

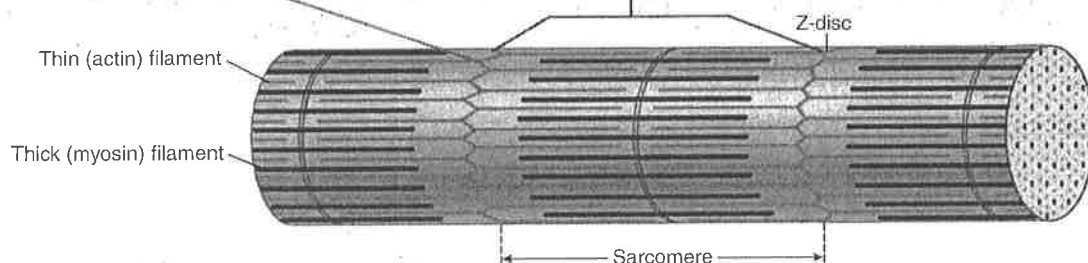
## Structure of Myofibril

The thin and thick myofilaments stack together, one alternating with the other, to form myofibrils. They do not completely overlap. Instead, they're arranged in a type of latticework to form units called **sarcomeres**.

### ANIMATION

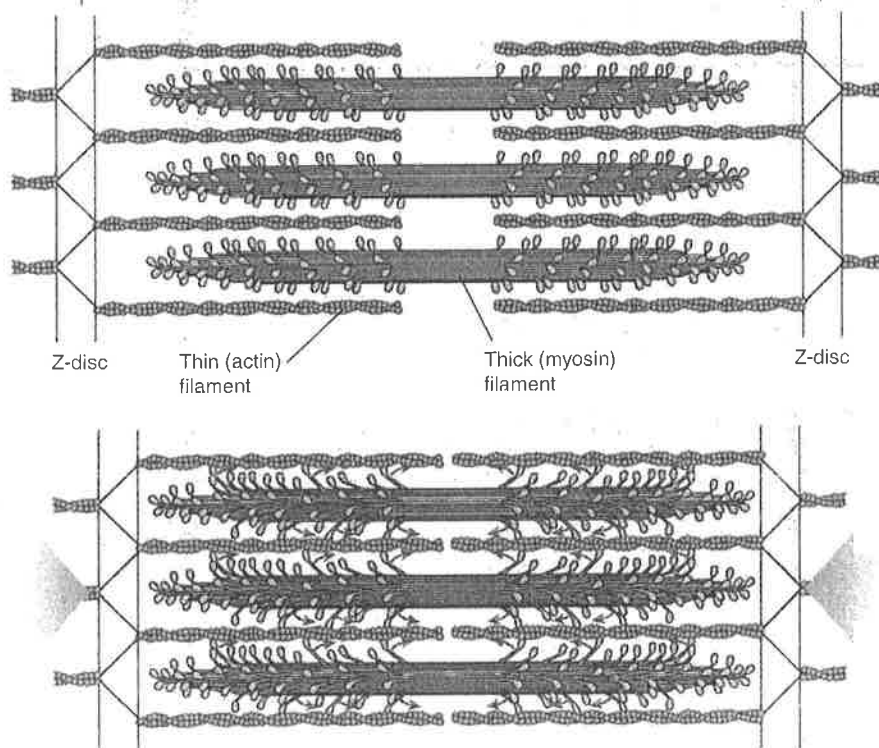
A plate or disc called a **Z-disc**, or **Z-line**, serves as an anchor point for thin myofilaments.

The section between the Z-discs is called a **sarcomere**. This is where muscle contraction occurs.



In a relaxed muscle, the **myosin** and **actin** lie side by side, partially overlapping. The **myosin** and **actin** are completely detached from one another.

Contraction occurs when the **myosin** heads latch onto the **actin** myofilaments. This forms what is known as a **cross bridge** between the **actin** and **myosin**. The **myosin** heads latch onto and release the **actin** repeatedly, creating a series of "power strokes" that propel the **actin** myofilaments forward, toward the center of the sarcomere. Because the **actin** myofilaments are attached to the Z-discs, they pull the Z-discs closer together, shortening the sarcomere. As the sarcomere shortens, so does the myofibril and the entire muscle. This is known as the **sliding-filament model** of contraction.



## The Body AT WORK

Muscle contraction requires energy in the form of adenosine triphosphate (ATP). In fact, ATP allows the myosin heads to release their grip on the actin filament. The myosin then splits the ATP, giving it fuel to form a new cross bridge. This cycle of gripping and releasing causes a series of "power strokes" that moves the actin smoothly forward.

Besides ATP, contraction requires calcium. That's because, when calcium is absent, tropomyosin and troponin—the two protein molecules entwined with the actin filament—block the sites where the myosin heads would attach. With the sites blocked, a cross bridge can't form, and contraction can't occur. When calcium is present, it binds with the troponin to expose the myosin attachment points, allowing contraction to occur.

### FAST FACT

Keep in mind that the myofilaments don't shorten; they stay the same length. The sarcomere shortens because the filaments slide over the top of one another.