The Nervous System

Overview & CNS

Lecture Outline

- General Overview of Nervous System Function
- Cells of the Nervous System
- CNS
  - Functional components
  - Neural networks
  - Organization of the CNS

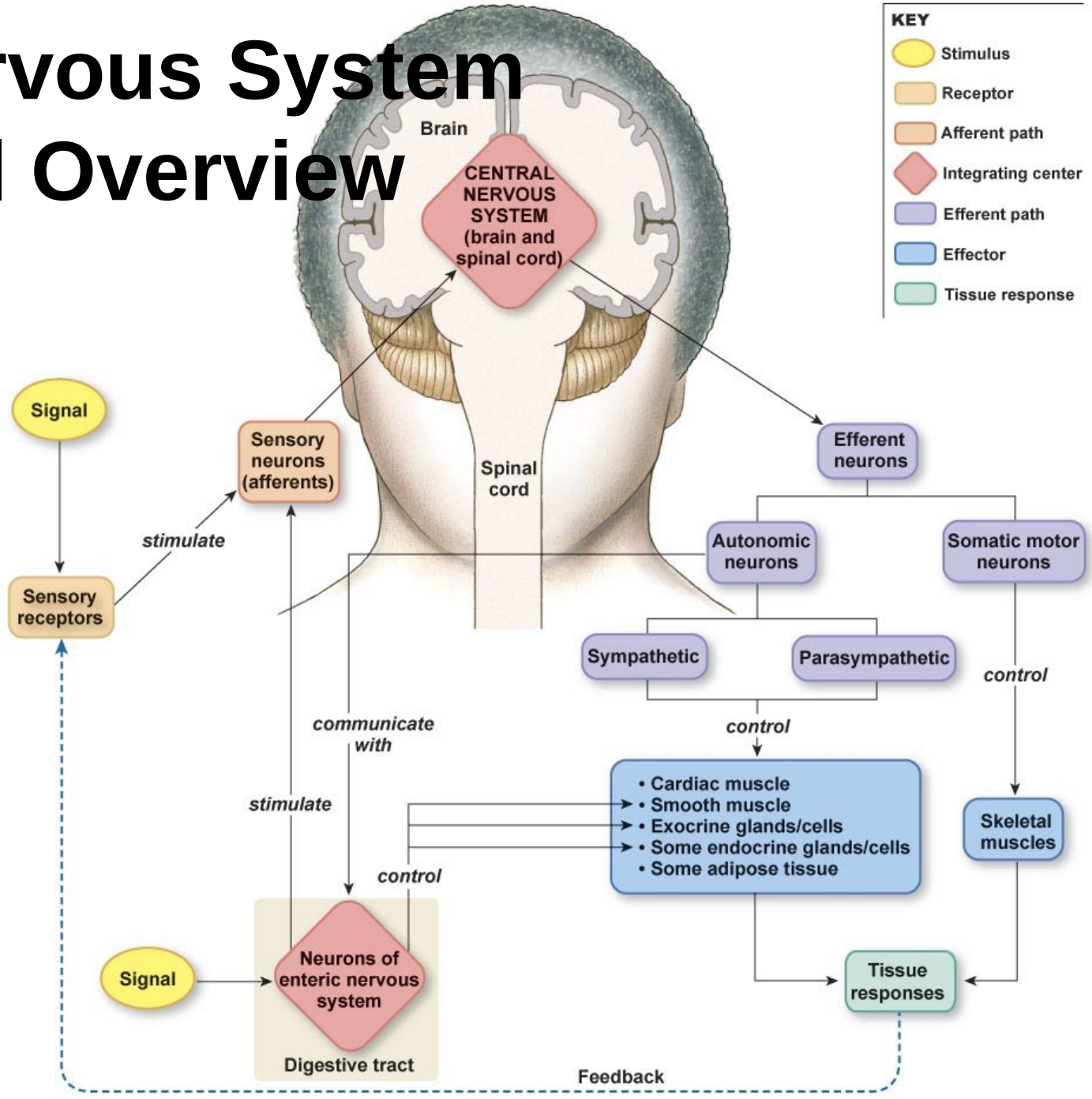
The Nervous System

General Overview

1. Sensory
2. Integration
3. Motor

The Nervous System
General Overview

The integration of all three major functions



The Nervous System

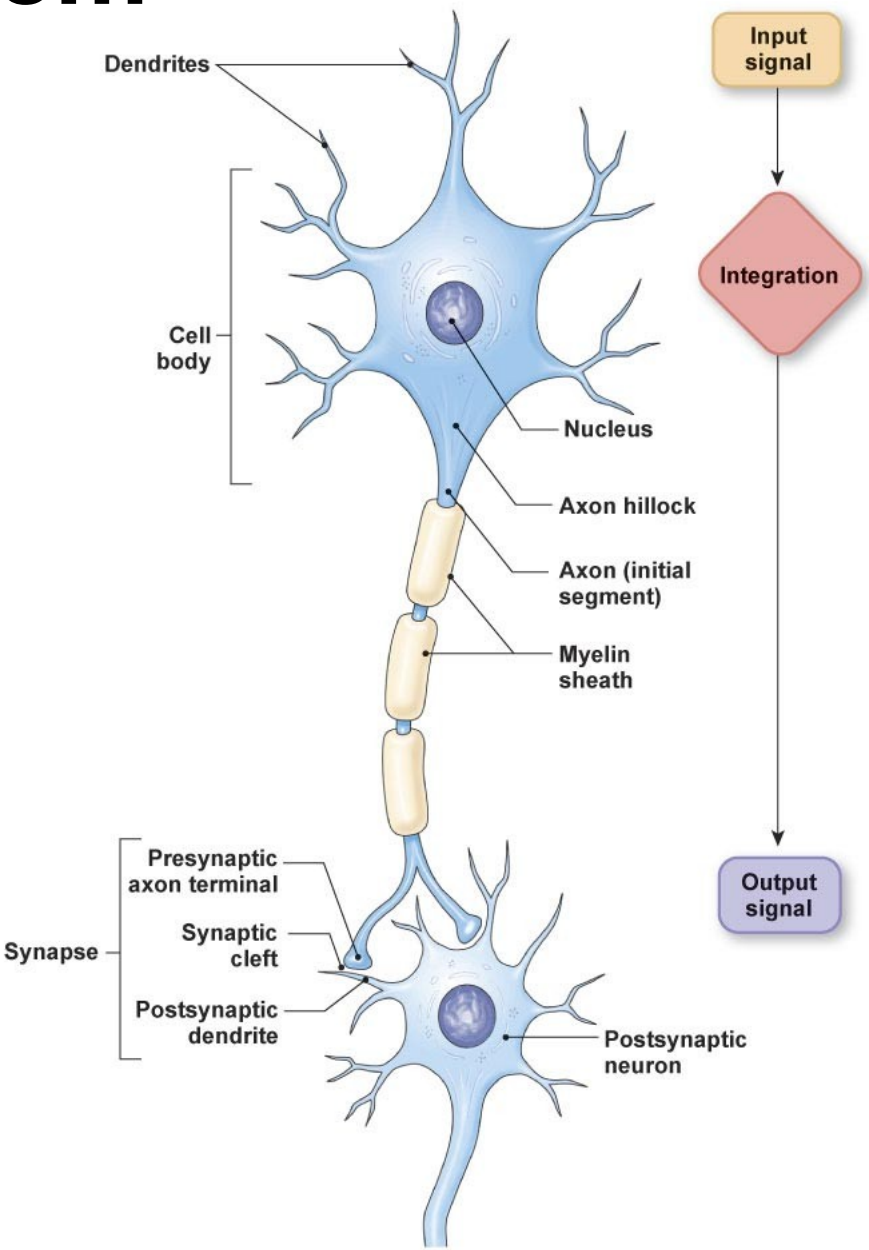
Cells of the Nervous System

- Cells are grouped into two functional categories
  - Neurons
    - Do all of the major functions on their own, are
      1. Afferent
