Johns Hopkins Engineering

Methods in Neurobiology

Introduction to Molecular and Cellular Neurobiology

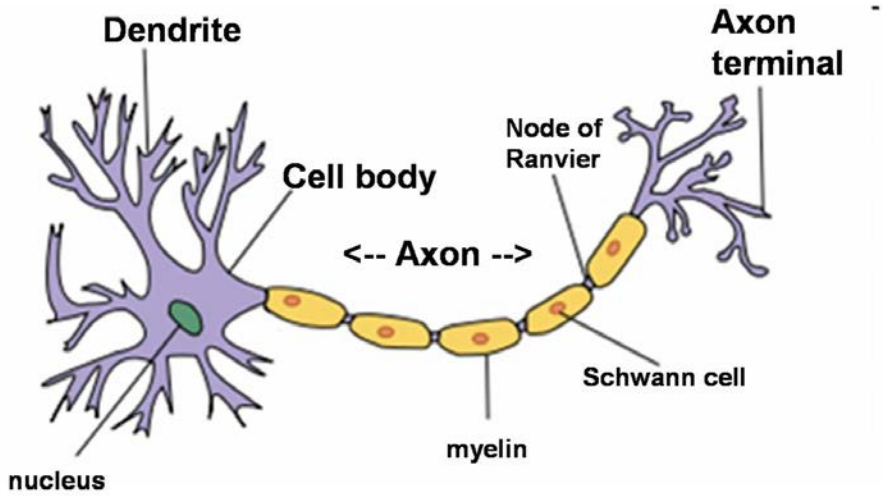
JOHNS HOPKINS
WHITING SCHOOL
of ENGINEERING

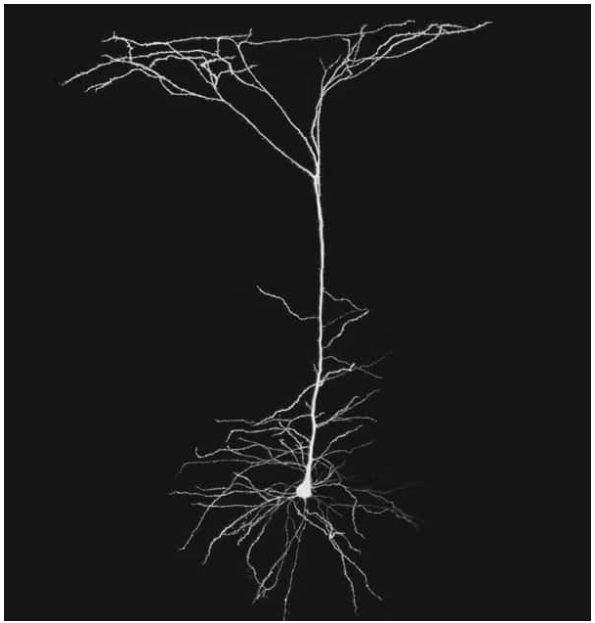
What is neurobiology?

Neurobiology is the study of cells of the nervous system and the organization of these cells into functional circuits that process information and mediate behavior.

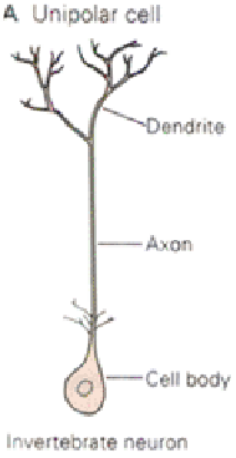
- We approach neuroscience at cellular and molecular level.
- Neurons v. glia
  - **Neurons** (nerve cells/neural cells) are the signaling unit of the nervous system (Neuron doctrine)
  - **Glia** support (the function) of nerve cells

