BSCI 360/708B:
Principles of Animal Behavior

Instructor: Dr. Jerry Wilkinson

Course Goals

Introduce you to the various disciplines that engage in research on animal behavior

Provide sufficient background in the basic principles to enable a motivated student to pursue graduate work in the field

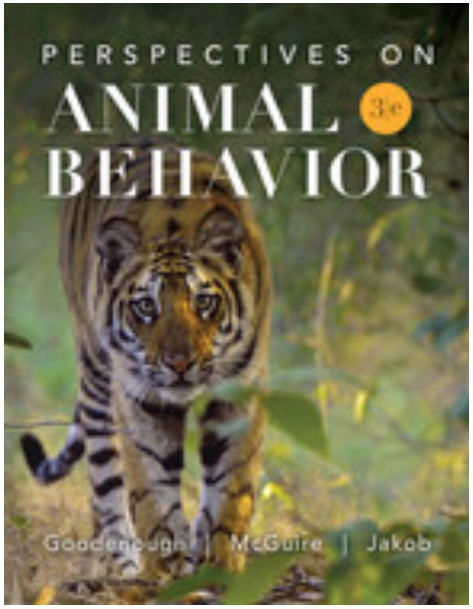
Provide opportunities to write and speak critically about original scientific research

Demonstrate the mechanism by which nonbiomedical research is funded by the US government

Course Structure

LECTURES: two per week on Mondays and Wednesdays from 11-11:50, PLS 1130. To supplement your notes, I will post my Powerpoint presentations on the class website, www.life.umd.edu/classroom/bsci360. Check the website for the most current information. **But, there is no substitute for attending class!**

TEXTBOOK: Perspectives on Animal Behavior, 3rd edition (2010) by Goodenough, McGuire and Jakob is the text for the course and is available as an eBook via CourseSmart (http://www.coursesmart.com/9780470045176) at a discount. In the schedule of classes I have listed the chapters or page numbers that relate most closely to the material covered in each lecture. The book is intended to supplement, not necessarily duplicate, the lectures.



DISCUSSIONS: Fridays at 9, 10 or 11 in 1168 or 1172 PLS.

WAITLIST: If you are on the waitlist, you should come to the first discussion. We will try to accommodate as many as we can.

BSCI360/708B Class Schedule 2012

Pdf doc

Month	Day	Topic	Session	Notes	Perspectives
Aug	29	Intro & levels of analysis	Lecture 1	12pdf	Ch. 1, 2
	31	Experimental design	Discussion		
Sept	5	Behavioral genetics - I	Lecture 2	11pdf	Ch. 3
	7	Genetics	Discussion		
	10	Behavioral genetics - II	Lecture 3	11pdf	Ch. 3
	12	Adaptation and selection	Lecture 4	11pdf	Ch. 4
	14	Selection	Discussion		
	17	Inferring evolution of behavior	Lecture 5	11pdf	pp 70-75
	19	Instinct and learning	Lecture 6	11pdf	Ch. 5, pp 159-171
	21	Evolution	Discussion		
	24	Social lear		11pdf	pp 85-87, 171-182
	26	Biological		11pdf	Ch. 9
	28	Social lear			
Oct	1	Migration a		11pdf	Ch. 10, pp 245-252
	3	**Midterm I (**			
	5	Grant Proposal Discussion	Discussion	11pdf	
	8	Optimal decision making	Lecture 11	11pdf	Ch. 12
	10	Foraging in a variable environment	Lecture 12	11pdf	Ch. 12
	12	Foraging	Discussion		
	15	Conflict resolution	Lecture 13	11pdf	pp. 68-70, 405-413
	17	Assessment	Lecture 14	11pdf	pp. 294-297
	19	Fighting	Discussion		

username: bsci360
password: alcock

Topic of paper for discussion, see reading list

	22	Dominance and territoriality	Lecture 15	11pdf	pp. 413-422
	24	Group living	Lecture 16	11pdf	pp 297-302, 423-427
	26	Social networks	Discussion		
	29	Communication, **Problem set 2 due**	Lecture 17	11pdf	Ch 16
	31	Communication - II (BM)	Lecture 18	11pdf	Ch 17
Nov	2	Communication	Discussion		
	5	Sex and sex ratios	Lecture 19	11pdf	Ch. 14
	7	**Midterm II (L10-18)**	**Exam**		
	9	Sex ratios	Discussion		
	12	Sexual selection	Lecture 20	11pdf	Ch. 14
	14	Mating systems	Lecture 21	11pdf	pp. 345-354
	16	Sexual conflict	Discussion		
	19	Lekking	Lecture 22	11pdf	
	21	Help with grant proposals (DA)	Workshop		
	23	**Thanksgiving**	**Holiday**		
	26	Dispersal, **Grant proposals DUE!**	Lecture 23	11pdf	pp 233-245
	28	Parental care	Lecture 24	11pdf	pp 333-344
	30	Grant proposal reviews	Discussion		
Dec	3	Cooperative breeding	Lecture 25	11pdf	pp 439-445
	5	Reciprocity (GC)	Lecture 26	11pdf	pp 427-439
	7	Grant proposal reviews	Discussion		
	10	Eusociality	Lecture 27	11pdf	pp. 445-450
	15	**FINAL (L1-26) 8-10AM**	**Exam**		

