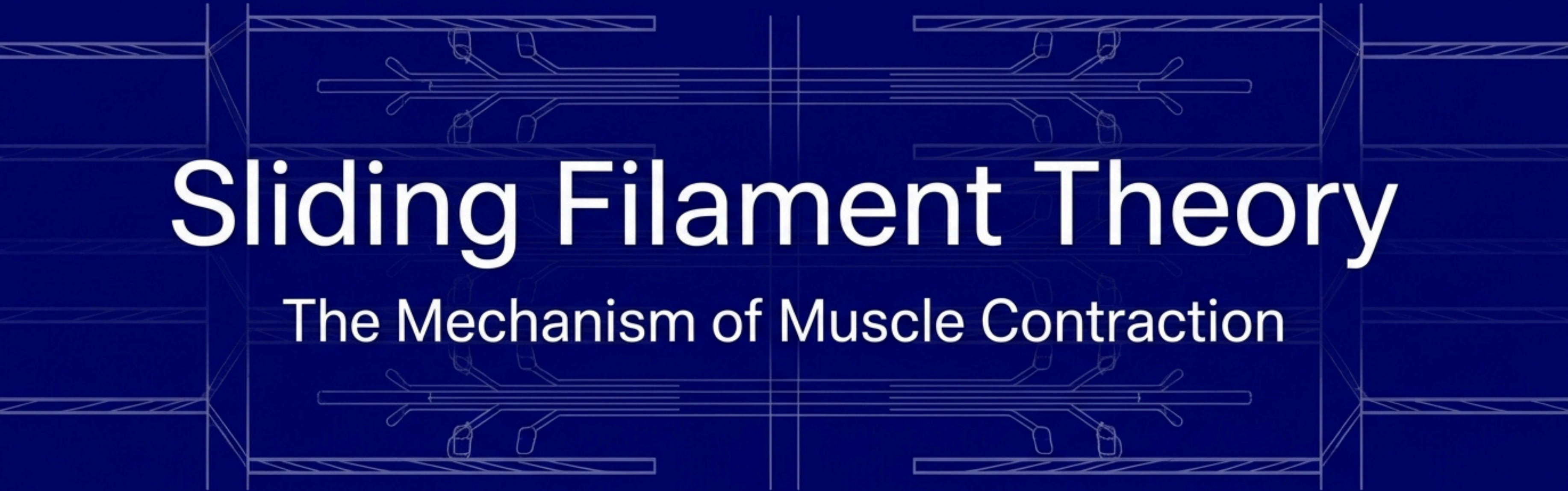
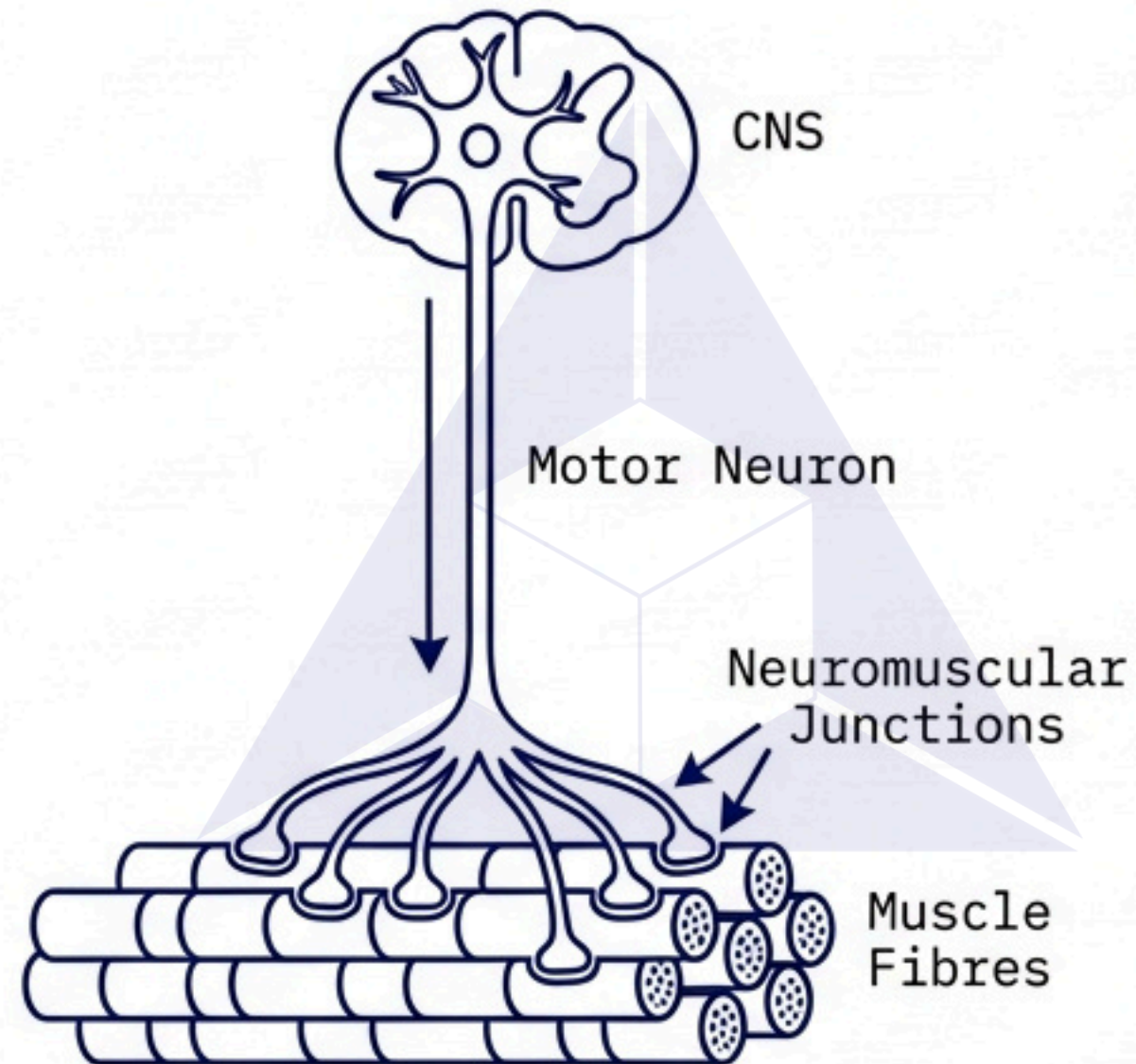


