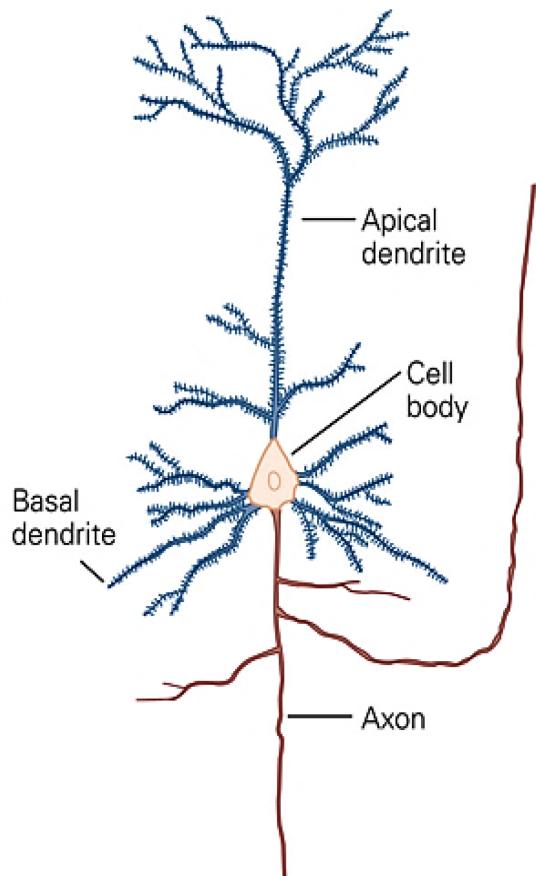


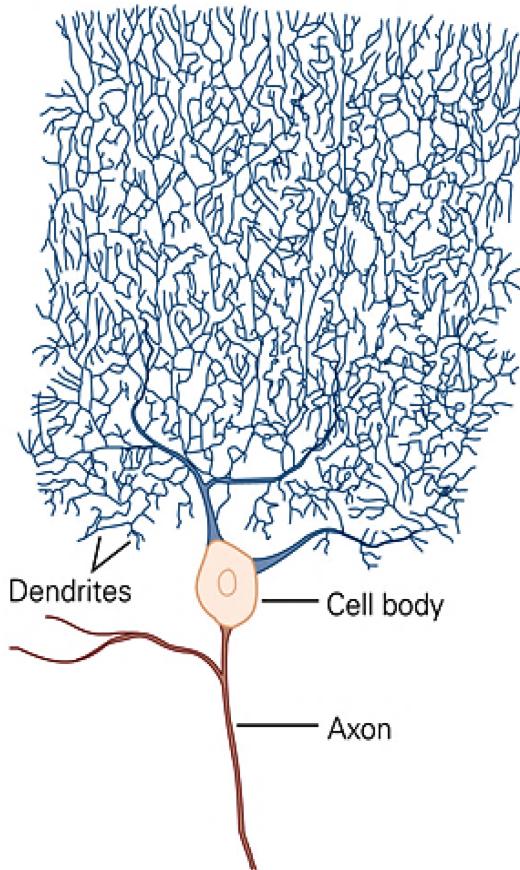
Chapter 3: Nervous System Cells and Circuits



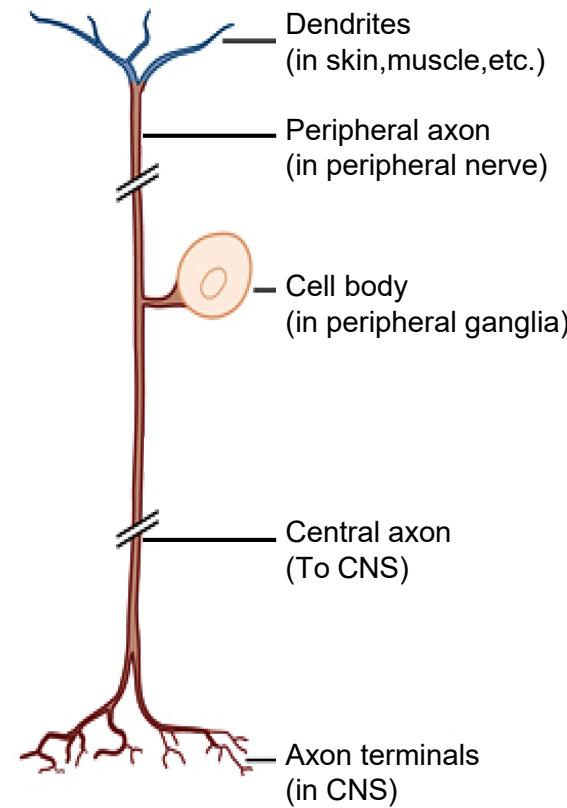
Anatomy of Neurons



Pyramidal neuron
(cerebral cortex and hippocampus)



Purkinje cell
(cerebellar cortex)