Pdf copy

BSCI 360/708B Reading List 2012

Date		Title	Leader
Aug	31	Wiley, RH 2003 Is there an ideal behavioural experiment? *Animal Behaviour* 66: 585–588	JW, DA
Sept	7	Hopkins, W D; Donaldson, Z R; Young, L J. 2012 A polymorphic indel containing the RS3 microsatellite in the 5' flanking region of the vasopressin V1a receptor gene is associated with chimpanzee (*Pan troglodytes*) personality. *Genes, Brain and Behavior* 11: 552-558.	
	14	Wayne, R.K.; von Holdt, B.M. 2012 Evolutionary genomics of dog domestication. *Mammalian Genome* 23: 3-18 DOI: 10.1007/s00335-011-9386-7	
	21	Fitzpatrick, J L; Almbro, M; Gonzalez-Voyer, A; Hamada, S; Pennington, C; et al. 2012 Sexual selection uncouples the evolution of brain and body size in pinnipeds. *Journal of Evolutionary Biology* 25: 1321-1330 DOI: 10.1111/j.1420-9101.2012.02520.x	
	28	Holzhaider, J.C.; Hunt, G.R.; Gray, R.D. 2010 Social learning in new Caledonian crows. *Learning &* Hoppitt W, Samsc learning mechanisms in a doi:10.1371/journa	
Oct	12	Humphries, N E.; success of biological Levy flig 09: 7169-7174 DOI: 10.107	
	19	Yasuda, C.; Takeshita, F.; Wada, S. 2012 Assessment strategy in male-male contests of the hermit crab *Pagurus middendorffii*. *Anim. Behav.* 84:385-390. DOI: 10.1016/j.anbehav.2012.05.007 Reichert, M. S.; Gerhardt, H. C. 2011 The role of body size on the outcome, escalation and duration of contests in the grey treefrog, *Hyla versicolor*. *Anim. Behav.* 82: 1357-1366 DOI: 10.1016/j.anbehav.2011.09.019	
	26	Parra, G J.; Corkeron, P J.; Arnold, P 2011 Grouping and fission-fusion dynamics in Australian snubfin and Indo-Pacific humpback dolphins. *Anim. Behav.* 82: 1423-1433 DOI: 10.1016/j.anbehav.2011.09.027	

username: bsci360

password: alcock

Discussion

One or two recent scientific papers will be assigned for each discussion and can be downloaded directly as pdf files from the Reading List page. You must read a short paper for this Friday!

Beginning with the second week, each discussion will be run by two students who will have prepared questions, that must be turned in to the instructor in charge of the section at the beginning of the period, to encourage discussion and clarify the assigned reading. **Everyone is expected to read every assigned paper every week!**

Discussion performance will be evaluated by attendance (1/3), weekly participation (1/3), and preparation as a discussion leader (1/3). If you miss a discussion due to illness, you may get credit by submitting a 1 page summary to us within 2 weeks, along with a signed note affirming the campus honor code.

Problem sets

Most of the central concepts regarding the evolution of behavior are based on theoretical ideas that have empirical support. In lecture I will attempt to show you how some of these theoretical conclusions have been reached and provide examples. You will have to solve some algebraic problems on exams using the techniques I present in class.

To help you prepare, I will require that you solve and turn in answers to three problem sets. These problem sets will be graded and returned to you.

Exams

MIDTERM I (Oct 3, 100 pts)

MIDTERM II (Nov 7, 100 pts)

FINAL (Dec 15, 8-10 AM, 125 pts)

Exam questions will be a combination of multiple choice, short answer and problem solving and will integrate seminar and lecture material in a thought-provoking manner. A few sample midterm exam questions will be posted on the course website.

Make-up exams are permitted with a validated health excuse from a doctor.

Grant Proposal

Any topic which is related to animal behavior can be chosen, even if it was not discussed in class. Proposals **cannot be longer than 5 single-spaced** type-written pages (excluding references). **Five** copies of your proposal must be handed in **absolutely no later than Nov 26**.

If you would like to receive feedback on your grant proposal idea, don't hesitate to talk to us. It usually helps to try and generate the following four pieces first. If you send this information to us, we can provide suggestions to help you improve your idea.

1) the question you intend to address
2) at least two alternative hypotheses (i.e. answers to your question, cf. ch. 1)
3) the type of study you will propose, including the identity of the organism if the study is empirical
4) at least three primary references, e.g.

   Barrette, S and Giraldeau, LA 2008 Evidence against maximization of gross rate of seed delivery to the burrow in food-hoarding eastern chipmunks, *Tamias striatus*. *Animal Behaviour* 75: 655-661.

Grant Proposal Evaluation

Proposals will be read and discussed during a mock panel meeting which will take place during the last two discussion periods.

Your report will be distributed to three students who will each read and prepare a written evaluation of your proposal. Then, during the last two Friday Discussions the reviewers will discuss what was done well and what could have been done better in each proposal. The instructors will integrate those comments with their own.

After all proposals have been reviewed, the TA and I will rank them and assign grades

Grades

Your final course grade will be based on the sum of scores for all assignments/exams. I will assign letter grades, including plusses and minuses, on a curve based on how your total score ranks relative to others in the class. After each exam I will indicate how I would assign letter grades to help you track your progress.

