

PHYSIOLOGICAL PSYCHOLOGY: 363

Fall, 2006

Lecture: 8:00 MWF

Lab: 1-4 T or W

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REQUIRED TEXT:

Carlson, N. R. (2006). *Physiology of behavior* (9th ed.). New York: Allyn and Bacon.

Sept. 6 **Introduction:** What is physiological psychology? (Ch. 1)

Basics: Neuronal Transmission, Psychopharmacology, and Neuroanatomy

- 8 a. The neuron and axonal conduction (Ch. 2, 28-53; Ch. 15, 544-546; Fields, 2006)
- 11 b. Synaptic transmission: EPSPs, IPSPs, and synaptic integration (Ch. 2, 53-67)
- 13 c. Neuropharmacology (Ch. 4, 102-114; Ch. 5, 153-156 & 160-164)
- d. Psychopharmacology
 - 13 (1) Acetylcholine and Alzheimer's disease (Ch. 4, 114-118; Ch. 15, 539-543; Wolfe, 2006; Oddo et al., 2004)
 - 18 (2) Norepinephrine and depression (Ch. 4, 122-123)
 - 20 (3) Dopamine, Parkinson's disease, Huntington's disease, and schizophrenia (Ch. 4, 118-122; Ch. 8, 280-284; Ch. 15, 532-538; Youdim & Riederer, 1997; Freed et al. 2001; Marx, 2005)
 - 22 (4) Serotonin, glutamate, peptides, and others (Ch. 4, 124-133; Corbett et al., 1999; Kemp & McKernan, 2002; Moles et al., 2004)
- 26-27 (Lab) e. Neuroanatomy (Ch. 3; Ch. 5, 140-150)

27 FIRST EXAM

29 **Input and Output: Sensory and Motor Systems** (Rosenzweig et al., 2005, 216-228)

- a. Vision
 - Oct. 2 (1) Anatomy and coding (Ch. 6, 168-185; Ch. 5, 150-153)
 - 6 (2) Perception (Ch. 6, 185-209; Tsao et al., 2006)
 - 8 b. Audition (Ch. 7, 210-231; Rauschecker & Shannon, 2002)
 - 11 c. Somesthetic senses (Ch. 7, 234-246; Basbaum & Julius, 2006; Manzke et al., 2003)
 - 13 d. Motor systems (Ch. 8; Ch. 15, 543-545; Youdim & Riederer, 1997; Follett, 2000)

16 SECOND EXAM

Motivation

- 23 a. Water intake (Ch. 12, 394-403)
- 25 b. Food intake (Ch. 12, 403-429; Badman & Flier, 2005)
- 30 c. Sleep and arousal (Ch. 9)
- Nov. 1 d. Sexual behavior and sex differences (Ch. 10, 328-357; Cahill, 2005)
- 2 e. Reinforcement and addiction (Ch. 13, 454-458; Ch. 18; Nestler & Malenka, 2004; Deroche-Gamonet et al., 2004; Grimm et al., 2001; Siegel et al., 1982; Dackis & O'Brien, 2005)

10 **Excitotoxicity, Strokes, Recovery of Function, Transplants, Neurogenesis, and Growth Factors** (Ch. 15, 518-528 & 546; Kemp & McKernan, 2002; Björklund & Lindvall, 2000; Freed et al., 2001; Gage, 2003; Mirescu et al., 2004; Specter, 2001; Leuner et al., 2006; Kraft, 2005)

15 THIRD EXAM

Learning and Memory

- 17 a. Habituation and associative learning (Ch. 13, 430-458; Kandel, 2001; Tsien, 2000)
- 29 b. Memory (Ch. 13, 459-479; Riedel et al., 1999; Lee et al., 2004; Bechara et al., 1995)

Mental Illness and Stress

- Dec. 1 a. Depression (Ch. 16, 568-583; Blier & de Montigny, 1998; Santarelli et al., 2003)
6 b. Schizophrenia (Ch. 16, 550-568; Javitt & Coyle, 2004; Corbett et al., 1999)
8 c. Anxiety, stress, control, and health (Ch. 11; Ch. 17, 584-594 & 601-613; Sapolsky, 2003;
Bechara et al., 1995; Canli et al., 2002) **FINAL PROJECT DUE**

