

Hunter College and City College - The City University of New York

F A L L 2002

ANIMAL BEHAVIOR I (PSY U716 and BIO U724.03)

Prof. Peter Moller, Ofer Tchernichovski, and Christopher Braun

Classes will be held at The Graduate Center (GC room 6495) and will begin promptly

at 9:00 a.m. and end at 12:00

(V 9/6/02)

Session	Date	Topic	Instructor	Reading set
1	09/05	Introduction (framework, plans, and goals) Historical perspectives on the study of animal behavior	Moller	1
2	09/12	Mechanistic views of behavior	Tchernichovski	2
3	09/19	Measuring behavior	Tchernichovski	3
4	09/26	Neuroethology – neural bases of behavior	Braun	4
5	10/03	Neuroethology – sensory systems	Braun	5
6	10/10	Neuroethology – motor systems and CPGs	Tchernichovski	6
7	10/17	Molecular mechanisms of behavior	Tchernichovski	7
8	10/24	Development of behavior	Tchernichovski	8
9	10/31	Learning	Tchernichovski	9
10	11/07	Rhythmic behaviors	Moller	10
11	11/14	Orientation and navigation	Moller	11
12	11/21	Communication (systems, signals, coding)	Moller	12
13	12/05	Hormones and behavior	Moller & TBA	13
14	12/12	Cognitive ethology	Reiss & Basil	14
15	TBA	Final Examination		
16	TBA	Book discussion	M-T-B	15

Required Readings

Logistics and course requirements

Meaningful participation in discussions presupposes that assigned readings for class sessions will be read prior to the class meeting. **Starting 9/12**, there will be a 15-min quiz at the beginning of each session (12 in total) covering the reading material assigned for that session. During each meeting members of the class may be called upon to summarize the assigned readings. Each student will be required to give two 10-min presentations (plus 5 min discussion) on material to be assigned. Grades will be based on (a) your performance on these quizzes, (b) the final exam, (c) class presentations, and (d) participation in class discussions. If two sessions are missed for any reason, a summary of all assigned readings for that session must be submitted. If more than three class

sessions are missed, the student will be withdrawn from the course.

Instructors

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9/5: Reading set 1: Historical perspectives on the study of animal behavior

Readings:

- (1) Durant, J.R. (1986). The making of ethology: The Association for the Study of Animal Behaviour, 1936-1986. *Anim. Behav.* 34: 1601-1616.
- (2) Lehrman, D.S. (1970) Semantic and conceptual issues in the nature-nurture problem, pp. 17-52. In: T.C. Schneirla, L.R. Aronson, E. Tobach, D.S. Lehrman & J. Rosenblatt (eds.) *Development and Evolution of Behavior: Essays in Memory of T.C. Schneirla*. W.H. Freeman, San Francisco.
- (3) Tinbergen, N. (1963). On aims and methods of ethology. *Z. Tierpsychol.* 20: 410-433.
- (4) Camhi, J.M. (1984) Behavioral concepts. pp. 9-29. In: Camhi, J.M. *Nerve cells and the natural behavior of animals*. Sinauer, Sunderland, Mass.
- (5) Moller, P. (2000). Neuroethology and the Department of Animal Behavior at the American Museum of Natural History (1928-1971). *Newsletter Int. Soc. Neuroethol.*, July 2000: 8-9.

9/12: Reading set 2: Mechanistic views

Readings:

- (1) Manning, A. *An Introduction to Animal Behavior*: Ch. I: Reflexes and complex behavior. pp 1-20
- (2) Power, W.T. (19). *Behavior: the control of perception*. Ch. 1: The dilemmas of behaviorism. pp 1-9. Aldane Publishing Co.

