Introduction to Biopsychology
Syllabus for Psychology 230 – Fall 2014
The University of Michigan
Ann Arbor, Michigan

Professor Kent Berridge                   Lecture: Mon & Wed 11:30-1:00
Office: 4038 Psychology Dept, East Hall                   Lecture Room 1324 East Hall
Email: berridge@umich.edu     Phone: 763-4365
Office Hours: Wed 2:00-4:00 or by appointment

DISCUSSION SECTION LEADERS (GSIs):
Daniel Castro    Email: castrod@umich.edu
Alex Kawa   Email: akawa@umich.edu
Kyra Phillips   Email: kbphil@umich.edu
Shelley Warlow    Email: smwarlow@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>Th 3 - 4 PM</td>
<td>130 Dennison</td>
<td>Castro</td>
</tr>
<tr>
<td>003</td>
<td>T 11am-12 PM</td>
<td>1405 East Quad</td>
<td>Castro</td>
</tr>
<tr>
<td>004</td>
<td>W 10-11 AM</td>
<td>142 Lorch</td>
<td>Warlow</td>
</tr>
<tr>
<td>005</td>
<td>T 8-9 AM</td>
<td>3088 East Hall</td>
<td>Kawa</td>
</tr>
<tr>
<td>006</td>
<td>F 1-2 PM</td>
<td>1636 Chem</td>
<td>Kawa</td>
</tr>
<tr>
<td>007</td>
<td>W 9-10 AM</td>
<td>B856 East Quad</td>
<td>Warlow</td>
</tr>
<tr>
<td>008</td>
<td>T 6-7 PM</td>
<td>1372 East Hall</td>
<td>Castro</td>
</tr>
<tr>
<td>009</td>
<td>T 5-6 PM</td>
<td>173 Lorch</td>
<td>Kawa</td>
</tr>
<tr>
<td>010</td>
<td>Th 9-10 AM</td>
<td>1437 Mason</td>
<td>Phillips</td>
</tr>
<tr>
<td>011</td>
<td>F 9-10 AM</td>
<td>1372 East Hall</td>
<td>Phillips</td>
</tr>
<tr>
<td>012</td>
<td>F 10-11 AM</td>
<td>1372 East Hall</td>
<td>Phillips</td>
</tr>
<tr>
<td>013</td>
<td>F 12-1PM</td>
<td>2229 School of Edu</td>
<td>Warlow</td>
</tr>
</tbody>
</table>

COURSE DESCRIPTION:
Biopsychology combines the fields of Behavioral Neuroscience with Psychological Evolution & Human/Animal behavior (Comparative Psychology). In a nutshell, biopsychology is the study of how psychological processes relate to the brain and to evolution. Behavioral neuroscience studies how brain processes cause psychological processes and behavior, and with how psychological events are encoded in the brain. Comparative psychology studies how psychological processes have been shaped by evolutionary pressures, and how human psychology compares to psychological processes in other animals.
Specific topics this semester will include: behavioral evolution, brain neurons and systems, brain structure and the function of brain systems, perception, motivation, learning and cognition. Some basic familiarity with psychology (introductory psychology) and with biology concepts (high-school or introductory college level) is recommended, but biology courses are not a prerequisite for this course.

August 6, 2014
**READING:** A required text for the course is the paperback *The Selfish Gene* by R. Dawkins. An additional (highly) recommended textbook for most of the course is *Biological Psychology: An introduction to behavioral, cognitive, and clinical neuroscience* by Breedlove and Watson (7th edition). Additional required readings are posted online in the Readings folder in Resources on Ctools.

**GRADING:** There will be three exams, containing both multiple-choice and short-answer questions, which contribute a total of 70% of your course grade (see schedule on page 6). Discussion sections contribute the remaining 30% of your grade. The first exam will be in class Monday October 6, and the second exam will be in the November 5. The third exam is Monday December 17th 10:30 am -12:30 pm (LSA schedule assignment for final exam period). The three exams are not cumulative, and 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. The Quiz will be held in discussion during the week in November that will be specified in section. Your section leader will describe discussion section activities in more detail in your first meetings.

**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, and will occur in your regular discussion section around the middle of the semester [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 Wednesday September 17 by the start of lecture)
3) Depth Topic Project: either one Term Paper (10 pages; due by Monday December 1) or one group presentation (10-15 min per group) on a topic chosen from the list in your coursepack or a different topic approved by your GSI (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. Your depth project 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 GSI. 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 GSI 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 and disorders, or develop drug therapies? Are there particular conditions or rules that would determine whether your answer is yes or no? (Coursepack web: Farah; Breedlove Ch 16)

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 slides. Readings listed below are for general guidance.

