01: Introduction to Neuroscience

The Basics

Neuroscience is the science of the brain and nervous system.

Neuroscience is an **integrative** science comprised of Anatomy, Phyisology and Psychology.

Anatomy is the science of body structures and the relationships among structures.

Physiology is the science of body functions.

Psychology is the science of behavior.

Neuroscience can be studied from a number of different perspecitives: **molecular**, **cellular**, **behavioral**, **cognitive**, and **pathologies**.

The Importance of Neuroscience

The brain and nervous system is complex. There are billions of cells in the brain and nervous system. Understanding the key components and how they interact is important when developing treatments and strategies to deal with diseases that affect the brain and nervous system. To build this understanding, many technological tools have been developed and utilized that allow neuroscientists to view the dynamic interactions within and between cells; visualize functional groups of cells; and map neural pathways throughout the body.

There are a number of pathologies related to the nervous sytem to include: **Alzheimer's disease, Cerebral palsy, Depression, Epilepsy, Multiple sclerosis, Schizophrenia, Spinal paralysis,** and **Stroke.** One of the chief aims of neuroscience is to understand these disease states and to find ways to prevent or cure them.

History of Neuroscience

The history of key concepts in neuroscience assists us in understanding how the concepts developed and appreciate the role of technology and societal views in their development.

7000 B.C. first evidence of neurosurgery
5000 B.C. Acient Egypt: the heart as the center of the soul

300's B.C. Ancient Greece: the brain as the organ of sensation; disagreement on the brain as the seat of the intellect
Key Scientists: **Hippocrates; Aristotle**

100's A.D. Roman Empire: functions for cerebrum and cerebellum; fluid-mechanical theory of nerve conduction.
Key Scientists: **Galen**

1500-1900 Renaissance: explanation of human behavior; distinction of humans as only animal with a soul; challenging the fluid-mechanical theory
Key Scientists: **Decartes**

1700's realization of central and peripheral nervous system; realization of the importance of the nervous system to life

1800's discovery of electricity is applied to the nervous system; scientists conduct experiments using electricity; nerves as wires replaces the fluid-mechanical theory; electrical theory of nerve conduction; refinement of the theory
Key Scientists: **Benjamin Franklin; Italian** and **German scientists**
Localization of Function explored further; phrenology; experimental ablation methods; application of electricity to specific areas of the brain
Key Scientists: **Gall, Flourens, Broca,**
Evolution of nervous systems and heritability of behavior; rationale for animal models
Key Scientists: **Darwin**

Current Views in Neuroscience

The Cell Theory
Invention of the microscope enabled scientists to see the individual cells within tissues; including the brain and nervous system. Introduction of the **neuron** as the basic microscopic unit of the nervous system. Key Scientist: **Schwann**

Debate raged as to how the cells are connected. Improvements in the magnification in microscopes ended the debate and established that neurons are not fused together but must pass some sort of signal between them.

Types of Experimental Neuroscientists Include:
Molecular Neurobiologist
Uses genetic material of neurons to understand function and structure of brain molecules
Developmental Neurobiologist
Analyzes the development and maturation of the brain
Neuroanatomist
Studies structure of the nervous system
Neurochemist
Studies chemistry of the nervous system
Neuroethologist
Neural basis of species-specific behavior
Neuropharmacologist
Effects of drugs on the nervous system
Neurophysiologist
Measures electrical activity of the nervous system
Psychobiologist
Studies the biological basis of behavior
Psychophysicist
Quantitatively measures perceptual abilities

Types of Medical Specialists in Neuroscience include:
Neurologist
MD trained to diagnose and treat diseases of the nervous system
Psychiatrist
MD trained to diagnose and treat disorders of mood and personality
Neurosurgeon
MD trained to perform surgery on the brain and spinal cord
Neuropathologist
MD or PhD trained to recognize changes in neural tissue resulting from disease

How to Use This Cheat Sheet: These are the keys related this topic. Try to read through it carefully twice then recite it out on a blank sheet of paper. Review it again before the exams.