

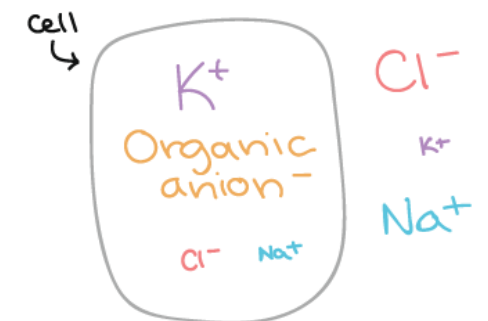
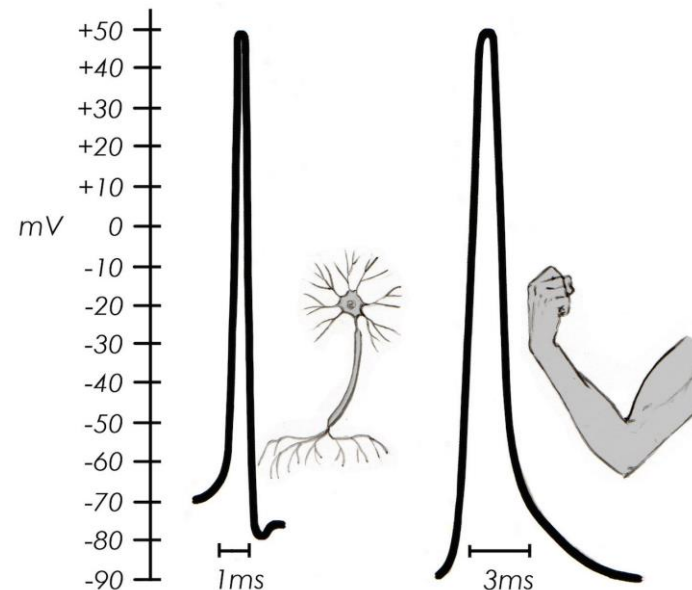
# Action Potential and Ion Channels

## Lecture 7

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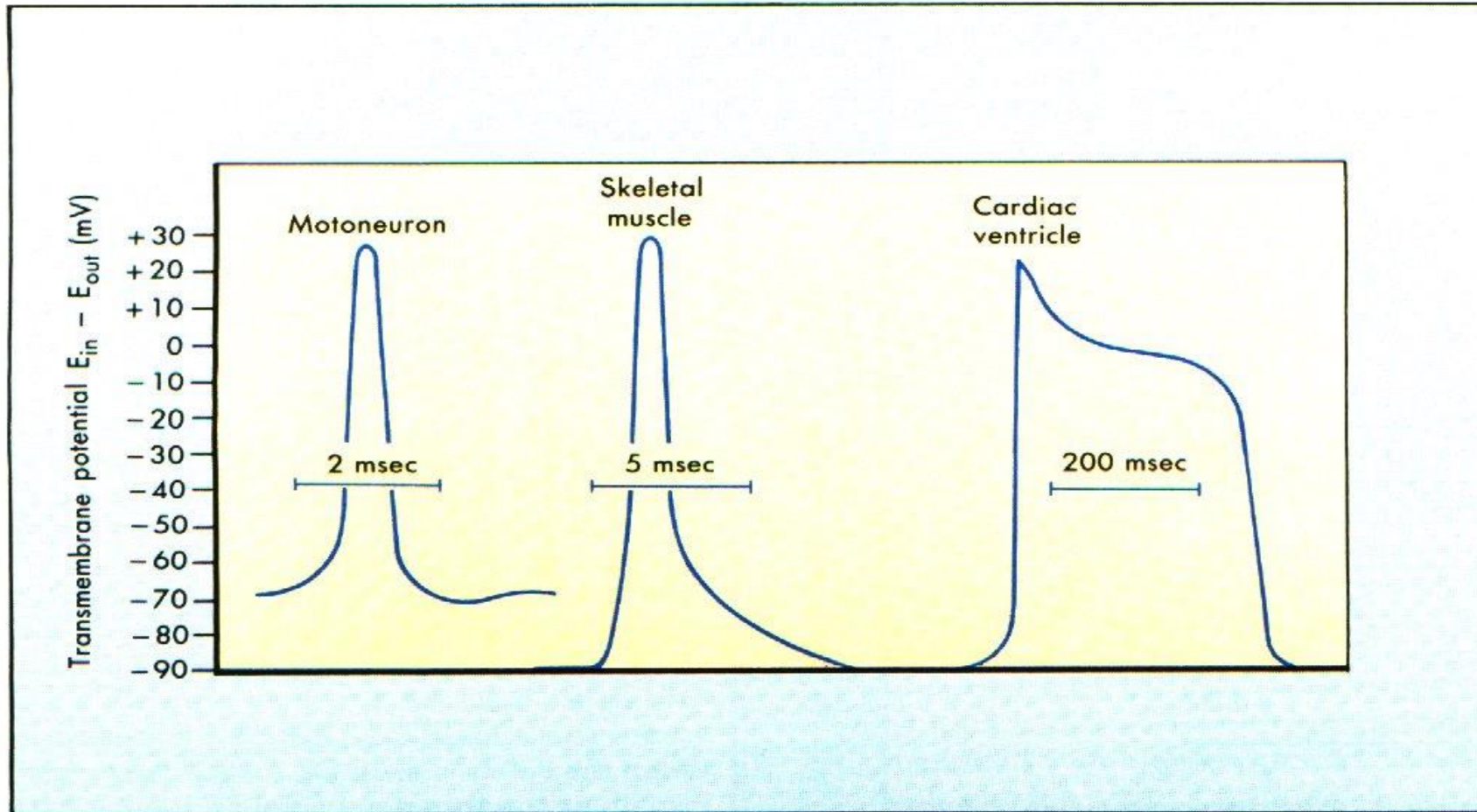
# Is there any difference between skeletal muscle and neuronal membrane potentials?