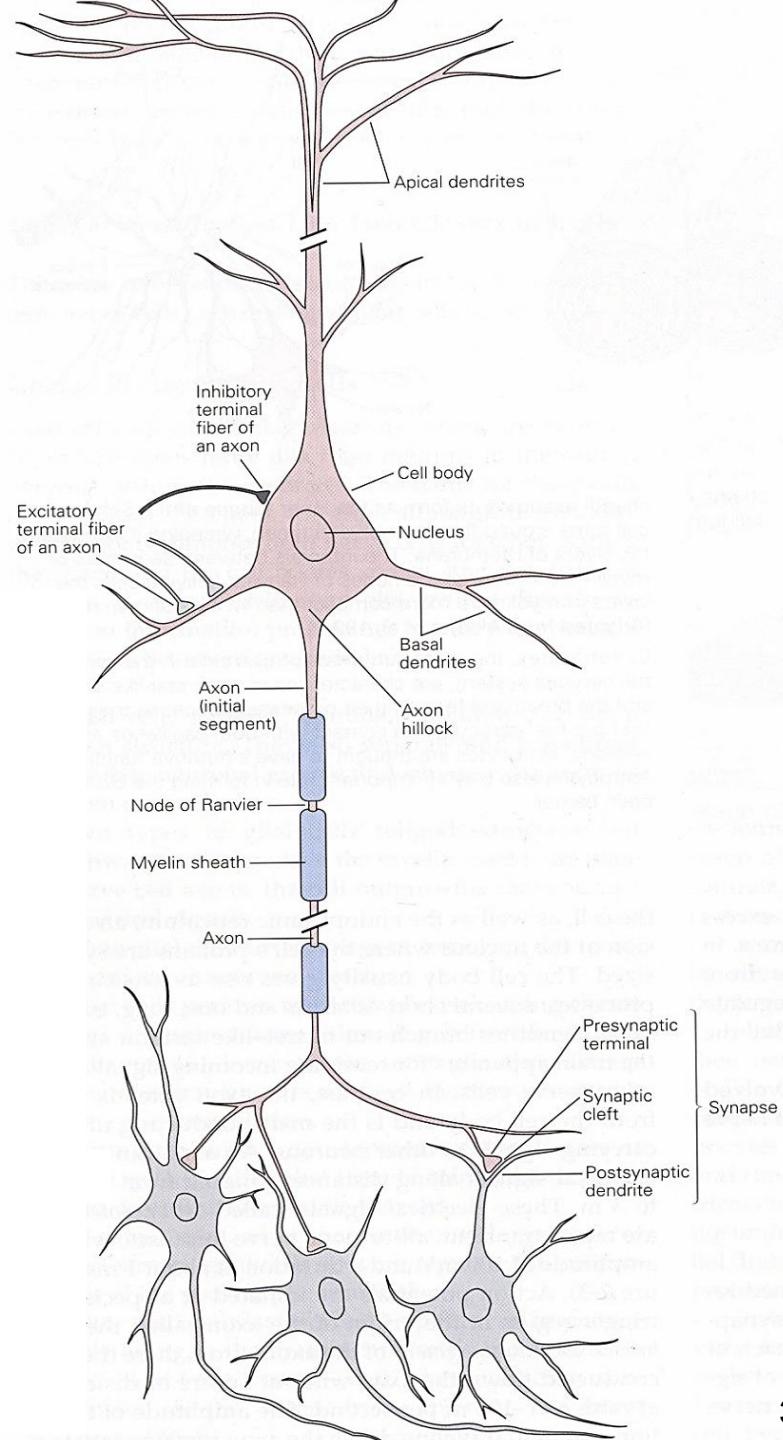


Primary afferent neuron
(peripheral nervous system)

