W2480 The Developing Brain
Fall 2016: 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 pages) 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**

WEEK 2

**Basic principles of neuroscience**

**READINGS:**
*Introduction to Neurons, Brains, and Biological Psychology*, Chapter 1 (page 1-54)

**Influence of environment on brain development prior to fertilization**

**READINGS:**


WEEK 3

**Maternal regulation of early embryonic development**

**READINGS:**


WEEK 4

Regional organization of the embryo & segmentation in the central nervous system
READINGS:
Development of the Nervous System Chapters 1 - 2

Generation of neurons
READINGS:
Development of the Nervous System Chapter 3

WEEK 5

Cellular differentiation
READINGS:
Development of the Nervous System Chapter 4

Guidance and growth of axons
READINGS:
Development of the Nervous System Chapter 5

WEEK 6

Selecting targets for neural connection
READINGS:
Development of the Nervous System Chapter 6

Death & survival of neurons
READINGS:
Development of the Nervous System Chapter 7

WEEK 7

Synapse formation
READINGS:
Development of the Nervous System Chapter 8

Midterm review

WEEK 8

MIDTERM EXAM

Refinement of the nervous system
READINGS:
Development of the Nervous System Chapter 9
WEEK 9

Behavioral development

READINGS:

*Development of the Nervous System* Chapter 10

WEEK 10

Prenatal programming of the infant brain

READINGS:


Epigenetic influence on brain development

READINGS:


WEEK 11

Neurotransmitters and hormones

READINGS:


Maternal vs. paternal influences on brain development

READINGS:


WEEK 12

Sex differences in brain development

READINGS:


Reward and the brain

READINGS:


WEEK 13

Immune system and the brain

READINGS:


Gene-environment interactions in the CNS

READINGS:


**WEEK 14**

**The adolescent brain**

**READINGS:**


**Plasticity in the adult brain**

**READINGS:**


**WEEK 15**

**Final review**

**FINAL EXAM: TBA**