

***NRO B60H3F***  
***FALL, 2003***  
***NEUROSCIENCE I: CELL ANATOMY AND PHYSIOLOGY***

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Professor: Dr. Gwen O. Ivy

Office: S569

Office Hours: Tuesday: 5-6 p.m.; Thursday: 5-6 p.m., Friday: 3-4 pm or by appointment. (Note: I teach in B-382 Friday 1-3pm and may be detained by getting to my office)

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**Textbook:** Neuroscience by D. Purves, et al (eds). Second Edition, 2001  
May be purchased in the bookstore

**Lab Text:** The Sheep Brain: A Photographic Series by C.H. Vanderwolf and Richard K. Cooley (May be purchased in the bookstore).

**Lectures:** T 4-5 p.m. S319  
R 3-5 p.m. S319

**Labs:** P0001 T 2-4 p.m. S250  
P0002 W 7-9 p.m. S250  
P0003 F 10-12 noon S250  
P0004 F 12-2 pm S250  
P0005 W 7-9pm S248  
P0006 F 10-12noon S248

TA's: Mani Vessal & Janelle LeBoutillier

***Course Description***

Neuroscience is the scientific study of nervous systems. It includes study of the nature and functioning of the nervous system at all levels, from the molecules that make up individual nerve cells and the transfer of information from one nerve cell to another, to the complexities of how thoughts, emotions and behaviours are produced.

Neuroscience is at the interface between biology and psychology. It is unique in that it makes use of a variety of methods and investigations from a wide range of traditional disciplines. To understand the nervous system and how it works requires knowledge of anatomy, molecular biology, biochemistry, pathology, physiology, pharmacology, psychology and zoology.

Neuroscience I is a fairly sophisticated introduction to the field of neuroscience; a virtual springboard from which to enter all of the other Neuroscience courses in our program. As well, this course can provide a physiological foundation for many of our Psychology courses and interdigitates nicely with many of our biology courses. We will cover the gross as well as cellular structure and function of the nervous system in depth. In particular, we will study the cellular and molecular biology of nervous system components, including: neurons, glial cells, meninges, choroid plexus, blood brain barrier, ventricular and vascular systems. We will definitely focus on the major cell of the nervous system - the neuron!

We will explore neuronal physiology at the cell and molecular levels in order to better understand the complex mechanisms of intercellular communication in the nervous system, including electro-chemical transformations at the synapse, different types of receptor mechanisms and neuroregulation at the DNA level. Finally, we will briefly cover the development of the vertebrate nervous system.

The laboratory will cover gross and systems anatomy of the nervous system. We will dissect sheep brains and will examine a wide variety of nervous system structures in 3-D. The fine histology and function of several systems, as well as several neuroanatomical techniques will be discussed and/or demonstrated. Students should bring their own dissecting equipment. This usually consists of a small pair of scissors, tweezers, a scalpel and a "blunt dissection instrument" like a small metal or plastic rod (certain coffee stirrers may work, or nail files). The labs may also include discussion of scientific articles to be handed out at appropriate times. Gloves will be provided in the labs at a cost of .25¢ per pair.

Altogether, this course lays the framework for understanding subsequent neuroscience courses. We will begin to understand how the activity of even small groups of neurons can lead to the activity of circuits specialized for all of our sensations, movements, specific goal directed behaviours, emotions, and ultimately, we hope, cognition.

### *Grading*

- 20% Midterm Exam I: Multiple Choice, Short Answer  
Week of October 6, 2003 - exact place and date TBA by Registrar  
(material covered to date from lectures & text chapters 1, 2 and 3)
- 30% Lab Quizzes: After your first week of lab (which comes during the second week of classes) you will be given 5 "pop" (i.e. surprise!) quizzes throughout the semester. You will be asked to answer questions or identify structures on pictures of a sheep brain or on an actual sheep brain regarding material that you have previously covered.  
NOTE: these quizzes will be cumulative in the sense that in the 5<sup>th</sup> week (10<sup>th</sup>

week, etc) you may be asked about any material taught up to that point. Each TA will make up his/her own quizzes and will decide when to "pop" them. Thus, each lab section will be tested 5 times out of 10 meetings, in random order, to ensure that students attend labs and keep up with the material. Grades from each lab section will later be standardized to ensure that no lab section is more difficult than another. An absence counts as a 0% unless a doctor's note, etc., is presented to your T.A. Your lowest quiz mark will be dropped and your lab grade will be based on the average of your four best quizzes.

25% Midterm Exam II: Multiple choice, Short Answer. 2 Hours.  
Week of November 3, 2003. Exact place and date to be made by Registrar.  
[Material covered since first midterm from lecture & text.]

25% Final Exam: Multiple choice, short answers  
3 hours during Final Exam Period, TBA by Registrar, Dec. 9-19.  
[Material from lectures & text (not from Labs) covered  
**SINCE** Midterm Exam II.]