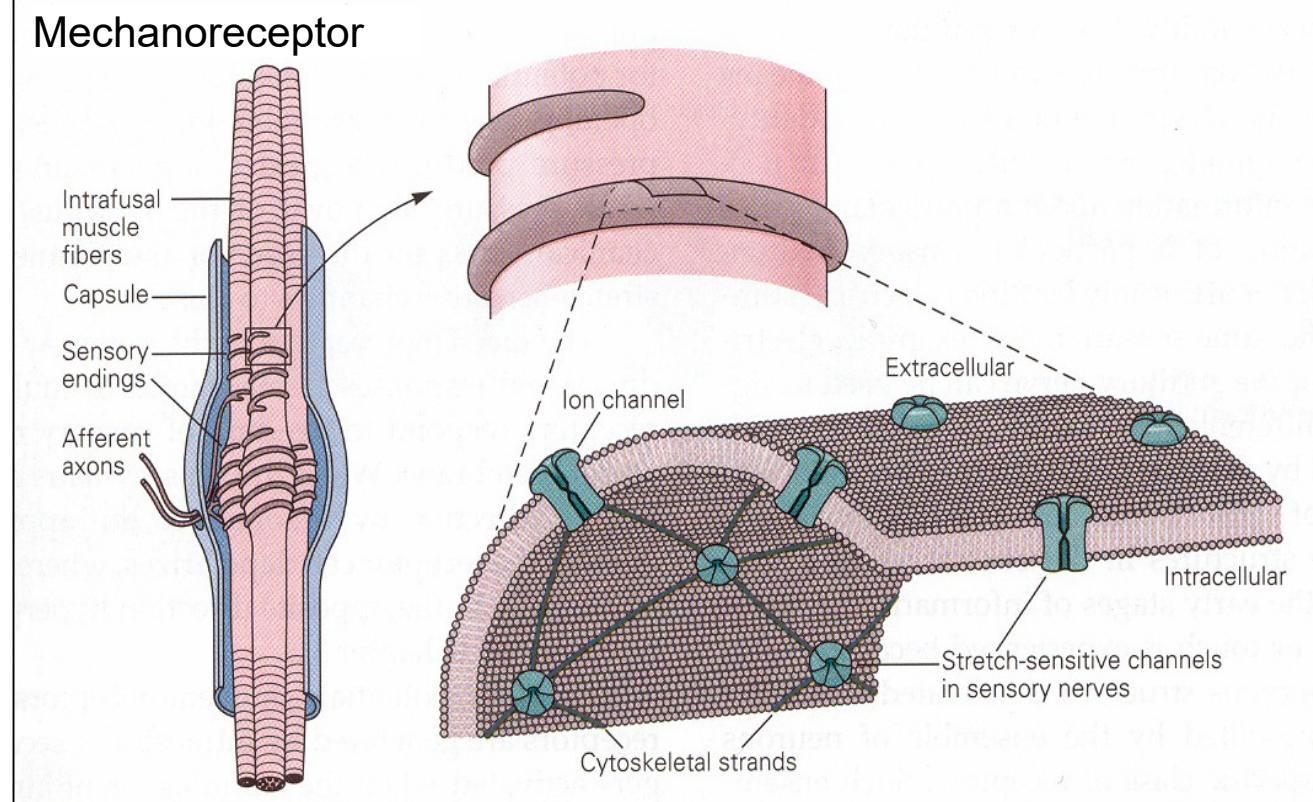
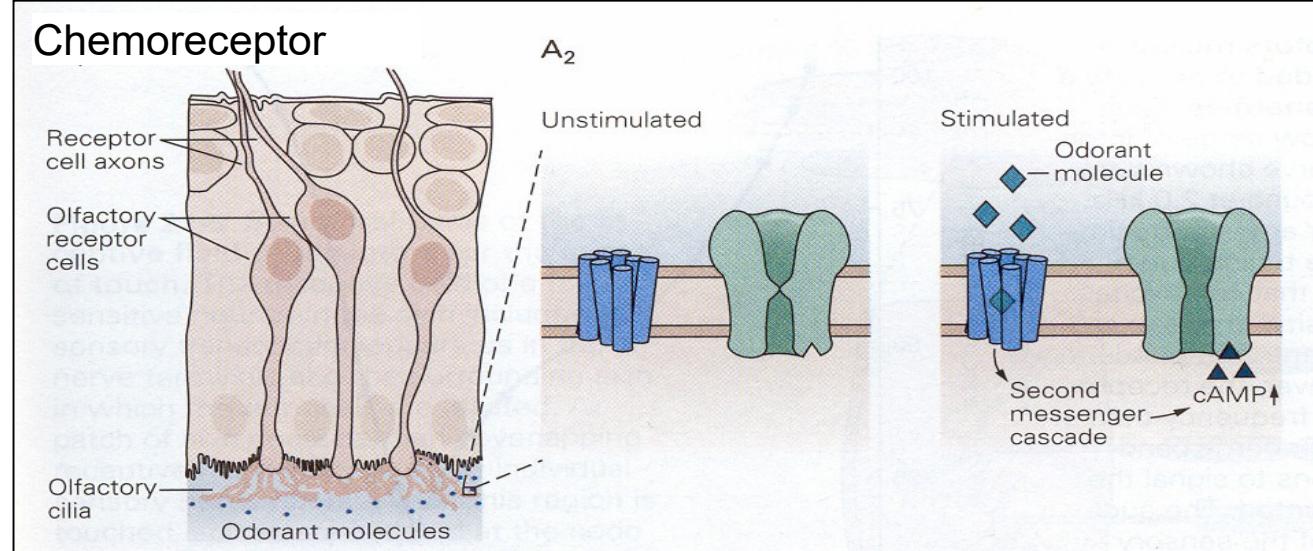
Neuronal Signals