# Sliding Filament Theory

The Mechanism of Muscle Contraction



# Initiating the Command: The Motor Unit

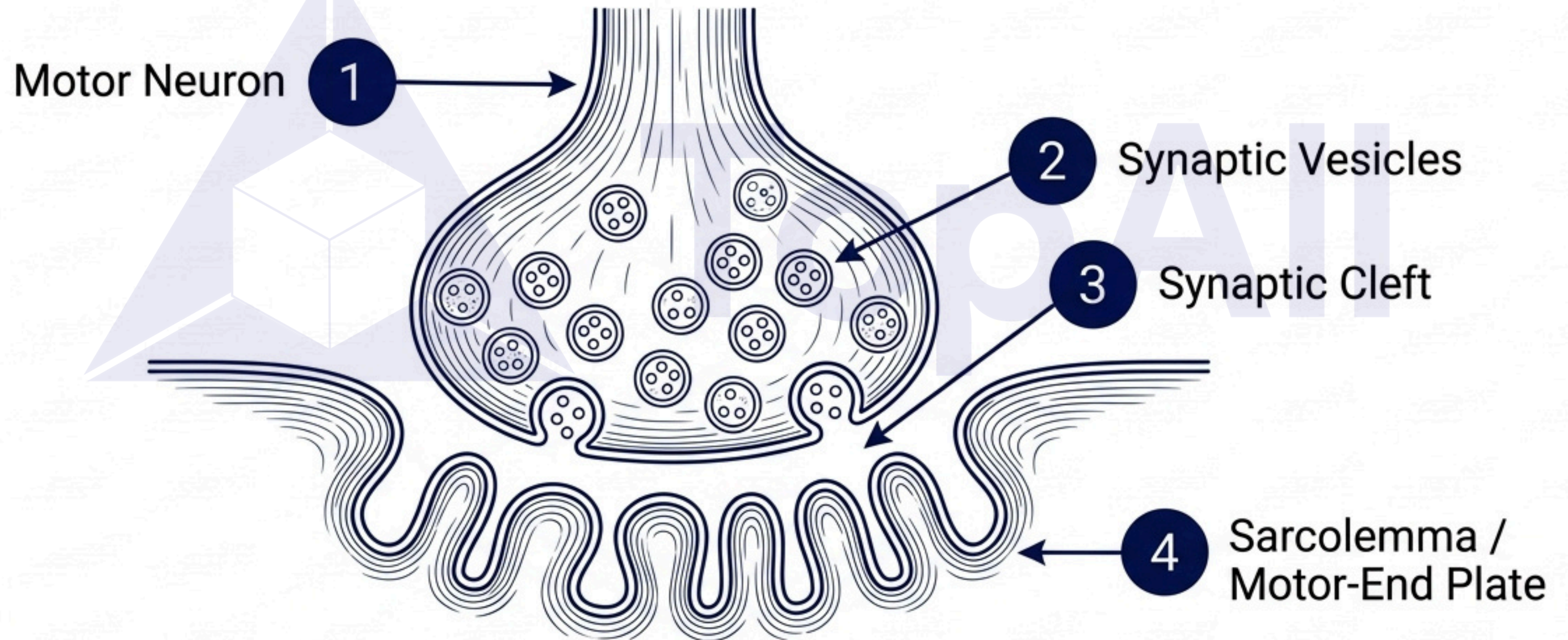


**Motor Neuron**  
+  
**Connected Muscle Fibres**  
=  
**Motor Unit**

Note: A single motor neuron can innervate multiple muscle fibers, coordinating a unified contraction.