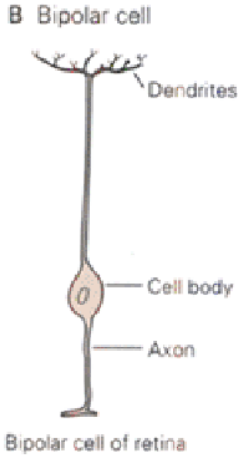
Neuron structure

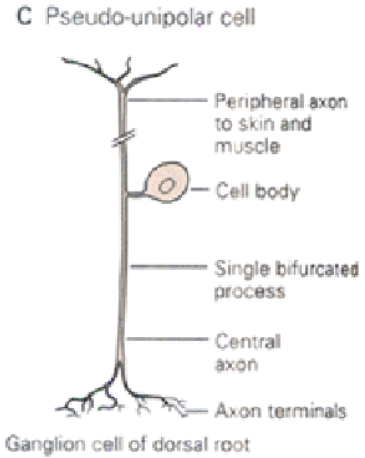


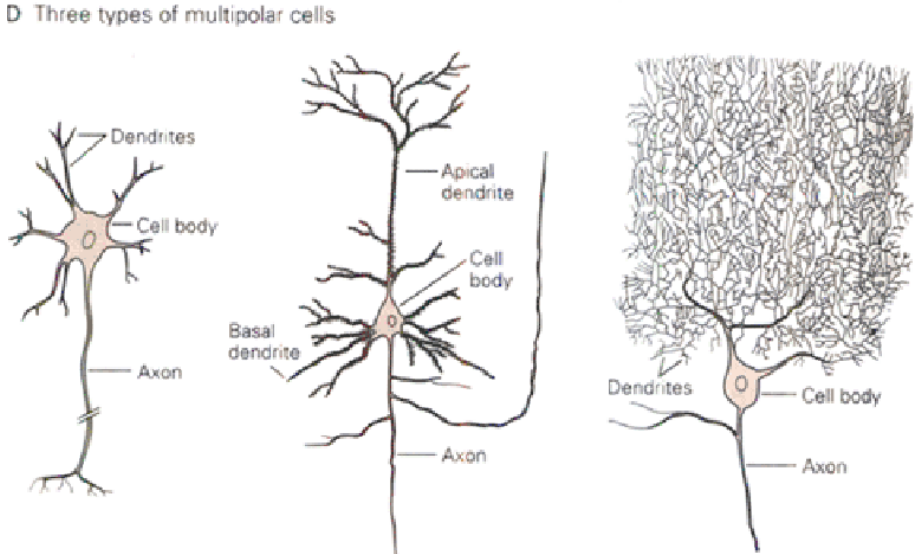


Neurons, classification





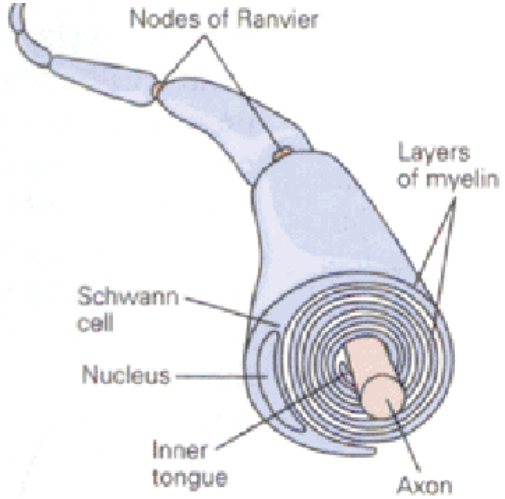




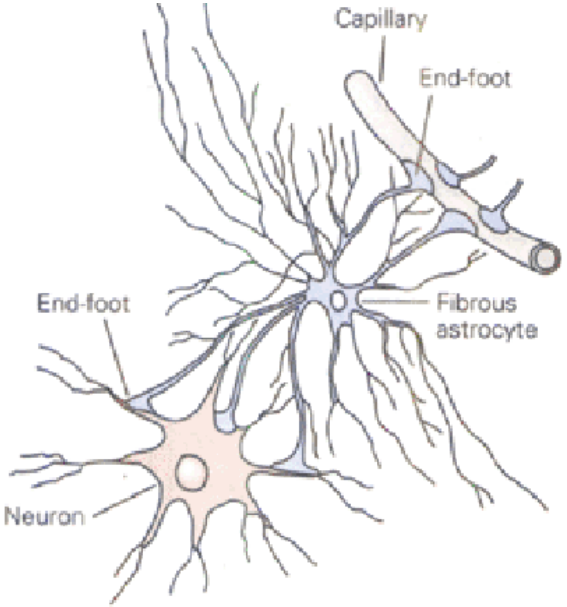
Glia-support for nerve cells

Oligodendrocytes in white matter

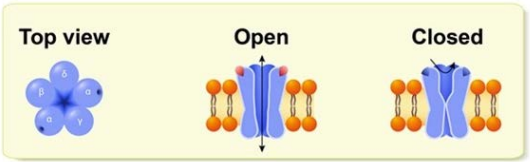
Schwann cells

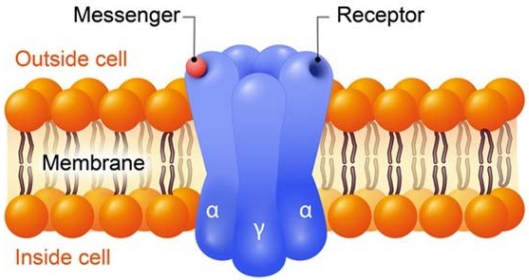


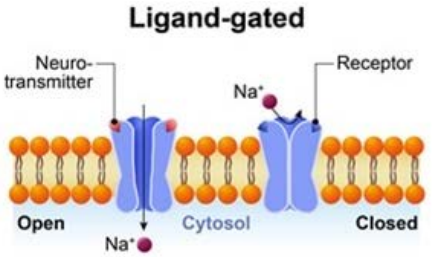
Astrocytes

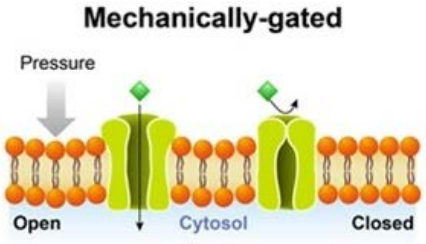


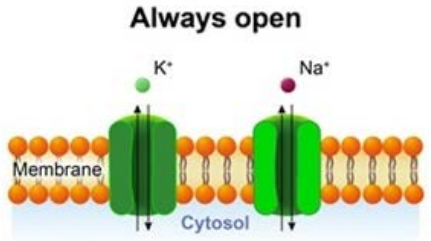
Electrical properties of cells: ion channels