Input

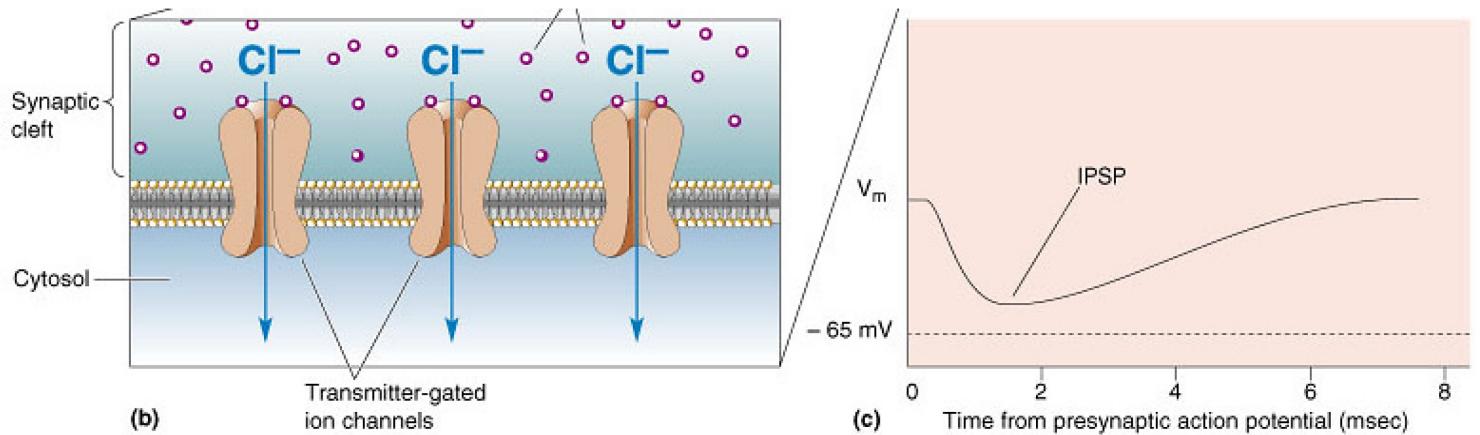
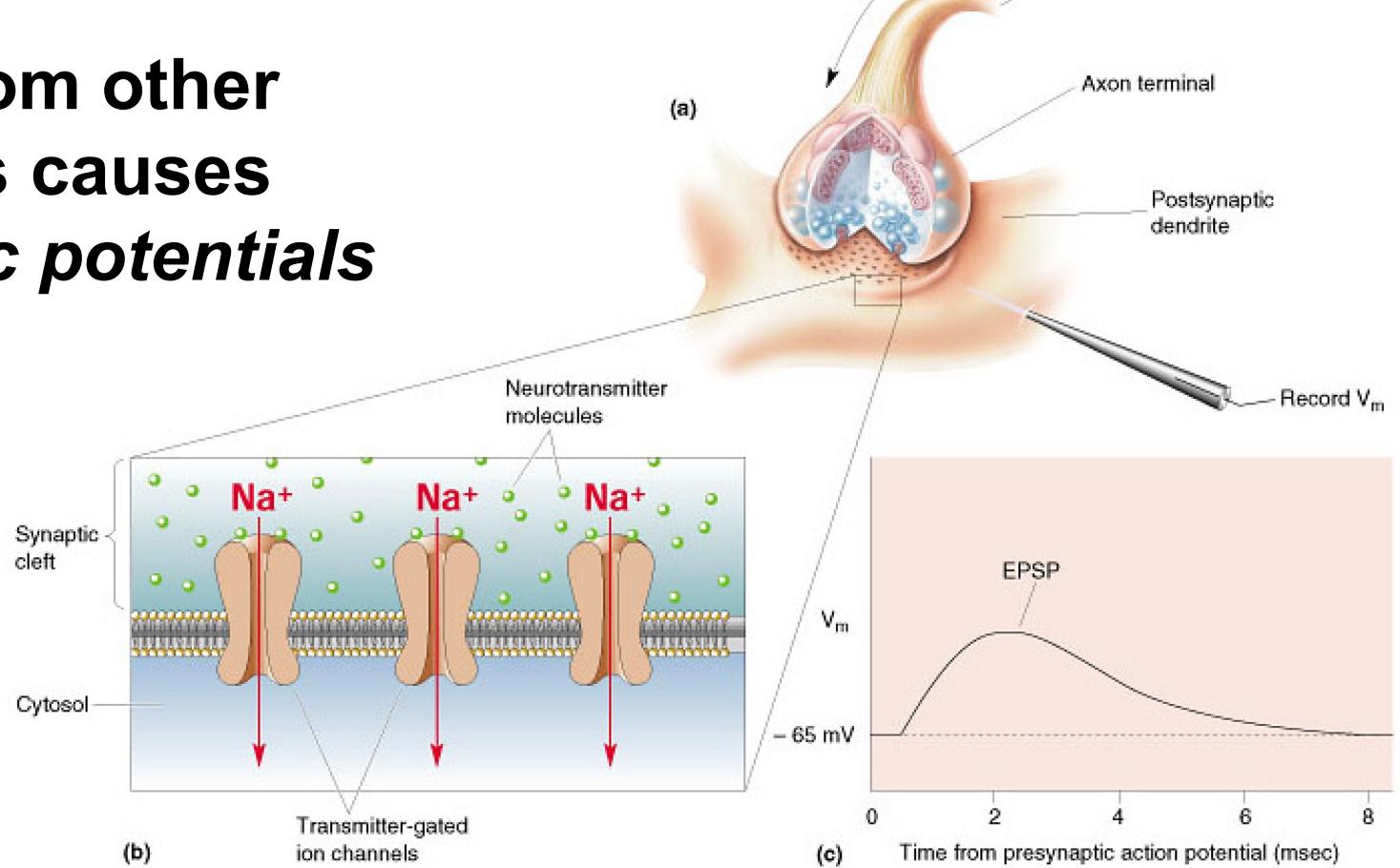
- Local change in membrane potential mediated by ion channels
- Depolarizing or hyperpolarizing
- Amplitude is variable (graded)
- Decays with distance and time



