

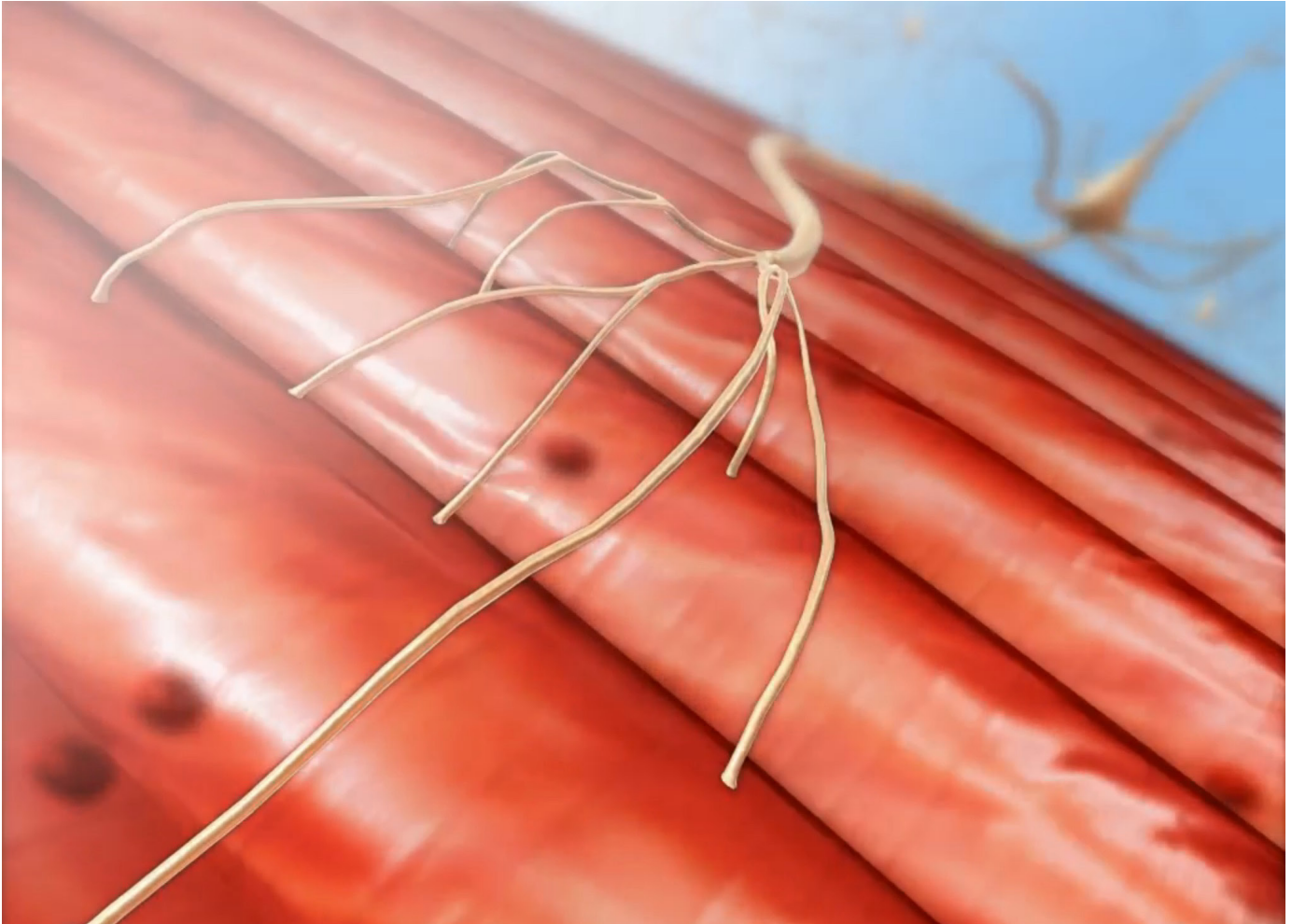
The Muscular System: Shoulder and Arm

A muscular system lab activity using
Visible Body's Human Anatomy & Physiology

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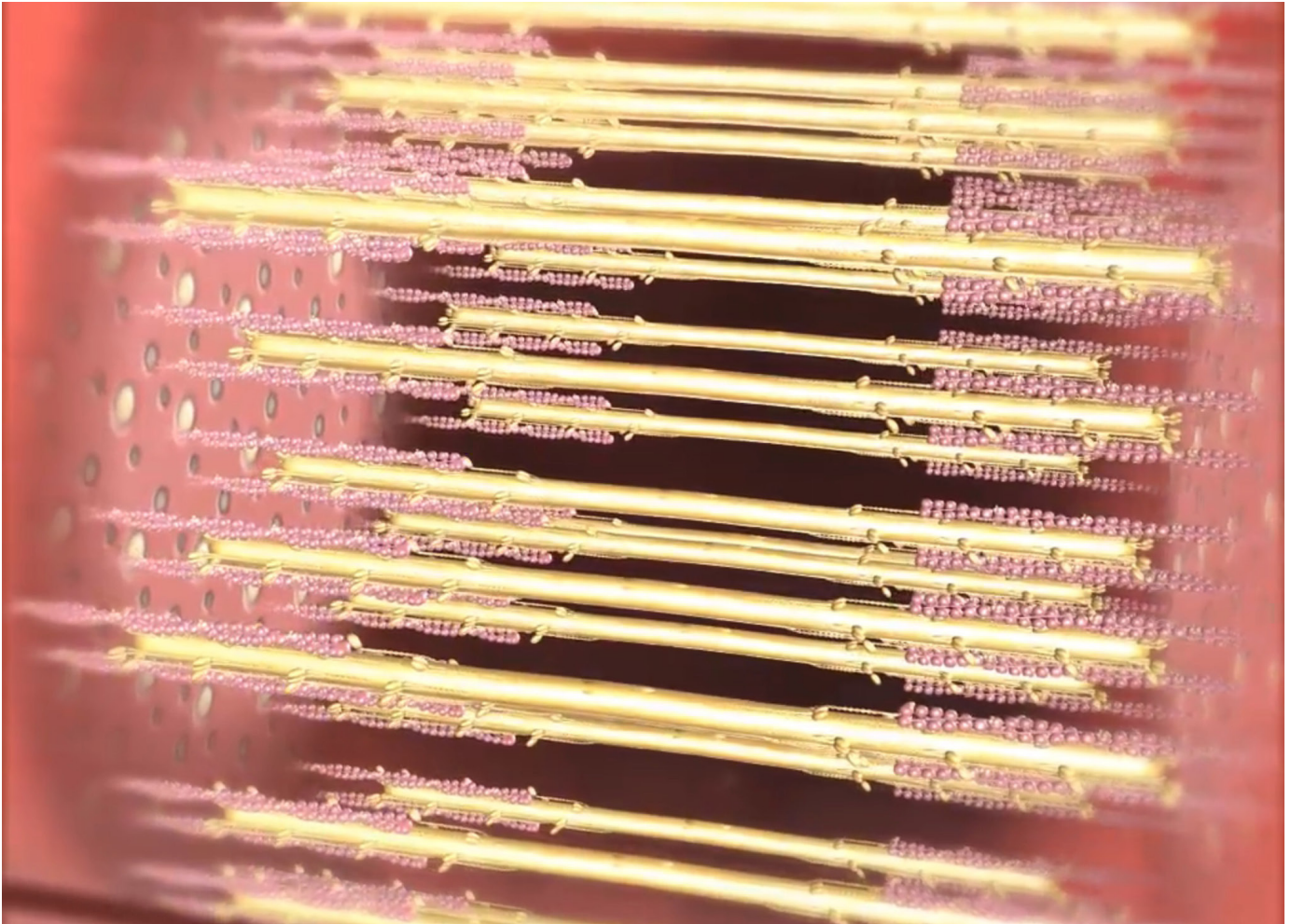
PRE-LAB EXERCISES

A. Watch the video for 13.1 Muscular System Overview and observe the following:



1. What is the function of the muscular system?
2. How does a muscle change in order to accomplish its function?
3. What stimulates a muscle to contract?

B. Watch the videos for 14.2 Skeletal Muscle Function Overview and 14.3 Muscle Contraction: Action Potential and observe the following:

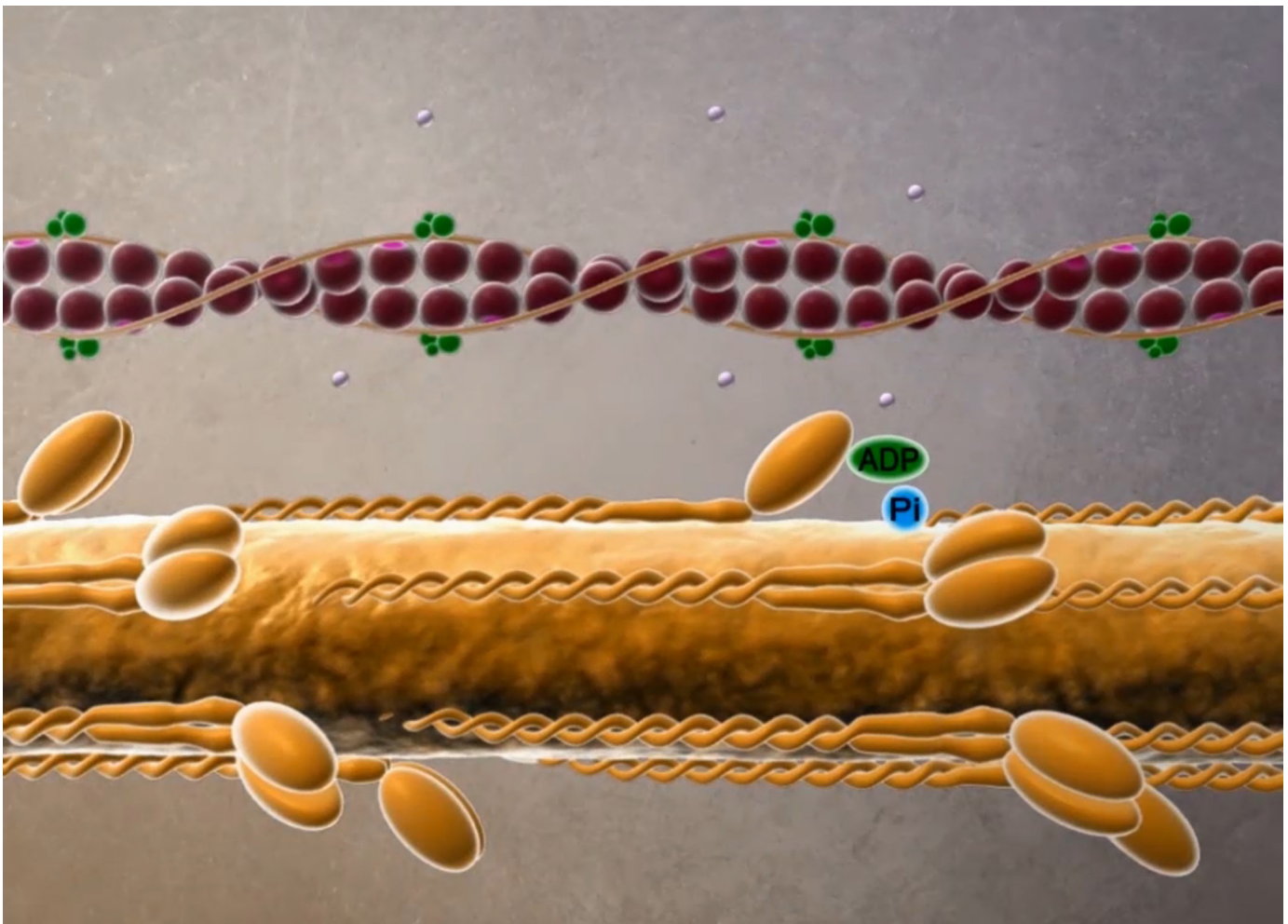


1. What is the initial stimulus for muscle contraction?
2. Which neurotransmitter is released at the neuromuscular junction after the action potential arrives?
3. When receptors open at the neuromuscular junction, does sodium travel in or out of the muscle fiber?

4. The action potential continues to travel down the muscle fiber on which structures? Which ion is released from the sarcoplasmic reticulum as this happens?