# The Neuromuscular Junction

The critical bridge where the nervous system interfaces with the muscular system.





# You've Learned the Theory. Let's Test Them Now.

$$E=mc^2$$



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## Key Highlights

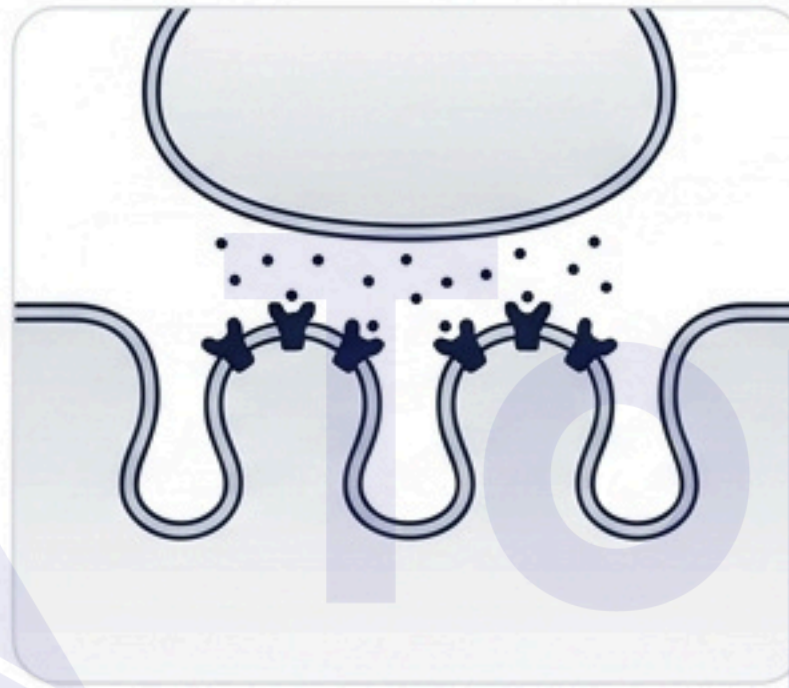
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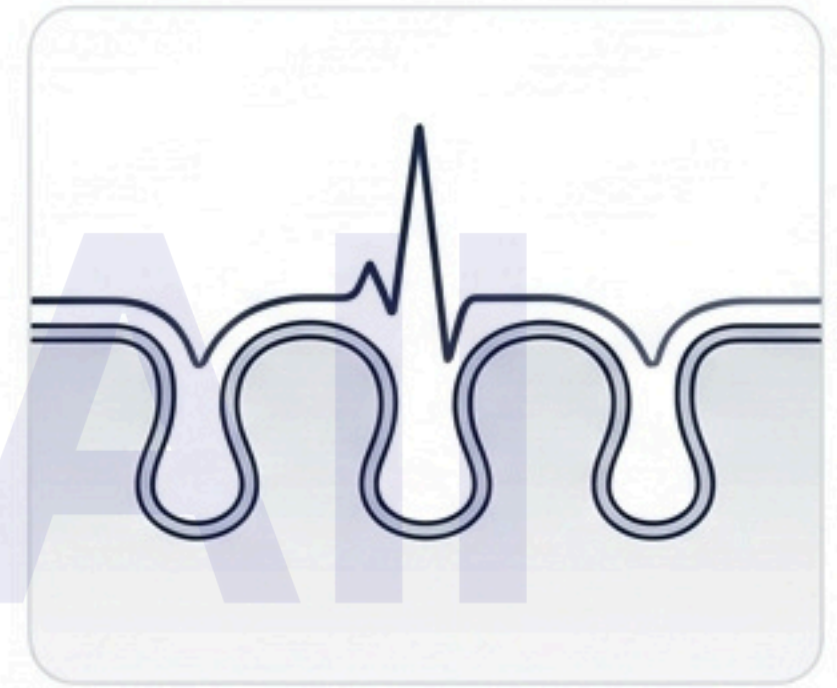
# Crossing the Synapse: Chemical to Electrical



