**Introduction to Biopsychology**

**Syllabus for Psychology 230 – Winter 2010**

The University of Michigan  
Ann Arbor, Michigan

Professor Kent Berridge  
Office: 4038 Psychology Dept, East Hall  
Email: berridge@umich.edu  
Office Hours: Wed 2:00-4:00 or by appointment

Lecture: Mon & Wed 11:30-1:00  
Lecture Room 1324 East Hall  
CTools web site: Psych 230

**DISCUSSION SECTION LEADERS (GSIs):**

Alexandra Difeliceantonio: agdife@umich.edu  
Caitlin Orsini: orsini@umich.edu  
Jocelyn Richard: jocelyri@umich.edu  
Mark Thomas: mbthomas@umich.edu

**DISCUSSION SECTIONS:**

<table>
<thead>
<tr>
<th>Section</th>
<th>Day &amp; Time</th>
<th>Room</th>
<th>GSI</th>
</tr>
</thead>
<tbody>
<tr>
<td>002</td>
<td>M 3-4 PM</td>
<td>1060 East Hall</td>
<td>Alexandra Difeliceantonio</td>
</tr>
<tr>
<td>003</td>
<td>M 5-6 PM</td>
<td>229 Dennison</td>
<td>Caitlin Orsini</td>
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<td>004</td>
<td>M 6-7PM</td>
<td>205 Dennison</td>
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<tr>
<td>005</td>
<td>T 8-9 AM</td>
<td>B239 East Hall</td>
<td>Alexandra Difeliceantonio</td>
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<tr>
<td>006</td>
<td>T 6-7PM</td>
<td>271 Dennison</td>
<td>Caitlin Orsini</td>
</tr>
<tr>
<td>007</td>
<td>W 9-10 AM</td>
<td>B247 East Hall</td>
<td>Alexandra Difeliceantonio</td>
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<tr>
<td>008</td>
<td>W 3-4 PM</td>
<td>Dennison</td>
<td>Jocelyn Richard</td>
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<td>009</td>
<td>T 6-6 PM</td>
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<td>Mark Thomas</td>
</tr>
<tr>
<td>010</td>
<td>TH 4-5PM</td>
<td>224 Dennison</td>
<td>Jocelyn Richard</td>
</tr>
<tr>
<td>011</td>
<td>F 9-10 AM</td>
<td>205 Dennison</td>
<td>Jocelyn Richard</td>
</tr>
<tr>
<td>012</td>
<td>F 10-11 AM</td>
<td>501 Dennison</td>
<td>Mark Thomas</td>
</tr>
<tr>
<td>013</td>
<td>F 12-1PM</td>
<td>501 Dennison</td>
<td>Mark Thomas</td>
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**COURSE DESCRIPTION:**

Biopsychology combines the traditional psychological fields of Behavioral Neuroscience (Physiological Psychology) with Behavioral Evolution & Animal behavior (Comparative Psychology). It is the study of how psychological processes relate to the brain and to evolution. Behavioral neuroscience is concerned with how brain processes cause psychological processes and behavior, and with how psychological events are encoded in the brain. Comparative psychology is concerned with how psychological processes have evolved, and how human psychology compares to psychological processes in other animals.

This 4-credit course surveys topics such as behavioral evolution, brain neurons and systems, and the function of brain systems in behavioral action, perception, motivation, and cognition. It is intended to provide broad exposure to biopsychology for the student who already has had introductory psychology. Some basic familiarity with biology concepts (high-school or introductory college level) is recommended, but biology courses are not a prerequisite for this course.

**READING:** The texts for this course are *Biological Psychology: An introduction to behavioral, cognitive, and clinical neuroscience* by Breedlove, Rosenzweig and Watson (5th edition)

1/08/2010 Version  
Check Ctools for latest version
and *The Selfish Gene* by R. Dawkins. Additional selected articles will be posted in the Readings folder in Resources on the Ctools web site.

**GRADING:** There will be three exams, containing both multiple-choice and short-answer questions, which contribute a total of 70% of your course grade. Discussion sections contribute the remaining 30% of your course grade. The exam dates are listed on the schedule on page 6. The first two exams will be in evenings in order to allow more seating room. The three exams are worth, respectively, 20%, 25%, and 25% of the course grade. Lectures are represented most heavily in exams (75%).