5. Draw and label a sketch of the neuromuscular junction in the space below.

C. Watch the video for 14.4 Muscle Contraction: Cross Bridge Formation and answer the following:



1. What is the basic functional unit of a muscle fiber?

2. Thick filaments are composed of _____ and thin filaments are composed of _____.

3. When calcium is released from the sarcoplasmic reticulum, where does it bind?

4. When a myosin head binds to actin, it forms a _____.

5. When a myosin head moves the actin toward the center of the sarcomere, this is called the _____.

6. What is the energy source that powers muscle contraction?

7. As myosin filaments pull the actin filaments toward the center of the sarcomere, will the muscle lengthen or shorten?

IN-LAB EXERCISES

Use the following modules to guide your exploration of the shoulder and arm regions of the muscular system. As you explore the modules, locate the muscles on any charts, models, or specimen available. These muscles are located in and act on the shoulder and arm regions. Because the glenoid cavity of the scapula is shallow and does not snugly fit the head of the humerus, the tendons of multiple muscles are involved in securing and stabilizing the humerus at the shoulder to prevent dislocation. Other muscles will cross the shoulder (glenohumeral) joint and insert on the arm, causing the arm to move when they contract.

Movement of the brachium, or upper arm, depends on the fixators of the shoulder to keep the scapula in place so the arm can move freely. Once we move down into the antebrachium (forearm) and hand, the muscles begin to get smaller and more numerous, which grants us our fine motor skills when we write or play the piano. Pay attention to whether the muscle is on the anterior or posterior side of the arm – muscles on the anterior side will flex, while muscles on the posterior side will extend. The long names of some of these muscles can be daunting, but they are often very descriptive. You can find origins, insertions, actions, and/or locations of these muscles simply in the names.

When reviewing the action of a muscle, it will be helpful to think about where the muscle is located and where the insertion is. Muscle physiology requires that a muscle will “pull” instead of “push” during contraction, and the insertion is the part that will move. Imagine that the muscle is “pulling” on the bone or tissue it is attached to at the insertion.

In the modules below, identify the following:

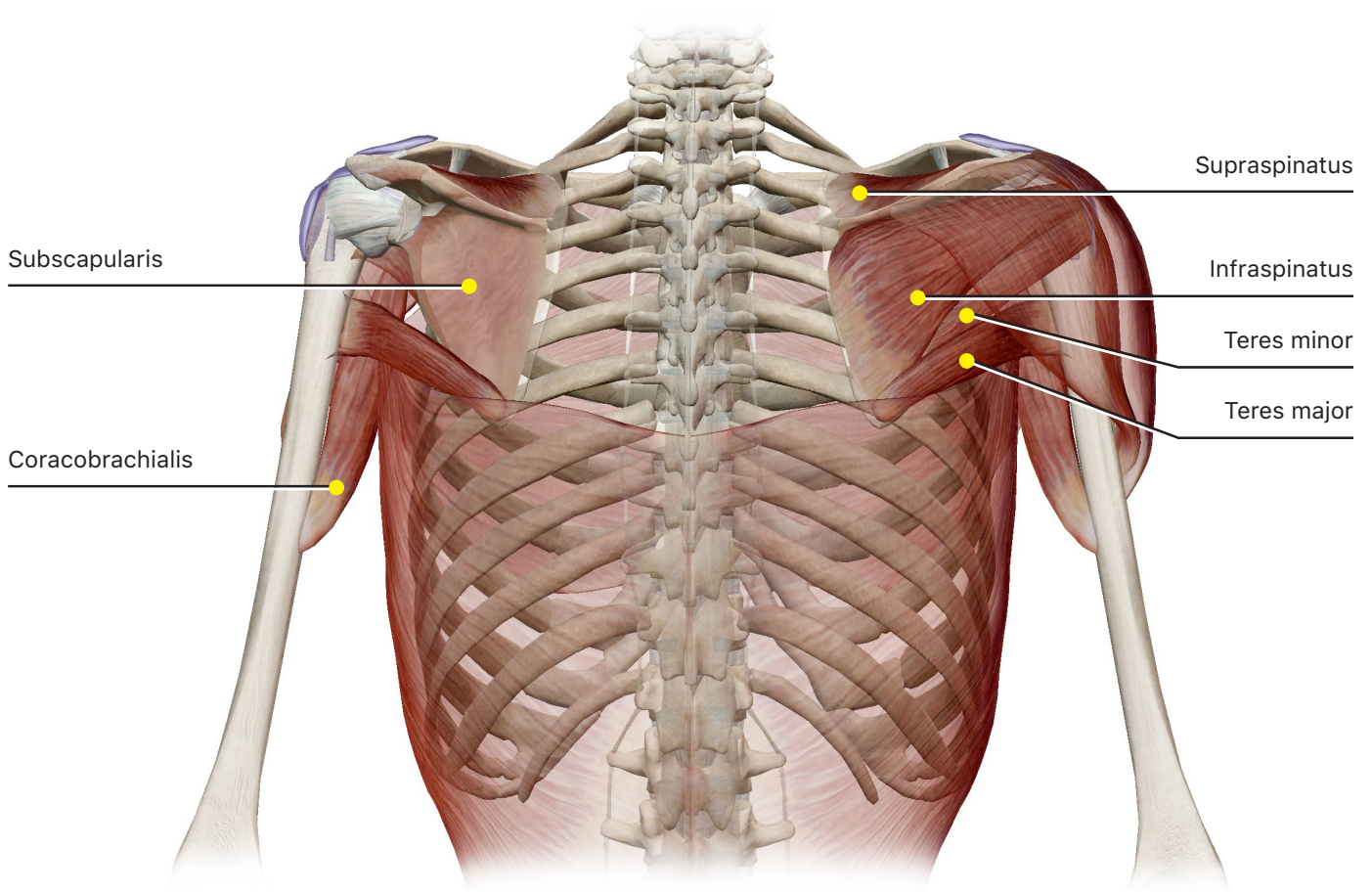
- Muscle location
- Origin(s) and insertion(s)
- Muscle action
- Nerve supply

A. Arm Synergists / Fixators and the Rotator Cuff

View Module 16.34 Arm: Synergists / Fixators and Module 16.35 Arm: Rotator Cuff

These muscles primarily act to stabilize the scapula and move the arm. Since the scapula is a moveable bone, it must be stabilized in order for the arm to be able to move. Four of these muscles are part of the rotator cuff, and are especially important in securing the humerus to the glenoid cavity of the scapula to prevent dislocation of the shoulder.

Module 16.34 Arm: Synergists / Fixators



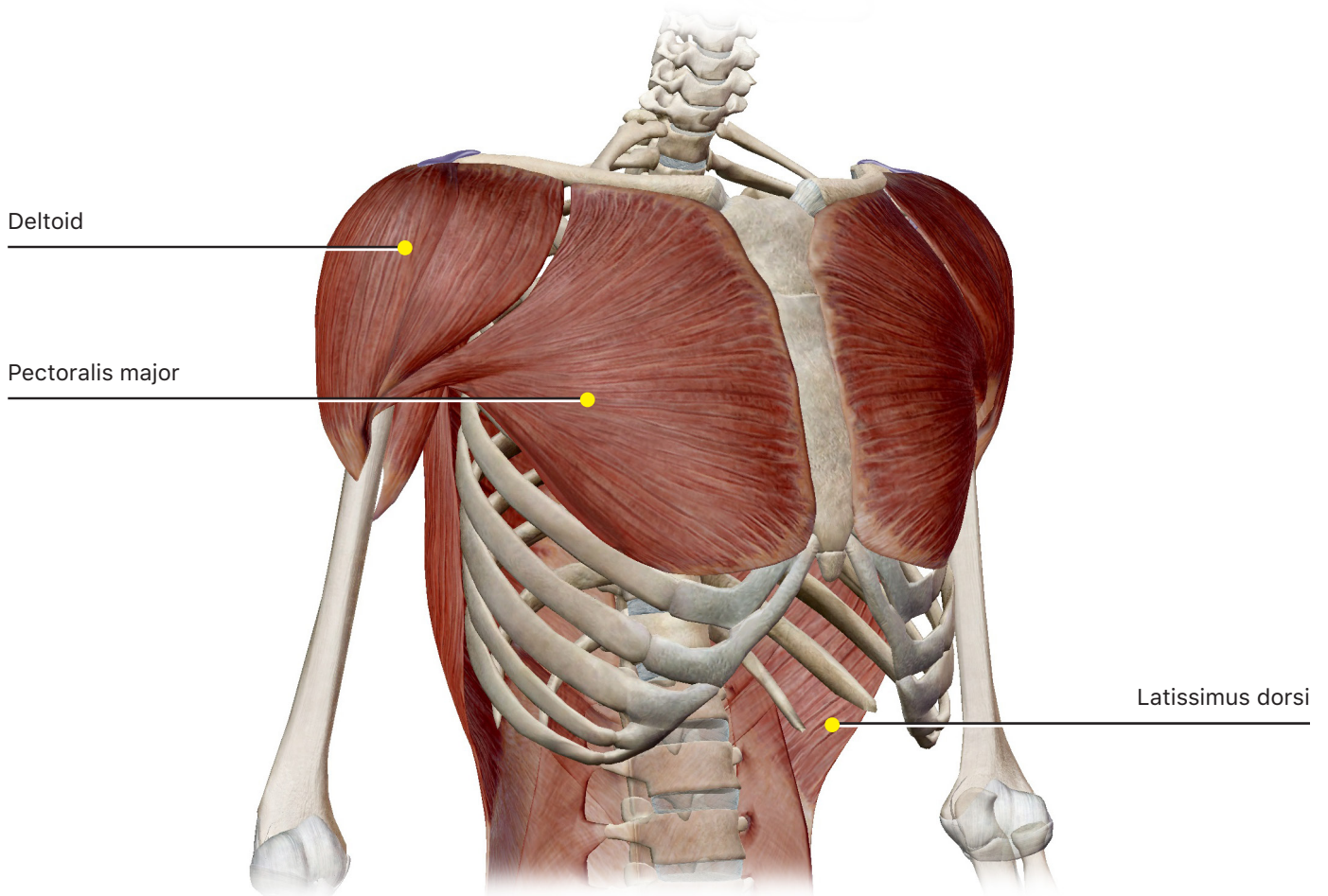
Arm: Synergists / Fixators and Rotator Cuff Muscles

Muscle	Origin	Insertion	Action	Innervation
Infraspinatus				
Supraspinatus				
Subscapularis				
Coracobrachialis				
Teres major				
Teres minor				

B. Prime Movers of the Arm

View Module 16.33 Arm: Prime Movers

These muscles are prime movers of the arm. They all cross the shoulder joint to insert on the humerus. Where the muscle crosses the joint will determine how the humerus moves. Remember that muscles pull, and imagine how the muscle will pull on the humerus as it contracts.