      2. Interneurons
      3. Efferent
  - Neuroglia
    - Play a supporting role to the neurons
    - Divided into CNS and PNS Neuroglia
      - CNS
        - » Astrocytes
        - » Oligodendrocytes
        - » Microglia
        - » Ependymal cells
      - PNS
        - » Neurolemmocytes
        - » Satellite cells

The Nervous System

Cells of the Nervous System

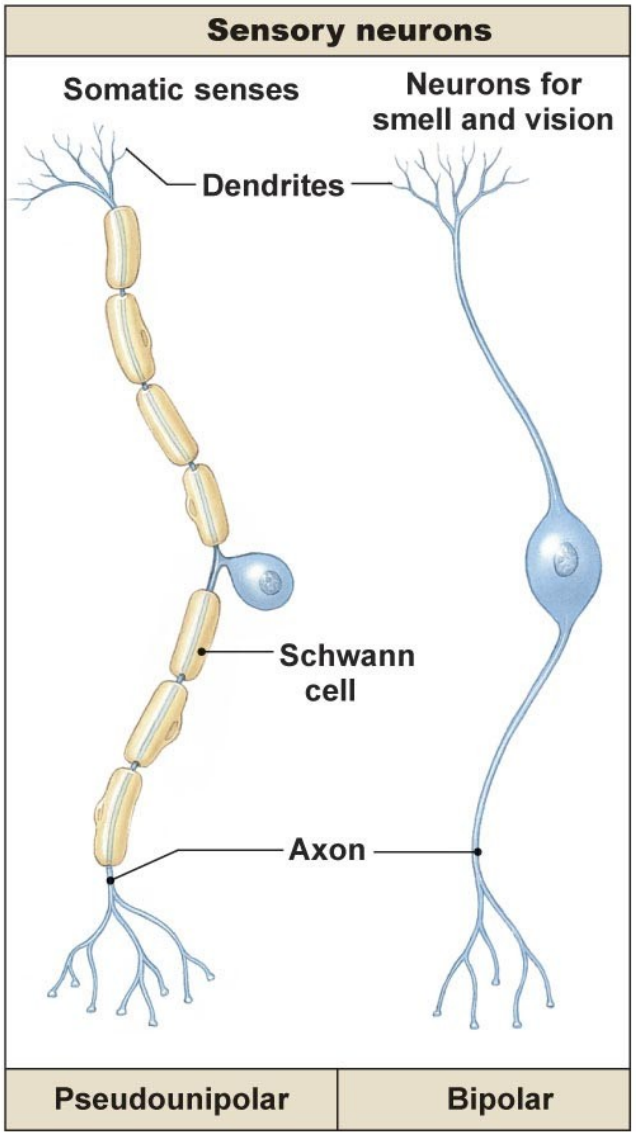
- The general neuron & it's function



The Nervous System

Cells of the Nervous System

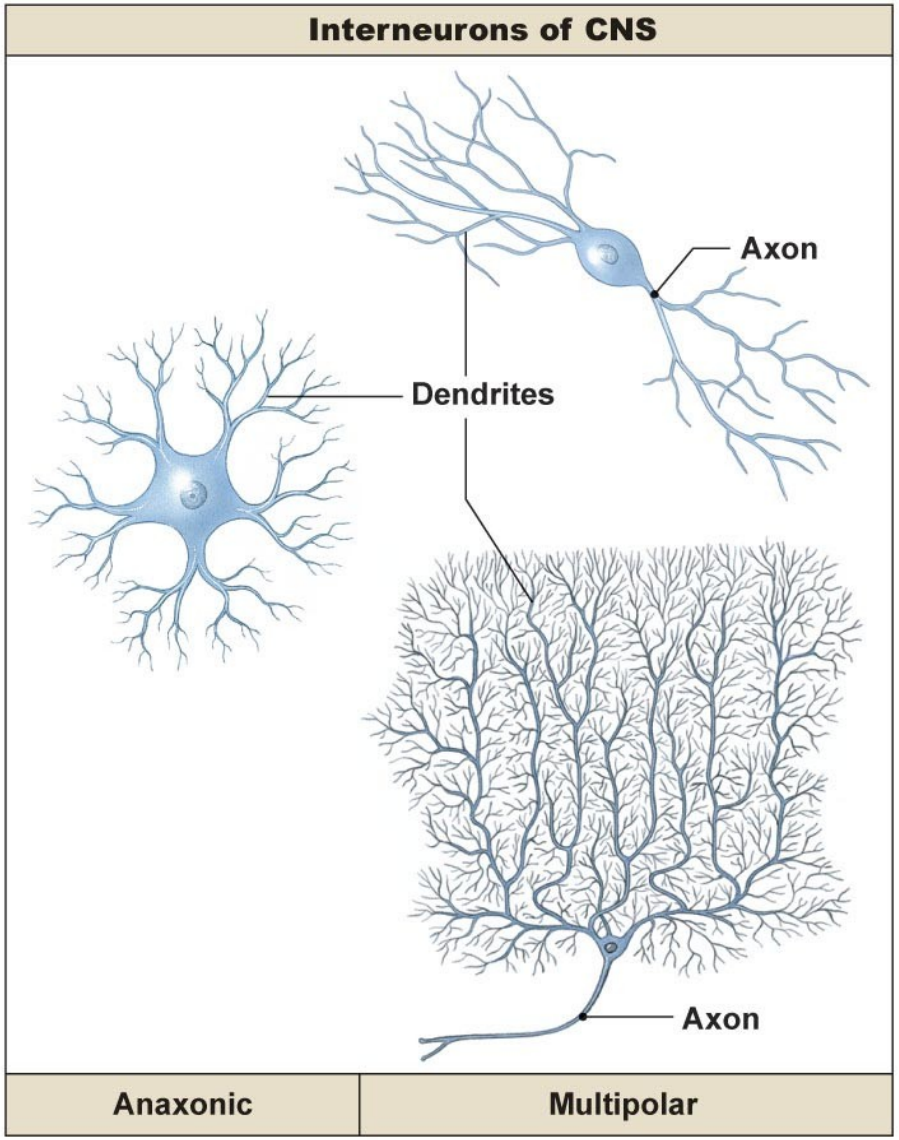
- Neurons
  - Functional Classification
    1. Afferent
       - Conduct APs to the CNS



