

# Neuroscience

## CTY Course Outline

**Required Texts:** Bear, Connors, Paradiso (2001). *Neuroscience: Exploring the Brain*;  
Lipincott, Williams, and Wilkins, Baltimore, Maryland

Sacks, Oliver: The Man who Mistook his Wife for a Hat

### WEEK 1

#### **I. Monday**

**Morning:** (Chapters 1, 2)

Class expectations,  
Getting to know you,  
Pre-test,  
Science lab safety video  
Review of cell structure (membrane, and phospholipids bilayer)  
Structure/functions of neuron, classifying neurons and glia  
Blood Brain Barrier

**Afternoon:** Structure/Function of phospholipids bilayer (Bubble Lab)

**Evening Study Hall:** Class Expectations, CTY Honor Code,  
Textbook Reading: Chapter 2

#### **II. Tuesday**

**Morning:** How nerves transmit messages: Action Potential (Chapters 3, 4)

All or none,  
depolarization,  
repolarization,  
threshold,  
Na<sup>+</sup>/K<sup>+</sup> pumps,  
ionic basis of membrane potentials  
Spatial and Temporal summation

**Afternoon:** Qualifying to be an AP expert  
On line activity: Attack of the Giant Squid  
Diagramming an Action Potential

**Evening Study Hall:** Building a neuron with junk (using candy, and other items)  
Textbook Reading: Chapter 3, 4  
Begin reading: Man who mistook His Wife for a Hat by Oliver Sacks

#### **III. Wednesday**

**Morning:** The Synapse and the Post Synaptic Neuron (Chapters 5, 6)

IPSP, EPSP  
G coupled receptors, second messengers  
Types of neurotransmitters: Ach, Serotonin, Epinephrine, Norepinephrine, GABA, Amino  
Acids, Glutamate, Proteins

**Afternoon:** Drug Interaction (How various drugs affect the nervous system)  
Neurotoxins  
Article: The Addicted Brain

**Evening Study Hall:** Sacks Reading (Chapters 11, 16)  
Textbook Reading: Chapters 5, 6  
Discussion of Research Projects and Topics

#### **IV. Thursday**

**Morning:** (Chapter 7, 13)  
The Overview of the nervous system  
Structure and Function

**Afternoon:** The action potential and the nervous system  
Signal transmission down the axon

Activity: Action/Reaction

**Evening Study Hall:** Oliver Sacks  
Text book Reading: Chapter 7, 13

#### **V. Friday**

**Morning:** (Chapter 13)  
The rest of nervous system  
Divisions of the nervous system  
Spine: segment, cross sections, how brain/spine work together to produce movement

**Afternoon:** Are you left brained or right?  
End of week review/discussion

**Sunday Study Hall:** Movie: Lorenzo's Oil

### **WEEK 2**

#### **VI. Monday**

**Morning:** (Chapter 7)  
Activity: Becoming cranial nerve experts  
In the Library: Introduction to scientific research

**Afternoon:** Computer Lab: Begin working on Research Projects

**Evening Study Hall:** Textbook reading Chp. 12, 19  
Oliver Sacks 4, 19, 22, 23

#### **VII. Tuesday**

**Morning:** (Chapter 7)  
BRAIN DAY!!!  
Anatomical Direction  
Terminology

Simon Says  
Parts of the Brain: Basic Structure and Function  
Activity: Play Doh Brain Models

**Afternoon:** Brain Dissection  
Human Brain Observation and Discussion

**Evening Study Hall:** Research Projects

### VIII. Wednesday

**Morning:** (Chapter 12)  
Somatosensory: Touch and Pain  
Kinds of receptors, rapidly, and slowly adapting  
Abeta/Abeta/Adelta/C fibers,  
Nociceptors  
Capsaicin,  
Gate Control Theory of Pain  
Somatosensory Homunculus p. 415

**Afternoon:** Lab: Two-point discrimination, Phantom Limb articles, Pain Tolerance activities

**Evening Study Hall:** Computer Lab: Research

### IX. Thursday

**Morning:** (Chapter 20)

**Guest Speaker: Language Acquisition**  
Language  
The discovery of specialized language areas in the brain  
Broca's and Wernicke's area  
Types of Aphasia and their Causes

**Afternoon:** Attention  
ADHD  
Behavioral Consequences of Attention

**Evening Study Hall:** Read in textbook: Life without pain  
Articles  
Textbook Reading: Chapter 12, 20  
Sacks

### X. Friday

**Morning: Guest Speaker: Behaviorism 9:30am**  
Learning and Memory  
LTD and LTP  
NMDA receptors/AMPA receptors  
Protein synthesis and learning (CREB 1 and 2), cerebellum

**Afternoon:** Memory: Declarative and Non-Declarative  
Short/long term  
Amnesia  
Critical periods

Video: Learning

**Sunday Study Hall:** Movie: A Beautiful Mind

### **WEEK 3**

#### **XI. Monday**

**Morning:** Audition

Anatomy

Pathways

Sound localization

Vestibular system: otolith organs and semicircular canals

**Afternoon:** Computer Lab: Research

**Evening Study Hall:** Textbook Reading: Chapter 19, Sacks

#### **XII. Tuesday**

**Morning:** (Chapter 19)

EEG, why we sleep

Disorders: narcolepsy

Epilepsy/seizures

REM vs. nonREM,

Circadian rhythms, dreams

**Afternoon:** **Guest Speaker:** Sleep stages

**Evening Study Hall:** Textbook Chapter 19, Sacks

#### **XIII. Wednesday**

**Morning:** (Chapter 9, 10)

The Eye: vision, anatomy, image formation,

Physiology of the vision: the visual hemifields

Light/dark adaptation

Near/Far sightedness

Activity: yarn and “goggled” visual hemifields, blind spot detection, optical illusions, dominant eye determination, afterimage, pupil reactions

**Afternoon:** Lab Dissection: Cow eye

**Evening Study Hall:** Computer Lab: Wrapping up research projects to present on Power Point

**XIV. Thursday**

**Morning:** Post Assessment

**Research Presentation Day (All Day)**

**XV. Friday**

**DONE!!!!**