

## Unit 8: Biodiversity

### Content Outline: Nervous Systems (8.9)

#### I. Evolution of a Nervous System

- A. Start with the evolution of an organism wide Nerve Net in Cnidarians.
- B. The evolution of a brain (a mass of neurons) leads to control of the system. It uses a nerve cord to control the body.
- C. The evolution of other sensory organs in the head region, called **Cephalization**, allows for *reception* and *response* to stimuli from the environment.

#### II. Overview of the Nervous System:

- A. **Sensory Input** (Stimulus sent into the brain or spinal cord.)
  1. Sensory Receptors receive a stimulus from the environment. A **stimulus** is a form of energy such as electromagnetic (light), mechanical (pressure), and sound waves.
- B. **Integration**
  1. This is the *interpretation* of the energy by the **Central Nervous System (CNS)**. (Basically “thinking” about the stimulus. )
  2. This interpretation of the stimulus leads to a determination of the appropriate response.
- C. **Motor Output** (Out of the brain or spinal cord.)
  1. The response is carried out by **Effector Cells**.
    - a. Effectors are Muscles or Glands. (These can have an *effect* on your body.)
- D. **Peripheral Nervous System (PNS)**
  1. This includes the Sensory receptors and Motor Nerves.

#### III. Neuron Structure (Nerve Cell)

- A. **Cell Body** - This takes stimuli from different dendrites and compiles the energy into one signal. (Like a funnel.)
- B. **Dendrites** - These collect and carry stimuli Energy *in to* the cell body. (They cover a large area.)
- C. **Axon** - This one arm carries the one compiled signal *away* toward the next neuron or effector cell.
- D. **Myelin Sheath** - This is a lipid layer of insulation around the axon created by **Schwann Cells**. It prevents the electrical energy of the neuron from burning the overlying muscle tissue. (It is analogous to the rubber covering on electrical wires.)
- F. **Synapse** - This is the *gap* between neurons or between a neuron and an effector cell.
  1. **Neurotransmitter** - This is the chemical, produced by the **neuron**, used to *transmit* the signal across the gap.
    - a. The most common neurotransmitter is Acetylcholine.

#### IV. Reflex Arc (The simplest neural pathway.)

- A. A stimulus energy is detected by a **Sensory Neuron**. (Carries the energy signal to the spinal cord.)
- B. An **Interneuron** (of the CNS – spinal cord) relays the energy back out to the motor nerve instead of to the brain.) (“inter” means “go between”... between the sensory and motor neurons.)
- C. The energy is carried out of the CNS by the **Motor Neuron**. It carries the energy to an effector cell, usually a muscle.
- D. This is why you do not think about a reflex, it just happens. The stimulus never made it to the brain for integration.