The Nervous System

Cells of the Nervous System

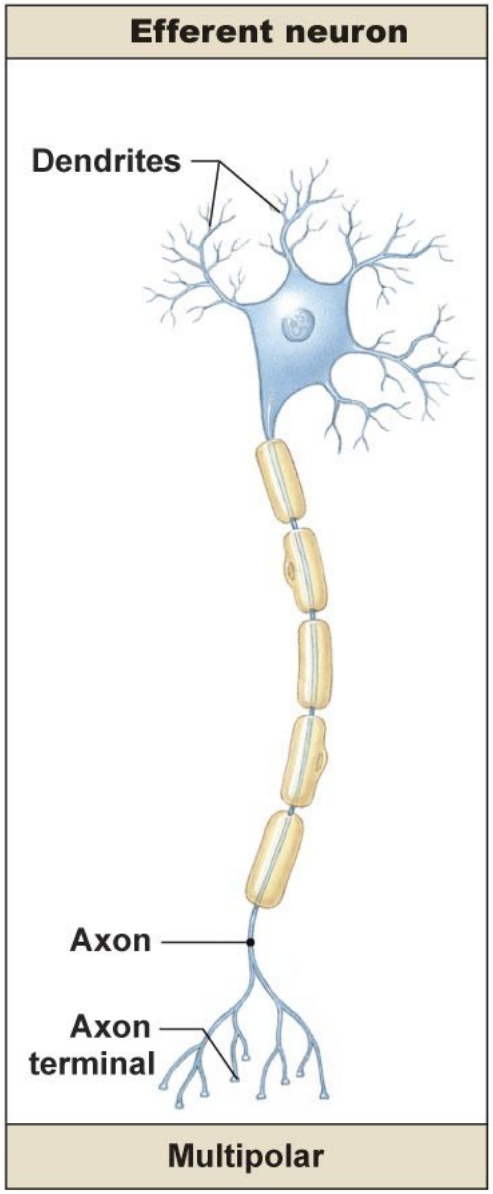
- Neurons
  - Functional Classification
    2. Interneurons
       - Conduct APs within the CNS



The Nervous System

Cells of the Nervous System

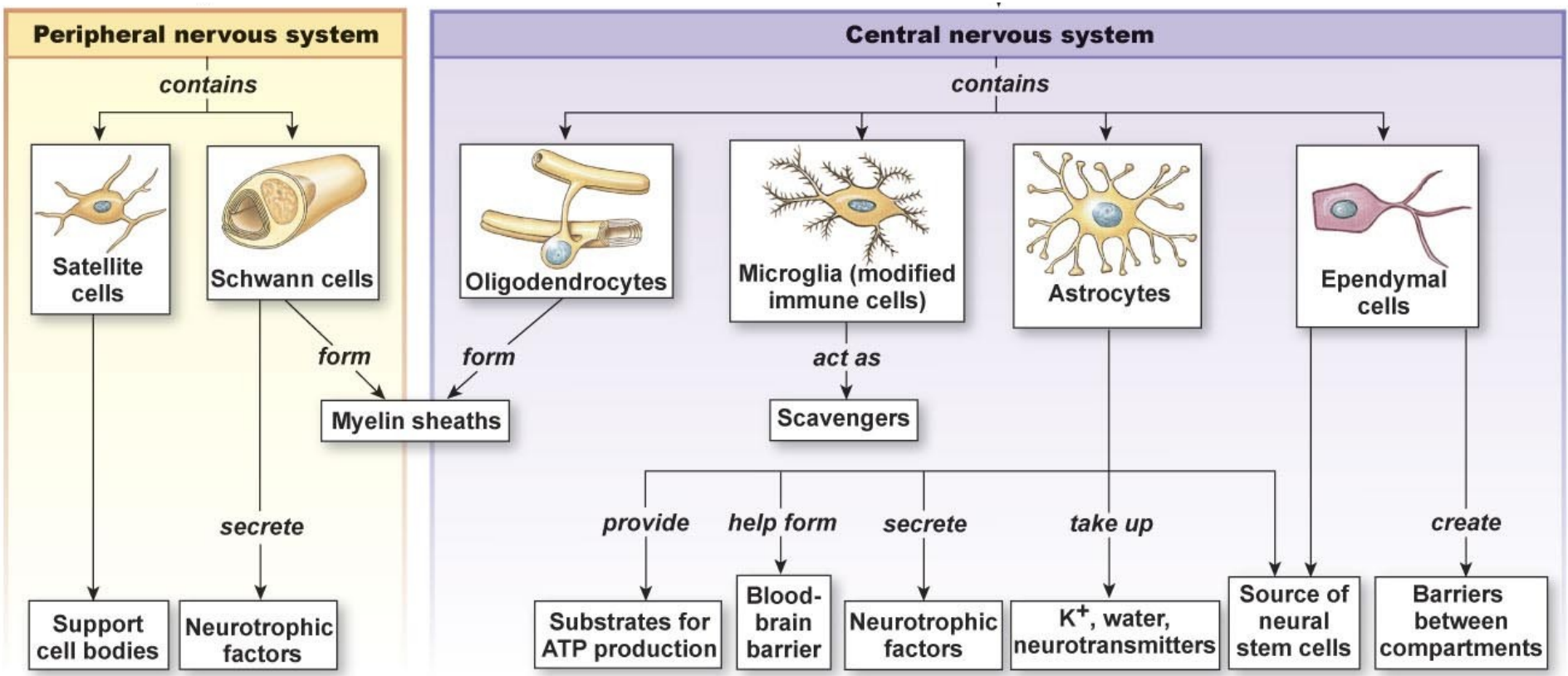
- Neurons
  - Functional Classification
    3. Efferent
       - Conduct APs to the PNS