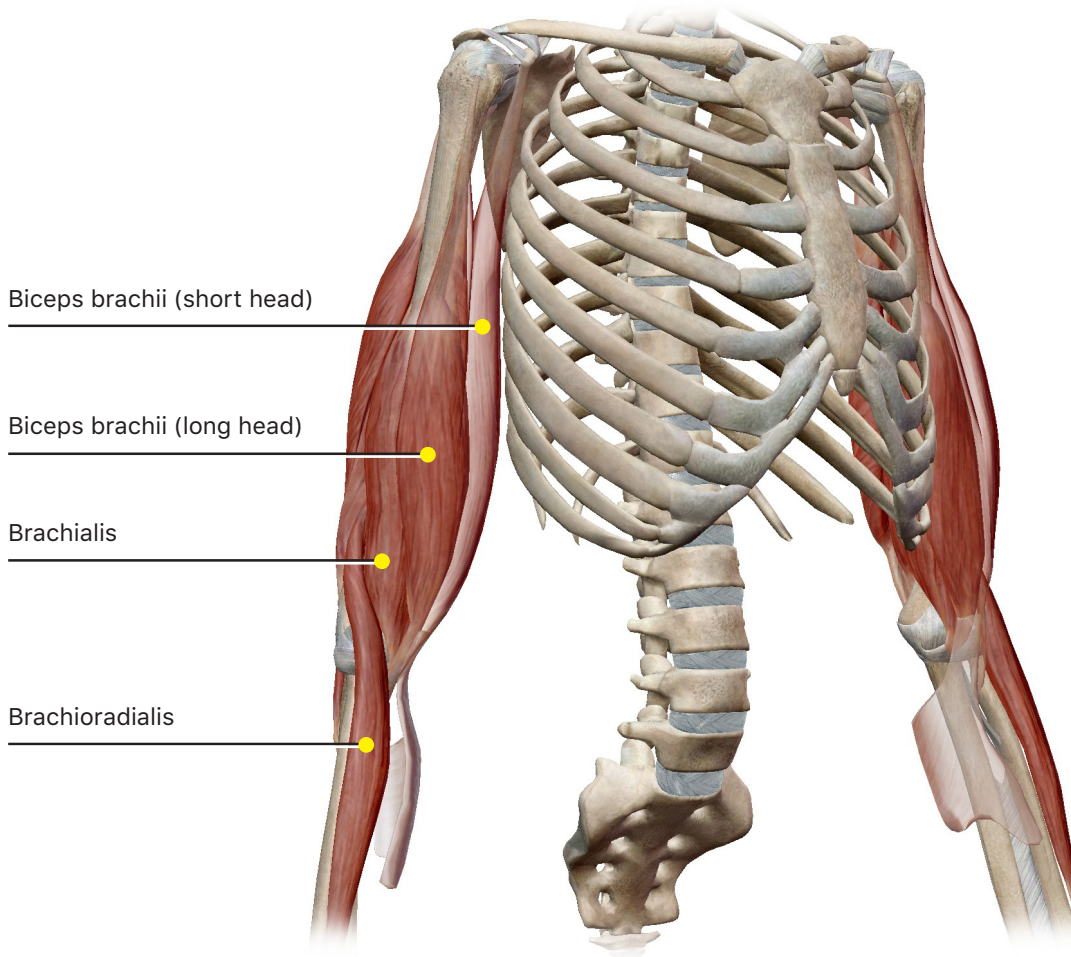
Arm: Prime Movers

Muscle	Origin	Insertion	Action	Innervation
Pectoralis major				
Deltoid				
Latissimus dorsi				

C. Forearm: Elbow Flexors

View Module 16.36 Forearm: Elbow Flexors

These muscles are all located on the anterior side of the humerus and cross the elbow to insert on the radius or ulna. When these muscles contract, the arm will flex at the elbow. Biceps brachii is named for its “two heads;” note the two different origins of this muscle.

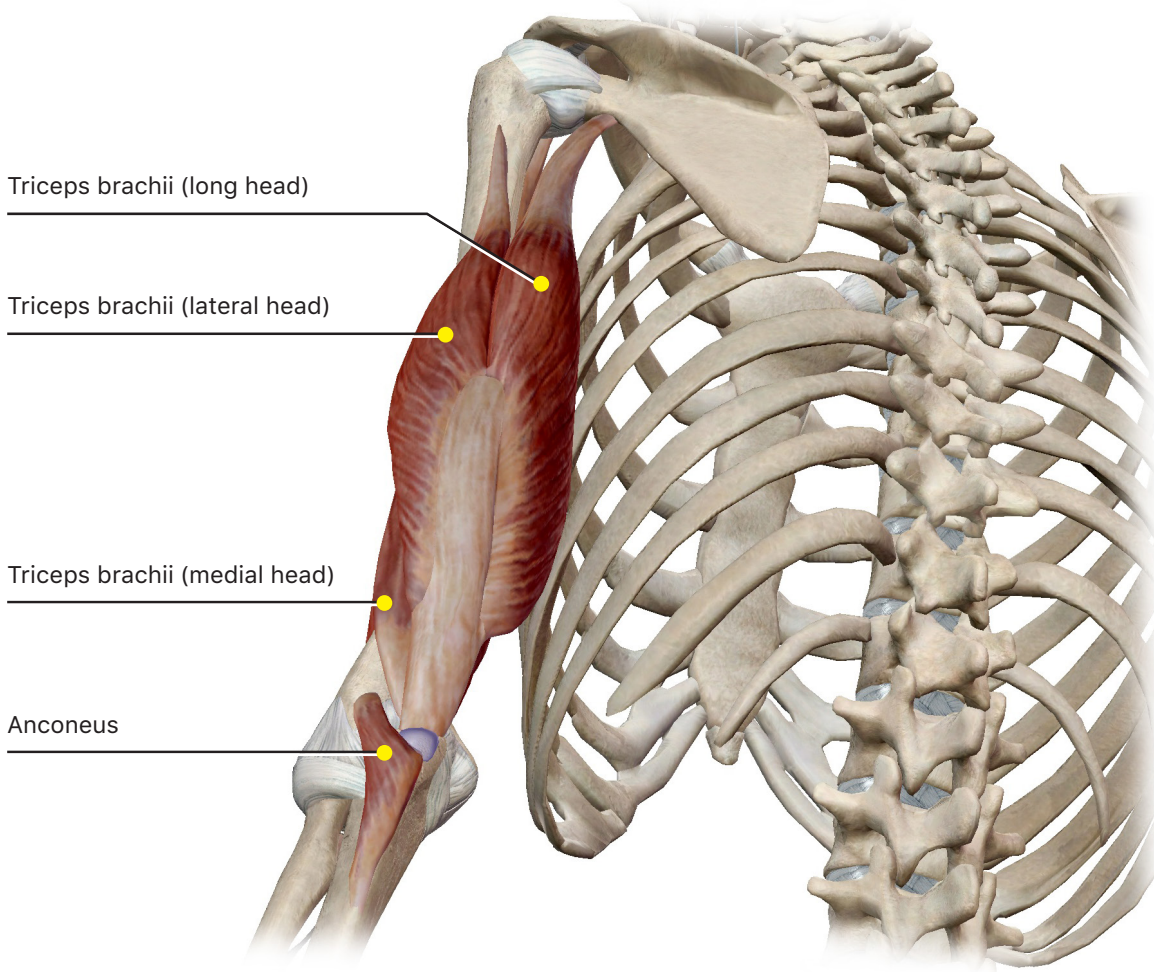


Forearm: Elbow Flexors				
Muscle	Origin	Insertion	Action	Innervation
Biceps brachii (long and short heads)				
Brachialis				
Brachioradialis				

D. Forearm: Elbow Extensors

View Module 16.37 Forearm: Elbow Extensors

These muscles are located on the posterior side of the forearm, and will cross the elbow joint to cause extension of the arm at the elbow when they contract. Note the three different origins of the three heads of the triceps brachii.

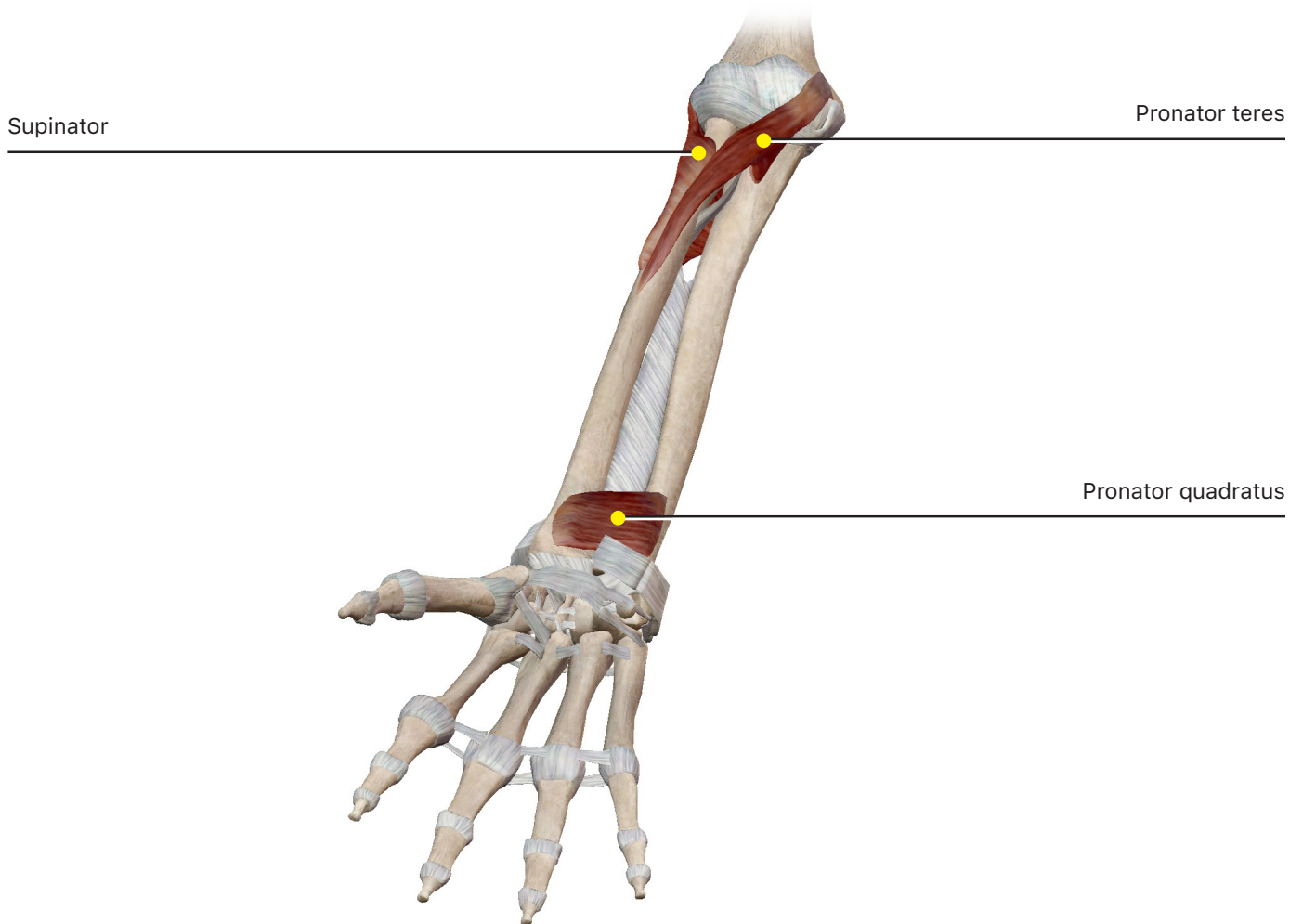


Forearm: Elbow Extensors				
Muscle	Origin	Insertion	Action	Innervation
Triceps brachii (medial head)				
Anconeus				

E. Forearm: Pronation and Supination

View Module 16.38 Forearm: Pronation / Supination

These muscles either pronate the forearm (turn the palm down), or supinate it (turn the palm up).



