Biology 3422: Genes, Brains, and Behavior
Genetic studies of physiological systems underlying animal behavior, including the genetic basis for normal and abnormal behaviors in animals and humans. Topics include: history of behavioral genetics; the ongoing debate about “nature vs. nurture”; contributions of genetic model systems including the nematode Caenorhabditis elegans, the fruit fly Drosophila melanogaster, the mouse Mus musculus, and other animal models; molecular mechanisms underlying the evolution of behavioral phenotypes; the emerging role of epigenetics in regulating nervous-system functions and behavior; the use of genetic and genomic analyses in studies of human behavior and psychiatric disorders. **Prerequisites:** Bio 2970.

**Class goals:** This course is designed to help upper level students who are interested in neuroscience and genetics understanding the role of the genome and the function of genes in regulating behavioral phenotypes. Students who take this course are expected to participate in informal discussions, and to read and comprehend primary research papers. By using behavior as a phenotype, a student should be able to master advanced concepts in modern genetics and molecular analyses of complex phenotypes. They should also achieve better understanding of how the nervous system functions at the cellular and molecular levels to produce behaviors. Furthermore, understanding how studies of behavior in simple organisms can affect our understanding of human behavior is important for realizing that behavior is a trait that is sensitive to natural selection and other evolutionary forces.

**Reading materials:**
Reading materials will be assigned from the primary literature. *No textbook will be required.*

**Meeting Times:**
Lectures are Mondays and Wednesdays; 11:00-12:00: Rebstock 322.
Discussion groups are Fridays 11:00-12:00:
A: McDonnell 212
B: McDonnell 412
C: Life Sciences 202
D: Life Sciences 310
E: Life Sciences 311

**Instructor:**
Yehuda Ben-Shahar: 935-3484; bensahary@wustl.edu
Monsanto Hall 411 (office hours by appointment)

**Teaching Assistants (office hours will be announced in first discussion session):**
A. Jun Hong; hong.j.p@wustl.edu
B. Derek Theisen; djtheisen@wustl.edu
C. Dennis Wu; denniswu@go.wustl.edu
D. Ross McKinney; ross.m.mckinney@gmail.com
E. Cassie Vernier; verniercass@gmail.com

**Class Website:**
http://www.nslc.wustl.edu/courses/Bio3422/bio3422.html

**Grading:**
*Exams and paper reports.* There will be two in-term exams (each represents 25% of the total grade). Each exam will emphasize materials introduced since the last exam but will also require synthesis of previous lectures. Final exam will include all covered materials with emphasis on lectures since midterm 2 (30% of total grade). Discussion sections will focus on analyses and discussions of primary literature. Students will be required to
write a short report on discussed articles (20% of total grade). Each student will also present one paper in class. Instructions for writing the report will be given in class.

**Syllabus:**

<table>
<thead>
<tr>
<th>Lecture</th>
<th>Date</th>
<th>Day</th>
<th>Topic</th>
<th>Readings</th>
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<tbody>
<tr>
<td>1</td>
<td>8/24/15</td>
<td>Mon</td>
<td>Introduction</td>
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<td>2</td>
<td>8/26/15</td>
<td>Wed</td>
<td>Behaving without a “brain”</td>
<td>Preer; Kung</td>
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<td>8/28/15</td>
<td>Fri</td>
<td>Journal club -TA</td>
<td>Huntington</td>
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<td>8/31/15</td>
<td>Mon</td>
<td>Behaving without a “brain” cont.</td>
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<td>4</td>
<td>9/2/15</td>
<td>Wed</td>
<td>The worm I</td>
<td>Brenner; Kaletta</td>
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<td>9/4/15</td>
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<td>Journal club Student 1</td>
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<td>9/7/15</td>
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<td>9/9/15</td>
<td>Wed</td>
<td>The worm II</td>
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<td>Journal club Student 2</td>
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<td>6</td>
<td>9/14/15</td>
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<td>The fruit fly I: Biology, genetic principles, and screens</td>
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<td>The fruit fly II</td>
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<td>The fruit fly III</td>
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<td>9</td>
<td>9/22/15</td>
<td>Wed</td>
<td>Courtship and mating behavior</td>
<td>Dickson; Baker</td>
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<td>Review for exam 1</td>
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<td>Exam I (Lectures 1-9)</td>
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<td>11</td>
<td>10/5/15</td>
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<td>The fruit fly: Natural variations</td>
<td>Mackay</td>
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<td>10/7/15</td>
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<td>Sociogenetics: The honey bee</td>
<td>Smith</td>
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<td>The mouse</td>
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<td>Olfaction</td>
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<td>10/19/15</td>
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<td>Learning and memory I</td>
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<td>10/21/15</td>
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<td>Learning and memory II</td>
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<td>The genetics of mammalian social behaviors</td>
<td>Donaldson</td>
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<td>10/28/15</td>
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<td>Eugenics (Dr. Gar Allen)</td>
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<td>Anxiety and depression</td>
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<td>11/4/15</td>
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<td>Genetics of addiction (Dr. Sarah Hartz)</td>
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<td>Sleep (Paul Shaw)</td>
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<td>Aggression and anti-social behaviors</td>
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<td>Behavioral epigenetics and imprinting</td>
<td>Miller</td>
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<td>26</td>
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<td>Wed</td>
<td>Genetic tools for manipulating neurons and behavior</td>
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**Final exam:** Dec 15 2015 10:30AM - 12:30PM