The Nervous System

Cells of the Nervous System

- Neuroglia
  - Functional Classification



The Nervous System

Functional Components

- What are the major functional components of the Nervous System?
  - Brain
  - Spinal Cord

  } Central Nervous System

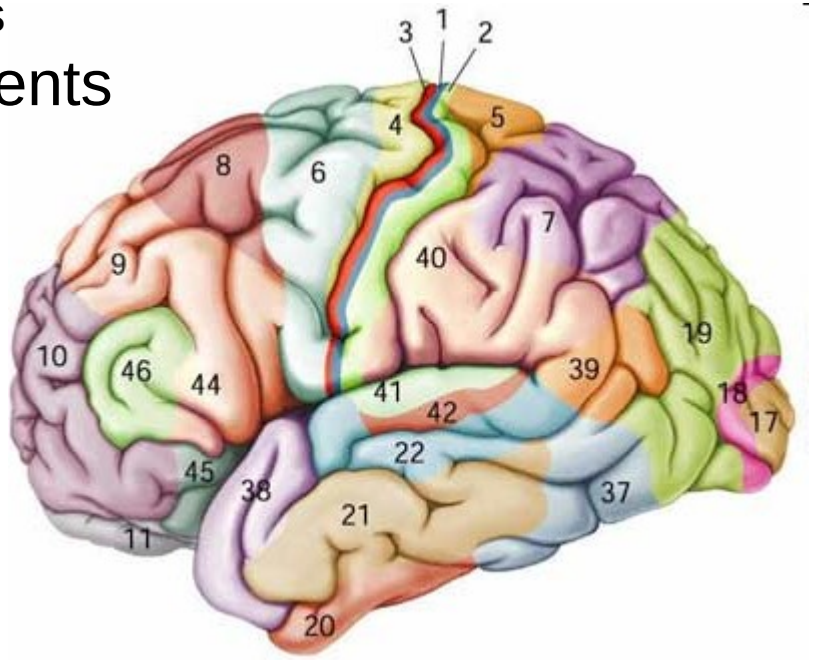
  - Afferent Tracts
  - Efferent Tracts
  - Ganglia

  } Peripheral Nervous System

The Nervous System

Functional Components

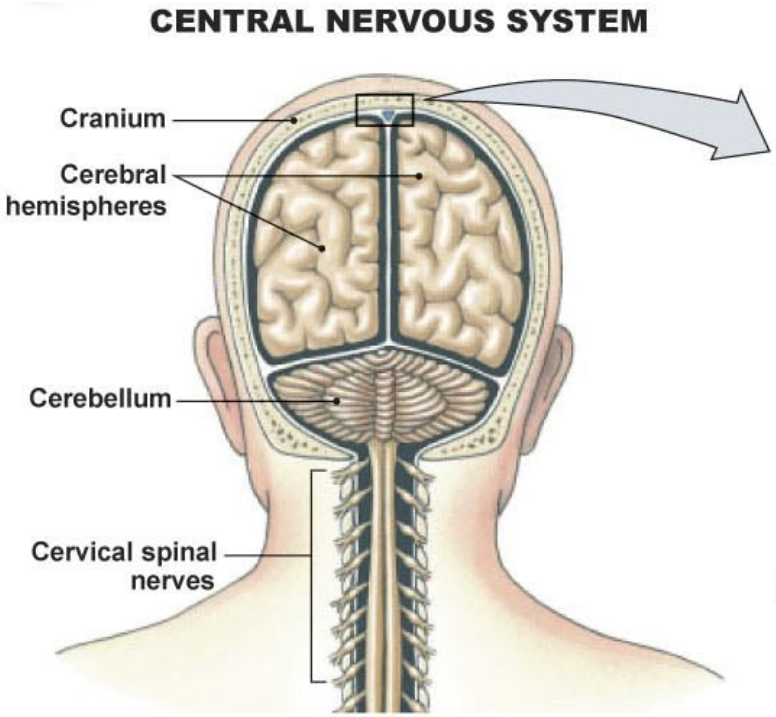
- How do the structural components allow the nervous system to function correctly?
  - Provides protected environment
    - Bony protection
    - Meninges
    - Blood brain barrier
    - Maintain correct ECF parameters
- How do the functional components allow the nervous system to function correctly
  - Creates and modifies neuronal circuits organized into
    - afferent & efferent tracts
    - Functional areas in the CNS
      - Gray & white matter
    - Reflex pathways