**DISCUSSION SECTION:**

Discussion sections are used for several purposes. In discussion section, your section leader will supplement the lecture with additional detail on a few topics that are especially interesting or controversial (for example: human psychological disorders, the evolutionary basis of human behavior). These topics plus neuroanatomy will form the basis of the Discussion Quiz. Also, when we cover brain structure (neuroanatomy) in lecture, you will have an opportunity to examine brain structure for yourself in discussion section. Led by your GSI, you will be able to dissect a sheep brain and compare its structure to that of a human brain (in small groups). Participation in the dissection is optional but you will be expected to know about brain structures and to be able to recognize them on the Quiz. Finally, in discussion sections you will view films and have an opportunity to review lecture topics. Your section leader will describe discussion section activities in your first meeting.

*Discussion Grading:* Your discussion/tutorial section contributes 30% to your final course grade. This part of your grade is based on 3 sources:

1) Quiz based on material presented during discussion sections (the quiz is scheduled during week 10 (3/08 – 3/12) and will occur in your regular discussion section [worth 15%])

2) A ‘Reaction Essay’ (4 pages on topic selected from below; worth 5% of your final grade, essay due to your GSI via CTools on January 25, by the start of lecture)

3) Depth Topic Project: *either* one Term Paper (10 pages) *or* one oral group presentation (10-15 min per group) on a topic chosen from the list in your coursepack (presented in discussion section near the end of the semester). Your section leader will describe the quiz, reaction essays, and depth project options in detail during your discussion section. Whichever one you choose will be worth 10% of your final grade.

*Options for Depth Topic projects:* You will choose your format (group presentation /term paper) and topic, and prepare an outline, in consultation with your discussion leader. A list of potential topics is posted on the CTools site. You can develop a topic not on the list if you get approval from your section leader. Oral presentations may be done with one or two partners and your section leader can help you find a partner. Regardless of format, you should find and read 2-5 articles related to your topic. Some relevant articles are listed in each textbook chapter. Your section leader or Prof. Berridge can also direct you if you need help. By midsemester, you will make a brief outline of your topic and sources. Outlines must be turned in to your section leader for approval. Toward the end of the semester you will turn in your paper or present your oral project (late papers may be assessed a penalty). Presentations will be scheduled during discussion sections. Oral groups should also hand in a 1 page 'Group Resume' listing the members and the particular contributions made by each member on the day of their presentation.
Reaction Essay Topics (Choose 1 from below)

1. Are psychological processes like thoughts, sensations, and emotions identical or reducible to brain processes? Or do psychological processes have an irreducible mental property, which is always “left over”, and is essentially different from a brain process? (Breedlove Ch. 1)

2. Is it ever ethical to use animal studies to improve our understanding of human brain function, disorders, or therapies? Are there particular conditions that would determine whether your answer is yes or no? (Coursepack web 2-5)

3. Can evolutionary principles that explain social behavior in animals (e.g., selfish gene, kin selection, reciprocal altruism, sexual selection) also be applied to human behavior? Is human culture also a product of these principles? Or is human culture exempt from ‘selfish gene’ selection, kin selection, and other principles of evolutionary psychology? (Dawkins Ch 11)

4. Are there ethical constraints that should limit the use of drugs to treat psychological problems? For example, is it okay to administer psychotherapeutic drugs against a person’s will? Or administer preventively to large populations? Or administer to young children deemed to be at risk? Are there additional constraints for other procedures, such as gene therapy or diagnostic neuroimaging? When drugs or biochemical therapies fail, is it ethical to use electroconvulsive shock therapy or psychosurgery? (Coursepack web: Farah; Breedlove Ch 16)

Note: Details of reading assignments are announced in lecture

OUTLINE OF LECTURE TOPICS
AND ASSIGNED READINGS FOR LECTURE

PART I - FUNDAMENTAL ISSUES
A. Mind-brain relations: history
B. The comparative approach
   1. Schematic behavioral understanding of other minds
   2. Brains and behavior as evolutionary products
   3. Mechanisms vs. Function
C. Ethics of Experimentation
   1. Weighing ends and means
   2. Animal experiments vs. Computer models
   3. Contemporary laboratory conditions