Input at sensory receptors causes receptor potentials



Input from other neurons causes synaptic potentials

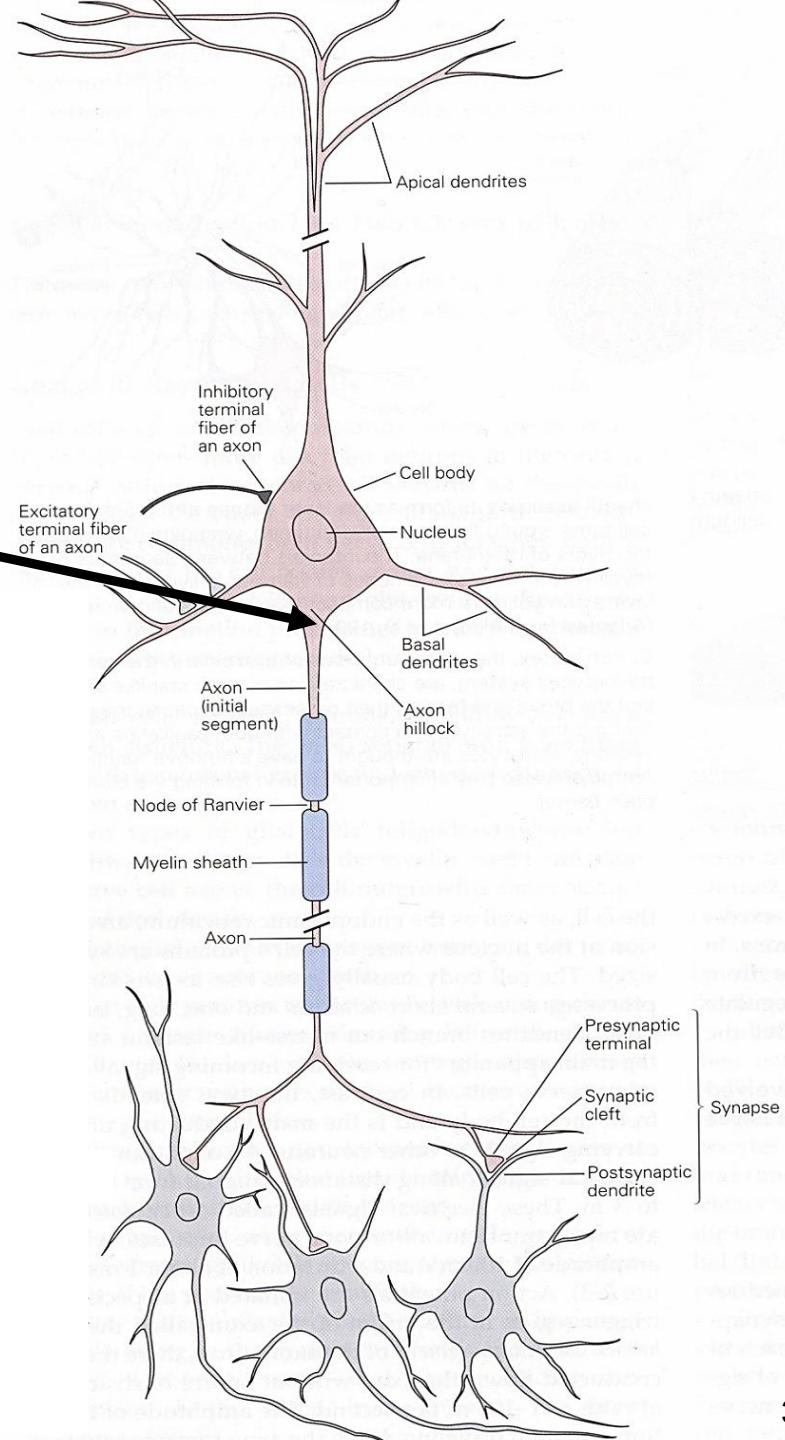


Neuronal Signals

Integration site

- High density of voltage-gated Na^+ channels
- Summation of inputs occurs

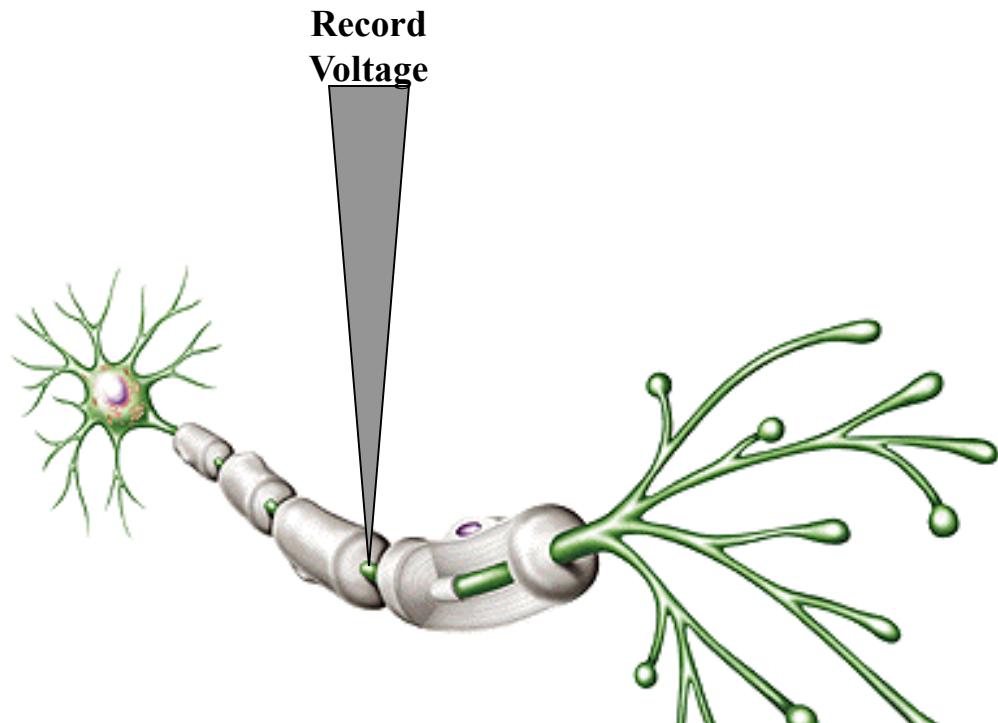
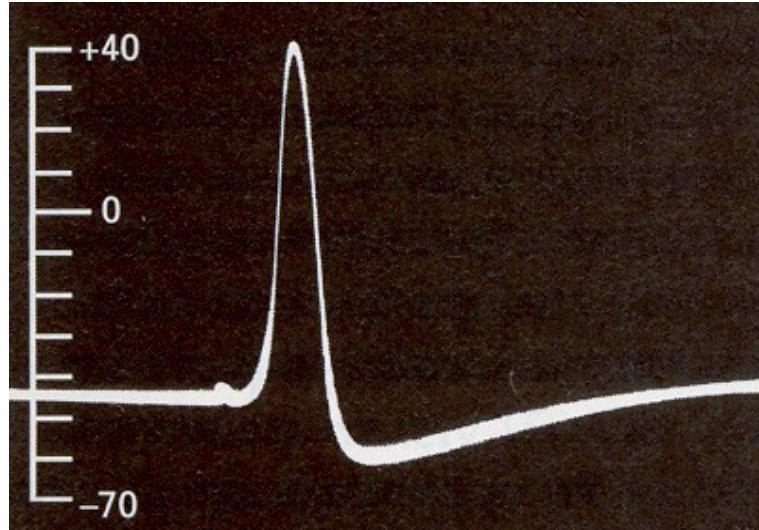