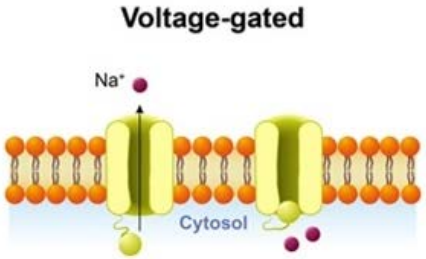








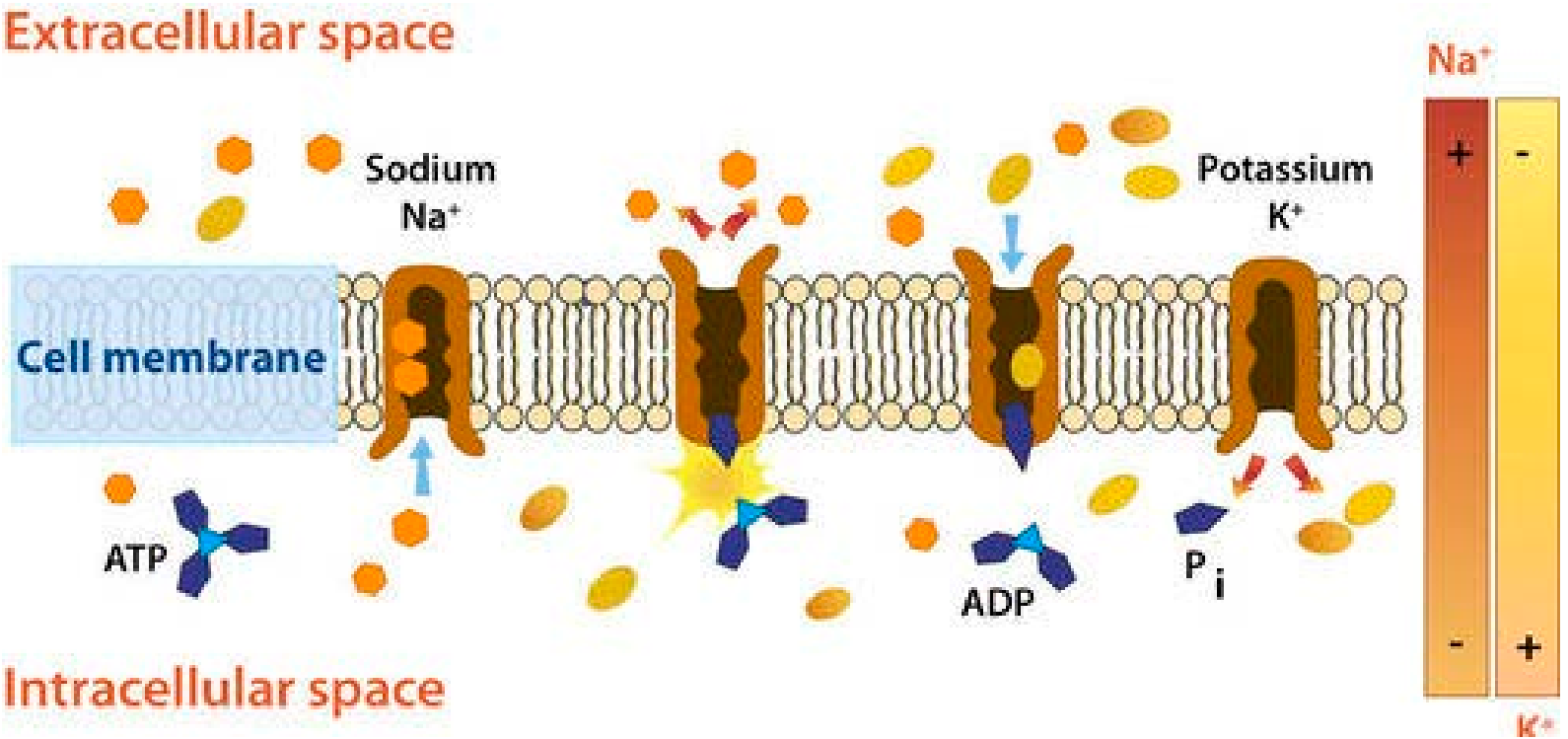




Ion channels v. pumps

Ion channels	Transporters
Ion channels are pore-forming membrane proteins that allow the movement of ions through the cell membrane	Transporters are transmembrane proteins that transport ions across the cell membrane against the concentration gradient
Transport ions through the concentration or electrochemical gradient	Ions move across the cell membrane against the gradient
A passive transport mechanism since cellular energy is not used for the transportation of ions	An active transport mechanism since ATP is used in the form of cellular energy

Electrical properties of cells: Na^+/K^+ pump



References

Slide	Reference
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