Neural signal reaches the junction. Synaptic vesicles release the neurotransmitter Acetylcholine (ACh).



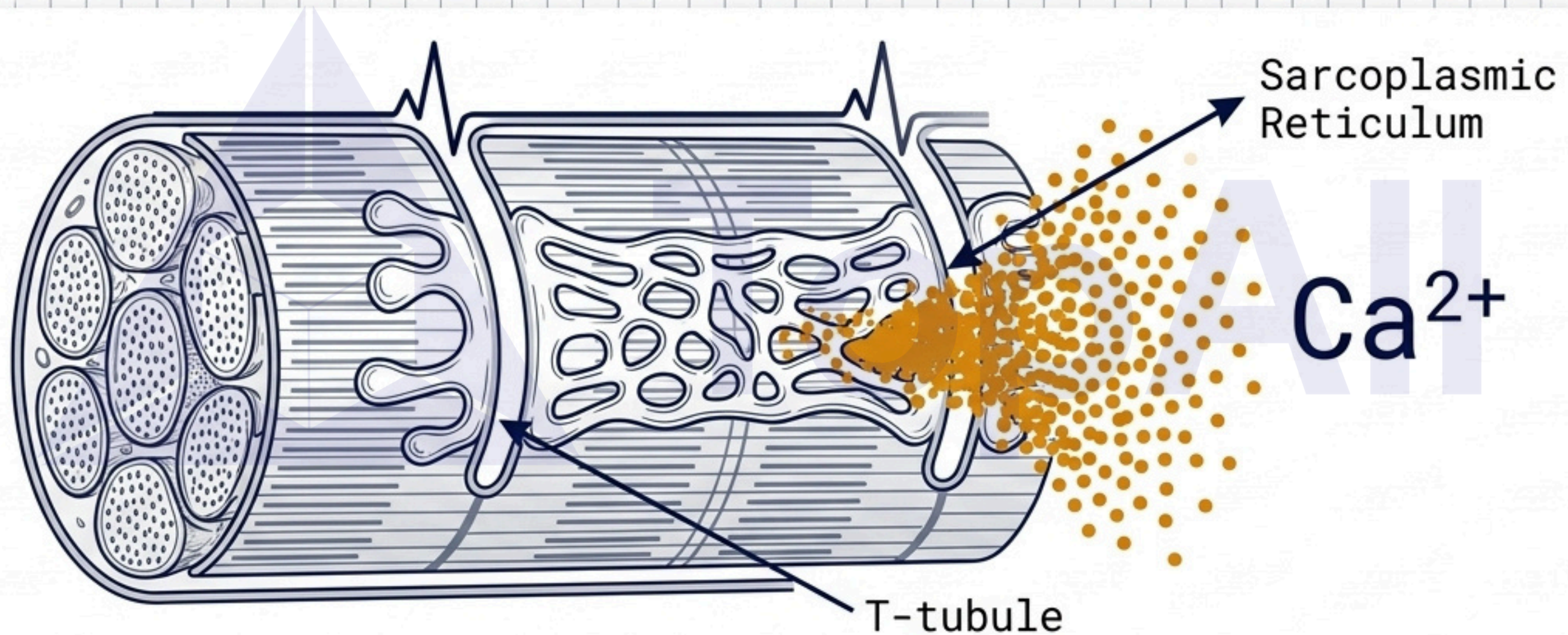
ACh binds to specific receptors located on the sarcolemma.