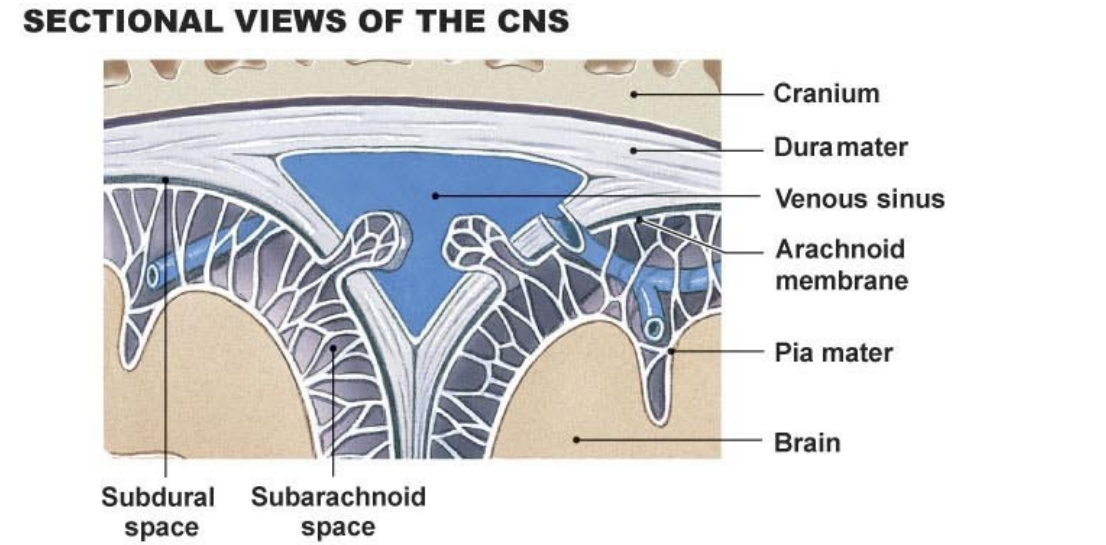


The Nervous System

Functional Anatomy Review

Quick Review of Functional Anatomy



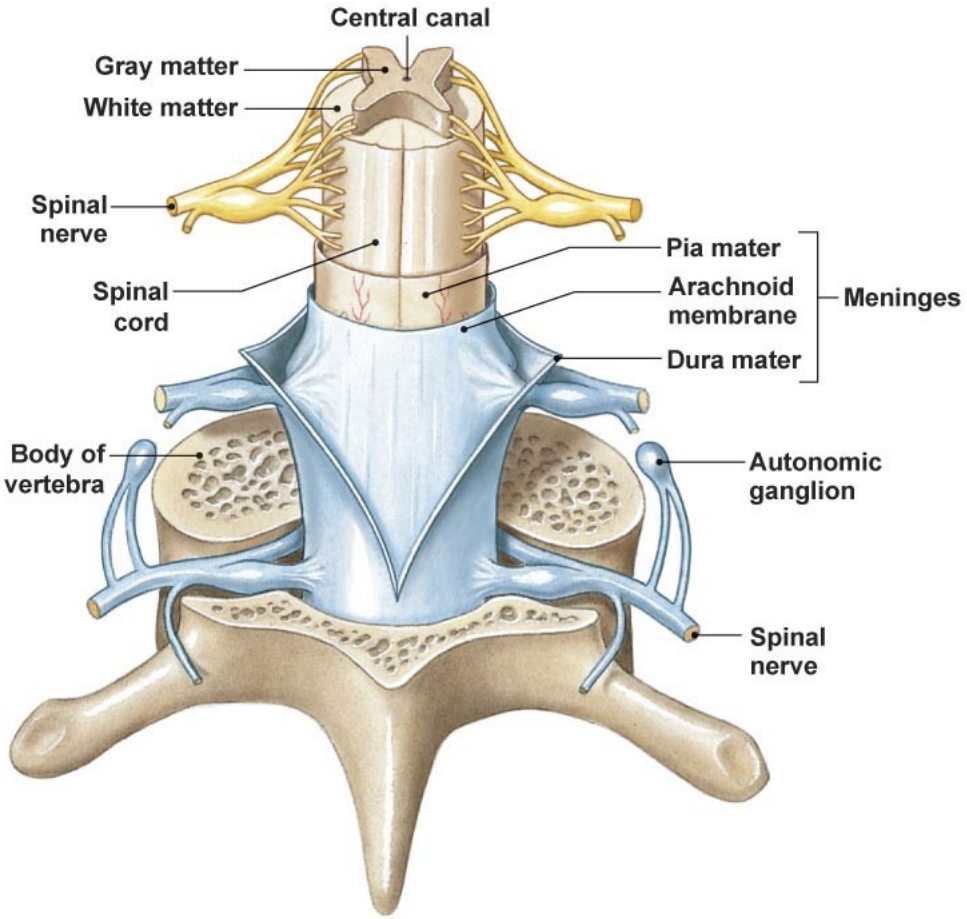


(b) Meningeal layers of the brain cushion and protect delicate neural tissue.

