Neurophysiology
Electrotonic Potentials

Psychology 372

Physiological Psychology

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Concept

- Depolarizaton = Becomes more positive
- Hyperpolarization = Becomes more negative

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Electrotonic Potentials

- Also called Passive Potentials
- Are decrimental – they decay
  - Rate of decay depends on
    - Distance measured from point of stimulation
    - Amount of Myelin
    - Length of the axon.
    - Diameter of the axon
    - Other

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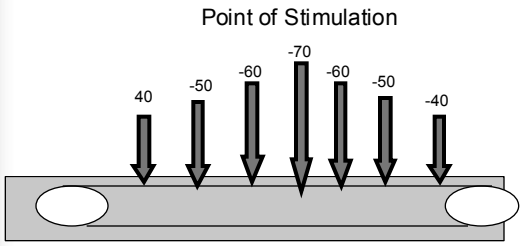
Decrimental Changes



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Charges Decrease in Both Directions from the Point of Stimulation

- Begin to stimulate, get depolarization (becomes more positive)
- K begins to move against the membrane and tries to leave by passive diffusion.
  - If the membrane is thick, the length of dissipation also increases.

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Length Constant

- Distance along the membrane from the point of stimulation where the change in the resting potential has dissipated to 37% of the original

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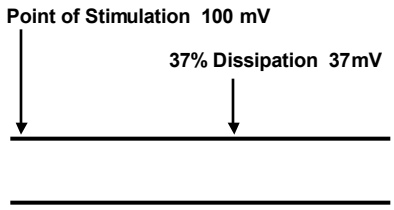
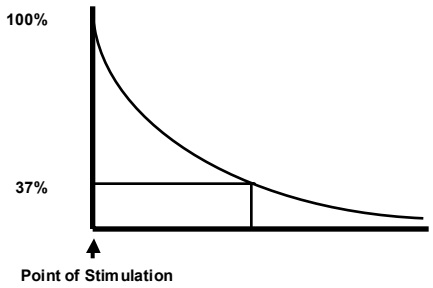
Length Constant

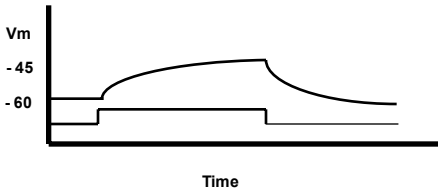


Length Constant



Temporal Summation

- Present a stimulus every ___ milliseconds.
- Observe depolarization



Resistance

- If membrane is resistant to K leaving, it becomes more difficult or K to leave
- Speed is the same
- All is done by passive channels.
- Decrease resistance by increasing the diameter of the axon.

Thus, length constant will also dictate temporal summation

How do you get an Action Potential?

Answer

- Add and Subtract Charges
- Must depolarize the membrane 15mV to get voltage gated channels to open and get an action potential.

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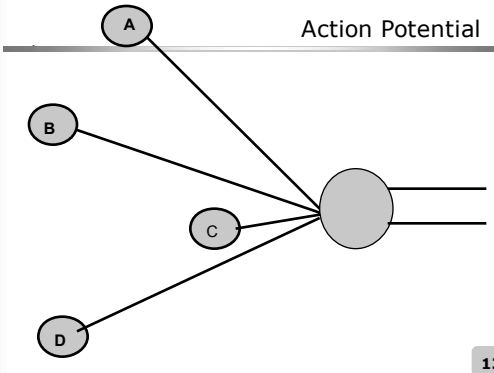
Action Potential



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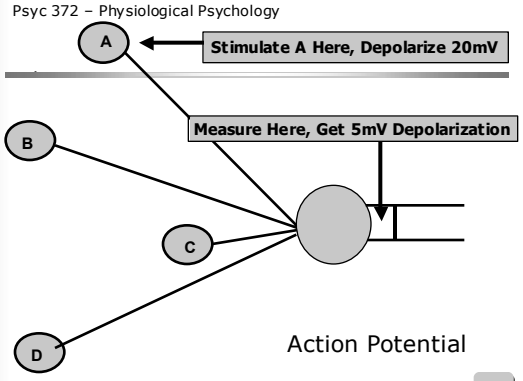

Action Potential

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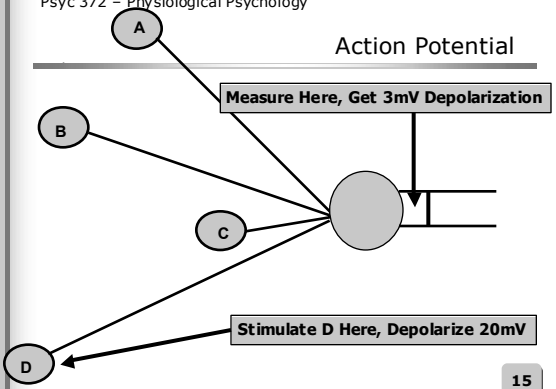
Action Potential



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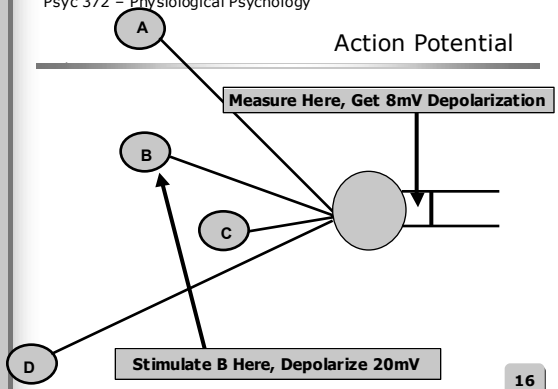
Action Potential



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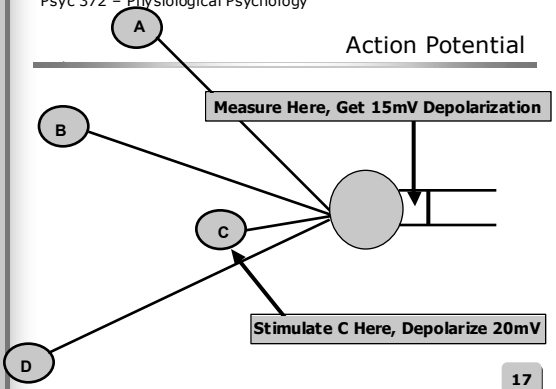
Action Potential



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Action Potential

- A alone — Get Nothing
- B alone — Get Nothing
- D alone — Get Nothing
- C alone — Voltage channels open - get AP
- A + B + D — Voltage channels open – get AP

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Influences

- Distance away - Length constant
- Temporal summation
- Inhibitory neurons
  - Cause hyperpolarization at the hillock (becomes more negative)
- Combination of depolarization and hyperpolarization determines if Voltage-Gated channels open.

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