciousness. *Anim Cogn*, 7: 5-18.
- Dukas R (1998) Evolutionary ecology of learning. In: *Cognitive Ecology: The Evolutionary Ecology of Information Processing and Decision Making*. Pp. 129-174.
- Mery F, Kawecki TJ (2004) An operating cost of learning in *Drosophila melanogaster*. *Animal Behavior* 68: 589-598.
- Healy SD, de Kort SR, Clayton NS (2005) The hippocampus, spatial memory and food hoarding: a puzzle revisited. *Trends in Ecology and Evolution*, 20: 17-22
- Francis RC (2005) It's a puzzle all right: the hippocampus and food hoarding. *TREE* 20: 476-477

Possible Mentors:

Any of the Behavior faculty, in particular Dave Stephens.

Week 8 (October 23)
Honesty and Dishonesty in Signaling Behavior

Have you ever told a lie? Do animals (and plants) ever tell lies? The question of whether animal signals are generally honest, or whether animals sometimes attempt to deceive or bluff other animals, has been an important theoretical and empirical question in the study of behavior and animal communication in particular. The review by Greenfield covers much of the debate and literature on this topic. The paper by Backwell et al. represents one of the few empirical studies that claims to demonstrate dishonest signaling in an animal. [For those of you interested in "plant behavior", check out the Suggested Further Reading by Schiestl on deceptive signaling in orchids!]

Core Readings:

1. Greenfield MD (2006) Honesty and deception in animal signals. In: *Essays in Animal Behaviour* (eds Lucas JR, Simmons LW). Amsterdam: Academic Press. pp. 281-300.
2. Backwell PRY, Christy JH, Telford SR, et al. (2000) Dishonest signalling in a fiddler crab. *Proceedings of the Royal Society of London Series B* 267: 719-724

Suggested Further Readings:

- Schiestl FP (2005) On the success of a swindle: pollination by deception in orchids *Naturwissenschaften* 92: 255-264
- Furlow FB (1997) Human neonatal cry quality as an honest signal of fitness. *Evolution and Human Behavior* 18:175-193
- Bee MA, Perrill SA, Owen PC (2000) Male green frogs lower the pitch of acoustic signals in defense of territories: a possible dishonest signal of size? *Behavioral Ecology* 11: 169-177

Possible Mentors:

Any of the Behavior faculty, in particular Mark Bee.

Week 9 (October 30)
Sexual Selection in Plants

Darwin was initially puzzled about why some animals, usually the males, have extravagant, elaborated, costly traits (think of the peacock's tail) that appeared to serve no adaptive purpose. He also proposed the solution to this puzzle: sexual selection, or competition in one sex (usually the males) for access to the more limiting sex (usually females). Thus, we can explain exaggerated traits as adaptations that lead to higher reproductive success, either through female choice or male-male competition. Sexual selection theory is a cornerstone of modern behavioral biology. However, sexual selection also offers an interesting perspective for investigating plant mating systems as well. Since the students in this journal club who are primarily interested in animal behavior are likely outnumbered by students who are more interested in plant ecology, the readings for this week focus on the application of sexual selection theory to plants.

Core Readings:

1. Skogsmyr, I, Lankinen, A (2002) Sexual selection: an evolutionary force in plants. *Biological Reviews* 77: 537-562

2. Bernasconi G, et al. (2004) Evolutionary ecology of the prezygotic stage *Science* 303: 971-975
3. Krauss, SL (2000) The realized effect of post-pollination sexual selection in a natural plant population. *Proceedings of the Royal Society of London Series B*, 267:1925-1929.

Suggested Further Readings:

- Willson MF (1994) Sexual selection in plants - Perspective and overview. *American Naturalist* 144 (supplement): s13-s39.
- Marshall, DL (1998) Pollen donor performance can be consistent across maternal plants in wild radish (*Raphanus sativus*, *Brassicaceae*): A necessary condition for the action of sexual selection. *American Journal of Botany*, 85: 1389-1397

Possible Mentors:

Any of the Behavior faculty and also Ruth Shaw and Georgiana May.

**Weeks 10 & 11 (November 6 & 13)
Birdsong**

As pointed out earlier, animal behavior is a diverse field that draws on numerous different disciplines. This fact is no where better reflected than in the scientific study of birdsong. Much of the interest in birdsong stems from the fact that birds must *learn* their songs, and this learning of a communication signal has some interesting parallels with human language acquisition. The readings for the first week on this topic reflect this aspect of the science of birdsong and include an important, albeit somewhat lengthy, review by Doupe and Kuhl on the commonalities between birdsong and human language. A short primer on the songbird nervous system by Nottebohm should help better clarify some of the concepts dealing with the bird brain. Finally, the paper by Nick & Konishi illustrates some of the neurobiological techniques used to study birdsong learning. [Note that Teresa Nick is a faculty member in the UMN Department of Neuroscience!]

In the second week on this important topic, the readings focus on a recent development in hypotheses for the function of birdsong and how it relates to sexual selection by female mate choice. The review by Nowicki and Searcy provides an overview of the "nutritional stress hypothesis" and the paper by Spencer et al. illustrates an experimental study that tests this hypothesis.

[Note, for those of you interested in the connections between birdsong, human language, and music, check out the recent review by Tecumseh Fitch listed under Suggested Further Readings.]