The Nervous System

Functional Anatomy Review

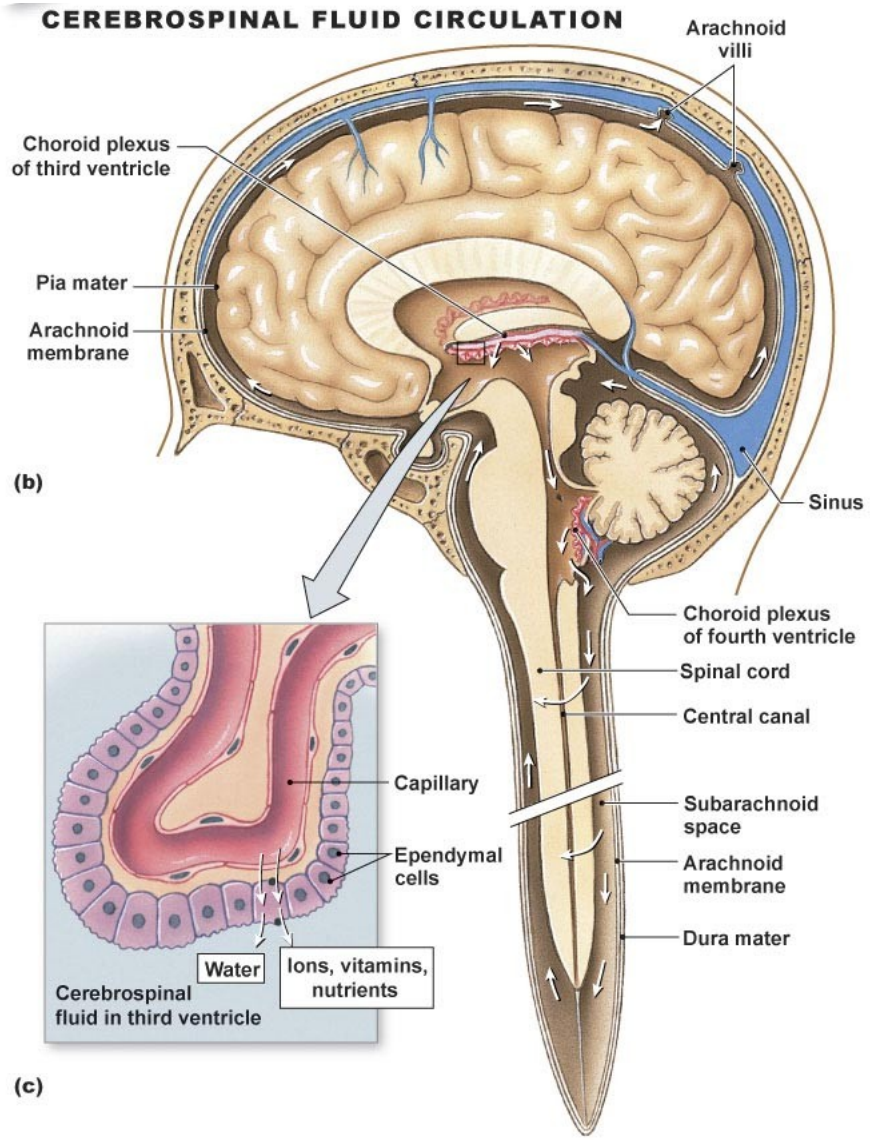
Quick Review of Functional Anatomy



The Nervous System

Functional Anatomy Review

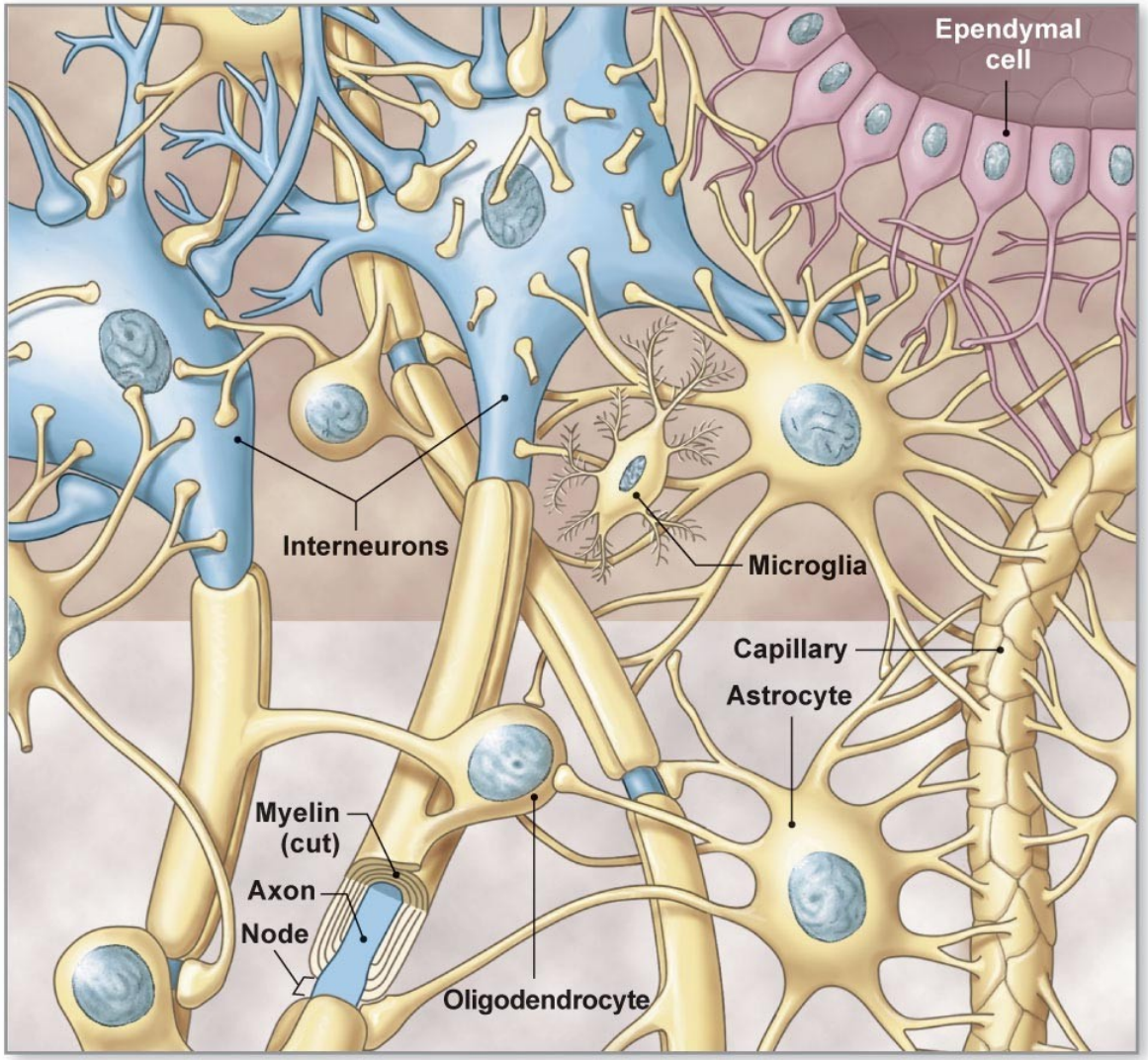
Quick Review of Functional Anatomy



The Nervous System

Functional Anatomy Review

Quick Review of Functional Anatomy