This binding generates an electrical Action Potential that spreads rapidly across the muscle fiber.

# The Calcium Trigger

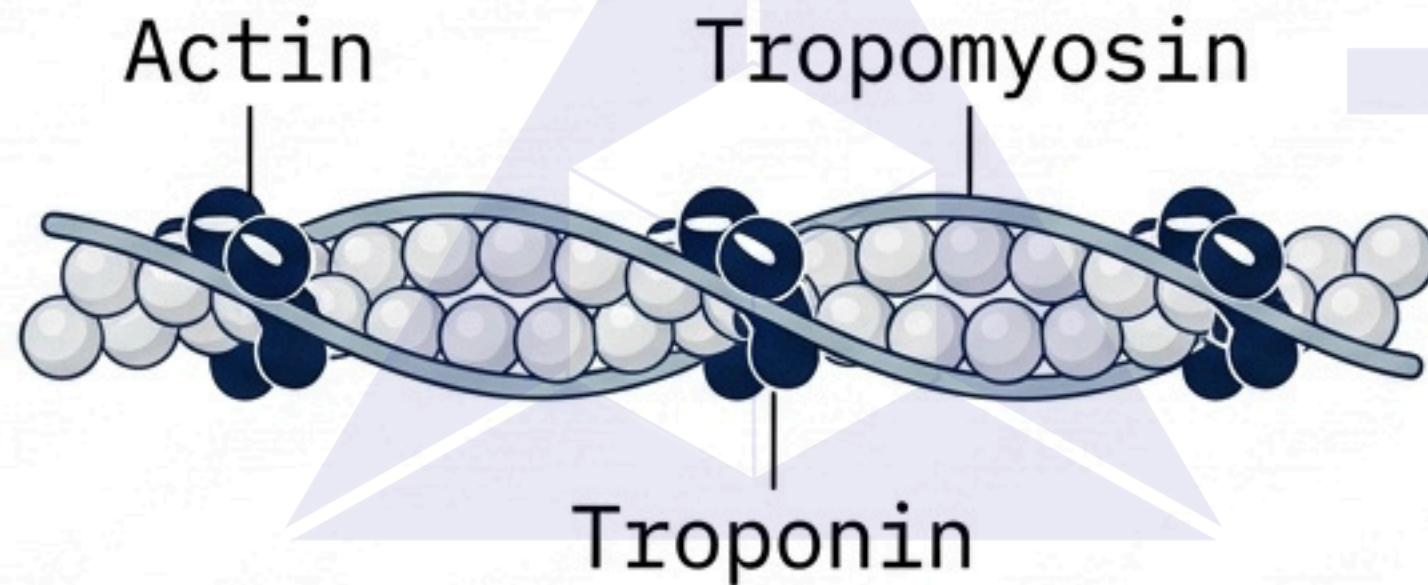
The spreading action potential penetrates the muscle fiber, triggering the sarcoplasmic reticulum.



The Sarcoplasmic Reticulum acts as the primary storehouse for Calcium ions in muscle fibers.

