

PHYSIOLOGICAL PSYCHOLOGY: 363

Fall, 2003

Lecture: 8:00 MWF

Lab: 1-4 T or W

Mr. John E. Kelsey
Instructor

Office: Pettingill 359
Phone: 786-6184

Office Hours: 9-10:30 T Th
and by appointment

Ms. Tina Rioux
Assistant in Instruction

Office: Carnegie 410
Phone: 786-8267

Office Hours: 10-11:30 M & W
and by appointment

REQUIRED TEXTS:

Carlson, N. R. (2004). *Physiology of behavior* (8th ed.). New York: Allyn and Bacon.

Pinel, J. P. J., & Edwards, M. (1998). *A colorful introduction to the anatomy of the human brain*. Needham Heights, MA; Allyn and Bacon.

Sept. 3 **Introduction:** What is physiological psychology? (C: Ch. 1)

Basics: Neuronal Transmission, Psychopharmacology, and Neuroanatomy

- 5 a. The neuron and axonal conduction (C: Ch. 2, 27-50; P: Ch. 3)
- 8 b. Synaptic transmission: EPSPs, IPSPs, and synaptic integration (C: Ch. 2, 50-65)
- 10 c. Neuropharmacology (C: Ch. 4, 100-111; Ch. 5, 149-152 & 155-159)
- d. Psychopharmacology
 - 12 (1) Acetylcholine and Alzheimer's disease (C: Ch. 4, 112-115; Ingram, 2003; Capsoni et al., 2000; P: 176-177 & 167-169)
 - 15 (2) Norepinephrine and depression (Ch. 4, 120-121)
 - 15 (3) Dopamine, Parkinson's disease, Huntington's disease, and schizophrenia (C: Ch. 4, 116-120; Ch. 8, 262-268; Youdim & Riederer, 1997; Freed et al. 2001; Follett, 2000; Cattaneo et al., 2002; P: 120-121 & 160-161)
 - 19 (4) Serotonin, glutamate, peptides, and others (C: Ch. 4, 121-130; Corbett et al., 1999; Kemp & McKernan, 2002)
- 23-24 (Lab) e. Neuroanatomy (C: Ch. 3; Ch 5, 137-145; P: Chs. 1-2 & 5-7)

24 **FIRST EXAM**

26 **Input and Output: Sensory and Motor Systems** (Rosenzweig et al., 1999, 189-202)

- a. Vision
 - 29 (1) Anatomy and coding (C: Ch. 6, 162-183; Ch. 5, 146-149; P: 129-133)
 - Oct. 3 (2) Perception (C: Ch. 6, 183-201; Zeki, 1993)
 - 6 b. Audition (C: Ch. 7, 202-219; Rauschecker & Shannon, 2002; P: 134-137)
 - 8 c. Somesthetic senses (C: Ch. 7, 222-233; Vogel, 2000; Manzke et al., 2003; P: 138-148)
 - 10 d. Motor systems (C: Ch. 8; Youdim & Riederer, 1997; Follett, 2000; P: Ch. 9)

13 **SECOND EXAM**

Motivation

- 20 a. Water intake (C: Ch. 12, 373-382; P: 94-99 & 186-187)

- 22 b. Food intake (C: Ch. 12, 382-409; Wisse & Schwartz, 2003; Woods et al., 1998; P: 183-185)
- 27 c. Sleep and arousal (C: Ch. 9; P: 192-195; Mieda & Yanagisawa, 2002; Mednick et al., 2003)
- 29 d. Reinforcement and addiction (C: Ch. 13, 444-450 & Ch. 18; Ch. 5, 152-155; Nestler et al., 2000, Ch. 16; Grimm et al., 2001; Siegel et al., 1982; Vorel et al., 2001; P: 188-189)
- Nov. 3 e. Sexual behavior and sex differences (C: Ch. 10, 308-336; Kimura, 2002; P: 196-201)

5 **Excitotoxicity, Strokes, Recovery of Function, Transplants, and Growth Factors** (Fisher, 1999; Björklund & Lindvall, 2000; Freed et al., 2001; Gage, 2003; Specter, 2001; Olson, 2000; Wickelgren, 2002)

10* **THIRD EXAM**

Learning and Memory

- 14 a. Habituation and associative learning (C: Ch. 13; Kandel, 2001; Tsien, 2000)
- 17 b. Memory (C: Ch. 14; Riedel et al., 1999; Bechara et al., 1995; P: Ch. 10)

Mental Illness and Stress

- 21 a. Depression (C: Ch. 16, 532-545; Blier & de Montigny, 1998; Santarelli et al., 2003)
- Dec. 3 b. Schizophrenia (C: Ch. 16, 515-532; Sawa & Snyder, 2002; Corbett et al., 1999; Shi et al., 2003)
- 5 c. Anxiety, stress, control, and health (C: Chs. 11 & 17; Sapolsky, 2003; Canli et al., 2002; Ader, 2001; P: 190-191 & 212-213)

5 **FINAL PROJECT DUE**

11 **FINAL EXAM AT 8:00 A.M.**

* I will be out of town November 10-12.