Action potential conduction



Neuronal Signals

Action potentials

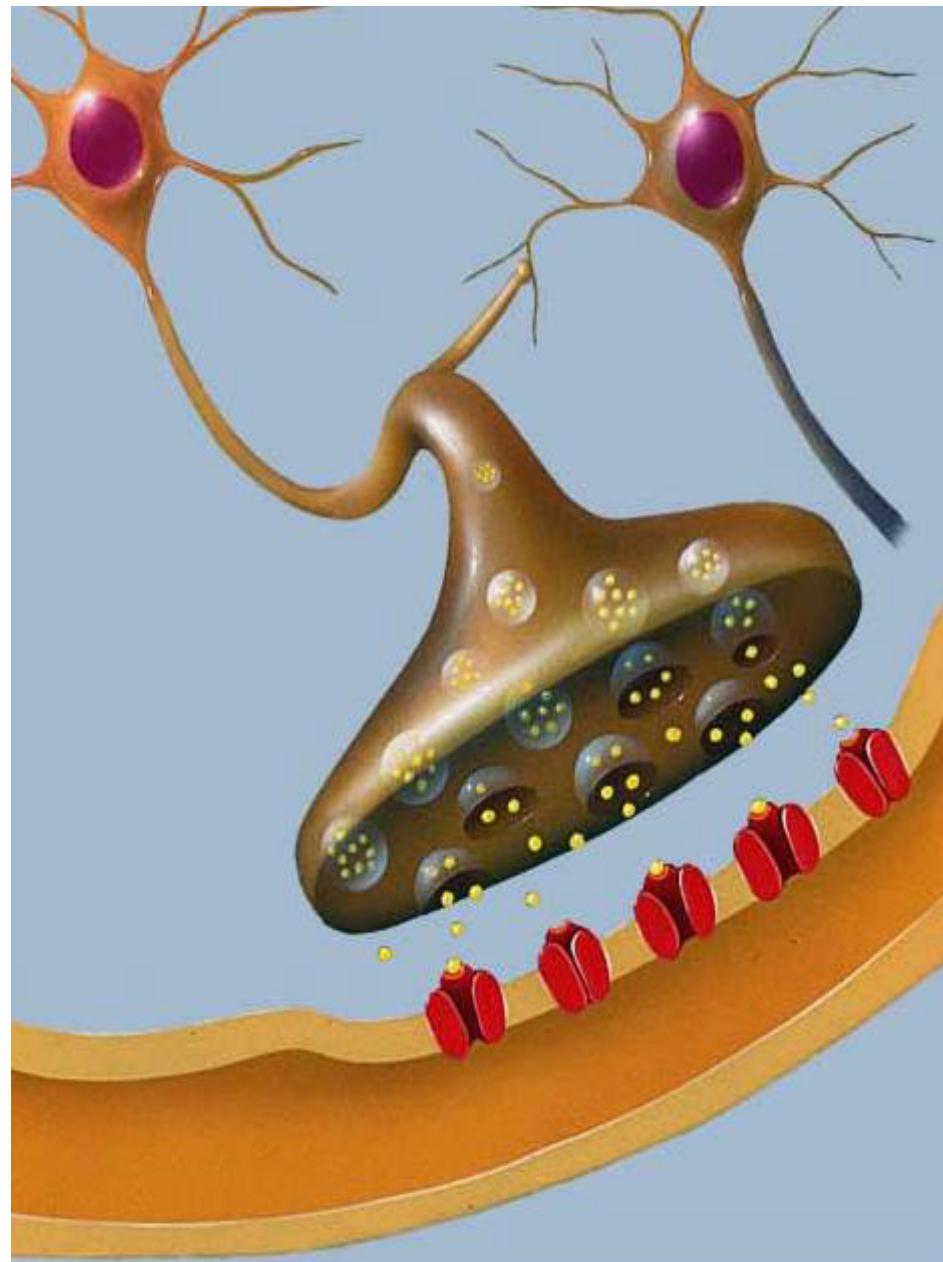
- Initiated at trigger zone when *threshold* is reached
- Mediated by voltage-gated channels
- All-or-none
- Self-propagating/regenerative as it moves down the axon
- Propagation velocity depends on axon properties, reaching speeds of up to 100 meters/second