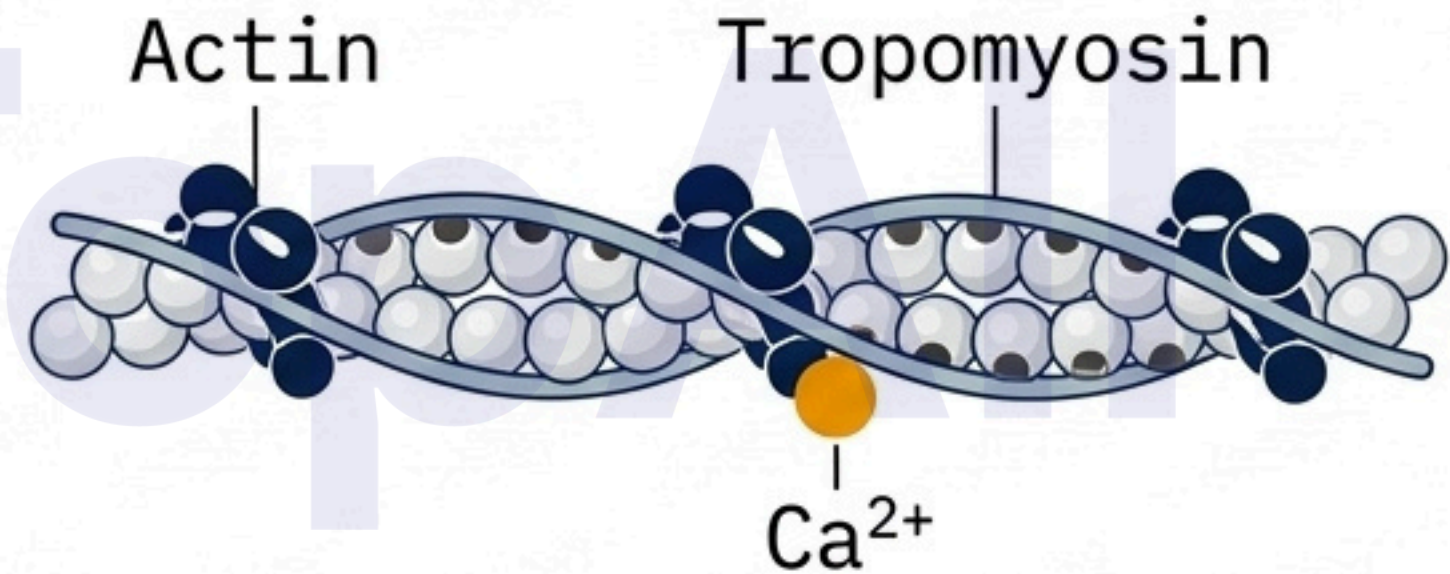
# Unlocking the Actin Filament

## Resting State



Active binding sites  
are blocked.

## Active State



Ca<sup>2+</sup> binding alters  
troponin, exposing  
active sites.