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

August 6, 2014
Readings: (A and B) R. Dawkins: The Selfish Gene, Chapt. Skim 1-3, Read 4-6; 8-9; (C) Ctools: Behavioral genetics article; Breedlove Ch 6 & 7 (recommend also Appendix A)

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

Readings: (1) CTOOLS paper: Tomasello & Herrmann; 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

August 6, 2014
# Lecture Schedule

<table>
<thead>
<tr>
<th>Week</th>
<th>Date</th>
<th>Lecture</th>
<th>Reading (See lecture slides &amp; Ctools for detailed reading assignments)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>W Sept 3</td>
<td>Introduction/History</td>
<td>B 1; C 1 (Mason)</td>
</tr>
<tr>
<td>2</td>
<td>M Sept 8</td>
<td>Animal Ethics/Behavioral Evolution</td>
<td>C 2(3, 4, 5, 6 optional)</td>
</tr>
<tr>
<td></td>
<td>W Sept 10</td>
<td>Evolutionarily Stable Strategies</td>
<td>D skim 1-3; read 4&amp;5</td>
</tr>
<tr>
<td>3</td>
<td>M Sept 15</td>
<td>Kin &amp; Sexual Selection</td>
<td>D 6, 8 &amp; 9 (7 skim); C 7; B Appendix A suggested</td>
</tr>
<tr>
<td></td>
<td>W Sept 17</td>
<td>Gene Conflict &amp; Behavioral Genetics</td>
<td>B 6 &amp; 7 appendix A; C 7</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(reaction essay due Wed)</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>M Sept 22</td>
<td>Behavioral Genetics &amp; Neurons</td>
<td>B 2 &amp; 3</td>
</tr>
<tr>
<td></td>
<td>W Sept 24</td>
<td>Neurons &amp; information</td>
<td>B 3 &amp; 4</td>
</tr>
<tr>
<td>5</td>
<td>M Sept 29</td>
<td>Synaptic transmission</td>
<td>B 4</td>
</tr>
<tr>
<td></td>
<td>W Oct 1</td>
<td>Receptors &amp; Drugs</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>M Oct 6</td>
<td>EXAM</td>
<td></td>
</tr>
<tr>
<td></td>
<td>W Oct 8</td>
<td>Neuroanatomy &amp; Brain</td>
<td>Evolution B 2 (pp 35-55)</td>
</tr>
<tr>
<td>7</td>
<td>M Oct 13</td>
<td>STUDY BREAK</td>
<td></td>
</tr>
<tr>
<td></td>
<td>W Oct 15</td>
<td>Action patterns</td>
<td>B11</td>
</tr>
<tr>
<td>8</td>
<td>M Oct 20</td>
<td>Brain Movement Systems</td>
<td>C 8 (Slater) B11</td>
</tr>
<tr>
<td></td>
<td>W Oct 22</td>
<td>Perception &amp; Audition</td>
<td>B 8 &amp; 9</td>
</tr>
<tr>
<td>9</td>
<td>M Oct 27</td>
<td>Audition/Vision</td>
<td>B 9 &amp; 10</td>
</tr>
<tr>
<td></td>
<td>W Oct 29</td>
<td>Vision</td>
<td>B 10</td>
</tr>
<tr>
<td>10</td>
<td>M Nov 3</td>
<td>Vision &amp; Motivation: Sleep</td>
<td>B 14</td>
</tr>
<tr>
<td></td>
<td>W Nov 5</td>
<td>EXAM</td>
<td></td>
</tr>
<tr>
<td>11</td>
<td>M Nov 10</td>
<td>Motivation: Sleep &amp; Arousal &amp; thirst</td>
<td>B 13</td>
</tr>
<tr>
<td></td>
<td>W Nov 12</td>
<td>Motivation: Thirst Hunger &amp; Sex</td>
<td>B 12, 14</td>
</tr>
<tr>
<td>12</td>
<td>M Nov 17</td>
<td>No lecture (SFN)</td>
<td>Prof. Berridge &amp; GSIs away at Society for Neuroscience meeting</td>
</tr>
<tr>
<td></td>
<td>W Nov 19</td>
<td>No lecture (SFN)</td>
<td></td>
</tr>
<tr>
<td>13</td>
<td>M Nov 24</td>
<td>Sex, Fear &amp; Reward &amp; Learning to Lashley</td>
<td>B 13, 14 &amp; 15</td>
</tr>
<tr>
<td></td>
<td>W Nov 26</td>
<td>Fear, Reward &amp; Learning</td>
<td>B 17(Wed Thanksgiving week)</td>
</tr>
<tr>
<td>14</td>
<td>M Dec 1</td>
<td>Learning</td>
<td>B17</td>
</tr>
<tr>
<td></td>
<td>W Dec 3</td>
<td>Learning &amp; Comparative Cognition</td>
<td>C 11 &amp; 12</td>
</tr>
<tr>
<td>15</td>
<td>M Dec 8</td>
<td>Comparative cognition &amp; Brain</td>
<td>B 19</td>
</tr>
<tr>
<td></td>
<td>W Dec 10</td>
<td>Cognition &amp; Brain</td>
<td></td>
</tr>
</tbody>
</table>

**FINAL EXAM**

Wednesday December 17th 10:30 am -12:30 pm (LSA schedule assignment)

**RED INDICATES ACTUAL SCHEDULE TOPICS, FASTER THAN SYLLABUS (good)**

*Reading abbreviations:  B= Breedlove & Watson textbook  D = Dawkins book  
C = Ctools coursepack  
Reading numbers refer to chapter # for Breedlove text and Dawkins book, and article # for Ctools readings.*