The Nervous System

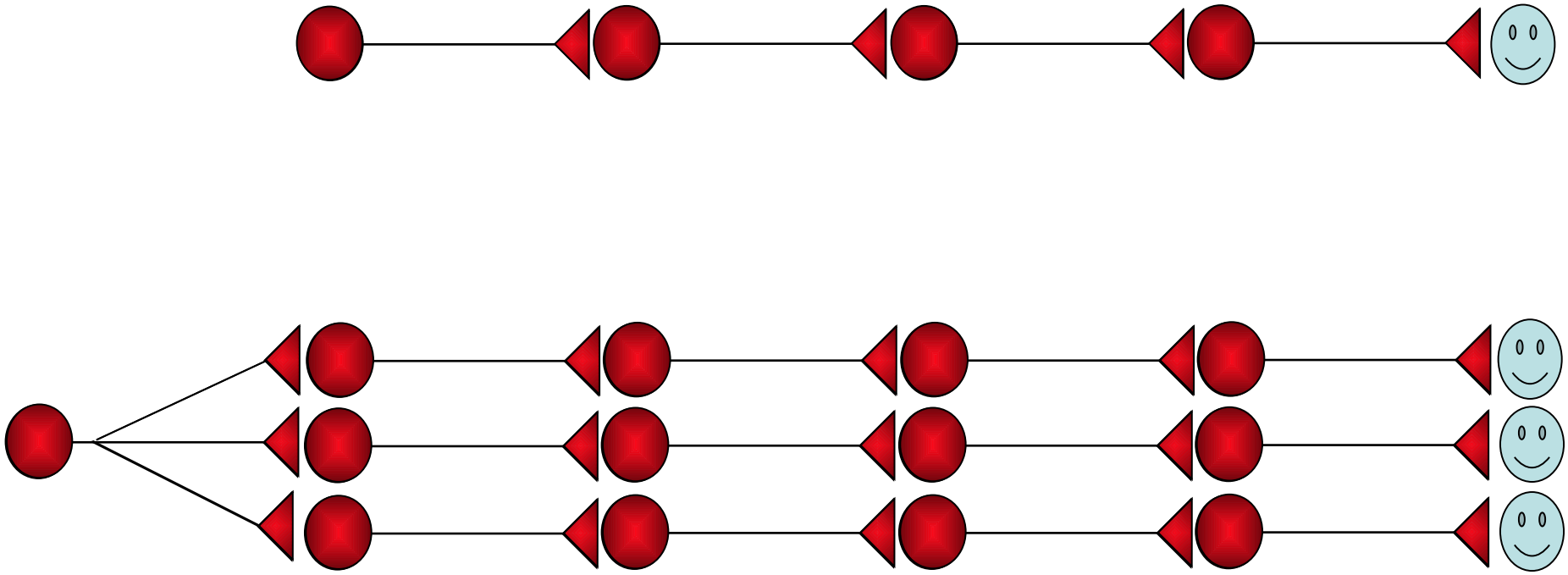
Functional Components

- Neuronal Circuits
  - The design of the circuit (arrangement of neurons) determines
    - Level of divergence or convergence
      - Spread or shrinkage of information
    - Speed
    - If a circuit will be autorhythmic
  - There is plasticity to neuronal circuits