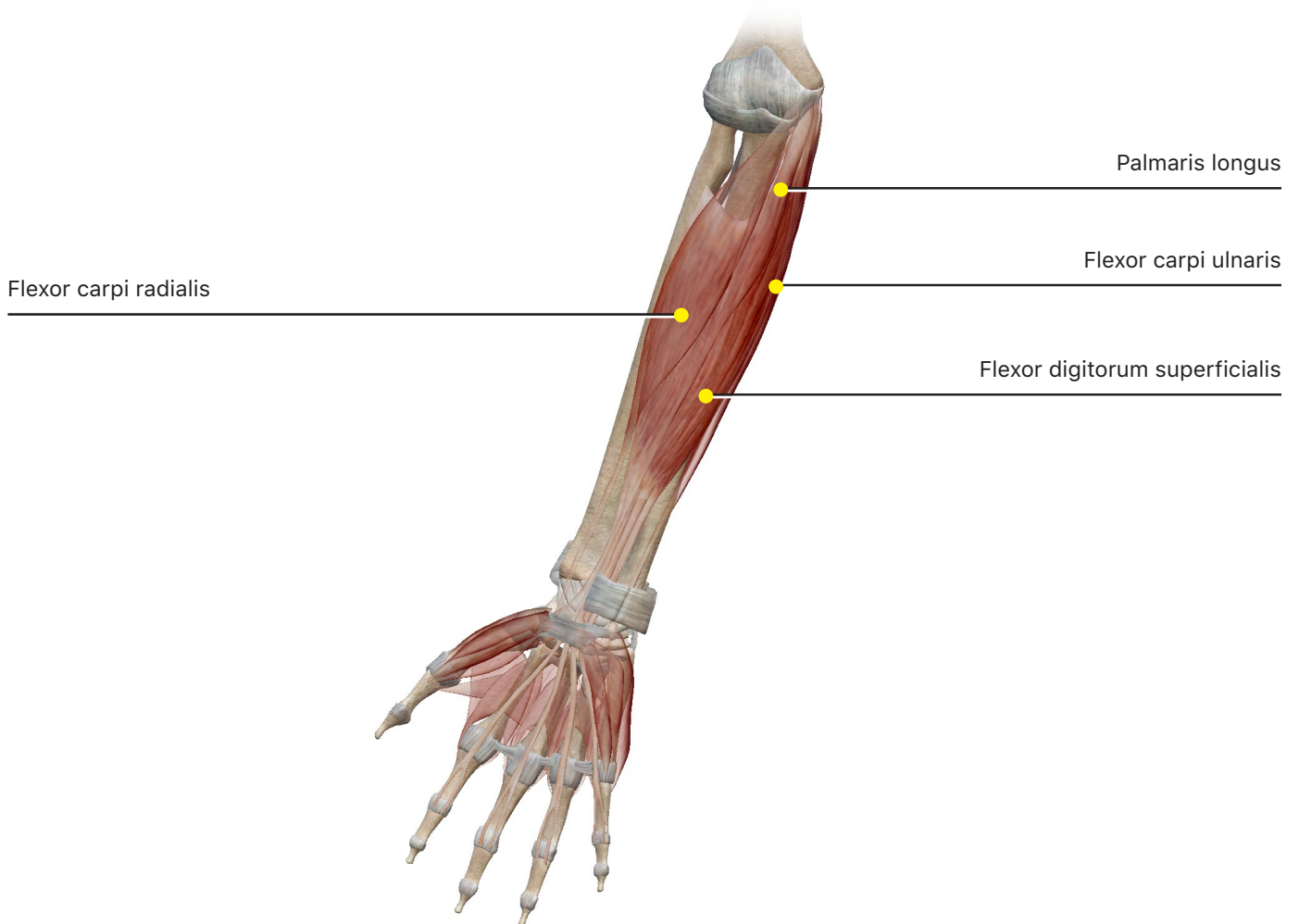
Forearm: Pronation and Supination

Muscle	Origin	Insertion	Action	Innervation
Pronator teres				
Pronator quadratus				
Supinator				

F. Hand: Superficial Flexors

View Module 16.39 Hand: Superficial Flexors

These muscles make up the anterior compartment of the forearm, and cross the wrist to insert on the hand. They all function to flex the wrist and/or the fingers when they contract. These muscles have long names, but the names are very descriptive of where the muscle is located and its action.

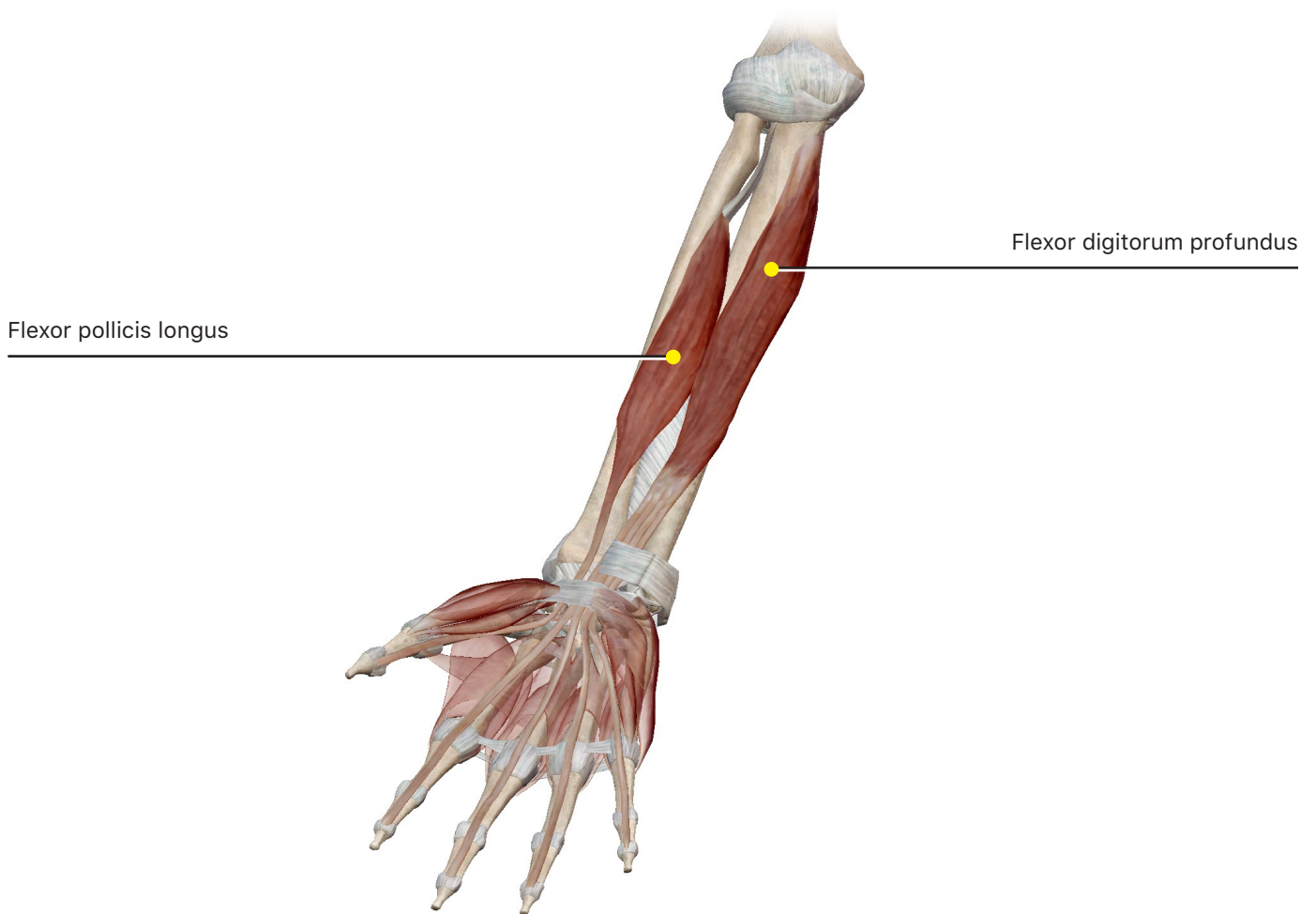


Hand: Superficial Flexors				
Muscle	Origin	Insertion	Action	Innervation
Flexor carpi radialis				
Palmaris longus				
Flexor carpi ulnaris				
Flexor digitorum superficialis				

G. Hand: Deep Flexors

View Module 16.40 Hand: Deep Flexors

These muscles also flex the hand, and are located deep to the hand flexors above.

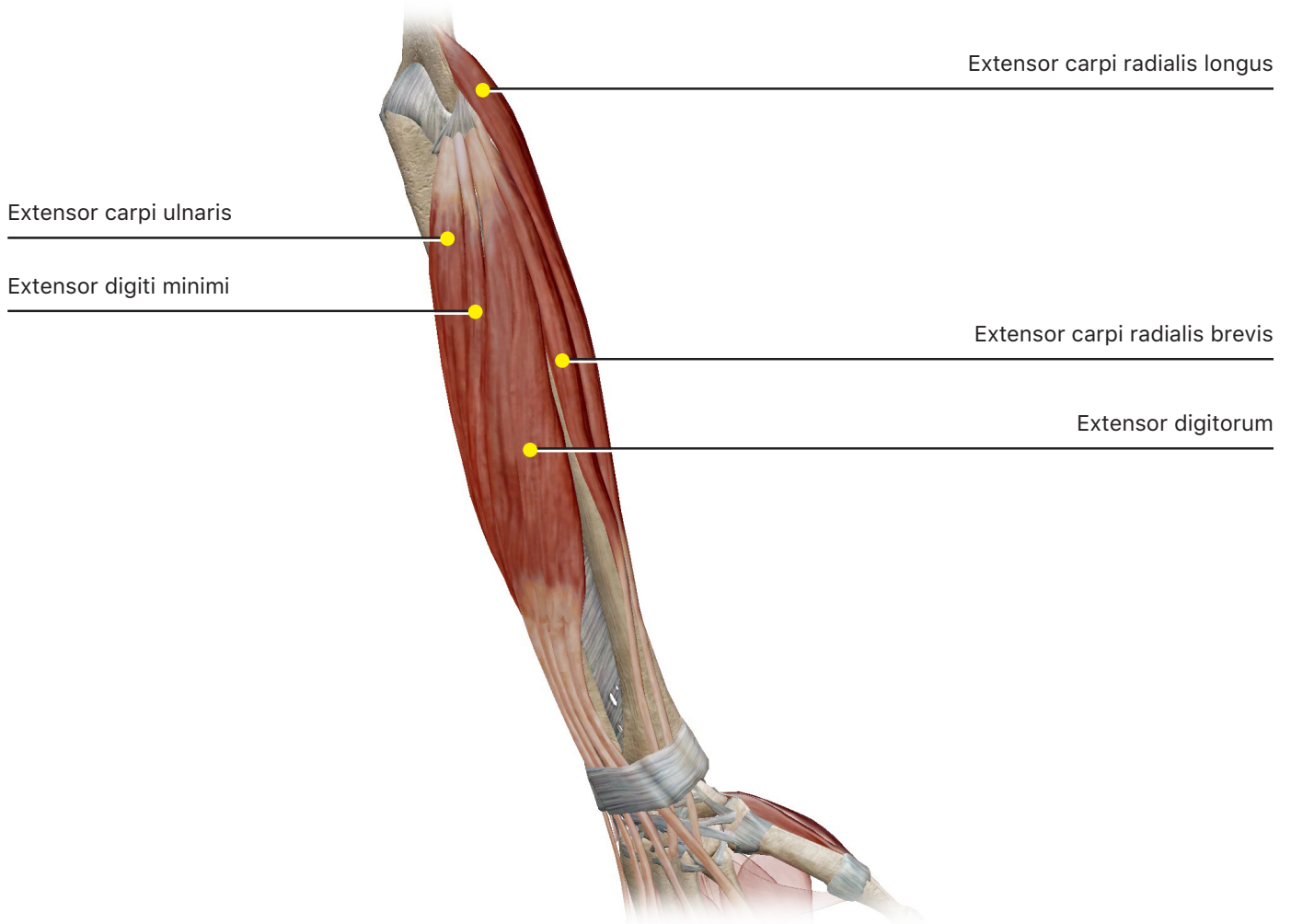


Hand: Deep Flexors				
Muscle	Origin	Insertion	Action	Innervation
Flexor pollicis longus				
Flexor digitorum profundus				

H. Hand: Superficial Extensors

View Module 16.41 Hand: Superficial Extensors

These muscles are located on the posterior side of the forearm and cross the wrist to insert on the hand. When these muscles contract, the wrist and/or fingers will extend.



