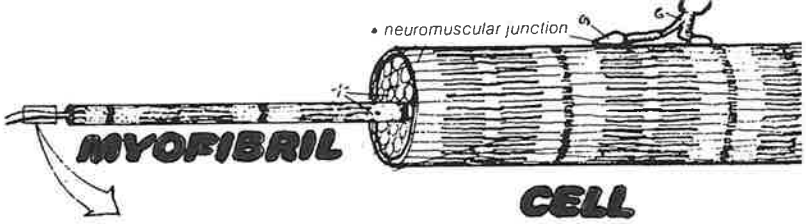
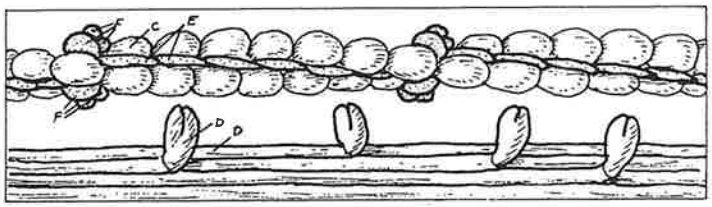
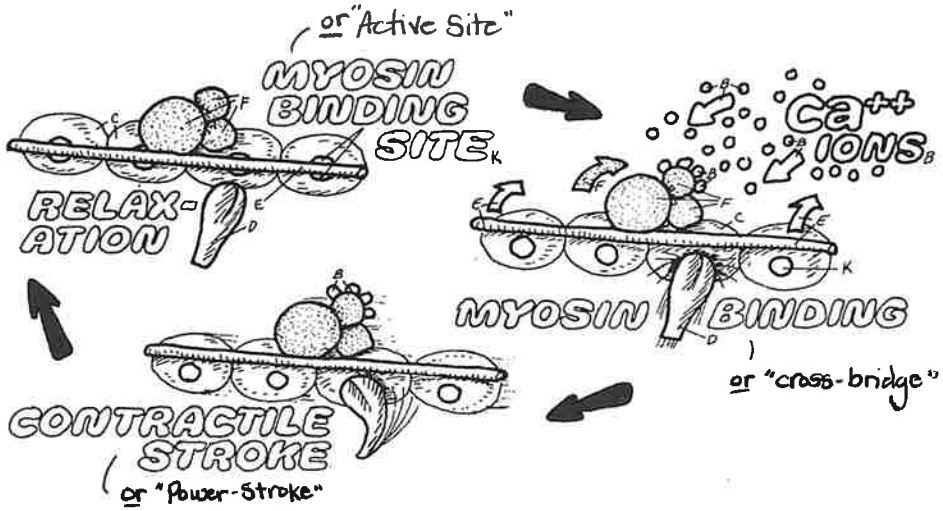
FREE CALCIUM TRIGGERS CONTRACTION



ACTIN C
MYOSIN, or Myosin Head
CROSS BRIDGE D
TROPOMYOSIN E
TROPONIN F



Tropomyosin is a long, two-stranded helical protein aligned almost parallel to the axis of the thin actin filaments. Troponin is a protein complex of three globular subunits, located at regular intervals (spaced approximately seven actin molecules apart) along the thin filament. One of the subunits attaches to tropomyosin, another to actin, and the third subunit can bind Ca^{++} ions

