

# UNIT 2 - THE BIOLOGICAL PERSPECTIVE

Waiting for the bus on Descartes avenue

## Overview of the unit

This unit is a big one. It looks at the various biological, physiological, chemical and evolutionary factors that shape behavior. In many ways, this perspective sits at the dividing line between humans as machines v. humans as living conscious beings. The perspective examines the interplay between these concepts of humanity

## Assessments

There will be quizzes at the end of sections 1-6.

This unit will conclude with a half period multiple choice exam and a period length essay exam

## Extra help

I will hold an after school review for the exam several days prior to the test itself. Additionally I will post videos on the website for your use

## Section 1 - Basic concepts

### Readings:

Popov, *et.al.*, 2: 44-55

### Objectives:

To understand the evolution of our understanding of function localization

To understand the basic structures of the brain and the general functions with which they correspond.

### Key terms and concepts:

Localization of function, context (frontal lobes parietal lobe, occipital lobe, temporal lobes), corpus collosum, Cerebellum, limbic system (thalamus, hypothalamus amygdala hippocampus) brain stem

Strict localization, Broca's area, Wernicke's area, aphasia. Wilder Penfield, neural stimulation, cortical homunculus

Opposition to strict localization, induced brain damage, distributed v. localized function, principle of mass action, equipotentiality

Relative localization, lateralization, Roger Sperry, Michael Gazzaniga, split brain research

Modern studies dealing with localization (Sharot 2007, Saxe and Kanwisher 2003, Macguire 2000)

Modern understandings of localization

## Section 2 - Neurotransmitters and behavior

### Readings/Sources:

Popov, *et.al* 2: 64-71

**Objectives:**

To understand the physiology of nerve cells and how they transmit information.

To understand the role of neurotransmitters and major research relating to how neurotransmitters impact behavior.

**Key terms and concepts:**

Neurons (soma, dendrites, axons, synapse, threshold of excitation, action potentials neurotransmitters, axon terminal, synaptic gap, reuptake), neurotransmitters (excitatory neurotransmitters, inhibitory transmitters, agonists, antagonists, SSRIs, serotonin and free will, Crockett 2010, Dopamine and romantic love, Fisher Aron and Brown 2005, dopaminergic pathway, dopamine and Parkinson's Disease, Freed 2001, putamen, serotonin and depression)

### Section 3 - Neuroplasticity

**Readings:**

Popov, *et.al* 2: 56-63

**Objectives:**

To understand the nature of how our brains adapt and change over time

**Key terms and concepts:**

Neuroplasticity, synaptic plasticity, cortical remapping, "neurons that fire together wire together," Merzenich 1894 (owl monkey and sensory stimulus research), neuroplasticity and learning, Draganski 2004, Draganski 2006, Grey matter, Maguire 2000, sense substitution, Paul Bach-y-Rita 1969, human echolocation, brain machine interfaces

### Section 4 - Techniques used to study the brain in relation to behavior

**Readings:**

Popov, *et.al* 2: 72-77

**Objectives:**

To understand the role of neuroimaging in psychological study

To understand the advantages and disadvantages of the various neuroimaging techniques

**Key terms and concepts:**

Neuroimaging, CAT scans, MRI (fMRI, blood oxygen level dependent signal (BOLD), spatial resolution, voxels, temporal resolution), Positron emission tomography (PET scans), Electroencephalography EEG (Brain waves), studies that use neuroimaging (Draganski 2004 and 2006, Maguire 2000, Freed 2001, Fisher, Aron and Brown 2005)

## Section 5 - Hormones and behavior

### Readings:

Popov, *et.al* 2: 78-86

### Objectives:

To understand the major recent research into the connection between certain hormones and behavior

### Key terms and concepts:

Hormones (endocrine glands, target cells, gene activation, gene suppression), Case study - Oxytocin (Romero 2014, Kosfeld 2005, Scheele 2012 (stop distance paradigm, approach/avoidance task), De Dreu 2012 (defense-motivated non-cooperation, the prisoner's dilemma), De Dreu 2011 (ethnocentrism)

## Section 6 - Pheromones and Behavior

### Readings:

Popov, *et.al* 2: 87-93

### Objectives:

To understand what Pheromones are and major research into Pheromones and human behavior  
To understand the problems associated with human pheromone research

### Key terms and concepts:

Pheromones, main olfactory bulb, differences between human and non-human animals (vomeronasal organ, accessory olfactory bulb), Human sex pheromones? (Lundstrom and Olsson 2005, androstadienone(AND), Hare 2017, estratetrenol (EST), Cutler, Friedmann and McCoy 1998, McCoy and Pitino 2002), Criticisms of pheromone research

## Section 7 - Genetics and Behavior

### Readings:

Popov, *et.al* 2: 94-107

### Objectives:

To understand the role of genetics in shaping behavior  
To understand how environment and genetics work together to shape behavior

### Key terms and concepts:

Genotype v. phenotype, chromosomes, base pairs, gene, alleles, nature v. nurture, methods of genetic research (twin studies, family studies, adoption studies (additive influence, Kendler 2015, selective placement, Scarr and Weinberg 1983, transracial adoption study, adolescent adoption study, molecular genetics), genetic heritability, Falconer model, niche picking, Bouchard and McGue 1981, influence of environment on gene expression (gene expression, functional product, transcription, translation, RNA, regulation of gene expression, methylation, epigenetic changes), behavioral epigenetics (Weaver 2004, glucocorticoid receptors, glucocorticoid receptor gene, Miller 2009, McGowan 2009, Kaminsky 2008)

## Section 8 - Evolution and behavior

### Readings:

Popov, *et.al* 2: 108-114

### Objectives:

- To understand major research efforts to understand the impact of evolution on behavior
- To understand the limitations of evolutionary explanations of behavior

### Key terms and concepts:

Evolution, differential fitness, natural selection, Chiao and Blizinsky, gene-culture coevolution theory, kin selection theory (Hamilton 1964, Madsen 2007), LeDoux 1996, Harlow 1958, Shaver and Hazan 1988, Theory of mind (Call and Tomasello 2008), Curtis hunger and Rabie 2004, Criticisms of evolutionary explanations (Massive modularity v. neuroplasticity, speculations about the environment, testability, Assumptions about the linearity of development (exaltation), cultural variation, adaptation v. other evolutionary mechanisms (genetic drift, spandrels, Gould and Lewontin