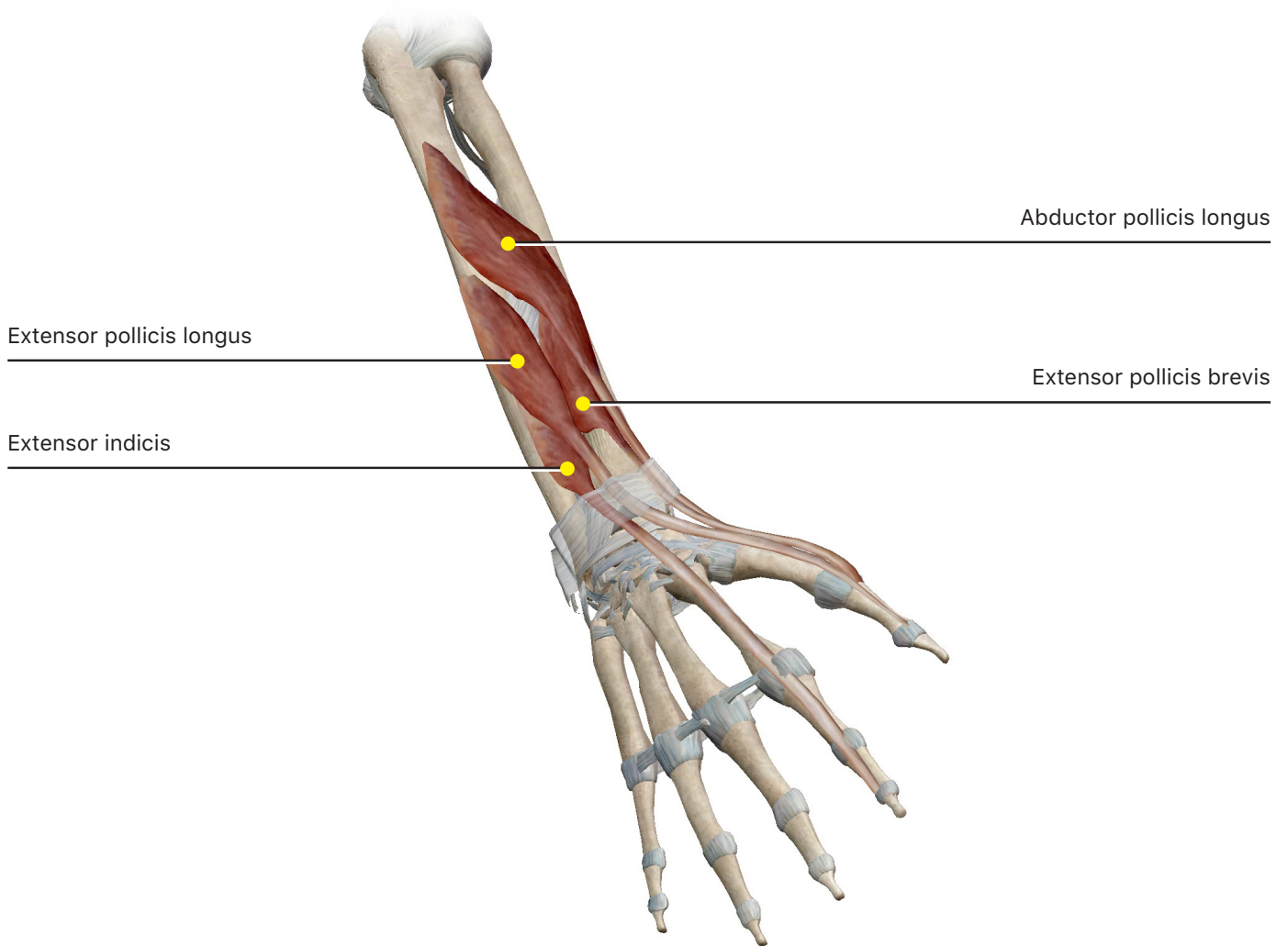
Hand: Superficial Extensors

Muscle	Origin	Insertion	Action	Innervation
Extensor carpi radialis longus				
Extensor carpi radialis brevis				
Extensor digitorum				
Extensor digiti minimi				
Extensor carpi ulnaris				

I. Hand: Deep Extensors

View Module 16.42 Hand: Deep Extensors

These muscles are also located on the posterior compartment of the forearm, but are located deep to the muscles in the previous section. They will also cross the wrist to insert on the hand, functioning to move the first or second digit when contracted. It will be helpful to remember that "pollicis" is referring to the thumb and "indicis" to the index finger.



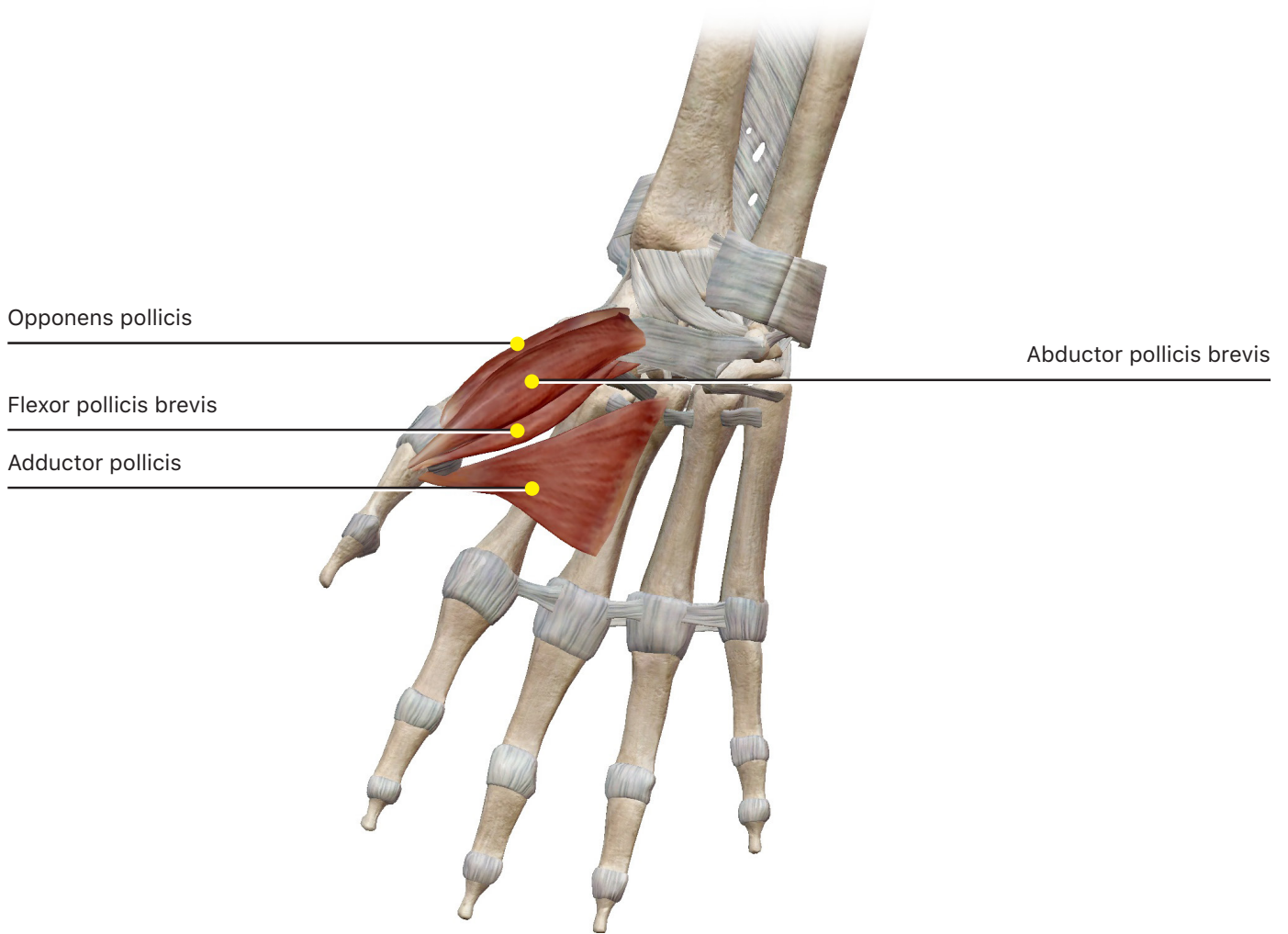
Hand: Deep Extensors

Muscle	Origin	Insertion	Action	Innervation
Abductor pollicis longus				
Extensor pollicis longus				
Extensor pollicis brevis				
Extensor indicis				

J. Finger: Thenar

View Module 16.43 Fingers: Thenar

These muscles move the first digit – the thumb. Earlier sections have included muscles that move the thumb, but are primarily located in the forearm. Thenar muscles are entirely located within the hand and form the thenar eminence – the fleshy protrusion in the hand at the base of the thumb.

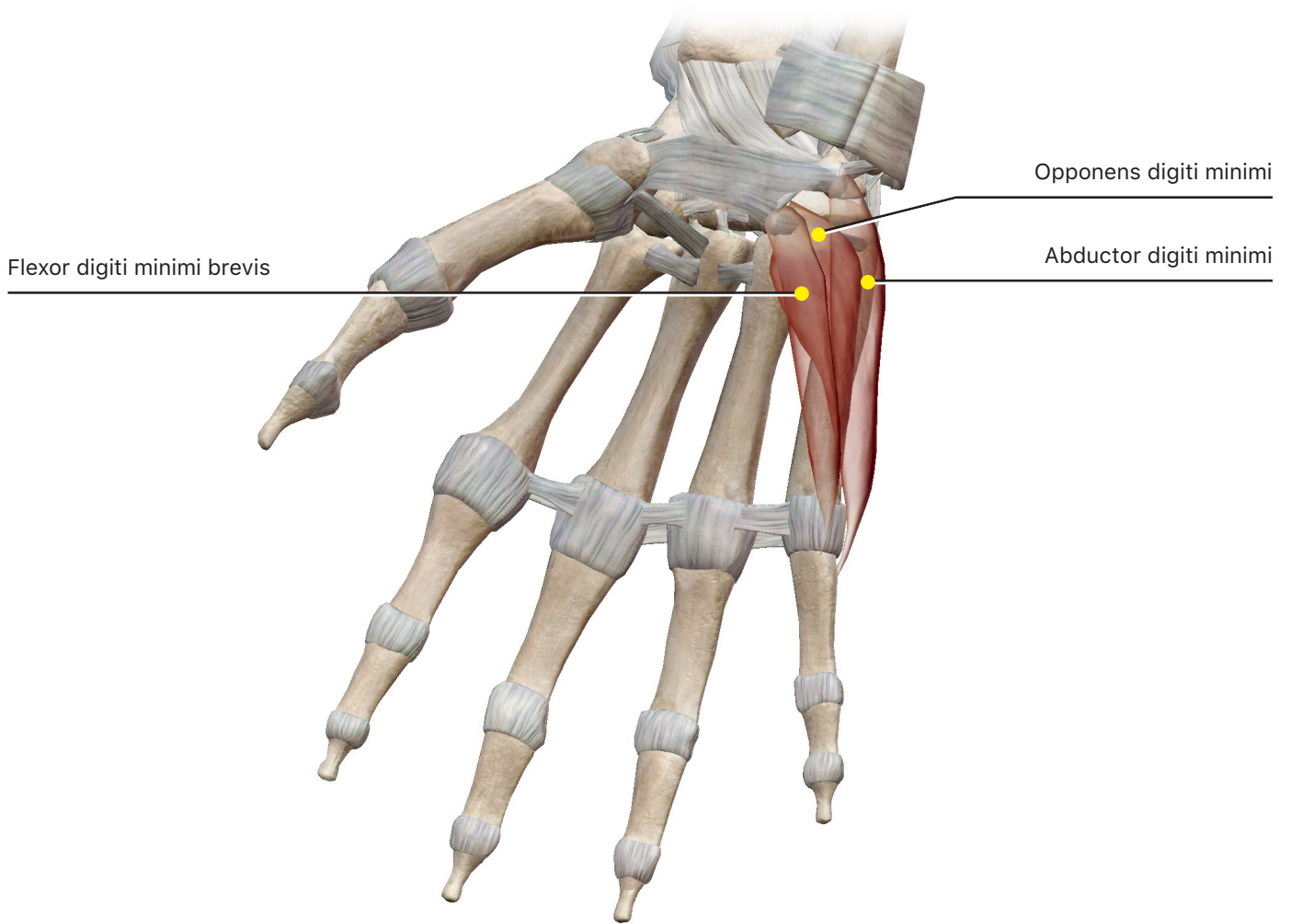


Finger: Thenar				
Muscle	Origin	Insertion	Action	Innervation
Abductor pollicis brevis				
Opponens pollicis				
Flexor pollicis brevis				
Adductor pollicis				

K. Fingers: Hypothenar

View Module 16.44 Fingers: Hypothenar

These muscles all function to move digit 5, the little finger. These muscles are also entirely located within the hand.