TENTATIVE LAB SCHEDULE:

- Week 1 (9/8) Ethics of animal (and human) research (C: Ch 1, 20-21 & 453-455; Bowd, 1980; Gallistel, 1981; Siegel et al., 1982; Freed et al., 2001)
- Week 2 (9/15) Psychopharmacology project: Use of EXCEL and ENDNOTE; Discussion of final projects
- Week 3 (9/22) Neuroanatomy lecture; Analysis of psychopharmacology project (continued)
- Week 4 (9/29) Sheep brain dissection and rat brains; **Choose Final Project**
- Week 5 (10/6) Use of stereotax; Demonstration of brain lesion (C: Ch. 5, 131-137)
- Week 6 (10/13) **NO LAB** (October break)
- Week 7 (10/20) Neurosurgery for final project
- Week 8 (10/27) Neurosurgery for final project: Work on final project
- Week 9* (11/3) Work on final project
- Week 10 (11/10) Work on final project

Week 11 (11/17) Histology (C: Ch. 5, 137-143) and data analysis
Week 12 (12/1) Neuroanatomy; **FINAL PROJECT DUE ON DECEMBER 5**

GRADING PROCEDURE:

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

First Exam	18%
Second Exam	10%
Third Exam	18%
Lab and Class Participation	10%
Final Lab Project	18%
Final Exam	<u>26%</u>
	100%

RESERVED READINGS (the articles marked by an asterisk are not available on-line)

- Ader, R. (2001). Psychoneuroimmunology. *Current Directions in Psychological Science*, 10, 94-98.
- 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.
- 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.
- *Capsoni, S., Ugolini, G., Comparini, A. Ruberti, F., Beradi, N., & Cattaneo, A. (2000). Alzheimer-like neurodegeneration in aged antinerve growth factor transgenic mice. *Proceedings of the New York Academy of Sciences*, 97, 6826-6831.
- Cattaneo, E., Rigamonti, D., & Zuccato, C. (May 2002). The enigma of Huntington's disease. *Scientific American*, 93-97.
- *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.
- *Fisher, M. (1999). Neuroprotection of acute ischemic stroke: where are we? *Progress in Clinical Neuroscience*, 5, 392-401.
- 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., Dillon, S., Winfield, H., Culver, S., Trojanowski, J. Q., Eidelberg, D., & Fahn, S. (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.
- Grimm, J. W., Hope, B. T., Wise, R. A., & Shaham, Y. (2001). Neuroadaptation. Incubation of cocaine craving after withdrawal. *Nature*, 412, 141-142.
- Gura, T. (2000). Tracing leptin's partners in regulating body weight. *Science*, 287, 1738-1741.
- Ingram, V. (2003). Alzheimer's disease. *American Scientist*, 91, 312-321.
- Jacobs, B. L., van Praag, H., & Gage, F. H. (2000). Depression and the birth and death of brain cells. *American Scientist*, 88, 340-345.
- 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.
- *Kimura, D. (2002). Sex differences in the brain, *The hidden mind - Spring 2002* (pp. 32-37). New York, NY: W. H. Freeman.
- Manzke, T., Guenther, U., Ponimaskin, E. G., Haller, M., Dutschmann, M., Schwarzacher, S., & Richter, D. W. (2003). 5-HT₄(a) receptors avert opioid-induced breathing depression without loss of analgesia.[comment]. *Science*, 301, 226-229.
- Mednick, S., Nakayama, K., & Stickgold, R. (2003). Sleep-dependent learning: a nap is as good as a night. *Nature Neuroscience*, 6, 697-698.
- Mieda, M., & Yanagisawa, M. (2002). Sleep, feeding, and neuropeptides: roles of orexins and orexin receptors. *Current Opinion in Neurobiology*, 12, 339-345.
- *Nestler, E. J., Hyman, S. E., & Malenka, R. C. (2001). Molecular neuropharmacology: a foundation for clinical neuroscience. New York: McGraw-Hill.
- 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., de Hoz, L., Poeschel, B., McCulloch, J., & Morris, R. G. M. (1999). Reversible neural inactivation reveals hippocampal participation in several memory processes. *Nature Neuroscience*, 2, 898-905.
- *Rosenzweig, M. R., Leiman, A. L., & Breedlove, S. M. (1999). Biological psychology (2nd ed.). Sunderland, MA: Sinauer, 189-202.
- Santarelli, L., Saxe, M., Gross, C., Surget, A., Battaglia, F., Dulawa, S., Weisstaub, N., Lee, J., Duman, R., Arancio, O., Belzung, C., & Hen, R. (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.
- Sawa, A., & Snyder, S. H. (2002). Schizophrenia: diverse approaches to a complex disease. *Science*, 296, 692-695.
- Shi, L., Fatemi, S. H., Sidwell, R. W., & Patterson, P. H. (2003). Maternal influenza infection causes marked behavioral and pharmacological changes in the offspring. *Journal of Neuroscience*, 23, 297-302.
- *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.
- Vogel, G. (2000). Hot pepper receptor could help manage pain. *Science*, 288, 241-242.
- Vorel, S. R., Liu, X., Hayes, R. J., Spector, J. A., & Gardner, E. L. (2001). Relapse to cocaine-seeking after hippocampal theta burst stimulation. *Science*, 292, 1175-1178.
- Wickelgren, I. (2002). Neuroscience. Animal studies raise hopes for spinal cord repair. *Science*, 297, 178-181.
- Wisse, B. E., & Schwartz, M. W. (2003). The skinny on neurotrophins. *Nature Neuroscience*, 6, 655-656.
- Woods, S. C., Seeley, R. J., Porte Jr., D. P., & Schwartz, M. W. (1998). Signals that regulate food intake and energy homeostasis. *Science*, 280, 1378-1383.
- Youdim, M. B. H., & Riederer, P. (January 1997). Understanding Parkinson's disease. *Scientific American*, 52-59.
- *Zeki, S. (1993). The visual image in mind and brain. In *Mind and brain* (27-39). New York, NY: W. H. Freeman.