14 FINAL EXAM AT 8:00 A.M.

TENTATIVE LAB SCHEDULE

Week 1	(9/12)	Ethics of animal (and human) research (Ch. 1, 23-24; Bowd, 1980; Gallistel, 1981; Siegel et al., 1982; Freed et al., 2001)
Week 2	(9/19)	Psychopharmacology project: Use of EXCEL and RefWorks; Discussion of final projects
Week 3	(9/26)	Neuroanatomy lecture; Analysis of psychopharmacology project (continued)
Week 4	(10/3)	Sheep brain dissection and rat brains; Choose Final Project
Week 5	(10/10)	Use of stereotax; Demonstration of brain lesion (Ch. 5, 134-140)
Week 6	(10/17)	NO LAB (October break)
Week 7	(10/24)	Neurosurgery for final project
Week 8	(10/31)	Neurosurgery for final project: Work on final project
Week 9	(11/7)	Work on final project
Week 10	(11/14)	Work on final project
Week 11	(11/28)	Histology (Ch. 5, 140-150) and data analysis
Week 12	(12/5)	Neuroanatomy; FINAL PROJECT DUE ON DECEMBER 8

GRADING PROCEDURE

The following percentages will be given to each assignment in computing your final grade.

First Exam	17%
Second Exam	10%
Third Exam	17%
Quizzes and Lab and Class Participation	14%
Final Lab Project	17%
Final Exam	<u>25%</u>
	100%

RESERVED READINGS

- Badman, M. K., & Flier, J. S. (2005). The gut and energy balance: visceral allies in the obesity wars. *Science*, 307, 1909-1914.
- Basbaum, A. I., & Julius, D. (June, 2006). Toward better pain control. *Scientific American*, 60-67.
- Bechara, A., Tranel, D., Damasio, H., Adolphs, R., Rockland, C., & Damasio, A. R. (1995). Double dissociation of conditioning and declarative knowledge relative to the amygdala and hippocampus in humans. *Science*, 269, 1115-1118.
- Björklund, A., & Lindvall, O. (2000). Cell replacement therapies for central nervous system disorders. *Nature Neuroscience*, 3, 537-544.
- Blier, P., & de Montigny, C. (1998). Possible serotonergic mechanisms underlying the antidepressant and anti-obsessive-compulsive disorder responses. *Biological Psychiatry*, 44, 313-323.
- Bowd, A. D. (1980). Ethical reservations about psychological research with animals. *The Psychological Record*, 30, 201-210.
- Cahill, L. (May, 2005). His brain, her brain. *Scientific American*, 292, 40-47.
- Canli, T., Sivers, H., Whitfield, S. L., Gotlib, I. H., & Gabrieli, J. D. (2002). Amygdala response to happy faces as a function of extraversion. *Science*, 296, 2191.
- Corbett, R., Zhou, L., Sorensen, S. M., & Mondadori, C. (1999). Animal models of negative symptoms: M100907 antagonizes PCP-induced immobility in a forced swim test in mice. *Neuropsychopharmacology*, 21, 202-206.