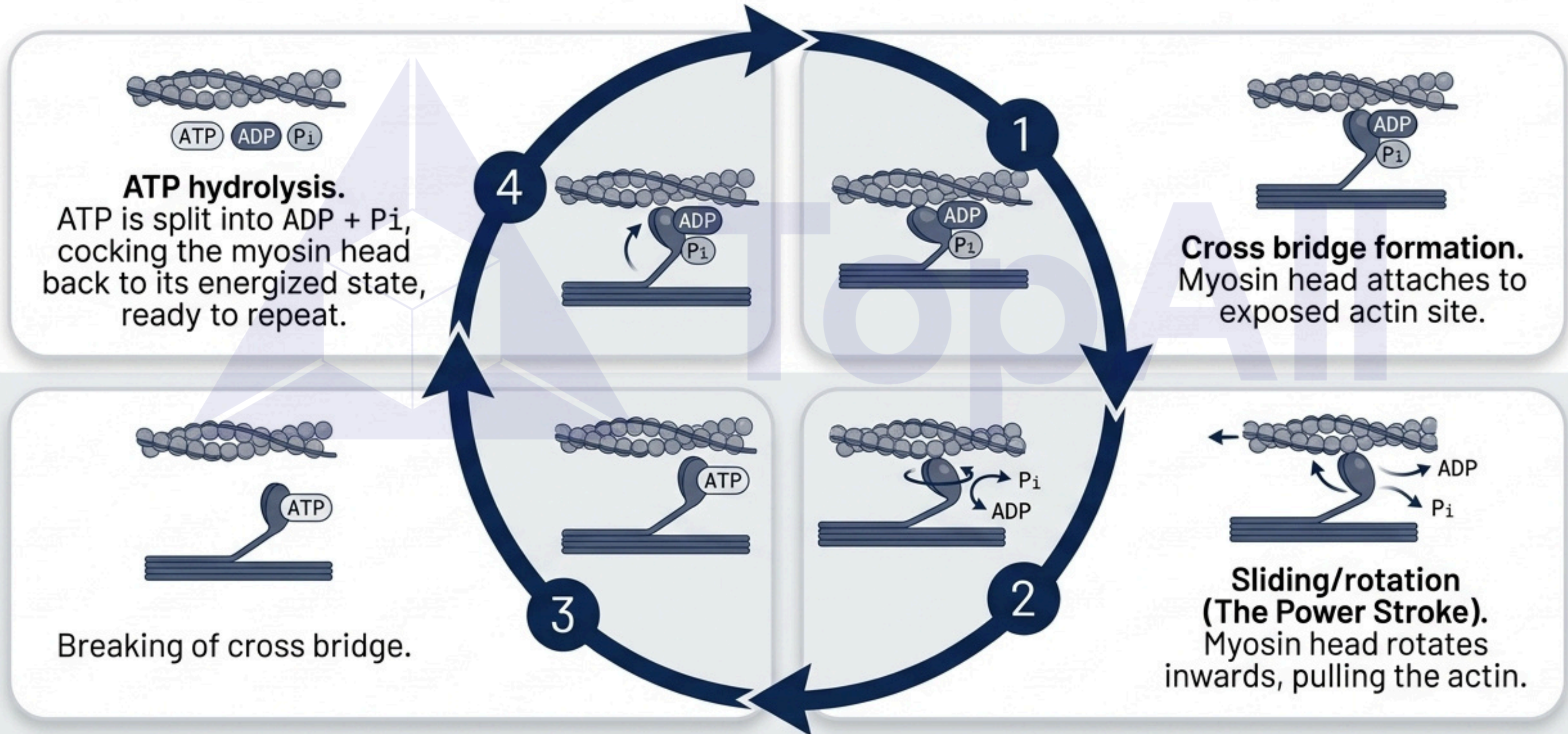
# The Engine of Contraction

With binding sites exposed, the myosin head can physically attach to the actin filament.



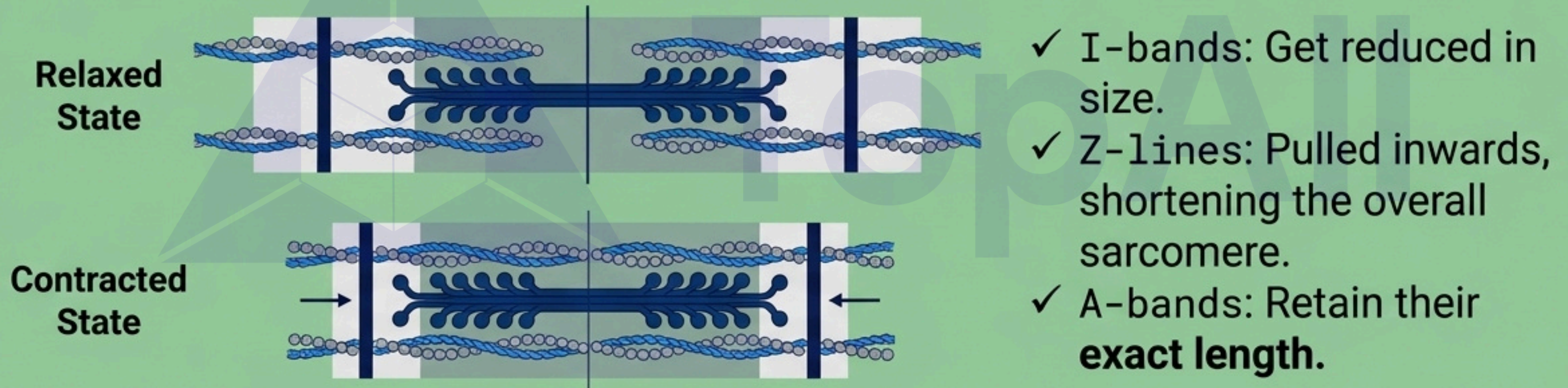
# The Cross-Bridge Cycle

The continuous mechanical cycle of muscle contraction.



# Summary: The Sliding Filament Theory

**Muscle contraction is achieved by thin filaments (Actin) sliding over thick filaments (Myosin).**



The cycle **repeats** until  $\text{Ca}^{2+}$  is pumped back into the sarcoplasmic reticulum, masking the active sites and allowing the muscle to **relax**.



# You've Learned the Theory.

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