The Nervous System

Functional Components

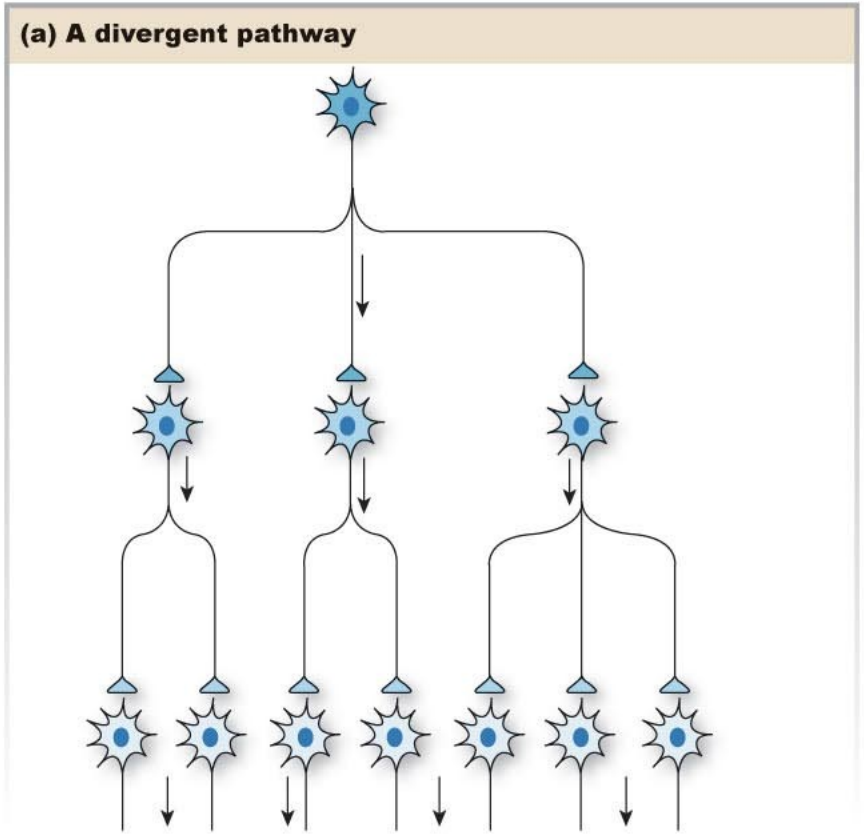
- Serial & Parallel Circuits

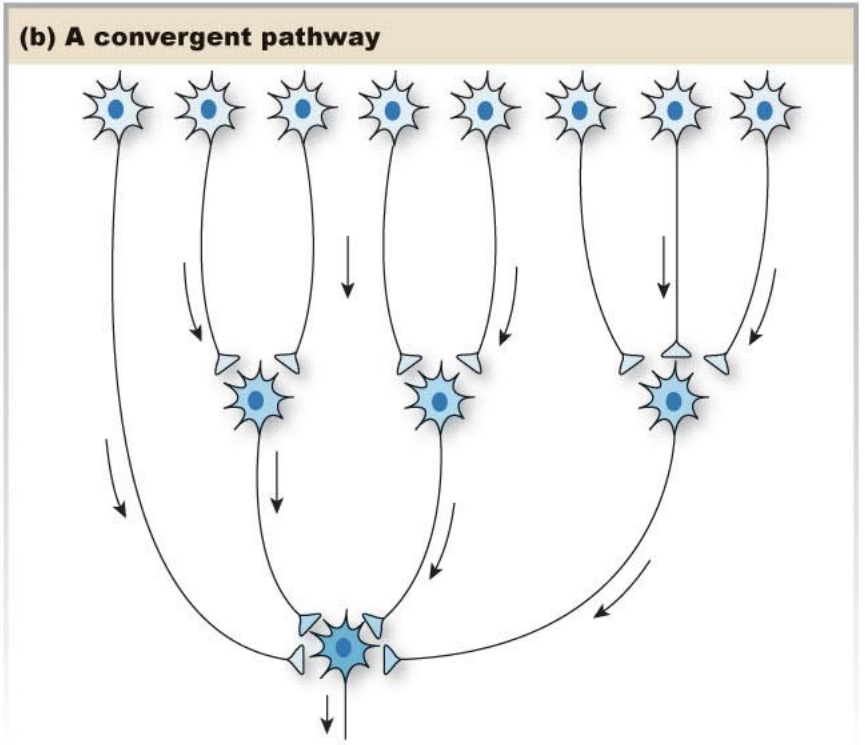


The Nervous System

Functional Components

- Converging vs. Diverging Circuits

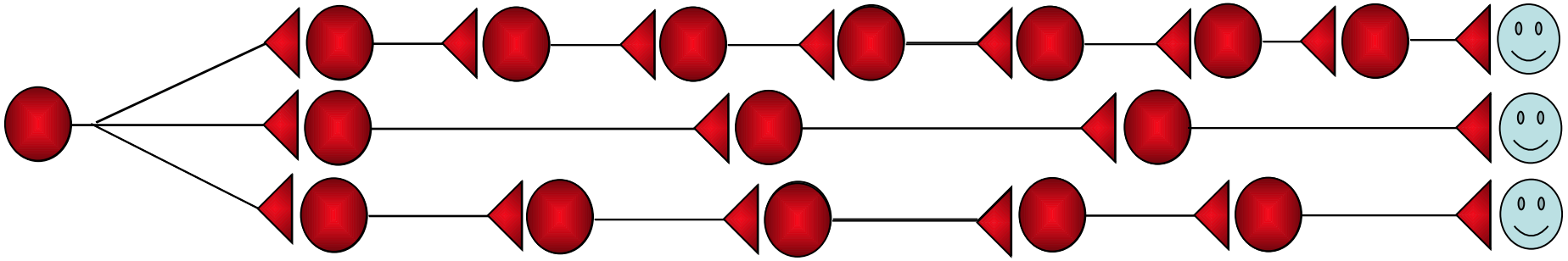




The Nervous System

Functional Components

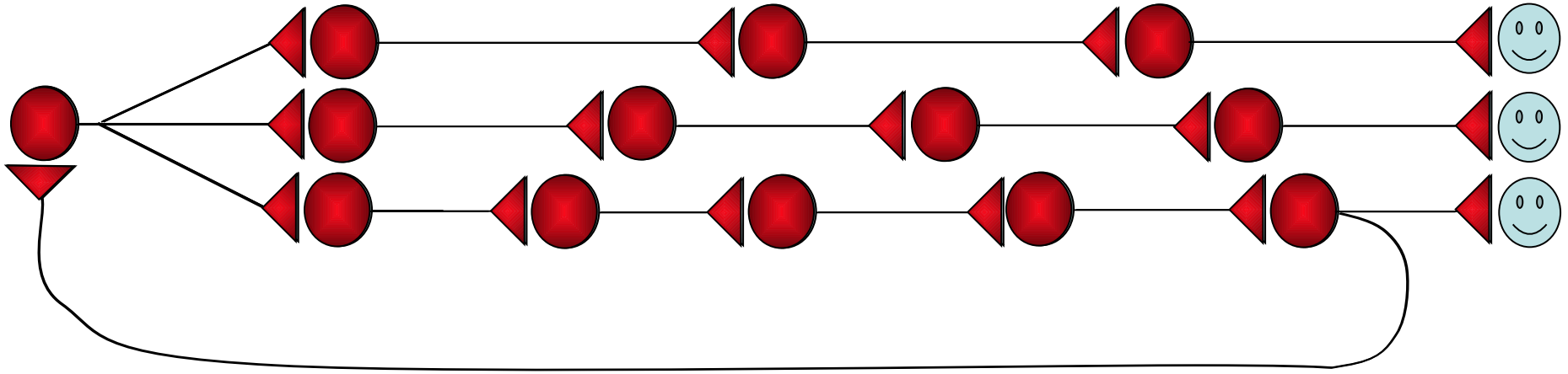
- Parallel After Discharge Circuit



The Nervous System

Functional Components

- Reverberating (Oscillating) Circuits



The Nervous System

Reflex Pathways

- What are reflexes?
- Types
  - Monosynpatic vs. polysynaptic
  - Contralateral, bilateral, ipsilateral

  - Lab Session on Reflexes…

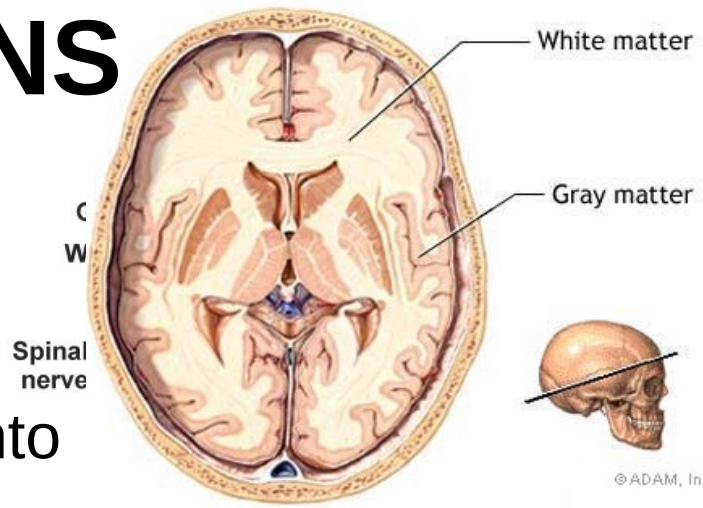
The Nervous System
Organization of the CNS

- Central Nervous System is divided into two functional groups
  - The brain
  - The spinal cord

  - What goes on in these two different areas?
    - Sensory aspect
    - Integrative aspect
    - Motor aspect

The Nervous System
Organization of the CNS

- The Brain
  - Functional organization
    - Neuronal circuits organized into
      - Gray matter & White Matter



Gray Matter

Consists of
- Non myelinated axon terminals
- Dendrites
- Cell Bodies

Functions in
- signal processing (integration)
- Neurocrine / neurohormone secretion

White Matter

Consists of
- Myelinated axons

Functions in
- Formation of tracts
  - ascending or descending (SC)
  - commissural, association, projection (B)

The Nervous System
Function of the CNS

- Next Tuesday

