

SYLLABUS FALL 2004

Psychology 623

Biological Clocks and Behavior (4 credits)

Instructor: Professor Randy Nelson

Office: 09 TO

Office Hours: Thursday 2:30-4:00 pm and by appointment

Phone: 614.538.9526

Fax: 614.451.3116

Email: rmelson@osu.edu

Course Assistant: Jacqueline Von Spiegel (Email: Von-Spiegel.2@osu.edu)

Course Summary: A consideration of the broad variety of biological rhythms of animals and humans, including ultradian, daily, lunar, tidal and annual cycles. After considering the field in historical perspective, we will spend several weeks on the formal properties of biological clocks and then go to the ways in which rhythms are generated and how they are synchronized to the external environment. Emphasis is on the role of the nervous and endocrine systems of mammals and birds in relation to behavioral rhythms of eating, drinking, sleeping, sex activity, hibernation, migration, seasonal affective disorders, menstrual and estrous cycles.

Prerequisite: Psychology 313 or a course in physiology.

Grading: Grades will be based on two midterm (50% of the grade for undergrads; 40% of the final grade for grads), and a final (cumulative) examination (50% of the grade for undergrads; 40% of the final grade for grads). The exam material will consist of both lecture material and material from your readings. The tests are multiple-choice, short answer, and essay examinations. Students will be responsible for attending class, reading the assigned materials in the reader, and studying the materials. Final grades will be calculated as follows: $\geq 90\%$ of the highest score = A; $\geq 80\%$ of the top score = B; $\geq 70\%$ of the top score = C; $\geq 60\%$ of the top score = D. $< 59\%$ of the top score = F.

Academic Ethics: All students enrolled in courses at the Ohio State University should be familiar with the University's policy on academic integrity (http://www.asc.ohiostate.edu/honors/conduct_document.htm). The instructor and course assistants are committed to maintaining a fair assessment of student performance in this course. There is one major ethical consideration in this course. The three exams are closed book. No notes may be used during the examinations and you may not confer with your fellow students or look at other examinations for answers during the exam period. Prior to the examinations, all students are encouraged to study in small groups to facilitate your preparation for the tests. However, once you enter the examination room, you are expected to work alone.

Absence from Exams: Make-up exams and quizzes may be taken only in cases in which absence from the scheduled exam is unavoidable, such as in cases of illness or family emergency. Any such absence must be approved by the instructor in advance of the exam. Any excuse for an absence must be documented and reported to the instructor or CA as soon as possible. Undocumented absences from the scheduled exams will result in 0 points for that exam. Students are also expected to abide by the Code of Student Conduct as outlined in the University Student Handbook (http://www.asc.ohio-state.edu/honors/conduct_document.htm).

Accommodations for Disabled Students: The policy of The Ohio State University is to provide every reasonable, appropriate, and necessary accommodation to qualified disabled students. The University's colleges and academic centers evaluate and judge applications on an individual basis and no categories of disabled individuals are automatically barred from admission. The privacy rights of each disabled person are honored to the fullest extent possible. The University's interest in a student's disabilities are only for the purpose of accommodating his/her specific disability, thereby providing an academically qualified disabled student access to programs and activities accorded all other qualified students. Whenever generally accessible facilities do not adequately accommodate a specific disability, the University makes every reasonable accommodation and program or facility adjustment to assure individual access. These policies are fully supported and practiced in this class. If you have a disability documented with The Ohio State University Office of Disability Services (<http://www.ods.ohio-state.edu>; 614.292.3307, or visit 150 Pomerene Hall), then please contact the instructor privately by the end of the second week of the quarter so that any accommodations (e.g., large font exams, separate examination facilities) can be made (contact information is listed above).

Textbook: *Chronobiology: Biological Timekeeping*, 2004. Dunlap et al., Sinauer and Associates. Instructor-provided readings will also be used (see below).

Important! If you are having difficulty with any of the material, either in lecture or in the readings, then please see the instructor for help. The instructor is here to facilitate your learning, and that means not only giving lectures, but also consulting with you individually. The quarter is very short, so it is critical to seek assistance as soon as you detect a problem.

Graduate Students: If you are taking this course for graduate credit, you can either complete a term paper (10 pages--topic to be mutually agreed upon with the instructor) or present one of the lectures. Performance on this requirement will count for 20% of your final grade.

