Organization of Contractile Proteins in Muscle	
Thick Filament	Composed of hundreds of long, contractile myosin molecules arranged in a staggered side by side complex.
Thin Filament	Composed of a linear array of hundreds of globular, actin monomers in a double helical. arrangement.
Sarcomere	The unit of contractile activity composed mainly of actin and myosin and extending from Z line to Z line in a myofibril.
Myofibril	End to end arrays of identical sarcomeres.
Myofiber	A single multinucleate muscle cell containing all the usual cell organelles plus many myofibrils.
Muscle	Organized arrays of muscle fibers.

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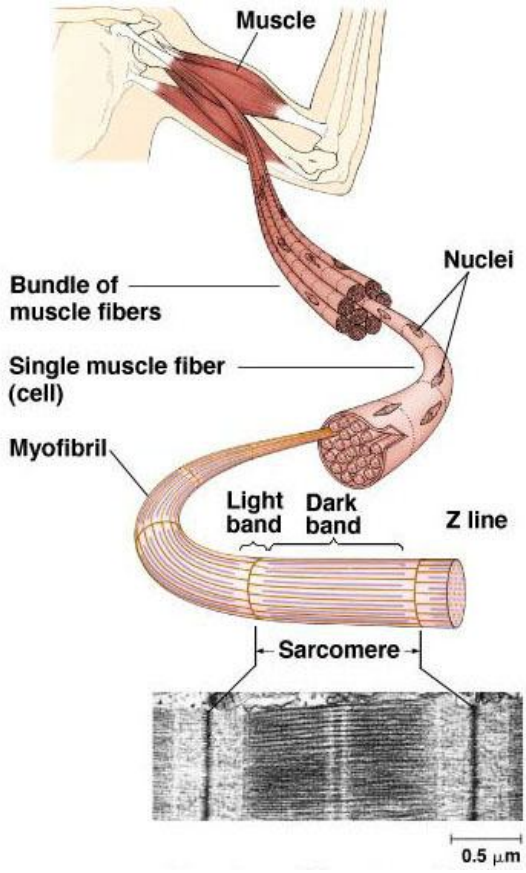
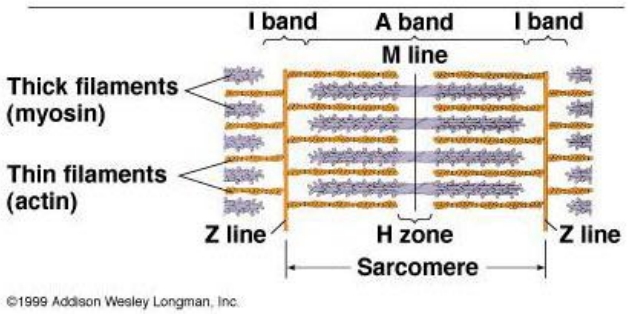




Myofilament- Two kinds of myofilaments are identifiable on the basis of their diameter and protein composition, thin and thick myofilaments ,thick myofilaments are composed of several hundred molecules of a fibrous protein known as myosin. Thin myofilaments are composed of two helically interwound, linear polymers of a globular protein known as actin. Thin and thick filaments also contain accessory proteins. Proteins of the Z line, including α-actinin, serve as an embedding matrix or anchor for one end of the thin filaments, which extend toward the center of sarcomeres on either side of the Z line. The Z line proteins often appear continuous across the width of a muscle fiber and seem to act to keep the myofibrils within a myofiber in register. The distal end of each thin filament is free in the sarcoplasm and is capped with a protein known as β-actinin.

