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## NATURE VS. NURTURE: GENETIC & ENVIRONMENTAL DETERMINANTS OF BEHAVIOR

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**Professor:** Dr. Tania Roth

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Office Hours: Wolf Hall 131, Mondays 3-5p, and by appointment

**Class Meetings:** MWF 10:10-11:00a, ISE 307

**Course description:** This course will examine the contribution of biological and environmental determinants to individual differences in behavior and disease. Students will also be introduced to the interdisciplinary field of behavioral epigenetics, which combines behavioral and developmental sciences, neuroscience, and psychiatry to study the roles of genes and the environment in a variety of complex behaviors in humans and animals, including attachment, memory, emotion, stress, and psychiatric disorder.

### Course objectives will include:

- To understand that phenotypes (behavior and disease) are a product of both genetic and environmental influences.
- To understand the basic principles and methods used in a new interdisciplinary field (*epigenetics*) aimed at understanding gene-environment interplay in phenotypic outcome.
- To survey current clinical and basic research regarding genes, environmental influences, and their interaction on behavior and disease.

### Course materials:

Textbook: David S. Moore (2015). *The Developing Genome*. Oxford University Press.

Additional readings are posted on the course website (Sakai). Assigned readings are mandatory and must be read prior to the class for which they are assigned.

**Course format:** My lectures will cover background rationale for course material, an introduction to specific topics, and the basic molecular biology and neuroscience necessary for understanding literature. Yes, I will post my power points prior to each lecture. Professor and student led discussions of empirical reports will compliment lecture content. You are expected to read and think about the assigned readings (book content and empirical reports) before each class. You are also expected to actively participate in class lecture and discussions. You cannot be an active participant if you are not here. Bottom line- come to class and bring the reading materials with you!

If you miss a lecture, you are responsible for obtaining lecture/discussion notes from one of your classmates.

Tests are scheduled far in advance. If you have a conflict with a test date because of a sporting event, religious holiday, military duty, or attendance at a scientific conference, let me know this in email by the 2<sup>nd</sup> week of the semester. If you miss an exam because of a family emergency or illness, you must notify me immediately via email, preferably before the exam, but no later than 24 hours after the missed exam. If you have not contacted me within this 24hr period, I'll need

a note from the Dean's office regarding an excused absence. Permission for a make-up exam will be at my discretion and scheduled at my convenience.

**Assessment and grading:** Your course grade will be based on a total of 425 points.

4 exams, each worth 75 pts

*Exam format: multiple choice, short answer, essay.*

1 writing assignment – 50 pts

1 presentation – 25 pts

Class participation – 50 pts

Class participation – 50 pts These points come from completing assignments (3@5 pts max each = 15), asking/submitting questions for article discussions (5@3 pts max each=15), and speaking up in class/class attendance (20).

**No extra credit will be available, so do not ask.**

**I will not respond to requests asking what you need to get in order to reach a particular grade.**

**If you are interested in tracking your progress you can always find your grades on the Sakai course page. Calculating your own grade is a simple process- just add your total points earned and divide by the total points possible.**

**I do not calculate grades until the end of the semester. Grades are determined by strict point thresholds.**

#### Grade scale

Letter	Percentage	Points
A	100-95%	425-402
A-	94-90%	401-381
B+	89-87%	380-368
B	86-83%	367-355
B-	82-80%	354-338
C+	79-77%	337-326
C	76-73%	325-313
C-	72-70%	312-296
D+	69-67%	295-283
D	66-63%	282-270
D-	62-60%	269-253
F	59-0%	252-

**Presentation:** This project has been designed to give you some experience at giving oral presentations and critically reviewing scientific research. Student led seminars will consist of a group-led detailed description of a single published research article (chosen by the professor) describing an experiment/study related to topics in this course. **Additional guidelines will be available on Sakai.** Your grade will be based on presentation, clarity, and your understanding of the article. Your presentation is worth 25 pts.

*After the first week of class, you will be assigned a date/group for your article presentation.*

**Article discussion questions:** To earn participation points, you can also submit discussion questions. If your question is deemed to have significant thought behind it (clear to me you have read the article and thought about it), you will receive 3 pts for the question. **There are a total of 20 article presentations/discussions this semester (professor or student-led), so to earn the maximum amount of points allocated for questions (15), you need to submit 1 question for 5 separate articles.**

**How this will work:** You will 1) bring your question with you to class; 2) ask the question during the article discussion; and, 3) at the end of class, hand-in your question to the professor on a piece of paper with your name.

I want big picture type questions, not something that was easily answered if you actually took the time to read the article, or a rehash of future directions/questions written by the authors of the article.

You cannot submit a question for the article you present.