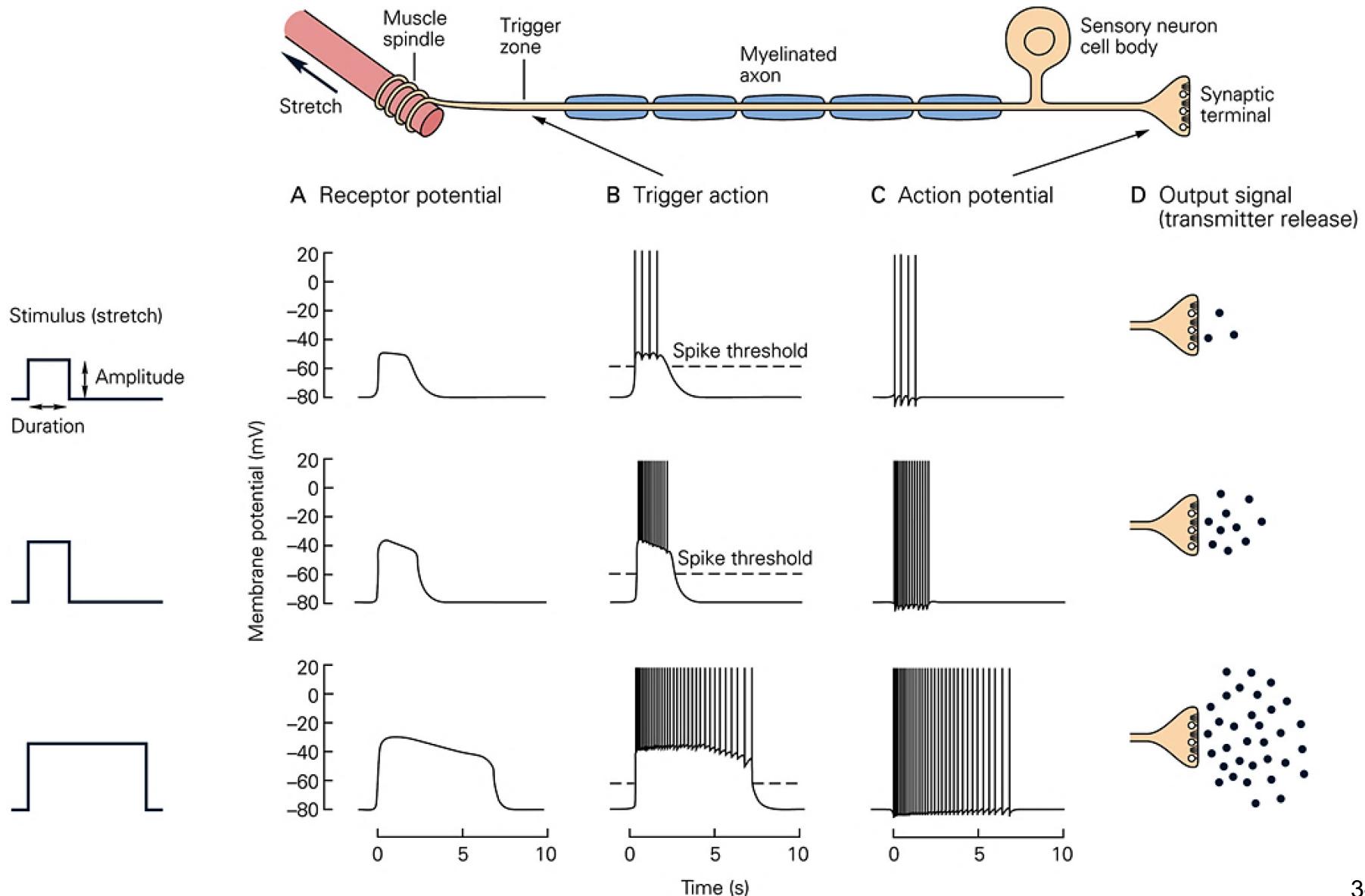
Neuronal Signals

Output

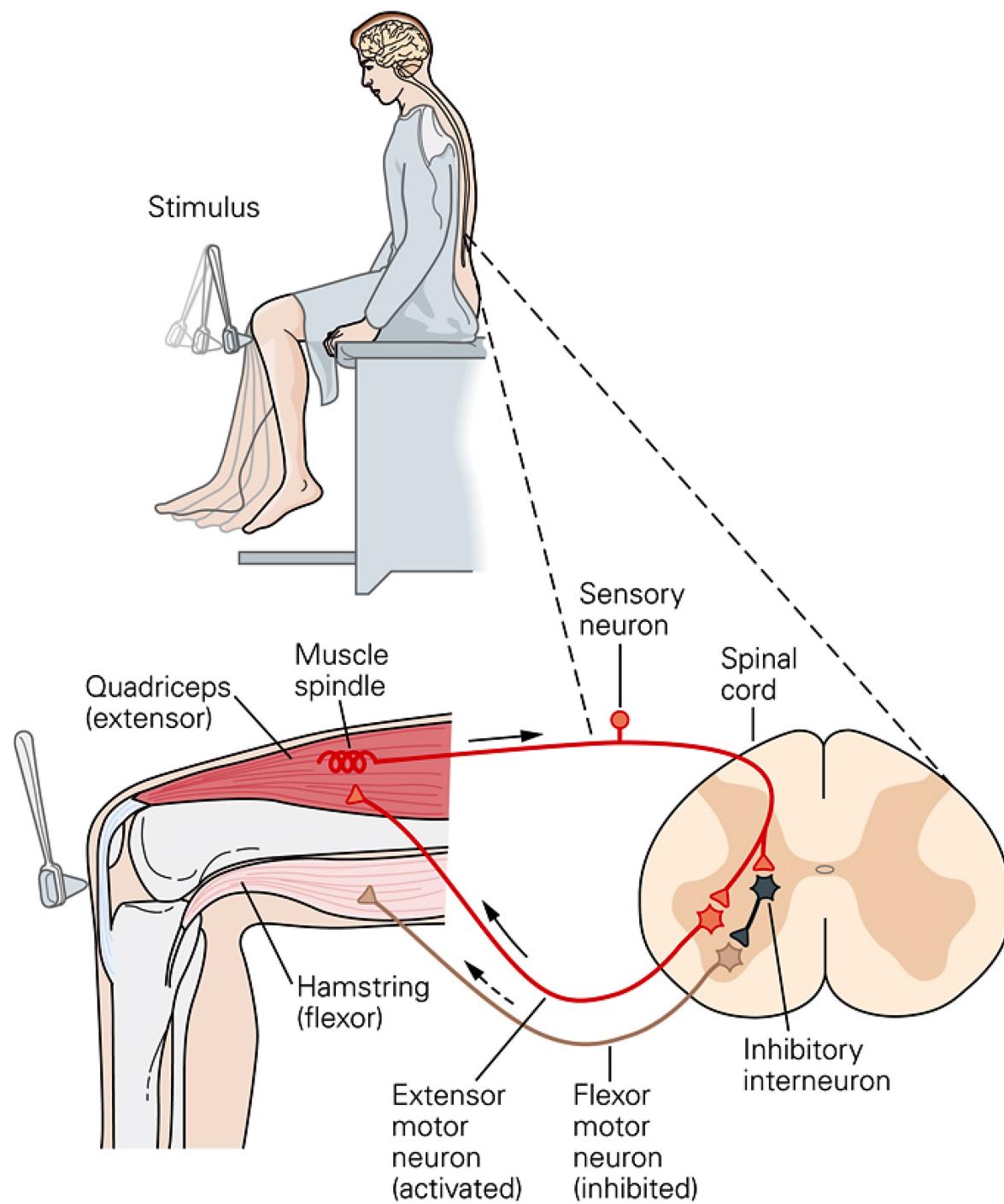
- Neurotransmitter is released
 - Amino acids
 - Amines
 - Peptides
- The amount of transmitter released is dictated by the frequency and timing of action potentials arriving at the axon terminal
- Affects the membrane potential of the postsynaptic neuron



Neuronal Signals



Neuronal Circuits



Neuronal Circuits

