Brain & Behavior Syllabus
V55.0306
Instructor Mike Hawken
Spring 2005

Lecture Notes
Assessment

Week 1

1/18 Lecture 1  Introduction and History of Neuroscience – early influences
Reading: Chapter 1, pp 2 – 23

1/20 Lecture 2  History of Neuroscience – later influences
Reading: Chapter 1, pp 2-23

Week 2

1/24 Lab 1  Introduction to the Laboratory: The Scientific Method – Developing a Hypothesis

1/25 Lecture 3  Building a Brain: Neurons and Glia - Cells and Synapses, structure, properties, cell types
Reading: Chapter 2, pp 26-59

CELLS and SYNAPSES

1/27 Lecture 4  The Language of Neurons: Electrical Properties - resting potential, synaptic transmission, integration, graded potentials, action potentials
Reading: Reading: Chapter 3, pp 60 – 89

Week 3

1/31 Lab 2  Organization of the Brain I: Sheep Brain Dissection

2/1 Lecture 5  Synaptic transmission; release and receptors
Reading: Chapter 4, pp 90 – 120

2/3 Lecture 6  Synaptic transmission: neurotransmitters and neurochemical modulation
Reading: Chapter 4, pp 90 – 120
Week 4

2/7  Lab 3  Organization of the Brain II: Build Your Own Human Brain

2/9  Quiz #1  Lecture 7  Evolution and Brain Development
Reading: Chapter 6, pp 154 – 181

2/11 Lecture 8  Growth, Growth Factors/Regression
Reading: Chapter 7, pp 183 – 214

Week 5

2/14 Lab 4  Neuronal Visualization

2/15 Lecture 9  General Principles of Sensory & Motor Systems
Reading: Chapter 8, pp 217 – 222; Chapter 11, pp 321 – 331

2/17 Lecture 10  Vision - the visual brain, visual perception and seeing
Reading: Chapter 10, pp 282 – 319

Week 6

2/21  President’s Day: No Class

2/22 Lecture 11  Audition - auditory brain and hearing; balance - vestibular system
Reading: Chapter 9, pp 249 – 269

2/24 Lecture 12  Touch, Pain, Taste and Smell
Reading: Chapter 8, pp 228 – 247; Chapter 9, pp 269 – 280

Week 7

2/28 Lab  Midterm Review

3/1 Lecture 13  Motor Systems I: Muscles, motor units, reflexes
Reading: Chapter 11, pp 320 – 351

3/3 Midterm Exam

Week 8

3/ 7 Lab 5  Electrical Potentials in Neurons
3/8 Lecture 14 Motor Systems II: Control of movements, walking, eye and head movements
Reading: Chapter 11, pp 320 – 351
SEXUAL BEHAVIOR and RHYTHMS

3/10 Lecture 15 Sexual Behavior
Reading: Chapter 12, pp 354 – 388

Week 9  Spring Break

Week 10

3/21 Lab 6 Perception I: Reaction Time
3/22 Lecture 16 Neuroendocrinology - chemical control of temperature, fluids and eating
Reading: Chapter 13, pp 390 – 422
3/24 Lecture 17 Sleep and Waking rhythms, dreaming, and cycles controlled by the brain
Reading: Chapter 14, pp 424 – 455

Week 11

3/28 Lab 7 Perception II: Vision
DRUGS and ADDICTION
3/29 Lecture 18 Drugs and Behavior
Reading: Chapter 4, pp 105 – 119
3/31 Lecture 19 Drugs and the Brain
Reading: Chapter 4, pp 105 – 119

Week 12

4/4 Lab 8 Perception III: Somatic Sensation
COGNITIVE SYSTEMS
4/5 Quiz # 2 Lecture 20 Learning and Plasticity-developmental processes and adult learning
Reading: Chapter 17, pp 522 – 551
4/7 Lecture 21 Learning & Memory - cellular and molecular mechanisms
Reading: Chapter 18, pp 552 – 581
### Week 13

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<thead>
<tr>
<th>Date</th>
<th>Activity</th>
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<tr>
<td>4/11</td>
<td>Lab 9</td>
<td>Electrophysiology of the Touch Receptors of the Cockroach</td>
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<td>4/12</td>
<td>Lecture 22</td>
<td>Language and Cognition</td>
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<td>Reading: Chapter 19, pp 582 – 614</td>
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<td><strong>EMOTIONAL SYSTEMS and MENTAL DISORDERS</strong></td>
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<td>4/14</td>
<td>Lecture 23</td>
<td>Emotion and Motivation</td>
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### Week 14

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<tr>
<td>4/18</td>
<td>Lab 10</td>
<td>Animal Behavior: Rat Open Field Behavior</td>
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<td>4/19</td>
<td>Lecture 24</td>
<td>Monitoring Brain activity in Humans-functional imaging, PET and fMRI</td>
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<td>4/21</td>
<td>Lecture 25</td>
<td>Mental Disorders I</td>
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<td>Reading: Chapter 16, pp 488 – 518</td>
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### Week 15

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<tr>
<td>4/25</td>
<td>Lab</td>
<td>Final Exam Review</td>
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<td>4/26</td>
<td>Lecture 26</td>
<td>Functional Disorders of the Brain</td>
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<td>4/28</td>
<td>Lecture 27</td>
<td>Mental Disorders II</td>
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### Introduction:

The study of the brain and behavior has intrigued some of the greatest minds over the last 2000 years.
What have we learned over this period about how behavior depends on the brain?

### Signals and Brain Structure:

- Chemistry and Biology of neurons.
- The organization of neurons and the brain.
- How neurons send messages around the brain.
- How neurons talk to each other and in groups, neuronal networks.

### Sensory Signals, Perception & Action (Moving around):

- How light, pressure, and chemical substances detected by the body.
- How the signals from the senses are turned into perceptions we call seeing, hearing, touching, tasting, smelling and maintaining balance.
Moving around:
What do we need to move around, muscles and their biology.
How do the signals from the brain control the muscle groups and joints to make different kinds of movements.

Sexual Behavior and Rhythms
There are lots of behaviors that have different time cycles. Some of these also exhibit complex behavioral patterns. Yet many of the patterns or rhythms are maintained across species. How are these patterns controlled by the brain?

Cognitive Behaviors:
What parts of the brain are used for language, thought, decision making. How are memories made, stored and retrieved by the brain.

Drugs, Behavior and the Brain:
Drugs, prescription and illicit, can have powerful effects on behavior. How do these drugs interact with the brain to exert their effects. Can we understand anything about addiction from studying the effects of drugs on the brain?

Learning and Plasticity:
Young children acquire many new behaviors during their early life. How does the brain change during the early years? Can these changes be influenced by practice, training or are they a result of a genetic program?

Emotion:
Do we have separate brain regions that influence how we feel when we are angry, fearful, happy? What is the chemistry that influences these feelings. How do drugs affect the way we feel, how do they affect our perceptions and our movements?

Brain and Behavioral Dysfunction:
What happens if parts of the brain stop working normally. What happens if parts of the brain don’t develop in the normal manner. There are numerous serious neural disorders that lead to major alterations in behavior such as schizophrenia, or bipolar disorder. How does this happen? Are there ways to reverse these changes?