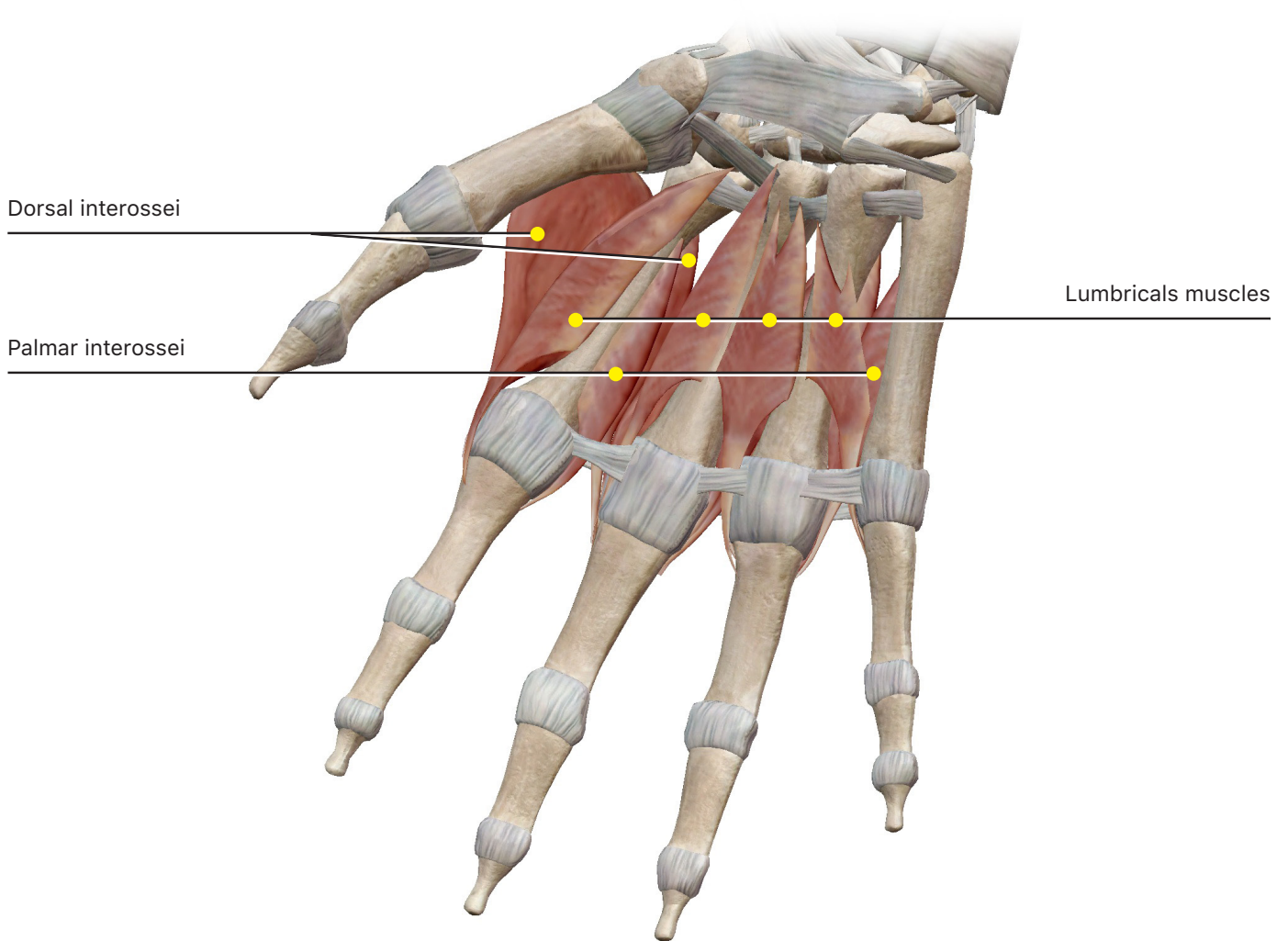


Finger: Hypothenar				
Muscle	Origin	Insertion	Action	Innervation
Abductor digiti minimi				
Flexor digiti minimi brevis				
Opponens digiti minimi				

L. Fingers: Midpalmar

View Module 16.45 Fingers: Midpalmar

These muscles are located within the hand and are responsible for the fine movements of the fingers. The muscles listed in the chart below are actually groups of muscles. The number of muscles normally found in each group is in parentheses after the name.



Fingers: Midpalmar

Muscle	Origin	Insertion	Action	Innervation
Lumbricals (4)				
Palmar interossei (3)				
Dorsal interossei (4)				

PUTTING IT ALL TOGETHER

1. Based on what you've learned about the muscles in this exercise, what do you think the following terms mean?

a. Major

b. Minor

c. Extensor

d. Flexor

e. Longus

f. Brevis

g. Spinatus

h. Pollicis

i. Carpi

2. Which muscles are part of the rotator cuff that serve to stabilize the shoulder joint?

3. Which muscles are used when performing the following actions?

a. Raising your hand high over your head during class

b. Rowing a boat

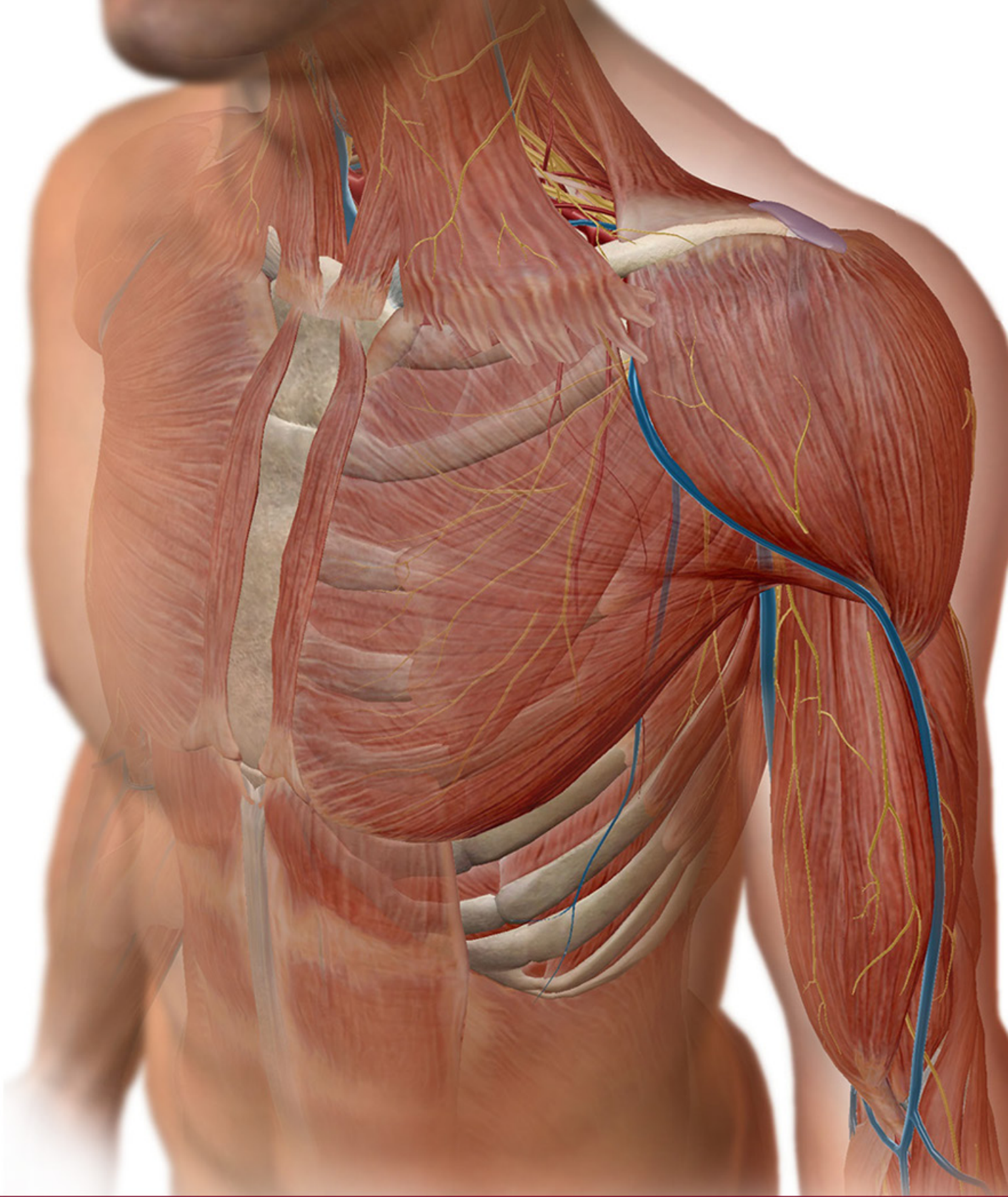
c. Reaching behind you, arm extended and pronated

d. Reaching in front of you, arm extended and supinated

e. Bringing your hand to your heart

f. Holding a pencil

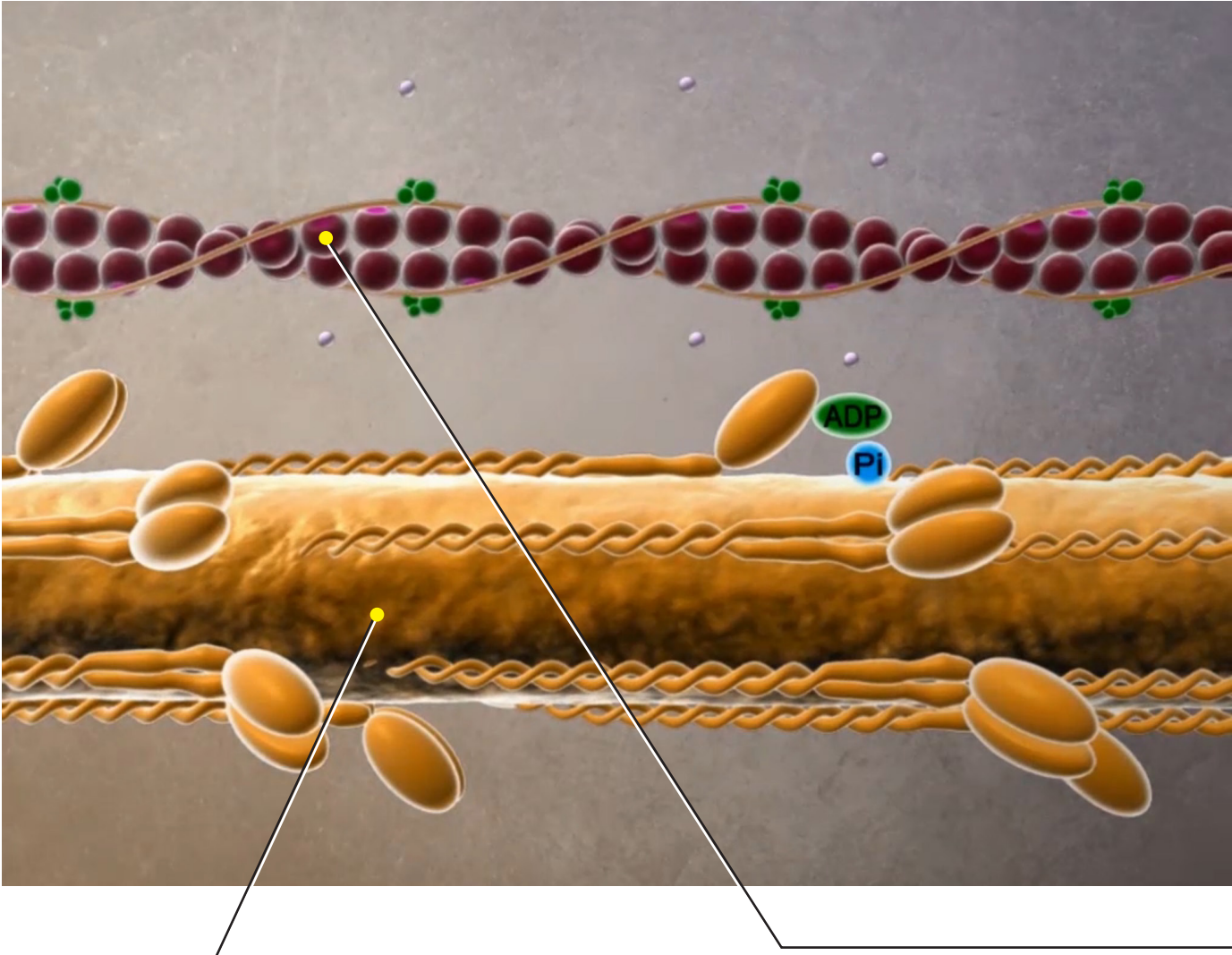
4. Carpal tunnel syndrome can result from repetitive motions in the fingers causing inflammation in the carpal tunnel – a space covered by the flexor retinaculum where tendons and nerves pass through the wrist. In this syndrome, the median nerve is compressed, which can lead to tingling, numbness, and muscle weakness. Which muscles are most likely to be affected by carpal tunnel syndrome?