	Points	%
Problem sets:	20	4
Discussion :	80	15
Grant proposal:	100	19
Exams:	325	62
Total:	525	100

Past grades in BSCI 360

Grade	2001	2002	2003	2004	2005	2007	2008	2009	2010	2011
A+	96	93		94	95	95	94	91	95	94
A	88-94	85-90	86-92	84-93	87-94	87-94	87-94	87-91	89-94	85-93
A-	86-87	83-84	85	83	86	85-86	86	86	86-88	84
B+	84-85	79-82	82-84	81-82	83-84	83-84	85	83-85	84	81-83
B	78-83	75-78	77-81	76-81	75-82	74-82	76-84	77-82	76-83	73-80
B-	75-77	72-74	75-76	74-75	74	73	76	76	75	72
C+	73-74	70-71	74	73	73	71	75	75	73-74	71
C	69-73	63-69	62-73	65-72	67-72	64-70	67-74	66-74	66-72	62-70
C-	62-67	61-62	60-61		61-65	62-63	64	61-65	61-63	61
D+	61	60		61	60				59	
D		54-59		58	57-58	57-59	58-59		53-56	54-57
D-										
F	<50	<50	<50	50	<50	<50	<50	<50	<50	<50
% A/B	0.65	0.63	0.79	0.62	0.65	0.7	0.74	0.69	0.67	0.65

Office Hours

Dr. Jerry Wilkinson

Bio/Psych 2223A: Wed 1-2 or by appointment

wilkinso@umd.edu or x56942

Ms. Danielle Adams

Bio/Psych 2223A: Mon 10-11 or by appointment, dadams@umd.edu or x56914

Academic Dishonesty

Academic dishonesty will not be tolerated

This includes cheating on exams, fabricating information for a paper, helping another student to cheat, or plagiarizing material without adequately citing the source.

If you have any doubt about what constitutes plagiarism, please ask us.

I encourage each of you to sign the following statement on each assignment: "I pledge on my honor that I have not given or received any unauthorized assistance on this examination (or assignment)."

Cell Phones

Cell phones should be turned off and put away during every class period.

Cell phones are not permitted during exams and will be confiscated if we see them in use.

Any student that is a repeated offender of ringing/talking on a cell phone in the classroom will be referred to the Honor Council under the Student Code of Conduct classroom disruption policy for disciplinary action.

Interested in research experience?

- We are looking for undergraduate research assistants for several projects
- Can enroll for BSCI 399 for 1 or 2 credits (3 or 6 hrs/week)
- Send resume, unofficial transcript and statement of interest to…

Social cooperation in vampire bats

Graduate student: Gerry Carter
(gcarter@umd.edu) and
see: socialbat.org/assistants

Meiotic drive and multiple mating in stalk-eyed flies

Postdoctoral researcher: Kim Paczolt (kpaczolt@umd.edu)
Or for a paid position, to me (wilkinso@umd.edu)

Social networks in Asian elephants

Graduate student: Julie Samy (jusamy3@gmail.com)

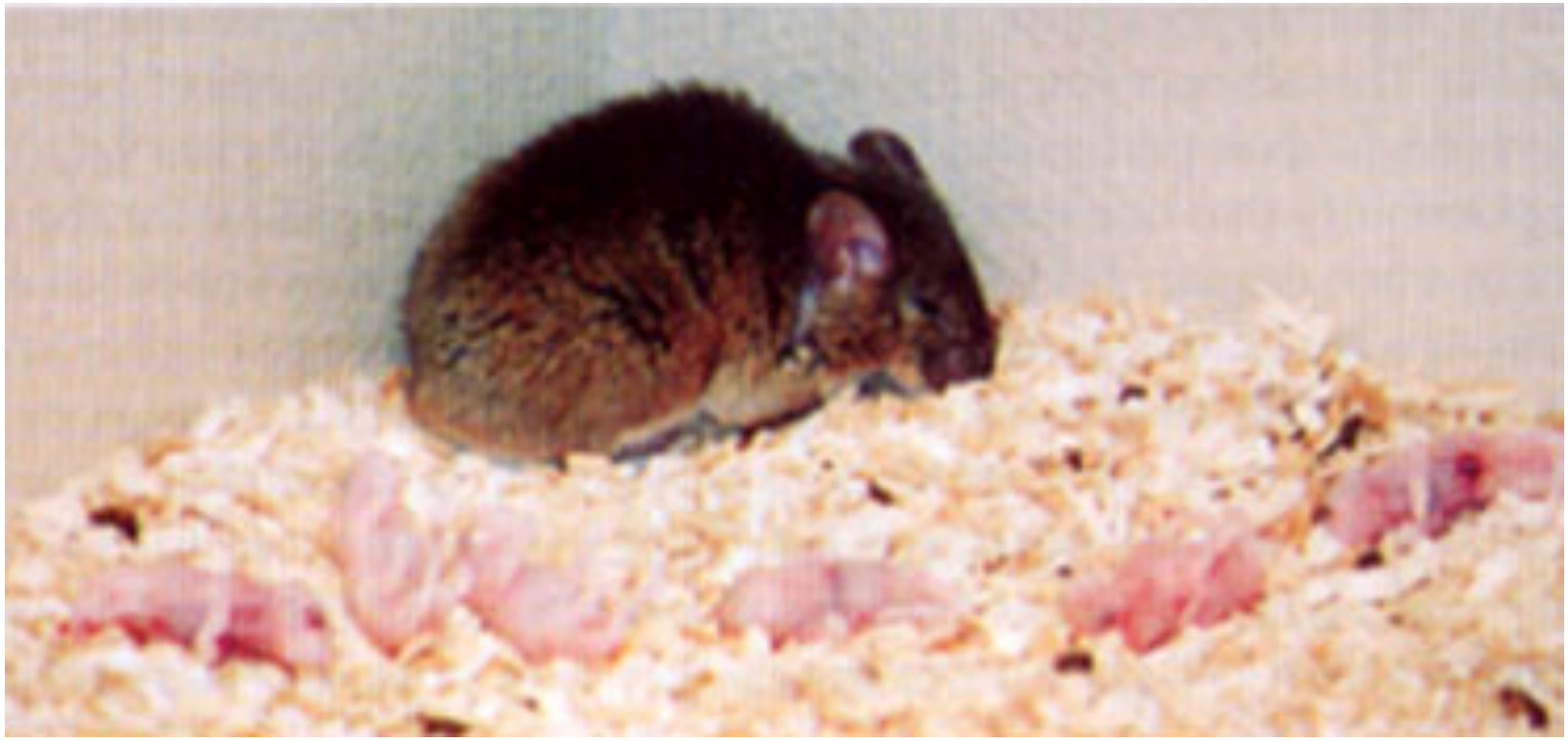
Why study animal behavior?