**Itinerary - NRO B60H3F**

|   |          |   |
|---|----------|---|
| T | Sept. 9  | <u>Introduction</u> to course; no labs this week.                     |
| R | Sept. 11 | <u>Chapter 1: The Organization of the Nervous System</u><br>(Pp 1-15) |
| T | Sept. 16 | Chapter 1 (cont'd.) (pp 15-26 briefly; pp 26-29)                      |
| R | Sept. 18 | Chapter 1 (cont'd.) (pp 33, 38-39, 32 + 445 + 477). Begin Chapter 2.  |
| T | Sept. 23 | <u>Chapter 2 Electrical Signals of Nerve Cells</u> (pp 42-51)         |
| R | Sept. 25 | Chapter 2 (cont'd.) (pp 51 -56)                                       |
| T | Sept. 30 | <u>Chapter 3: Voltage-Dependent Membrane Permeability</u> (pp 57-65)  |
| R | Oct. 2   | Chapter 3 (cont'd.) (pp 65-76)  |

***OCT 6th week Mid term I (20% of grade) (TBA by the Registrar)***

|   |         |   |
|---|---------|---|
| T | Oct. 7  | Chapter 4: Channels and Transporters (pp 77-84) |
| R | Oct. 9  | Chapter 4 (cont'd.) (pp 85-97)                  |
| T | Oct. 14 | Chapter 4 (cont'd.) (pp 90, 92-93)              |
| R | Oct. 16 | Chapter 5: Synaptic Transmission (pp 99-106)    |
| T | Oct. 21 | Chapter 5 (cont'd.) (pp 106-110)                |
| R | Oct. 23 | Chapter 5 (cont'd.) (pp 111-115)                |
| T | Oct. 28 | Chapter 6: Neurotransmitters (pp 117-123)       |
| R | Oct. 30 | Chapter 6 (cont'd.) (pp 123-135)                |

**November 3- last day to cancel class**

***November 3<sup>rd</sup> week Midterm II (25% of grade)(TBA by Registrar)***

|   |            |  |
|---|------------|--|
| T | Nov. 4     | Chapter 6 (cont'd.) (pp 135-140)                                     |
| R | Nov. 6     | Chapter 7: Neurotransmitter Receptors and Their Effects (pp 141-150) |
| T | Nov. 11    | Chapter 7 (cont'd.) (pp 150-159)                                     |
| R | Nov. 13    | Chapter 7 (cont'd.) (pp 156-163)                                     |
| T | Nov. 18    | Chapter 8: Intracellular Signal Transduction (pp 165-172)            |
| R | Nov. 20    | Chapter 8 (cont'd.) (pp 172-181)                                     |
| T | Nov. 25    | Chapter 8 (cont'd.) (pp 181-185)                                     |
| R | Nov. 27    | Review for Final Exam  |
| M | Dec. 1     | <b><i>Last Day of Classes</i></b>                                    |
|   | Dec. 9- 19 | <b><i>Final Exam Period, date TBA<br/>25% of grade</i></b>           |

**Neuroscience I: Cell Anatomy and Physiology  
NROB60F - Laboratory Schedule (Fall, 2003)**

**(1) Week of 9/16/03**

Lecture

- a) planes of view
- b) planes of sectioning
- c) basic gross anatomy
- d) meninges (Purves, p. 33)
  - ❖ Atlas pages 15, 42-48

Dissection

- a) review of lab rules
- b) assignment of sheep brains

**(2) Week of 9/23/03**

Lecture

- a) cerebrovasculature
- b) blood brain barrier  
(Purves, p. 38, Box E)
  - ❖ Atlas pages 16 & 17

Dissection

- a) removal of meninges and external blood vessels
- b) major sulci and gyri

**(3) Week of 9/30/03**

Lecture

- a) cranial nerves & functions
- b) review of select ventral surface structures
  - ❖ Atlas pages 18-20, 69

Dissection

- a) ventral surface structures
- b) mid-sagittal section & return of right hemisphere

**(4) Week of 10/07/03**

Lecture

- a) ventricular system
  - ❖ Atlas pages 21-24

Dissection

- a) mid-sagittal structures
- b) hippocampal dissection

**(5) Week of 10/14/03**

Lecture

- a) tissue preparation
- b) staining methods
  - ❖ Atlas pages 25 & 26, 54-62.

Dissection

- a) cerebellar dissection
- b) completion of gross dissections

**(6) Week of 10/21/03**

Lecture

- a) laminated vs. unlaminated
- b) neocx cytoarchitecture
  - ❖ Atlas pages 28, (29 & 30 = horizontal), 58

Dissection

- a) rostral coronal sections

(7) Week of 10/28/03

Lecture

a) hippocampus

❖ Atlas pages 34-37, 94-99

Dissection

a) caudal coronal sections

(8) Week of 11/04/03

Lecture

a) cerebellum

❖ Atlas pages 38-40, 82-83

Dissection

a) cerebellar coronal sections

(9) Week of 11/11/03

Lecture

a) Question & Answer

Dissection

a) review

(10) Week of 11/18/03

**Lab Exam (15% overall) : date TBA by registrar**

❖ Examination will be cumulative

❖ There will be NO labs this week.

(11) Week of 11/25/03

**Final week of classes : NO LABS.**