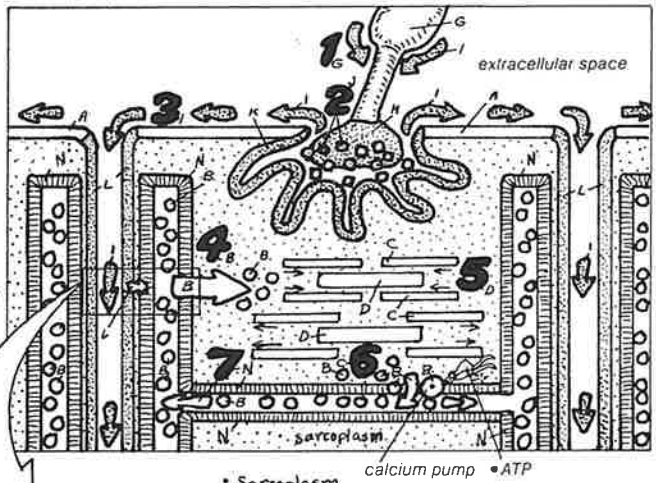


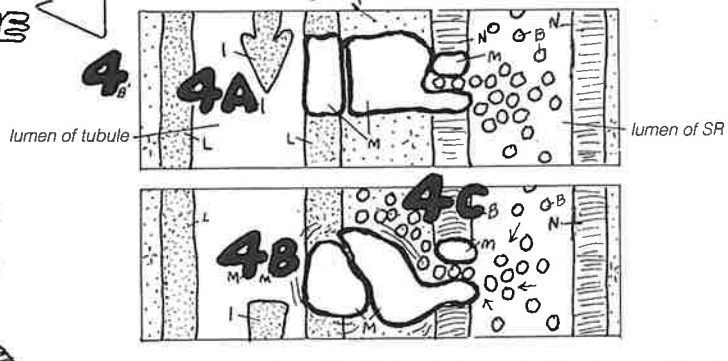
1. Relaxation: *Myosin cross bridges* cannot attach to thin filament because the site of attachment is blocked by *tropomyosin*. **2. Myosin binding:** *Ca^{++} ions appear* on the scene. Four Ca^{++} bind to each troponin and the complex moves the tropomyosin away from the binding sites. Myosin can now bind to *actin*. *3.* **Contractile stroke:** Once *energized myosin* binds to actin, the head tilts and propels the thin filament.

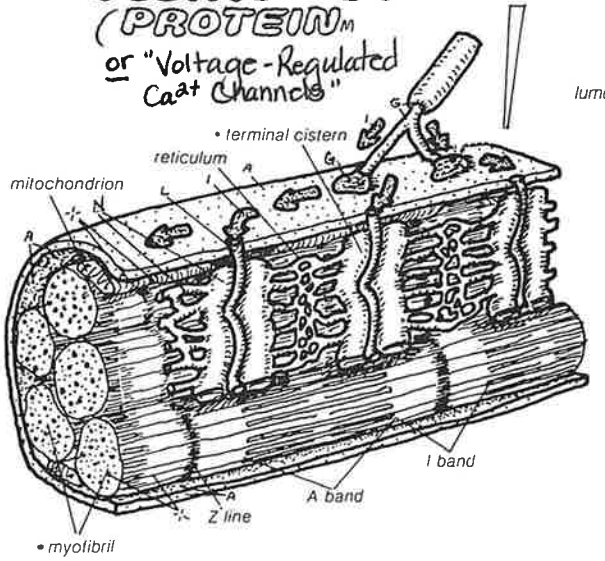
SARCOPLASMIC RETICULUM N
(Ca^{++} STORAGE)

AXON G
+ AXON TERMINAL G
ACTION POTENTIAL I
ACETYLCHOLINE J
or "Synaptic Terminal"

or "Sarcolemma"
CELL MEMBRANE A
T TUBULE L
VOLTAGE-SENSITIVE (PROTEIN M
or "Voltage-Regulated Ca^{2+} Channels"







Relaxation: Ca^{++} is trapped within the sarcoplasmic reticulum (SR) and cannot bind to troponin to trigger contraction **Contraction** (1, 2, 3): An action potential on the surface of the cell invades the interior via T tubules and comes in close contact with the SR. (4) Depolarization produced by the advancing action potential (4A in the lower enlargement) changes the conformation of a voltage-sensitive tubule membrane protein (*dihydropyridine* or *DHP* receptor). The changed shape of this protein forces the SR channels open (4B), releasing Ca^{++} into the cytosol (4C). (5) Ca^{++} ions bind to troponin and expose binding sites for myosin. Contraction follows. **Relaxation** (6, 7): An ATP-driven Ca^{++}pump actively transports Ca^{++} back into the SR. The cytoplasmic Ca^{++} level falls and relaxation follows.