- Links physiology and morphology of an organism to its environment
- Essential for reproduction and, therefore, should be under strong selection. Consequently, it is ideal for studying evolutionary mechanisms
- Crucial for effective conservation in natural and captive situations.
- Important for production of domestic animals and training of companion animals
- Can provide insights for human health and behavior

Levels of analysis in the study of animal behavior

- Proximate cause (mechanism)
  - Is the behavior heritable (influenced by genes)?
  - Is the behavior modified by experience?
  - Which hormones influence the behavior?
  - How does the nervous system produce a behavior?
- Ultimate cause (function)
  - How is the behavior influenced by natural selection, i.e. related to the reproductive success of individuals?
  - What is the evolutionary origin of the behavior?

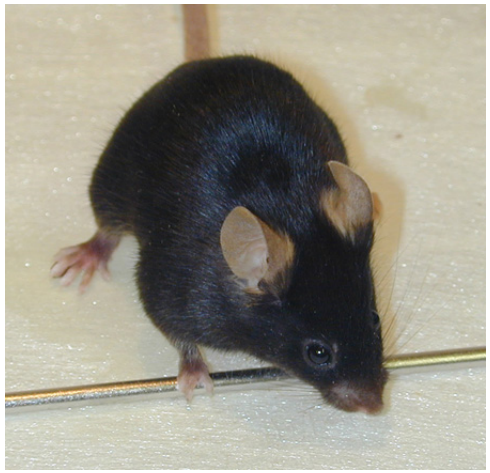
Levels of analysis example: infanticide in house mice



Infanticide has a genetic basis

Inbred strains

C57BL/6J



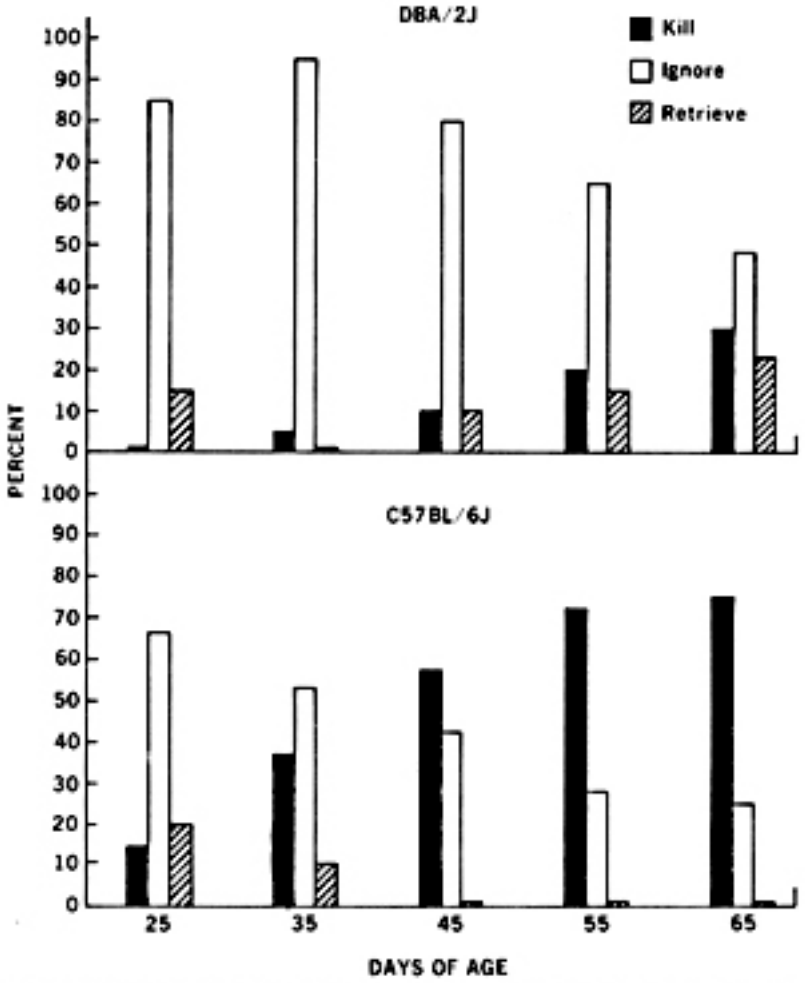


Figure 1. The percentage of 25-, 35-, 45-, 55-, and 65-day-old male C57BL/6J and DBA/2J mice that killed, ignored, or retrieved a single, newborn (1–3-day-old), Rockland–Swiss Albino mouse pup during a 15 min test. Following 24 hr of isolation, separate groups of animals from each age and strain were tested for their reaction toward the newborn. (Adapted from Svare and Mann, 1981.)