**Writing assignments:** This assignment has been designed to give you some experience at scientific writing, in which you will summarize a block of information in a concise, organized manner. You will need to find 1 recent (published 2013 or after) empirical (where authors have conducted an actual study/series of experiments, not a literature review) article that is relevant to any of the ideas/research we have discussed, and must be relevant to the course (i.e. examining genetic, environmental, or epigenetic influences on behavior and disease). It cannot be one listed on the syllabus/presented in class. You will write a 2 page summary of the article, in which you will summarize the article (question addressed, overview of methods, results and conclusion) and discuss how it relates to this course and understanding biological and environmental determinants to individual differences in behavior and disease. **Additional guidelines will be available on Sakai.**

Your summary is worth 50 pts.

Your article summary is due: **Oct 31** – Please hand in to the professor at beginning of class, with the article attached.

**Late summaries- You will lose 10 pts per day for each day it is late. Note, computer/printer problems do not constitute an excuse for late work. So start this assignment early to have sufficient time to deal with such problems.**

**Statement for students with disabilities:** Any student who thinks he/she may need an accommodation based on a disability should contact me personally as soon as possible, as well as contact the Disability Support Service (DSS) office. The DSS office is located at 119 Alison Hall, Phone: 302-831-4643, [www.udel.edu/DSS](http://www.udel.edu/DSS).

**Statement on academic integrity:** “All students must be honest and forthright in their academic studies. To falsify the results of one's research, to steal the words or ideas of another, to cheat on an assignment, or to allow or assist another to commit these acts corrupts the educational process. Students are expected to do their own work and neither give nor receive unauthorized assistance. Any violation of this standard will be reported to the Office of Student Conduct.”

**Statement regarding cell phones:** Silence your cell phone during class. Using your cell phone during an exam will result in the immediate expulsion from the exam.

Date	Topic	Material	Lecturer/leaders
Aug 31	Syllabus review		Dr. Roth
Sept 2	Overview of history of nature nurture debate	Lecture notes, Ch1-3	Dr. Roth
Sept 5	Labor Day- No classes		
Sept 7	History cont'd <b>Assignment 1 (available on Sakai) due at beginning of class</b>	Lecture notes, Ch1-3	Dr. Roth
Sept 9	From genetics to epigenetics	Lecture notes, Ch1-3	Dr. Roth
Sept 12	Study designs and genetic and environmental influences	Lecture notes	Dr. Roth
Sept 14	Study designs continued	Lecture notes	Dr. Roth
Sept 16	Early environment and structural CNS changes article	Sakai	Dr. Roth
Sept 19	Early environment and brain/behavior changes article	Sakai	Dr. Roth
Sept 21	Heritability of phenotypes article	Sakai	Dr. Roth
Sept 23	Brain responsivity in PTSD article	Sakai	###
Sept 26	Life stress and executive function article	Sakai	###
Sept 28	<b>Test 1</b>		
Sept 30	What genes do and their responses	Lecture notes, Ch4-7	Dr. Roth
Oct 3	What genes do cont'd	Lecture notes, Ch4-7	Dr. Roth
Oct 5	Gene response to traumatic experience article	Sakai	Dr. Roth
Oct 7	Gene responses in the brain to chronic stress article	Sakai	###
Oct 10	Susceptibility genes in behavior	Lecture notes	Dr. Roth
Oct 12	Genotype and attachment behavior article	Sakai	###
Oct 14	Genotype and learned behavior article	Sakai	Dr. Roth
Oct 17	Genotype and prosocial decision making article	Sakai	###
Oct 19	<b>Test 2</b>		
Oct 21	Gene-environment interactions	Lecture notes, Ch8-11	Dr. Roth
Oct 24	The classic Caspi studies (2002, 2003)	Sakai	Dr. Roth
Oct 26	5HTT GxE article (adolescent emotional problems)	Sakai	###
Oct 28	<i>Crf1</i> GxE article (adult depression)	Sakai	### or Dr. Roth
Oct 31	<i>Bdnf</i> GxE article (attention problems) <b>Writing assignment due at beginning of class</b>	Sakai	###
Nov 2	<i>COMT</i> GXE article	Sakai	Dr. Roth
Nov 4	Telomeres	Sakai	Dr. Roth
Nov 7	Childhood adversity and cellular aging article	Sakai	###
Nov 9	<b>Test 3</b>		
Nov 11	Read Ch 12-23, Complete Assignment 2 (posted on Sakai)		
Nov 14	Read Ch 12-23, Complete Assignment 2 (posted on Sakai)		
Nov 16	Read Ch 12-23, Complete Assignment 2 (posted on Sakai)		
Nov 18	Epigenetics to understand GxE interactions <b>Assignment 2 due at beginning of class</b>	Lecture notes, Ch12-23	Dr. Roth
Nov 21-25	Thanksgiving Holiday- no classes		
Nov 28	Epigenetics of maternal behavior article	Sakai	Dr. Roth

Nov 30	Memory and epigenetics article	Sakai	###
Dec 2	Diet and epigenome article	Sakai	###
Dec 5	Transgenerational epigenetics article <b>Assignment 3- in class activity</b>	Sakai	Dr. Roth
Dec 7	Stress and human epigenome article	Sakai	### (schedule 2 groups if need be)
Dec 9	<b>Test 4</b>		