- Dackis, C., & O'Brien, C. (2005). Neurobiology of addiction: treatment and public policy ramifications. *Nature Neuroscience*, 8, 1431-1436.
- Deroche-Gamonet, V., Belin, D., & Piazza, P. V. (2004). Evidence for addiction-like behavior in the rat. *Science*, 305, 1014-1017.
- Fields, R. D. (June/July, 2006). Beyond the neuron doctrine. *Scientific American*, 20-27.
- Follett, K. A. (2000). The surgical treatment of Parkinson's disease. *Annual Review of Medicine*, 51, 135-147.
- Freed, C. R., Greene, P. E., Breeze, R. E., Tsai, W. Y., DuMouchel, W., Kao, R., et al. (2001). Transplantation of embryonic dopamine neurons for severe Parkinson's disease. *New England Journal of Medicine*, 344, 710-719.
- Gage, F. H. (September, 2003). Repair yourself. *Scientific American*, 47-53.
- Gallistel, C. R. (1981). Bell, Magendie, and the proposals to restrict the use of animals in neurobehavioral research. *American Psychologist*, 36, 357-360.
- Grimm, J. W., Hope, B. T., Wise, R. A., & Shaham, Y. (2001). Neuroadaptation. Incubation of cocaine craving after withdrawal. *Nature*, 412, 141-142.
- Javitt, D. C., & Coyle, J. T. (January, 2004). Decoding schizophrenia. *Scientific American*, 290, 48-55.
- Kandel, E. R. (2001). The molecular biology of memory storage: a dialogue between genes and synapses. *Science*, 294, 1030-1038.
- Kemp, J. A., & McKernan, R. M. (2002). NMDA receptor pathways as drug targets. *Nature Neuroscience*, 5, 1039-1042.
- Kraft, U. (2005). Mending the spinal cord. *Scientific American Mind*, 16, 68-73.
- Lee, J. L., Everitt, B. J., & Thomas, K. L. (2004). Independent cellular processes for hippocampal memory consolidation and reconsolidation. *Science*, 304, 839-843.
- Leuner, B., Gould, E., & Shors, T. J. (2006). Is there a link between adult neurogenesis and learning? *Hippocampus*, 16, 216-224.
- Manzke, T., Guenther, U., Ponimaskin, E. G., Haller, M., Dutschmann, M., Schwarzacher, S., et al. (2003). 5-HT4(a) receptors avert opioid-induced breathing depression without loss of analgesia. *Science*, 301, 226-229.
- Marx, J. (2005). Neurodegeneration. Huntington's research points to possible new therapies. *Science*, 310, 43-45.
- Mirescu, C., Peters, J. D., & Gould, E. (2004). Early life experience alters response of adult neurogenesis to stress. *Nature Neuroscience*, 7, 841-846.
- Moles, A., Kieffer, B. L., & D'Amato, F. R. (2004). Deficit in attachment behavior in mice lacking the mu-opioid receptor gene. *Science*, 304, 1983-1986.
- Nestler, E. J., & Malenka, R. C. (March, 2004). The addicted brain. *Scientific American*, 290, 78-85.
- Oddo, S., Billings, L., Kesslak, J. P., Cribbs, D. H., & LaFerla, F. M. (2004). Abeta immunotherapy leads to clearance of early, but not late, hyperphosphorylated tau aggregates via the proteasome. *Neuron*, 43, 321-332.
- Rauschecker, J. P., & Shannon, R. V. (2002). Sending sound to the brain. *Science*, 295, 1025-1029.
- Riedel, G., Micheau, J., Lam, A. G. M., Roloff, E. v. L., Martin, S. J., Bridge, H., et al. (1999). Reversible neural inactivation reveals hippocampal participation in several memory processes. *Nature Neuroscience*, 2, 898-905.
- Rosenzweig, M. R., Breedlove, S. M., & Watson, N. V. (2005). *Biological psychology: an introduction to behavioral and cognitive neuroscience* (4th ed.). Sunderland, MA: Sinauer Associates.
- Santarelli, L., Saxe, M., Gross, C., Surget, A., Battaglia, F., Dulawa, S., et al. (2003). Requirement of hippocampal neurogenesis for the behavioral effects of antidepressants. *Science*, 301, 805-809.
- Sapolsky, R. (September, 2003). Taming stress. *Scientific American*, 87-95.
- Siegel, S., Hinson, R. E., Krank, M. D., & McCully, J. (1982). Heroin "overdose" death: Contribution of drug-associated environmental cues. *Science*, 216, 436-437.
- Specter, M. (July 23, 2001). Rethinking the brain. *The New Yorker*, 42-53.
- Tsien, J. Z. (2000). Linking Hebb's coincidence-detection to memory formation. *Current Opinion in Neurobiology*, 10, 266-273.
- Tsao, D. Y., Freiwald, W. A., Tootell, R. B., & Livingstone, M. S. (2006). A cortical region consisting entirely of face-selective cells. *Science*, 311, 670-674.
- Wolfe, M. S. (May, 2006). Shutting down Alzheimer's. *Scientific American*, 72-79.
- Youdim, M. B. H., & Riederer, P. (January, 1997). Understanding Parkinson's disease. *Scientific American*, 52-59.