Proximate or ultimate?

(Svare & Broida 1982)

Mating affects infanticide in male mice

Proximate or ultimate?

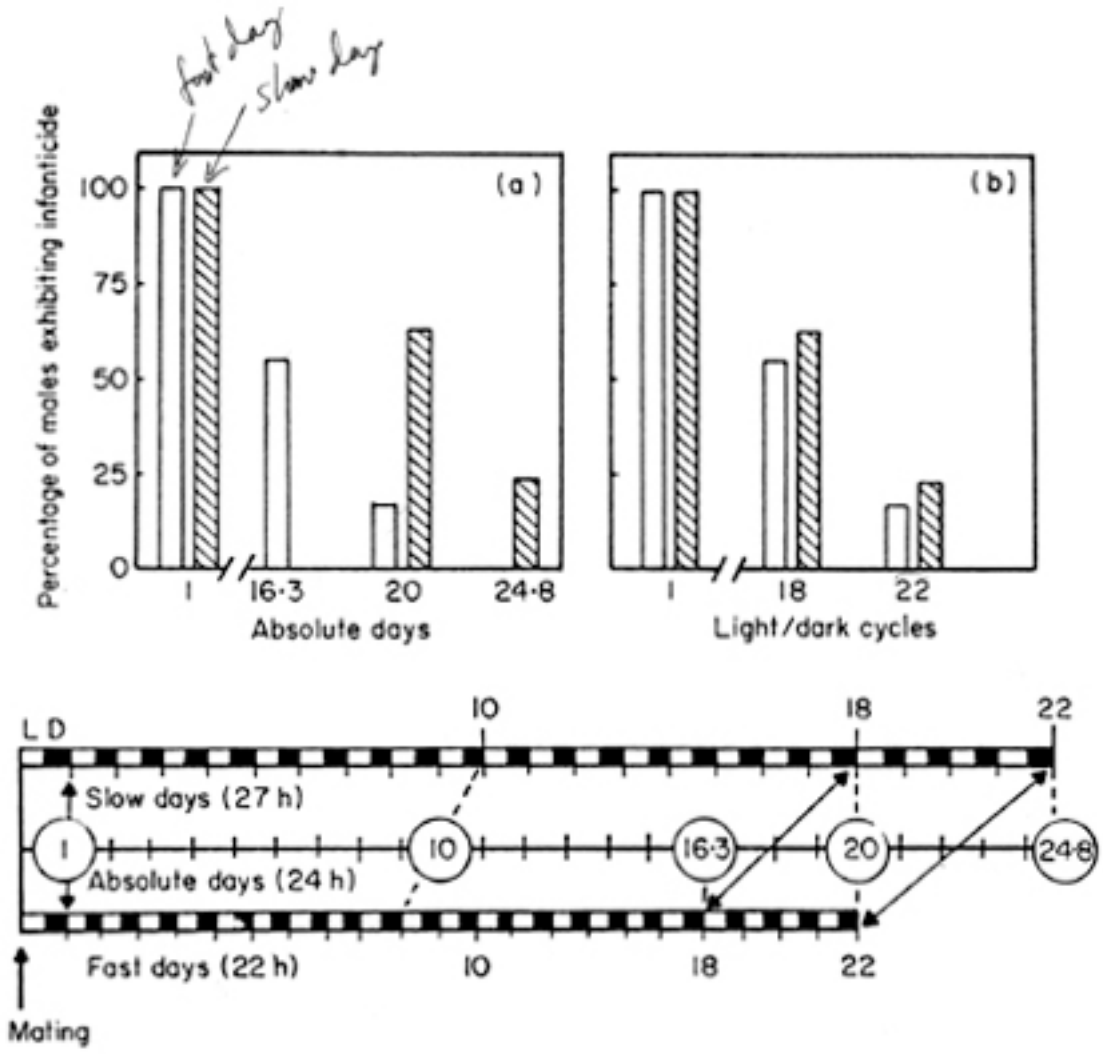
Table I. Effect of mating on infanticide[a]

Behavior	Pre-mating	Days after mating							
		4	12	20	35	42	50	60	90
Infanticide	50	83 →	10	10	17	30	23 →	77	73
Parental	23	17	83	80	63	63	57	17	23
Ignore	27	0	7	10	20	7	20	6	4
χ^2 versus premating group:		10.8	21.3	19.6	10.8	10.6	7.4	5.6	6.8
Significance level (p):		<0.005	<0.001	<0.001	<0.005	<0.005	<0.05	<0.05	<0.05

[a] The percentage of different groups of male mice (30 males/group) that committed infanticide, behaved parentally toward, or ignored two newborn mice that were placed into a male's cage for 30 min. The males were tested at different times after mating with a female.

