The Nervous System

THE LAST MELON!!! 😊

- Define:
  - **Nervous System:** master controlling & communicating system of the body
  - **Describe:**
  - **How does it communicate:** electrical & chemical signals
  - **Speed & Response:** immediate

- What are the three overlapping functions:
  - **Sensory Input**
    - **Function:** info gathered by sensory receptors about int & ext changes
  - **Integration**
    - **Function:** processing & interpretation of sensory input
  - **Motor Output**
    - **Function:** activate effector organs (muscles & glands), produces a response

Divisions of the Nervous System:

- **CNS**
  - **Made of:** brain & spinal cord
  - **Function:** integration & control center, interprets sensory input & dictates motor output

- **PNS**
PNS
- Made of: nerves
- Kinds of Nerves:
  - **spinal nerves**
    - Where: to & from spinal cord
  - **cranial nerves**
    - Where: brain to & from

Peripheral nervous system (PNS) divisions
- **sensory** division (afferent)
  - Fibers:
    - somatic sensory fibers
    - visceral sensory fibers
- **motor** division (afferent)
  - Transmits: impulses from CNS to effectors organs
    - Muscles and glands
  - Somatic NS
    - Conduct where: CNS to skeletal muscles

- Voluntary nervous system
  - Autonomic NS
    - Regulates: smooth, cardiac muscles, glands
    - Involuntary
    - Two subdivisions:
      - **sympathetic**
        - "fight or flight"
        - Increases activity levels in response to stress
- Dilates pupils
  EX. THE Respiratory rate ↑ livers to release glucose
- Parasympathetic
  “rest & digest”
  Decreases activity or returns to normal

- Nervous Tissue Histology
  - Neuroglia: glial cells—cells that surround delicate neurons
  - Neurons: nerve cells—excitable cells, transmit electrical signals
- Neuroglia:
  - Supports: CNS
  - Kinds of cells:
    - Astrocytes
    - Microglial cells
    - Ependymal cells
    - Oligodendrocytes

<table>
<thead>
<tr>
<th>Astrocytes</th>
<th>Microglial cells</th>
<th>Ependymal cells</th>
<th>Oligodendrocytes</th>
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<tbody>
<tr>
<td>most abundant</td>
<td>phagocytized microorganisms</td>
<td>ciliated cells, line cavity</td>
<td>branched cells that wrap CNS nerve fibers</td>
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<tr>
<td>support migration response &amp; blood exchange</td>
<td>secrete cerebrospinal fluid</td>
<td>forming insulating myelin sheaths</td>
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- Neuroglial cells in PNS
  - Satellite cells
    - Surround: neuron cell bodies
  - Schwann cells
    - Surround: all PN fibers
    - Form: myelin sheaths in thicker fibers
    - Similar function to: oligodendrocytes
    - Vital to: regeneration of damaged peripheral nerve fiber

Neurons

- Neuron: structural unit of NS
- Conduct: impulses
- Special characteristic:
  - extreme longevity
  - amitotic
  - ↑ metabolic rate
- All have cell body and one or more processes

- Neuron cell body
  - Aka: perikaryon or soma
  - Biosynthesis center of neuron
- Synthesizes: *proteins*, *membranes*, *chemicals*
  - In most plasma membrane is part of receptive regions that receives input info from other neurons
  - Most neuron cell bodies are located in CNS
    - **CNS**: Nuclei: clusters of neuron cell bodies in CNS
    - **PNS**: Ganglia: clusters of neuron cell bodies PNS
- Neuron Processes
  - Arm like processes that extend from cell body
    - CNS contain both: neuron cell bodies & their processes
    - PNS contain chiefly: neuron processes
  - Tracts: CNS bundles of neuron processes
  - Nerves: PNS
- Two types:
  - **Dendrites**
    - Contain 100s of these short, tapering, branches
    - Contain same *organelles* as the cell body
    - Input: receptive region of neuron
    - Convey incoming messages toward cell body as: graded potentials
  - Axon structures
axon structures

- Each neuron has one axon that starts at a cone shaped area called the axon hillock.
- In some neurons, axons are short/absent and in other ones length of entire cell.
- Long axons: nerve fibers
- Axons have branches called: axon collaterals
- Where do axons branch: end (terminus)
- Distal endings are called: axon terminals

- The axon function
  - Axon is what region: conducting axodlemma, which is the neuron cell mem to the axon terminal.

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