- Skeletal muscle membrane potential maintains more negative membrane potential than the neuronal membrane potential.
  - The more negative  $V_m$  due to
    - Increased  $K^+$  gradient
    - Increased  $Cl^-$  gradient
    - Greater resting  $Cl^-$  permeability
  - The T-tubule membranes contains chloride channel that contributes to the resting  $V_m$  potential together with leaky  $K$  channel.



BIG letters = high concentration  
tiny letters = low concentration

# Comparison between neuronal action potential and action potentials in other cell types



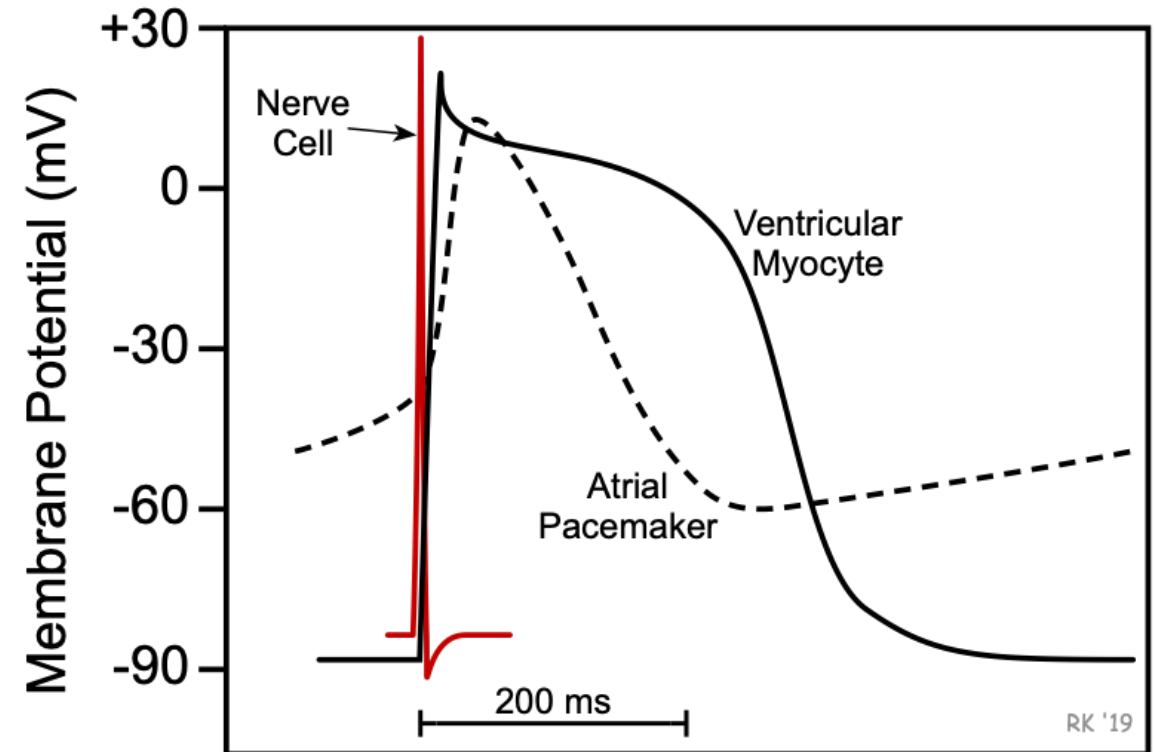
**FIGURE 3-1** Action potentials from three vertebrate cell types. Note the different time scales. (Redrawn from Flickinger CJ et al: Medical cell biology, Philadelphia, 1979, WB Saunders Co.)