Note: gestation takes 20 days and weaning occurs at 60 days

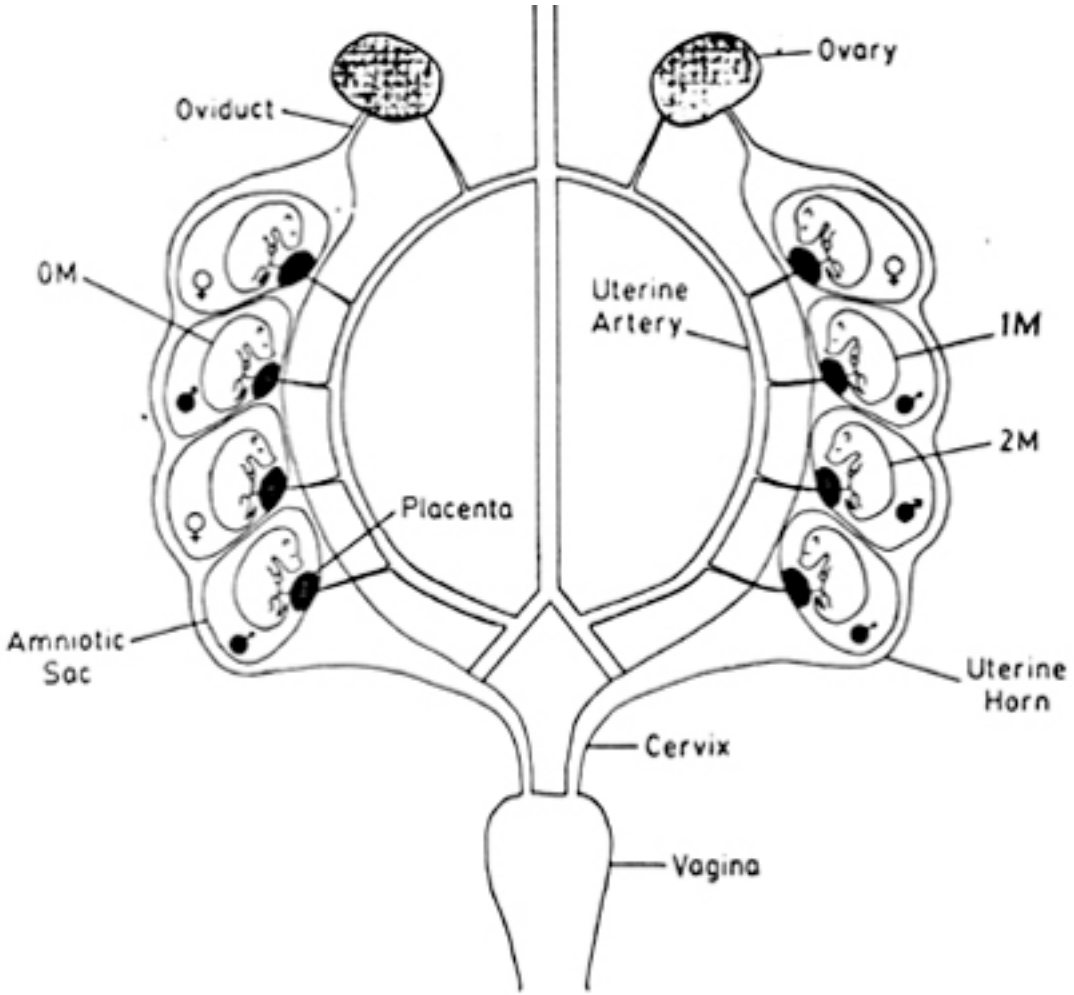
Photoperiod provides the temporal cue



Proximate or ultimate?

(Perrigo et al. 1990)

Fetal position in-utero affects infanticide by altering embryonic exposure to testosterone



Fetal position in-utero affects infanticide by altering embryonic exposure to testosterone

Proximate or ultimate?

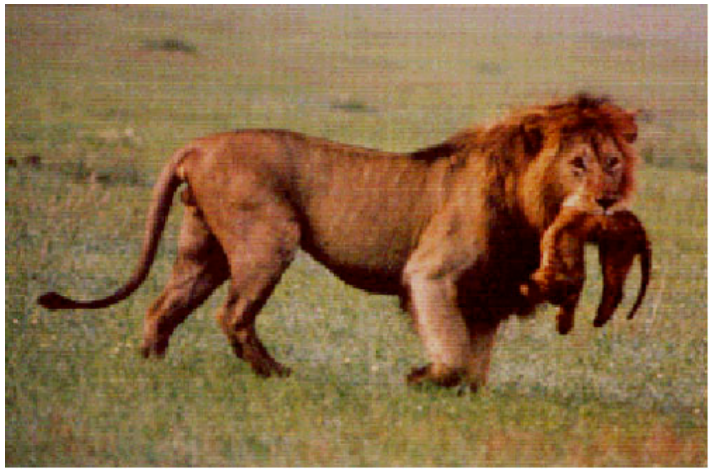
Behavior	Intrauterine position of male[b] 2M	1M	0M	Total
Infanticide	23	40	63	42
Parental	67	37	27	43
Ignore	10	23	10	15

[a] The percentage of gonadally intact, 75-day-old 0M, 1M, and 2M male mice (30/group) that committed infanticide, were parental toward, or ignored two newborn mice that were placed into a male's cage for 30 min (vom Saal, 1983c).