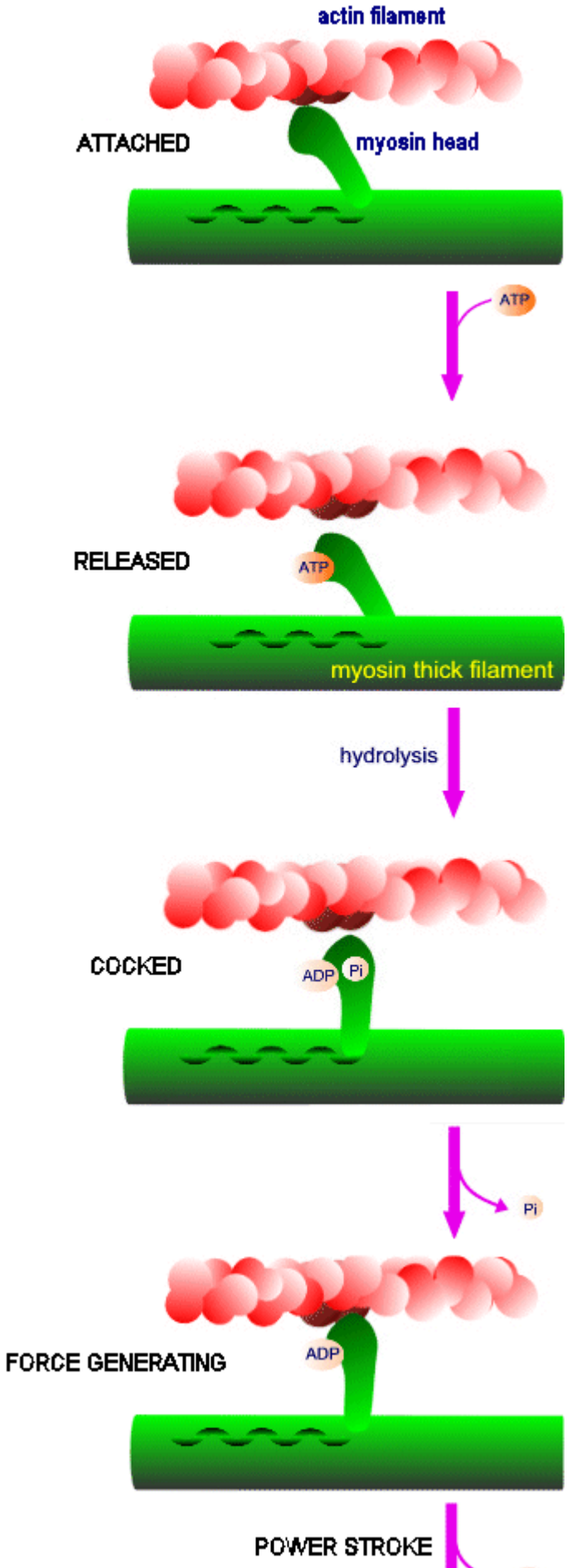
The molecular event underlying muscle contraction is the regulated binding of the myosin headpieces to actin thin filaments, followed by rapid myosin conformational changes about its hinge points with the bound actin being translocated toward the M line.

The main thin filament accessory proteins are tropomyosin and troponin. Tropomyosin is a long, rod-like, αβ helically-interwound heterodimer that spans a length of 7 G-actin residues. A pair of tropomyosin molecules is associated with every 7 pairs of G-actin residues along a thin filament, 1 tropomyosin molecule in each of the grooves of the F-actin helix. In relaxed muscle, each tropomyosin molecule covers the myosin binding sites of 7 G-actin residues, preventing interaction between actin and myosin and thus maintaining the relaxed state. The onset of contractile activity involves activating troponin, the second accessory protein of thin filaments. Troponin is a heterotrimer attached to one end of each tropomyosin molecule and to actin, physically linking tropomyosin to actin.

Conformational changes in the bridging molecule, troponin, are responsible for moving tropomyosin on and off myosin binding sites of actin and thus regulating muscle contraction. One of the troponin subunits, troponin-C (Tn-C), is a calmodulin-like calcium-binding protein. When Tn-C binds calcium, the whole troponin molecule undergoes the conformational change

that moves the attached tropomyosin away from the myosin binding sites on actin. This event permits nearby myosin heads to interact with myosin binding sites, and contractile activity ensues.

Prior to the appearance of free calcium in the sarcoplasm, tropomyosin covers the myosin binding sites on actin. The appearance of calcium in the sarcoplasm leads to calcium binding on Tn-C. The resulting conformational changes in troponin move the attached tropomyosin molecule more deeply into the helix groove of F-actin, uncovering the myosin binding sites on G-actin subunits. The exposed sites are then available to interact with myosin headpieces. Removing calcium from the sarcoplasm restores the original conformational states of troponin and tropomyosin, preventing interaction between actin and myosin and leading to the relaxed state.


actin filament
ATTACHED
myosin head
ATP
RELEASED
ATP
myosin thick filament
hydrolysis
COCKED
ADP
Pi
Pi
FORCE GENERATING
ADP
POWER STROKE