Papers:

- (1) von Holst, E. (1937 orig.). On the nature of order in the central nervous system (translation from the German: *Vom Wesen der Ordnung im Zentralnervensystem*. *Naturwissenschaften* 25: 625-631. (In: *The behavioral physiology of animals and man: selected papers of E. von Holst*; Vol. I. Coral Gables, University of Miami Press, 1973)
- (2) Power, W.T. (19). *Behavior: the control of perception*. Ch. 4: Feedback and behavior. pp 40-55. Aldane Publishing Co.
- (3) Tolman, E.C. (1948). Cognitive maps in rats and men. *Psychol. Rev.* 55, 189-208.

9/19: Reading set 3: Measuring behavior

Readings:

- (1) Golani, I. (1992) A mobility gradient in the organization of vertebrate movement: The perception of movement through symbolic language. *Behavioral and Brain Sciences*, 15: 249-308.
- (2) Gramer, K. (2000). E-motion: digital image analysis of human body movements. *Measuring Behavior*

Papers:

1. Nelson, D. & Marler, P. (1993) Measurement of song learning behavior. *Methods in Neurosciences* 14, 447-465
2. Hammerschmidt, K. & Fischer, J. (1998) The vocal repertoire of Barbary Macaques: a quantitative analysis of a graded signal system. *Ethology* 104, 203-216
3. Bennett, A.T.D., I.C. Cuthill, J.C. Partridge & E.J. Maier. (1996) Ultraviolet vision and mate choice in zebra finches. *Nature* 380: 433-434.
4. Brown, R.E., L. Stanford & H.M. Schellinck. (2000). Developing standardized behavioral tests for knockout and mutant mice. *ILAR Journal*, 41(3): 163-174.
5. Tchernichovski, O. & I. Golani (1995). A phase plane representation of rat exploratory behavior. *J. Neurosci. Methods*.

9/26: Reading set 4: Neuroethology – neural bases of behaviorReadings:

- (1) Hoyle, G. (1984). The scope of neuroethology. *Behavioral Brain Sciences* 7: 367-412.
- (2) Shettleworth, S.J. (1996) Introduction: Neuroethology, Perception, and Cognition. pp. 1- 8. In: Moss, C.F. and S.J. Shettleworth (eds.) *Neuroethological studies of cognitive and perceptual processes*. Westview Press: Boulder, CO.

If you know nothing about neurons, I suggest reading:

- (1) Gabbiani, F. & Midtgaard, J. (2001). Neural Information Processing. www.els.net. Nature Publishing Group. **PDF**

Papers:

- (1) Nemeč, P., J. Altmann, S. Marhold, H. Burda, and H.H.A. Oelschläger. (2001). Neuroanatomy of Magnetoreception: The superior colliculus involved in magnetic orientation in a mammal. *Science* 294: 366-368.
- (2) Young, L.J., Nilsen, R., Waymire, K.G., MacGregor, G. R., & Insel, T.R. (1999). Increased affiliative response to vasopressin in mice expressing the V1a receptor from a monogamous vole. *Nature*, 400, 766-768.
- (3) Vyssotski, A.L., Dell’Omo, G., Poletaeva, A.L., Vyssotski, D.L., Minichiello, L., Klein, R., Wolfner, D.P. & Lipp, H.-P. (2002). Long-term monitoring of hippocampus-dependent behavior in naturalistic settings: Mutant mice lacking neurotrophin receptor TrkB in the forebrain show spatial learning but impaired behavioral flexibility. *Hippocampus* 12: 27-38.

10/3: Reading set 5: Neuroethology – sensory systems

- (1) Diamond, M. E. (2001). Sensory system organization. www.els.net Nature Publishing Group.
- (2) Petersen, R. S. and Diamond, M.E. (2001). Topographic maps in the brain. www.els.net Nature Publishing Group.