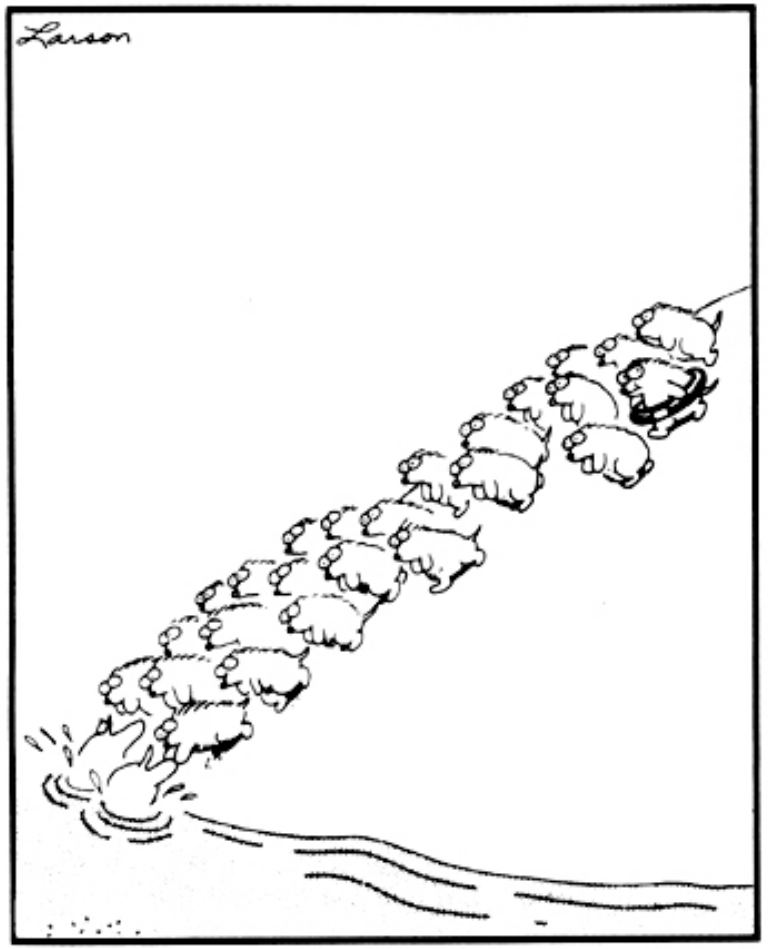
[b] $\chi^2(4) = 14.2$ $p < 0.01$. 2M = between two male foetuses; 1M = between a male and female foetus; 0M = between two female foetuses.

(vom Saal & Howard 1982)

Why do males commit infanticide?



- Nonadaptive: social pathology
- Provides food
- Decreases competition
- Increases mating options
- Regulates population size to improve the survival of the species (group selection)

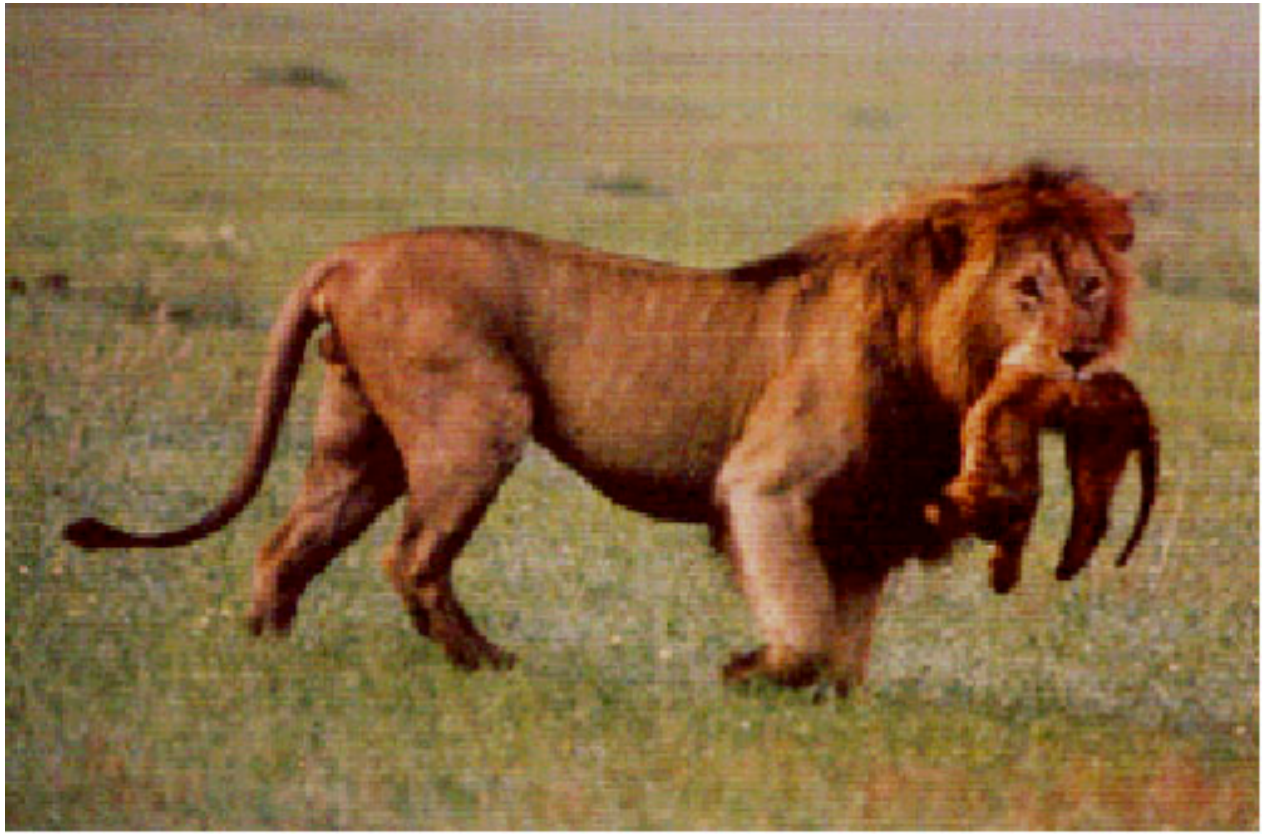


Scorpion cannibalism provides an important source of food

Brood reduction in hawks, herons and egrets decreases sibling competition

(Mock 1984)

