



## Neuronal Structures Soma

Psychology 372

Physiological Psychology

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### Membrane

- Separates the internal environment from the interstitial fluid of the body
- Contains a Lipid Bilayer

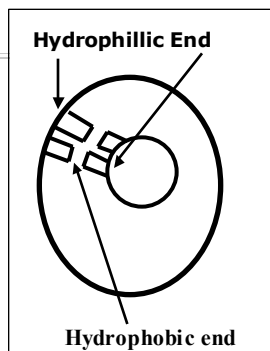
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### Membrane

- Two Layers
  - Each molecule has a hydrophilic (water loving) and hydrophobic (water fearing) end

Membrane = 5nm thick



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### Stuff in the Membrane

- Proteins
  - Are chains of amino acids
    - RNA, DNA, Receptors, NaK Pump, Channels etc.
- Peptides
  - Are small proteins
    - Have 30-40 amino acids
    - E.g., neurotransmitters
      - GABA, ACH,
    - Do things that classic Neurotransmitters don't do.

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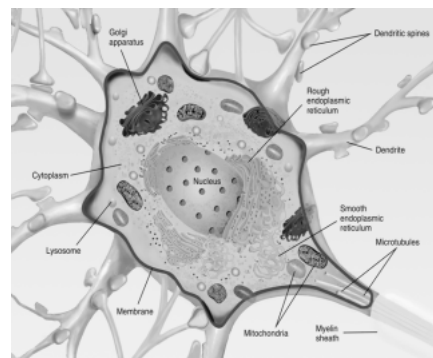
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### Major Components

- Soma = Parikaryon = (Around Nucleus)
- Dendrites
  - Postsynaptic Element
- Axon
  - Axon Hillock
  - Teleodendria
  - Presynaptic Element (Terminal Button, Synaptic Knob, Terminal Bouton, etc.)
  - Myelin

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### Soma Internal Structures



### Soma or Cell body

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- Has places where messages from other neurons can be received - Post Synaptic Element
- Is where cell metabolism takes place
  - Has many Structures
    - Nucleus
    - Mitochondria
    - Endoplasmic Reticulum
      - Rough
      - Smooth
    - Golgi apparatus
    - Lysosomes
    - Other

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### Two Classes of Cell Components

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- Inclusions
- Organelles

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### Inclusions

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- Different types
  - Lipofusion
    - Are fats in the cell
    - Accumulate over time
    - Fat ultimately can destroy the neuron
    - Suffocates the cell
  - Are pigmented areas of the cell
    - Substantia Nigra

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### Organelles

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- Are structures in the neuron that keep it healthy and living
- Are in
  - The Soma
  - Nucleus
  - Throughout the cell

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### Structures

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- Neurofilaments
- Nissel Bodies = Rough Endoplasmic Reticulum
- Smooth Endoplasmic Reticulum
- Golgi Bodies
- Neurotubules
- Mitochondria
- Lysosomes
- Inclusions
- Other

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### Neurofilaments

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- Forms the skeleton of the neuron
- Gives the neuron its shape
- Is distributed like a skeleton
- As we age, neurofilaments tangle up
  - May be related to Alzheimer's Disease
    - Get rapid tangles

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### Neurotubules

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- Receives material (vesicles) from Golgi bodies
- Tubules go from soma to presynaptic elements
- Are small, long tubes

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### Nissel Bodies = Rough ER

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- Produces Proteins
  - Are used to
    - Replace RNA
    - Repair structural damage
    - Make NT
- During heavy stress, neurosis, etc, see a decrease in Nissel Bodies
  - May not be able to keep up with the demand.
  - Are used up faster
  - Cells under stress swell 2-3 times normal size
    - Same number but because cytoplasm is larger, the ratio is decreased.

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### Golgi Bodies

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- Make packaging for proteins – Vesicles
- Generally package the proteins made by the Nissel Bodies
- After packaging, put vesicles into neurotubules - Called Axoplasmic Flow

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### Axoplasmic Flow

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- Three types
  - Fast
  - Slow
  - Retrograde
- Goes from Soma to Teleodendria
  - Tubules have Actin in the walls
  - Lipids have Myosin
  - Causes contraction by Peristalsis

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### Axoplasmic Flow

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- Fast
  - Uses Peristalsis
  - 400 mm/day = 12-16-20 inches /day
  - Can get up to 2800 mm/day
- Slow
  - 40 mm/day
  - Works by diffusion
- Fast is the most important
  - Carries more material
  - Mostly NT
  - Carries proteins through the cell

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### Retrograde

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- Goes from Presynaptic Elements to Soma
- Recycles products
- Can reuse vesicles
- 200 mm / day by diffusion
- Material returned to the soma provides a feedback loop
  - Fast return – speed up
  - Slow return – slow down

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### Vesicular Hypothesis

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- NT is synthesized in the Soma and wrapped
- Put into tubules
- Final components are done in the presynaptic element
- NT is released in the cleft

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### Non-Vesicular Hypothesis

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- Everything is done in the Presynaptic Element
- No Packaging
- NT is released in the cleft

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### Lysosomes

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- Are Oval Shaped organelles in the whole neuron
- Are enzyme packages
- Helps clean up the inside of the cell
- When damage to an organelle occurs
  - Enzymes chew up the damaged organelle
  - Damage to organelles are caused by
    - Toxins, herbicides, radiation, etc.
  - Generally break down proteins
    - Are effective recycling mechanisms
- During cell death, lysosome release all enzymes to self-destruct the cell

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### Mitochondria

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- Provides energy for the cell

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