Papers:

- (1) Metzner, W. and Juranek, J. (1997). A sensory brain map for each behavior? *Proc. Nat. Acad. Sci. (USA)*, 94: 14798-14803.
- (2) Wang, X., and Kadia, S.C. (2001). Differential representation of species-specific primate vocalizations in the auditory cortices of marmoset and cat. *J. Neurophysiol.* 86: 2616-2620.
- (3) Schaefer, M.L., Young, D.A. & Restrepo, D. (2001). Olfactory fingerprints for major histocompatibility complex-determined body odors. *J. Neuroscience* 21: 2481-2487

10/10: Reading set 6: Motor systems, central patternsReading:

- (1) Alcock, J. (199). *Animal Behavior. An evolutionary approach*, 5th edition: Ch. 5: Nerve cells and Behavior, pp 104-133
- (2) Hooper, S.L. (2001). Central pattern generators. *Encycl. Life Sci.:* 1-9. **PDF**

Papers:

- (1) Baldissera, F., P. Cavallari, L. Craighero & L. Fadiga. (2001). Modulation of spinal excitability during observation of hand actions in humans. *European J. Neurosci.*, 13:190-194.
- (2) Ghahramani, Z. (2000). Building blocks of movement. *Nature*, 407: 742-747 and perspective on pp. 682-683.
- (3) Thoroughman, K.A. & Shadmehr, R. (2002). Learning of action through adaptive combinations of motor primitives. *Nature* 407: 742-747.
- (4) Brezina, V. & Weiss, K.R. (2000). The neuromuscular transform constrains the production of functional rhythmic behaviors. *J Neurophysiol* (Jan) 83(1): 232-59.

- (5) Nolen, T.G. & Hoy, R.R. (2002). Initiation of behavior by single neurons: The role of behavioral context. *Science*: 226: 992-994.

10/17: Reading set 7: Molecular mechanisms of behaviorReading:Papers:

- (1) Raymond, J.L. (1998). Learning in the oculomotor system: from molecules to behavior. *Current Opinion in Neurobiology* 8: 770-776
- (2) Jarvis, E.D., Ribeiro, S., da Silva, M.L., Ventura, D., Vielliard, J. & Mello, C.V. (2000). Behaviorally driven gene expression reveals song nuclei in hummingbird brain. *Nature* 406: 627-632.

10/24: Reading set 8: Development of BehaviorReading:

- (1) Goodenough, J., B. McGuire & R.A. Wallace (2002). Perspectives on Animal Behavior (2nd ed); Ch. 8: The development of behavior, pp 157-187. John Wiley & Sons, New York.

Papers:

- (1) Marler, P. & V. Sherman (1985). Innate differences in singing behavior of sparrows reared in isolation from adult conspecific song. *Anim. Behav.* 33: 57-71.
- (2) Price, P.H. (1979). Developmental determinants of structure in zebra finch song. *J. Comp. Physiol Psychol.* 93:260-277.

10/31: Reading set 9: LearningReading:

- (1) Best, P.J. & A.M. White (1998). Hippocampal cellular activity: A brief history of space. *Proc. Natl. Acad. Sci. USA*, 95: 2717-2719
- (2) Nottebohm, F. (1993) The search for neural mechanisms that define the sensitive period for song learning in birds. *Netherl. J. Zool.* 43(2):

Papers:

- (1) Heisenberg, M., Wolf, R. & Brembs, B. (2001). Flexibility in a Single Behavioral Variable of *Drosophila*. *Learning & Memory* 8:1-10
- (2) McKibben, J.R. & A.H. Bass (1998). Behavioral assessment of acoustic parameters relevant to signal recognition and preference in a vocal fish. *J. Acoust. Soc. Am.* 104(6):3520-3533.
- (3) Hultsch & Todt (1996). Discontinuous and incremental processes in the song learning of birds: evidence for a primer effect. *J. Comp Physiol. A* 179: 291-299.
- (4) Scharff, C. & Nottebohm F. (1991) A comparative study of the behavioral deficits following lesions of various parts of the zebra finch song system implication for vocal learning. *J. Neuroscience* 11 (9): 2896-291.
- (5) Wood, E.R., Dudchenko, P.A., Robitsek, R.J. & Eichenbaum, H. (2000). Hippocampal neurons encode information about different types of memory episodes occurring in the same location. *Neuron* 27: 623-633.