Infanticide by male lions can increase male reproductive success after new males takeover a pride



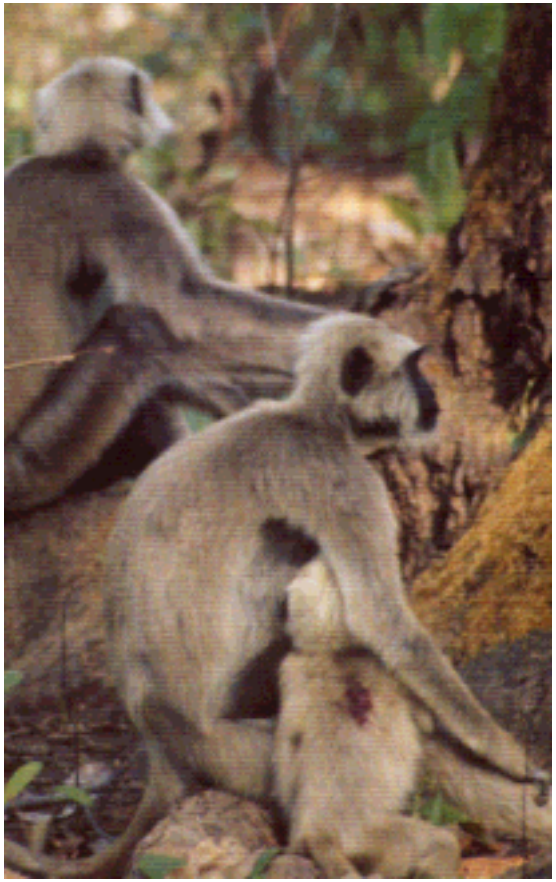
(Packer & Pusey, 1983; Dagg 1998)

Note that behaviors need not be adaptive for everyone

e.g. infanticide can lead to conflict between males and females (sexual conflict)

Male langurs are attacked by females

Intruder male being chased by females



(Hrdy 1977; Borries 1997, 1999)

Female house mice nest communally to protect pups from infanticidal males

References

Bartlett, T.Q., R.W. Sussman, & J.M. Cheverud 1993 Infant killing in primates: A review of observed cases with special reference to the sexual selection hypothesis. Am. Anthropologist 95:958-990.

Berger, J. 1983 Induced abortion and social factors in wild horses. Nature 303: 59-61.

Borries, C. 1997 Infanticide in seasonally breeding multimale group of Hanuman langurs (*Presbytis entellus)* in Ramnagar (South Nepal). Behav. Ecol. Sociobiol. 41:139-150.

Borries, C., K. Launhardt, C. Epplen, J.T. Epplen & P. Winkler 1999 DNA analyses support the hypothesis that infanticide is adaptive in langur monkeys. Proc. Roy. Soc. London, B 266:901-904.

Brown, J. R. et al. 1996 A defect in nurturing in mice lacking the immediate early gene fosB. Cell 86:297-309.

Dagg, A.J. 1998 Infanticide by male lions hypothesis: A fallacy influencing research into human behavior. Am. Anthropologist 100:940-950.

Ebensbarger, L.A. 1998 Strategies and counterstrategies to infanticide in mammals. Biol. Reviews 73:321-346.

Elgar, M. & B. Crespi (editors) 1992 Cannibalism. Oxford University Press, Oxford.

Emlen, S.T., N. J. Demong, & D. J. Emlen 1989 Experimental induction of infanticide in female wattled jacanas. Auk 106:1-7.

Hausfater, G. & S.B. Hrdy 1984 Infanticide: Comparative and Evolutionary Perspectives. Adine, New York.

Hoogland, J.L. 1996 The Black-Tailed Prairie Dog. Chicago University Press, Chicago.

Hrdy, S.B. 1977 Infanticide as a primate reproductive strategy. Am. Scientist 65:40-49.

Mock, D.W. 1984 Siblicidal aggression and resource monopolisation in birds. Science 225: 731-733.

Newton, P.N. 1986 Infanticide in an undisturbed forest population of hanuman langurs, Presbytis entellus. Anim. Behav. 34:785-789.

Packer, C. & A.E. Pusey 1983 Adaptations of female lions to infanticide by incoming males. Amer. Natur. 121: 716-728.

Parmigiani,S. & F. vom Saal (editors) 1994 Infanticide and parental care. Harwood Academic Publishers, Chur.

Perrigo, G., W.C. Bryant and F.S. vom Saal 1990 A unique neural timing system prevents male mice from harming their own offspring. Anim. Behav. 39:535-539.

Sherman, P.W. 1981 Reproductive competition and infanticide in Belding's ground squirrels and other animals. In Natural Selection and Social Behavior: Recent Research and New Theory. (R.D. Alexander and D.W. Tinkle, eds.), pp. 311-331. New York, Chiron Press

Svare, B. & J. Broida 1982 Genotypic influences on infanticide in mice: Environmental, situational, and experiental determinants. Physiology and Behavior 28: 171-175.

Trulio, L.A. 1996 The functional significance of infanticide in a population of California ground squirrels (Spermophilus beecheyi). Behav. Ecol. Sociobiol. 38:97-103.

Tuomi, J., Agrell, J. & Mappes, T. 1997 On the evolutionary stability of female infanticide. Behav. Ecol. Sociobiol. 40:227-233.

Vom Saal, F. & L.S. Howard 1982 The regulation of infanticide and parental behavior: Implications for reproductive success in male mice. Science 215: 1270-1272.