W2480y. The Developing Brain
Spring 2014: 3 pts. F. Champagne MW 10:10-11:25 AM. Room 614 Schermerhorn Hall
Prerequisite: Psychology W1001 or W1010 or the instructor's permission.
*Brain development across the life span, with emphasis on fetal and postnatal periods. How the environment shapes brain development and hence adult patterns of behavior.*

**Course Description**
This course is designed to provide students with an understanding of the process of brain development from embryogenesis through adulthood with emphasis on the role of the environment in directing this process. In the first 7 weeks of lectures, the origins of the central nervous system will be discussed. Topics will include the regional organization of the brain, neurogenesis, cellular differentiation, migration and targeting of neurons, synapse formation and refinement of the nervous system. In the second half of the course, lectures will focus on the infant brain and the role of experiences during infancy in modifying brain function. Topics will also include recent advances in our understanding of the role of gene-environment interactions and epigenetic programming and shaping brain development. Finally, the adaptive vs. maladaptive outcomes of environmental modifications to the nervous system will be discussed. Throughout the course, students will be guided through examples of how changes in the developing nervous system lead to behavioral patterns both in infancy and adulthood.

**Course Evaluation**
Grading: Midterm exam (30%), final exam (40%), and a short (6-8pages) term paper (30%).

**Textbook & Readings**

**Textbook:**

The required readings will consist of: (1) chapters from a textbook on brain development and (2) additional chapters/papers that provide literature reviews on specific topics (these will be posted on Courseworks)
Schedule of Topics

WEEK 1
Course introduction, overview of brain development (Jan 22)
Basic principles of neuroscience (Jan 27)
**READINGS:**
*Introduction to Neurons, Brains, and Biological Psychology*, Chapter 1 (page 1-54)

WEEK 2
Influence of environment on brain development prior to fertilization (Jan 29)
**READINGS:**


Maternal regulation of early embryonic development (Feb 3)
**READINGS:**


WEEK 3

Regional organization of the embryo & segmentation in the central nervous system (Feb 5 & Feb 10)

READINGS:
Development of the Nervous System Chapters 1 - 2

WEEK 4

Generation of neurons (Feb 12)

READINGS:
Development of the Nervous System Chapter 3

Cellular differentiation (Feb 17)

READINGS:
Development of the Nervous System Chapter 4

WEEK 5

Guidance and growth of axons (Feb 19)

READINGS:
Development of the Nervous System Chapter 5

Selecting targets for neural connection (Feb 24)

READINGS:
Development of the Nervous System Chapter 6

WEEK 6

Death & survival of neurons (Feb 26)

READINGS:
Development of the Nervous System Chapter 7

Synapse formation (Mar 3)

READINGS:
Development of the Nervous System Chapter 8

WEEK 7

Midterm review (Mar 5)

MIDTERM EXAM (Mar 10)

WEEK 8

Refinement of the nervous system (Mar 12)

READINGS:
Development of the Nervous System Chapter 9
**Behavioral development (Mar 24)**

**READINGS:**

*Development of the Nervous System* Chapter 10

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**WEEK 9**

**Prenatal programming of the infant brain (Mar 26)**

**READINGS:**


**Epigenetic influence on brain development (Mar 31)**

**READINGS:**


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**WEEK 10**

**Neurotransmitters and hormones (Apr 2)**

**READINGS:**


**Maternal vs. paternal influences on brain development (Apr 7)**

**READINGS:**


**WEEK 11**

**Sex differences in brain development (Apr 9)**

**READINGS:**


**Reward and the brain (Apr 14)**

**READINGS:**


**WEEK 12**

**Immune system and the brain (Apr 16)**

**READINGS:**


**Gene-environment interactions in the CNS (Apr 21)**

**READINGS:**


**WEEK 13**

**The adolescent brain (April 23)**

**READINGS:**


**Plasticity in the adult brain (Apr 28)**

**READINGS:**


**Final review (Apr 30 & May 5)**