Core Readings (Week 10):

1. Doupe AJ, Kuhl PK (1999) Birdsong and human speech: Common themes and mechanisms. *Annual Review of Psychology* 22:567-631.
2. Nottebohm F (2005) The neural basis of birdsong. *PLOS Biology* 3:759-761.
3. Nick TA, Konishi M (2005) Neural auditory selectivity develops in parallel with song. *Journal of Neurobiology* 62: 469-481

Core Readings (Week 11):

1. Nowicki S, Searcy WA (2004) Song function and the evolution of female preferences - Why birds sing, why brains matter. *Annals of the New York Academy of Sciences* 1016: 704-723.

- Spencer KA, Buchanan KL, Goldsmith AR, et al (2003) Song as an honest signal of developmental stress in the zebra finch (*Taeniopygia guttata*). *Hormones and Behavior*, 44: 132-139

Suggested Further Readings:

- Fitch WT (2006) The biology and evolution of music: A comparative perspective *Cognition* 100: 173-215
- Nowicki, S; Hasselquist, D; Bensch, S, Peters S (2000) Nestling growth and song repertoire size in great reed warblers: evidence for song learning as an indicator mechanism in mate choice. *Proceedings of the Royal Society of London Series B*, 267: 2419-2424
- Huber SK, Podos J (2006) Beak morphology and song features covary in a population of Darwin's finches (*Geospiza fortis*). *Biological Journal of the Linnean Society* 88:489-498.

Possible Mentors:

Any of the Behavior faculty, in particular Mark Bee. You should also consider inviting Teresa Nick from the UMN Department of Neuroscience...I'm sure she would be happy to help out.

Week 12 (November 20)
No Class: Thanksgiving Break

Weeks 13 & 14 (Nov 27 & Dec 4)
Evolutionary Perspectives on Human Sexual Behavior

Animal behaviorists are often accused of having one thing on their minds: SEX. [What would you rather have on your mind...sex or nutrient cycles?] It's true, animal behaviorists do think a lot about animal sex. We have Darwin's theory of sexual selection to thank for that! Over the last 30 years, human psychologists have taken an interest in applying the principles of behavioral ecology to human behaviors. This has led to the development of a controversial field known as Evolutionary Psychology. Proponents of Evolutionary Psychology make the general claim that human behaviors, including sexual behaviors, can be best understood in an evolutionary and ecological context by considering that the behaviors we see in modern society have their roots deep in human ancestry and evolved due to natural and sexual selection pressures associated with small hunter-gatherer societies. The readings in Week 13 represent two reviews that attempt to place human mate choice in an evolutionary framework. You may find the ideas in these readings somewhat controversial. You wouldn't be alone in this regard. Many social psychologists are not particularly fond of the ideas and methods espoused by evolutionary psychologists.

During Week 14, the readings delve into the nitty gritty of human sexual behavior by investigating the topic of sperm competition in humans. Sperm competition is a well-documented form of male-male competition in other animals, particularly insects. The two back-to-back papers by Baker & Bellis bring this idea to human sexual behaviors. There are also some real gems listed under the Suggested Further Readings!

Core Readings (Week 13):

- Shackelford TK, Schmitt DP, Buss DM (2005) Universal dimensions of human mate preferences. *Personality and Individual Differences* 39: 447-458
- Geary DC, Vigil J, Byrd-Craven J (2004) Evolution of human mate choice. *Journal of Sex Research* 41: 27-42

Core Readings (Week 14):

1. Baker RR, Bellis MA (1993) Human sperm competition - Ejaculate adjustment by males and the function of masturbation. *Animal Behaviour* 46: 861-885
2. Baker RR, Bellis MA (1993) Human sperm competition - Ejaculate manipulation by females and a function for the female orgasm. *Animal Behaviour* 46: 887-909

Suggested Further Readings:

- Thornhill R, Gangestad SW (1999) The scent of symmetry: A human sex pheromone that signals fitness? *Evolution and Human Behaviour* 20: 175-201
- Greiling H, Buss DM (2000) Women's sexual strategies: the hidden dimension of extra-pair mating. *Personality and Individual Differences* 28: 929-963
- Cellerino A, Jannini EA (2005) Male reproductive physiology as a sexually selected handicap? Erectile dysfunction is correlated with general health and health prognosis and may have evolved as a marker of poor phenotypic quality. *Medical Hypotheses* 65: 179-184.
- Rhodes G, Simmons LW, Peters M (2005) Attractiveness and sexual behavior: Does attractiveness enhance mating success? *Evolution and Human Behavior* 26: 186-201

Possible Mentors:

Hmmm...suggesting possible faculty experts on the topic of human sexual behaviors is a bit tricky and could get one in trouble!

Week 15 (December 11)
Student Mini-presentations

This week will be devoted to student presentations on the papers that you've selected to review yourselves. Your short summary (1-2 pages) of your selected paper will also be due this week.

Sample E-Mail (Courtesy C. Neuhauser)

Dear ...,

The Behavior Journal Club Participants will be discussing _____ (paper title, author, etc.) _____ on _____ (date) _____ from _____ to _____ in room _____. To put the discussion in the context of current research and to understand the significance of the papers we are reading for this week, our DGS suggested that we invite you to participate in our meeting. Please let us know whether you will be able to attend. We will put the reading materials in your mail box if you are able to attend.

Regards,

The Journal Club Participants