# Action potentials in the heart

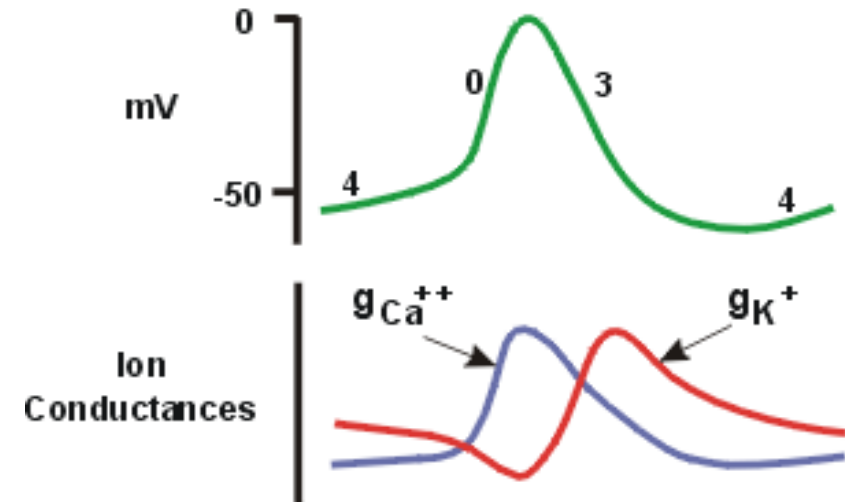
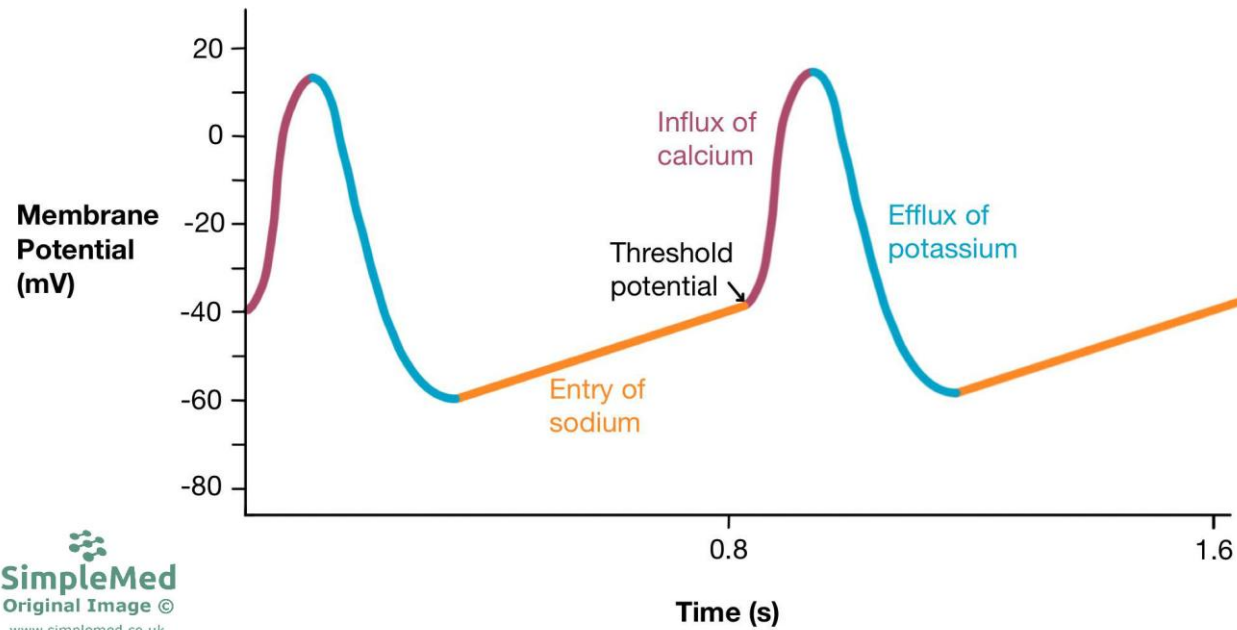
Cardiac action potentials in the heart differ considerably from action potentials found in neural and skeletal muscle cells. One major difference is in the duration of the action potentials.

In a typical nerve, the action potential duration is about 1 ms. In skeletal muscle cells, the action potential duration is approximately 2-5 ms. In contrast, the duration of cardiac action potentials ranges from 200 to 400 ms.

Another difference between cardiac and nerve and muscle action potentials is the role of calcium ions in depolarization.



# Sinoatrial Node Action Potentials



# *Summary*

- Membrane potentials in cells are determined primarily by three factors
- Ionic mechanisms of action potentials
- Membrane and action potential difference between neuronal, skeletal and heart muscle