Readings: (A) Breedlove Chapter 1
(B) Coursepack readings (Ctools web site): Mason - Psychology & animal behavior
(C) Ethics: CTools coursepack readings 2 (3, 4 &5 optional; 6 optional for human ethics)

PART II - THE EVOLUTION OF BEHAVIOR
A. Evolution
   1. Tenets of selection
   2. Directions and units of selection
   3. Evolutionarily Stable Strategies
B. Inclusive fitness
   1. Altruism and kin selection
   2. Sexual selection
   3. Parent/offspring conflict
C. Behavioral genetics
   1. Chromosomes, genes, and monogenic traits
   2. Polygenic traits and heritability
   3. Gene-brain-behavior relations

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PART III - NEURONS AND BRAINS

A. Neurons
   1. Neuronal structure
   2. Resting potentials and action potentials
   3. Synapses and graded potentials
   4. Neurotransmitters and drugs

B. Brain anatomy
   1. Terms and divisions: rhombencephalon, mesencephalon, diencephalon, and telecephalon
   2. Major afferents and efferents
   3. Internal structure: gross anatomy
   4. Differences among vertebrate brains: mammals, birds, etc.
   5. Brain Development


PART IV - ACTION

A. Morphology
   1. Reflex, oscillator, and servomechanism
   2. Combination principles

B. Neural Systems
   1. Pyramidal
   2. Extrapyramidal

Readings: (1) Breedlove Chapter 11. Online paper Slater chapter on action patterns

PART V - UMWELT: SENSATION AND PERCEPTION

A. Comparative audition
   1. Neural mechanisms for auditory information in moths, frogs, and humans

B. Vision
   1. Comparative color vision
   2. Neural mechanisms of form vision:
      a) Retinogeniculostriate system: projections, levels, and receptive fields
      b) Cortical visual functions
   3. Human disorders and visual development

Readings: Part A: Breedlove Chapter 8 & 9
          Part B: Breedlove Chapter 10

PART VI - MOTIVATION

A. Sleep, arousal, and the caudal brainstem
   1. Brain controls of waking, slow-wave sleep, & REM sleep

B. Specific motivations and the forebrain limbic system
   1. Hunger: LH and VMH embedded in a distributed system
   2. Sex
      a) Perinatal organization of the brain
      b) Preoptic and anterior hypothalamic nuclei

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3. Aggression: amygdala, septum, and hypothalamic interaction
4. Reward

**Motivation Readings:**

*Sleep & Arousal*: Breedlove Chapter 14 (read pages 426-447; other pages are optional)

*Hunger*: Breedlove Chapter 13 (read pp 405-413)

*Sex*: Breedlove Chapter 12 (read pp. 358-383)

*Fear, Aggression & Reward*: Breedlove Chapter 15(read pp. 460-472);

*Drug reward* Chapter 4 (read pp 106-114)

**PART VII - LEARNING**

A. Pavlov's cortical model
B. Lashley's maze test: mass action vs. redundant specialization
C. Hippocampal lesions in rats and humans
D. Learning in simple systems: mammalian spines, insect ganglia, and mollusk cells

**Readings:** (1) Breedlove Chapter 17

**PART VIII - COGNITION AND COMMUNICATION**

A. Comparative use of signal and symbols
   1. Orders of signal intentionality
   2. Dolphin vocal communication: failure on a second-order task
   3. Chimpanzee cognition: second-order relations, transitive and causal inference
B. Brain and language
   1. Hemispheric specialization
      a) Visual and auditory feature analysis in domestic chicks, monkeys, and humans by the left and right brain
      b) Lateralization of vocal communication in songbirds and humans
   2. Neural aphasia in humans
      a) Broca's and Wernicke's areas
      b) Production, syntactic, and semantic deficits

**Readings:**
(1) CTOOLS paper: Premack; Rumbaugh & Savage-Rumbaugh
(2) Breedlove Chapter 19

**ADDITIONAL READINGS FOR DISCUSSION SECTION**

**Brain dissection reading:**
Please read the “Sheep Brain Dissection” handout twice, both times before you do your sheep brain dissection & comparison to the human brain. You will enjoy and learn much more in the brain dissection if you the instructions first. This will be posted to CTools.

**Discussion quiz topics**
The following additional readings should be read in advance of the discussion section meetings in which your section leader will talk about the topics listed. You are responsible for their content: questions about them may be asked in the discussion section quiz (see discussion section syllabus for more details).