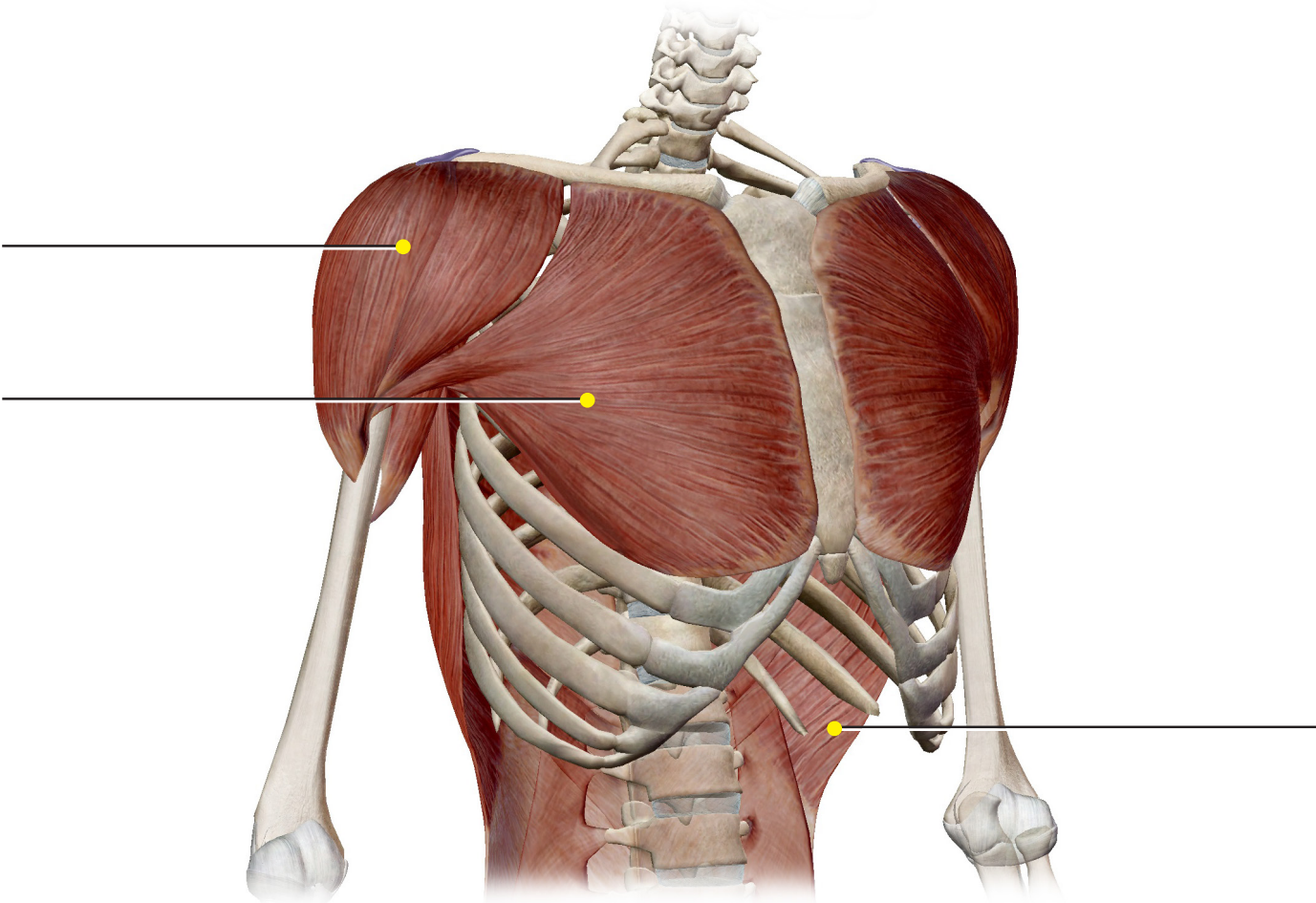
Student Practice

Label the muscles in the following figures

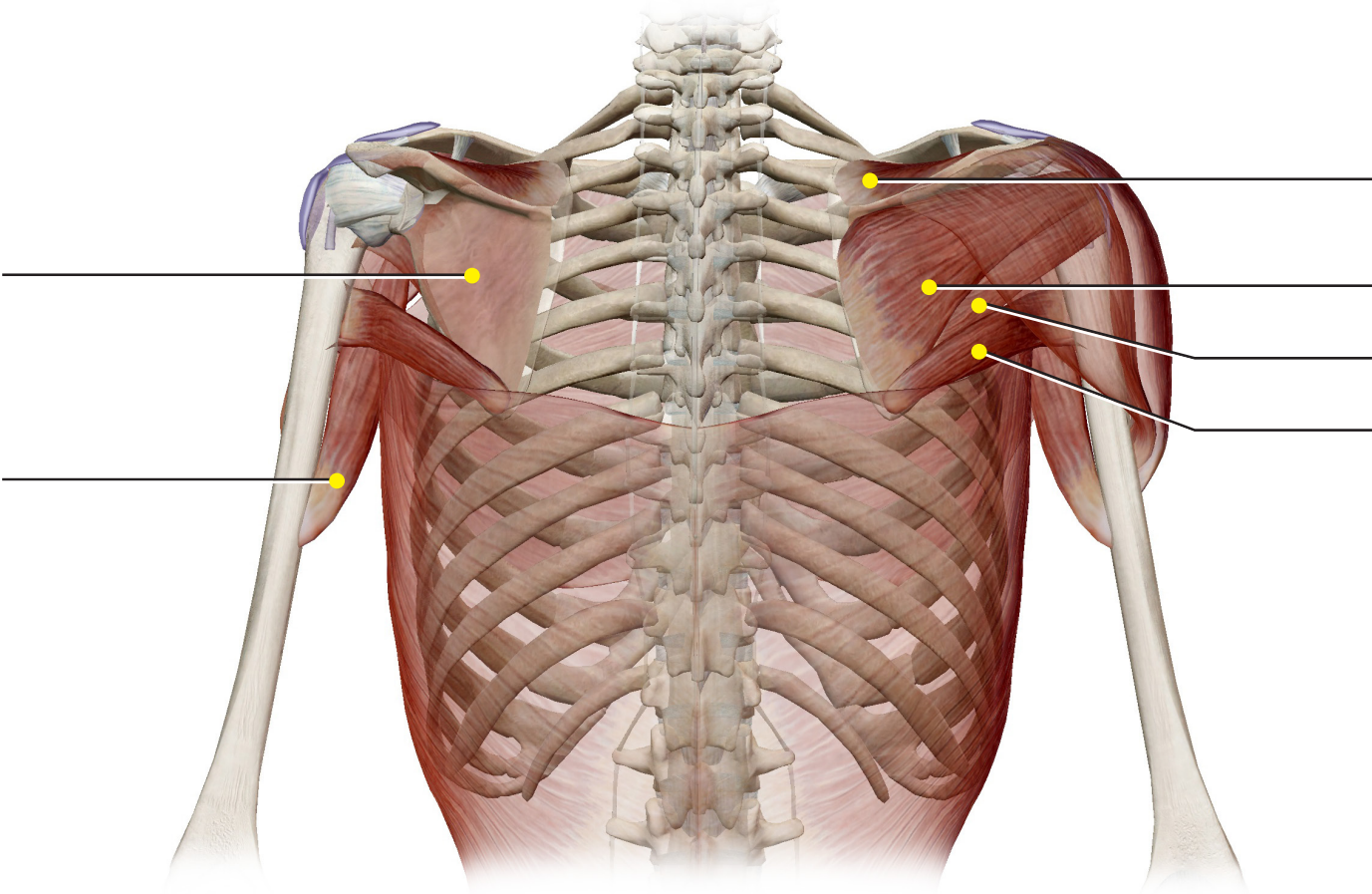
Video 14.4 Muscle Contraction: Cross Bridge Formation