11/7: Reading set 10: Rhythmic behaviorsReading:

- (1) Goodenough, J., B. McGuire & R.A. Wallace (2002). Perspectives on Animal Behavior (2nd ed); Ch 9: Biological Clocks, pp 189-216. John Wiley & Sons, New York
- (2) Ali, M.A., Boujard, T. & Gerkema, M.P. (1992). Terminology in biological rhythms. In: Rhythms in Fishes (M.A. Ali, ed.). Plenum Press. Pp. 7-10.

Papers:

- (1) Campbell, S.S. & Murphy, P.J. (1998). Extraocular circadian phototransduction in humans. *Science* 279: 396-399.
- (2) Gwinner, E. (1996). Circadian and circannual programmes in avian migration. *J. Exp. Biol.* 199: 39-48.
- (3) Chiba, A., Kikuchi, M. & Aoki, K. (1995). Entrainment of the circadian locomotor activity rhythm in the Japanese newt by melatonin injections. *J. Comp. Physiol. A* 176: 473-477.
- (4) Balys, M. & Pyza, E. (2001). Localization of the clock controlling circadian rhythms in the first neuropile of the optic lobe in the housefly. *J. Exp. Biol.* 204: 3303-3310.

11/14: Reading set 11: Orientation and navigationReading:

- (1) Goodenough, J., B. McGuire & R.A. Wallace (2002). Perspectives on Animal Behavior (2nd ed); Ch 10: Mechanisms of Orientation, pp 217-248. John Wiley & Sons, New York.
- (2) Keeton, W.N. (1974). The mystery of pigeon homing. *Sci. Am.* (Dec. 1974), 196-203.
- (3) Giurfa, M. & Capaldi, E.A. (1999). Vectors, routes and maps: new discoveries about navigation in insects. *TINS* 22:237-242.

Papers:

- (1) Görner P. & P. Moller (2001). Distance estimation in the funnel web spider, *Agelena labyrinthica*. *Proc. Roy. Inst. Navigation*, RIN01, P12/1 -9.
- (2) Bisch-Knaden, S. & R. Wehner (2001). Egocentric information helps desert ants to navigate around familiar obstacles. *J. Exp. Biol.* 204: 4177-4184.
- (3) Baker, R.R. (1980). Goal orientation by blindfolded humans after long-distance displacement: possible involvement of a magnetic sense. *Science* 210: 1061-1063. **AND** Gould, J.L. & K.P. Able (1981). Human homing: an elusive phenomenon. *Science* 212: 1061-1063.
- (4) Tarsitano, M.S. & R.R. Jackson (1996). Araneophagic jumping spiders discriminate between detour routes that do and do not lead to prey. *Anim. Behav.*, 53: 257-266.

11/21: Reading set 12: Communication (systems, signals, coding)Reading:

- (1) Markl, H. (1985). Manipulation, modulation, information, cognition: some of the riddles of communication. *Fortschr. Zool.* 31, 163-194.
- (2) Marler, P. (1961). The logic analysis of animal communication. *J. theoret. Biol.* 1, 295-317.

Papers:

- (1) Brenowitz, E.A. (1982). The active space of red-winged blackbird song. *J. Comp. Physiol. A*: 147, 511-522.
- (2) Leal, M. (1999). Honest signalling during prey-predator interactions in the lizard *Anolis cristatellus*. *Anim. Behav.* 58: 521-526.
- (3) McComb, K., C. Moss, S. Sayialel & L. Baker (2000). Unusually extensive networks of vocal recognition in African elephants. *Anim. Behav.* 59:1103-1109.

- (4) Rooney, N. J., J.W.S. Bradshaw & I.H. Robinson (2001). Do dogs respond to play signals given by humans? *Anim. Behav.* 61: 715-722.