DATE	LECTURE TOPIC	READINGS
23 Sept	Course organization and overview; strong inference	Chapter 1
28 Sept	The physical environment; types of rhythms;	<u>Platt</u> Chapter 2

30 Sept	history of chronobiology Circadian rhythms: Terminology; basic concepts and properties	Chapter 3 pp. 67-72
05 Oct	Circadian rhythms: Phase response curves, entrainment, formal models	Chapter 3 pp. 72-102
07 Oct	Mammalian circadian pacemakers: Early history and histology	<u>Moore,</u> <u>Pickard:</u> <u>Reppert &</u> <u>Weaver</u> <u>Zucker</u>
12 OCT	Hormones and circadian rhythms	
14 Oct	Midterm Exam I (25% of final grade)	
19 Oct	Hormones, neurotransmitters and circadian rhythms	<u>Turek, Meijer</u>
21 Oct	Entrainment of circadian rhythms by nonphotic cues	<u>Mrosovsky,</u> <u>Viswanathan,</u> <u>Tokura</u> <u>Reppert</u>
26 Oct	Ontogeny of circadian rhythms: Maternal-fetal communication	
28 Oct	Estrous, menstrual, tidal, and lunar rhythms	<u>Fitzgerald,</u> <u>Swann;</u> <u>Sanduleak</u> <u>Daan, Klein</u>
02 Nov	Ultradian rhythms	
04 Nov	Midterm Exam II	
	(25% of final grade)	
09 Nov	Annual rhythms: Hibernation, torpor and migration	Chapter 4 pp 107-118
11 Nov	Veterans Holiday (Sorry, no class)	
16 Nov	Photoperiodism	Chapter 4 pp 118-139
18 Nov	Photoperiodism (part deux)	Chapter 9
23 Nov	Human chronobiology: Jet lag, shift work	Chapters 7 & 8
25 Nov	Thanksgiving (Sorry, no class)	
02 Dec	Human chronobiology: Seasonal Affective Disorders	Chapter 10 & 11
06 Dec	Final Exam (50% of final grade)	

READINGS (tentative list) Copies are available at the course website:
<http://www.psy.ohio-state.edu/nelson/632syllabus.htm>

Platt, JR., 1964. Strong inference. *Science*, 146:347-353.

Moore, R.Y. 1999. Organization and function of a central nervous system circadian oscillator: The suprachiasmatic hypothalamic nucleus. *Federation Proceedings*, 42: 2783-2789.

Inouye, ST & Kawamura, H. 1979. Persistence of circadian rhythmicity in a mammalian hypothalamic "island" containing the suprachiasmatic nucleus. *PNAS*, 76:5962- 5966.

Pickard, G.E. & Turek, F.W. 1992. Splitting of the circadian rhythm of activity is abolished by unilateral lesions of the suprachiasmatic nuclei. *Science*, 215:1119-1121.

Reppert, S.M. & Weaver, D. 2002. Coordination of circadian timing in mammals, *Nature*, 418:935-941.

Zucker, I. 1999. Hormones and hamster circadian organization. In: M. Suda (ed) *Biological Rhythms and Their Central Mechanisms*. Elsevier/North-Holland Biomedical Press.

Turek, FW. 1997. Pharmacological probes of the mammalian circadian clock: Use of the phase response curve approach. *TIPS*, 8:212-217.

Meijer, JH, van der Zee, E.A., & Dietz, M. 1998. Glutamate phase shifts circadian activity rhythms in hamsters. *Neuroscience Letters*, 86:177-183.

Mrosovsky, N., 1998. Phase response curves for social entrainment. *J.Comp. Physiol.*, 162:35-46.

Viswanathan, N. & Chandrashekar, MK. 1985. Cycles of presence and absence of mother mouse entrain the circadian clock of pups. *Nature*. 317:530-532.

Tokura, H. & Aschoff, J. 1993. Effects of temperature on the circadian rhythm of pig-tailed macaques. *Am J. Physiol.*, 245:R-800-R804.

Reppert, S.M., Weaver, D.R. & Rivkees, S.A. 1988. Maternal communication of circadian phase to the developing mammal. *Psychoneuroendocrinology*, 13: 63-78.

Daan, S. & Slopeema, S. 1978. Short-term rhythms in foraging behavior of the common vole. *J. Comp. Physiol.*, 127: 215-227.

Klein, R. & Armitage, R. 1979. Rhythms in human performance: 1 ½ -hour oscillations in cognitive style. *Science*, 204:1326-1328.

Fitzgerald, K.E. & Zucker, I. 1996. Circadian organization of the estrous cycle of the golden hamster. *PNAS*, 73: 2923-2927.

Swann, JM & Turek, F.W. 1985. Multiple circadian oscillators regulate the timing of behavioral and endocrine rhythms in female golden hamsters. *Science*, 225:898- 900.

Sanduleak, N. 1995. The moon is acquitted of murder in Cleveland. *Skeptical Inquirer*, 3:236-242.