*Psychopathology*: Breedlove Chapter 16
## Lecture schedule:

<table>
<thead>
<tr>
<th>Week</th>
<th>Date</th>
<th>Lecture</th>
<th>Reading</th>
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<tbody>
<tr>
<td>1</td>
<td>W Jan 6</td>
<td>Introduction/History</td>
<td>B 1; C 1 (Mason)</td>
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<tr>
<td></td>
<td>M Jan 11</td>
<td>Animal Ethics/Behavioral Evolution</td>
<td>C 2(3, 4, 5, 6 optional)</td>
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<td></td>
<td>W Jan 13</td>
<td>Evolutionarily Stable Strategies</td>
<td>D skim 1-3; read 4&amp;5</td>
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<td></td>
<td>M Jan 18</td>
<td>MLK Day</td>
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<td></td>
<td>W Jan 20</td>
<td>Kin &amp; Sexual Selection</td>
<td>D 6, 8 &amp; 9 (7 opt/skim); C 7; B appendix A</td>
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<td>2</td>
<td>M Jan 25</td>
<td>Gene Conflict &amp; Behavioral Genetics</td>
<td>B 6 &amp; 7 appendix; C 7;</td>
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<td></td>
<td>W Jan 27</td>
<td></td>
<td>B 2 (pp23-34) &amp; 3</td>
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<td>3</td>
<td>M Feb 1</td>
<td>Neurons &amp; information</td>
<td>B 3 &amp; 4</td>
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<td></td>
<td>W Feb 3</td>
<td>Synaptic transmission</td>
<td>B 4</td>
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<td>M Feb 8</td>
<td>Receptors &amp; Drugs</td>
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<td>W Feb 10</td>
<td>EXAM 1 (6-8 pm)</td>
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<td>M Feb 15</td>
<td>Neuroanatomy &amp; Brain Evolution</td>
<td>B 2 (pp 35-55)</td>
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<td>W Feb 17</td>
<td>Action Patterns</td>
<td>C 8 (Slater) B11</td>
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<td>4</td>
<td>M Feb 22</td>
<td>Motor systems</td>
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<td></td>
<td>W Feb 24</td>
<td>Perception &amp; Audition</td>
<td>B11</td>
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<td>M Mar 8</td>
<td>Audition/Vision</td>
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<td>W Mar 10</td>
<td>Vision</td>
<td>B 9 &amp; 10</td>
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<td></td>
<td>M Mar 15</td>
<td>Motivation: Sleep &amp; Arousal</td>
<td>B 14 (pp 426-447)</td>
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<td></td>
<td>W Mar 17</td>
<td>Motivation: Thirst Hunger ??</td>
<td>B 13 (pp 405-413)</td>
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<td>M Mar 22</td>
<td>EXAM 2 (8-10 pm)</td>
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<td></td>
<td>W Mar 24</td>
<td>Motivation: Hunger &amp; Sex</td>
<td>B 12 (pp 358-383)</td>
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<td>M Mar 29</td>
<td>Motivation: Sex &amp; Fear &amp; Reward</td>
<td>B15 (pp 460-472),</td>
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<td>W Mar 31</td>
<td>Reward &amp; Learning??</td>
<td>B17</td>
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<td></td>
<td>M Apr 5</td>
<td>Learning (paper option due)</td>
<td>B 17 &amp; 18</td>
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<td>W Apr 7</td>
<td>Learning</td>
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<td></td>
<td>M Apr 12</td>
<td>Learning &amp; Comparative Cognition</td>
<td>C 11 &amp; 12</td>
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<td>W Apr 14</td>
<td>Comparative cognition &amp; Brain</td>
<td>B19</td>
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<tr>
<td>6</td>
<td>M Apr 19</td>
<td>Cognition &amp; Brain</td>
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**Reading abbreviations:**  
- **B** = Breedlove Rosenzweig & Watson textbook  
- **D** = Dawkins book  
- **C** = Ctools coursepack  

Reading numbers refer to chapter # for Breedlove text and Dawkins book, and article # for Ctools readings.

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**FINAL EXAM**

Wednesday April 28 4:00 pm - 6:00 pm (LSA schedule assignment)