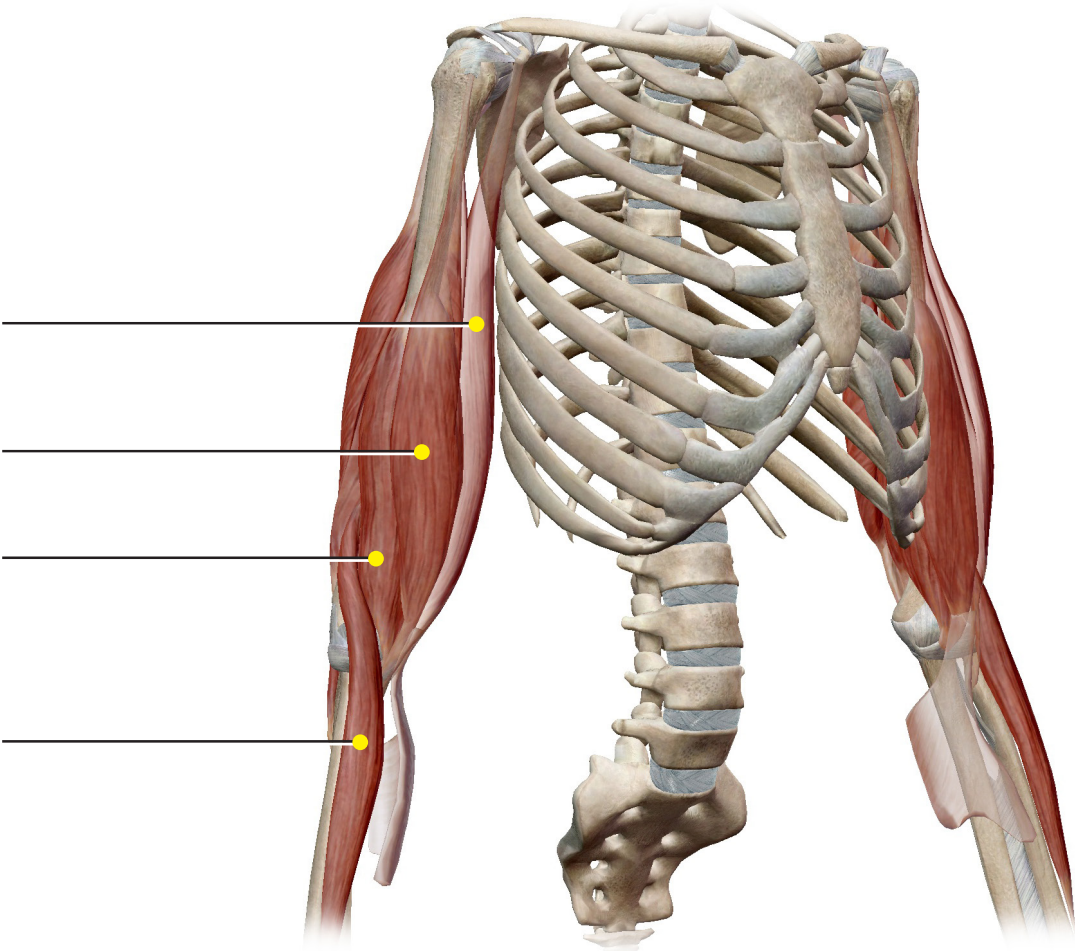
Module 16.33 Arm: Prime Movers



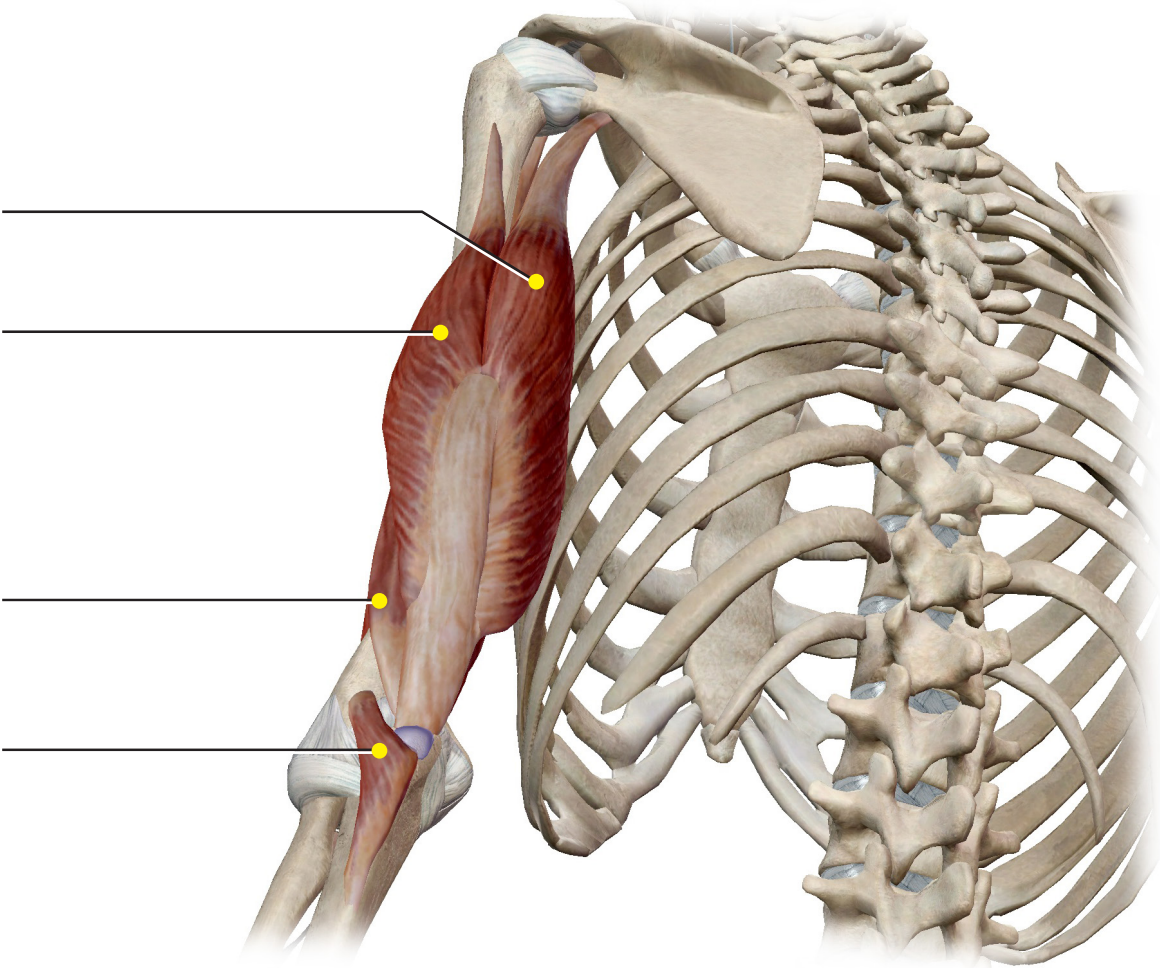
Module 16.34 Arm: Synergists / Fixators



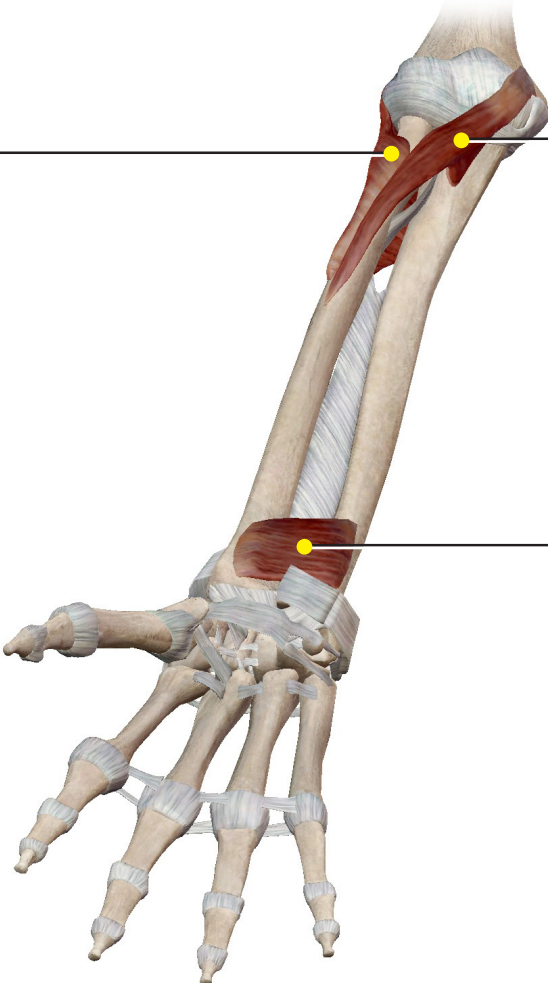
Module 16.36 Forearm: Elbow Flexors



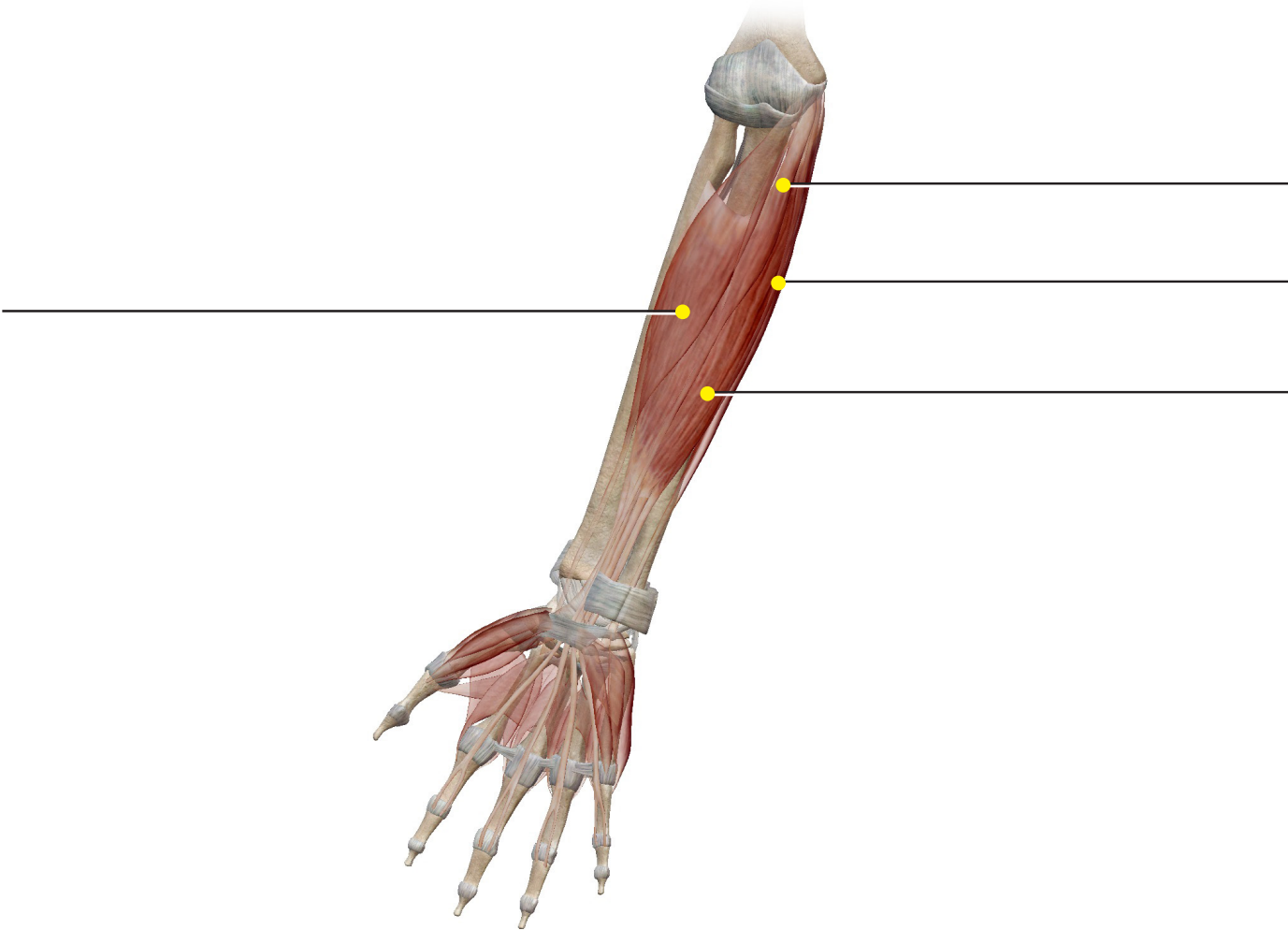
Module 16.37 Forearm: Elbow Extensors



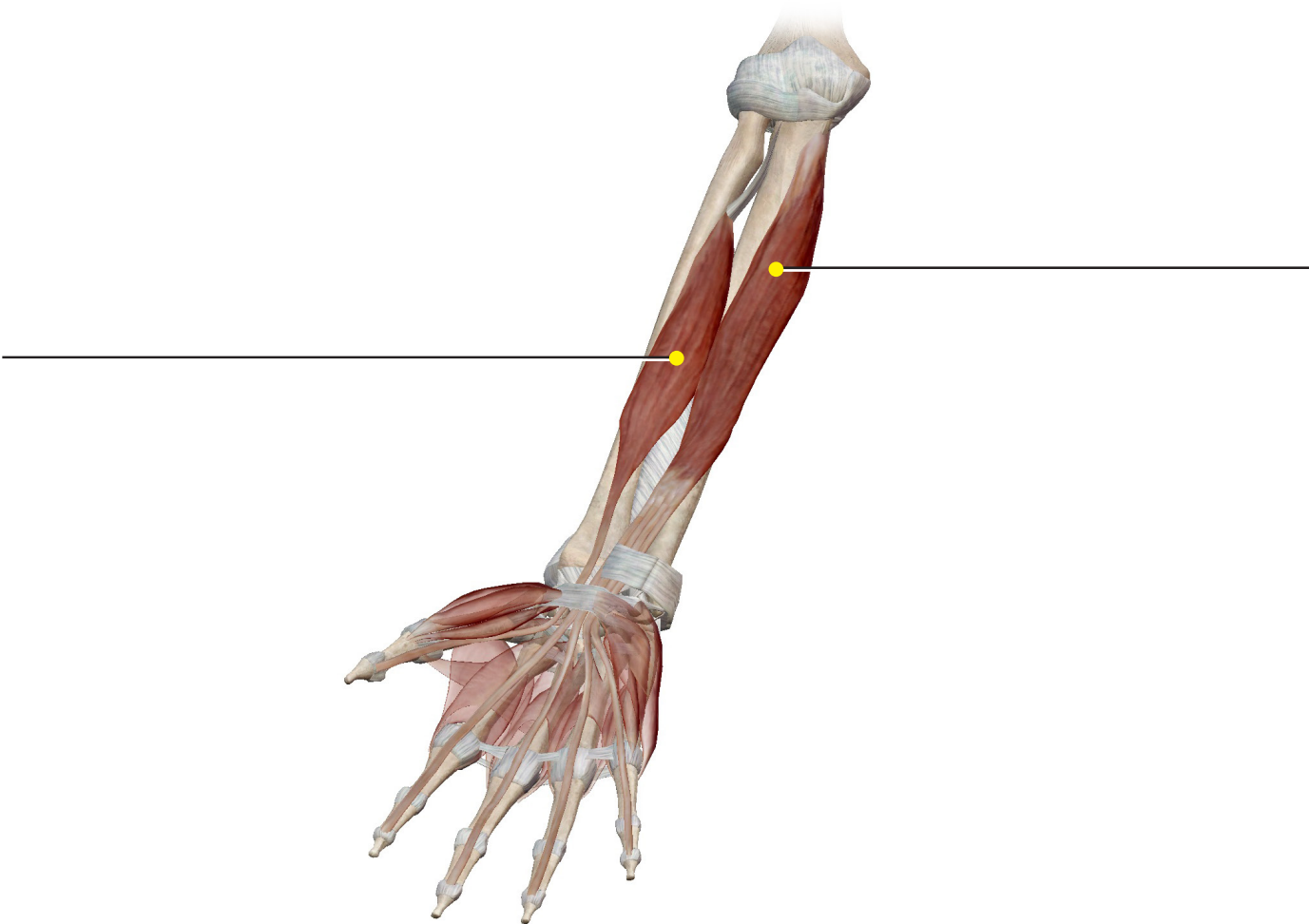
Module 16.38 Forearm: Pronation / Supination



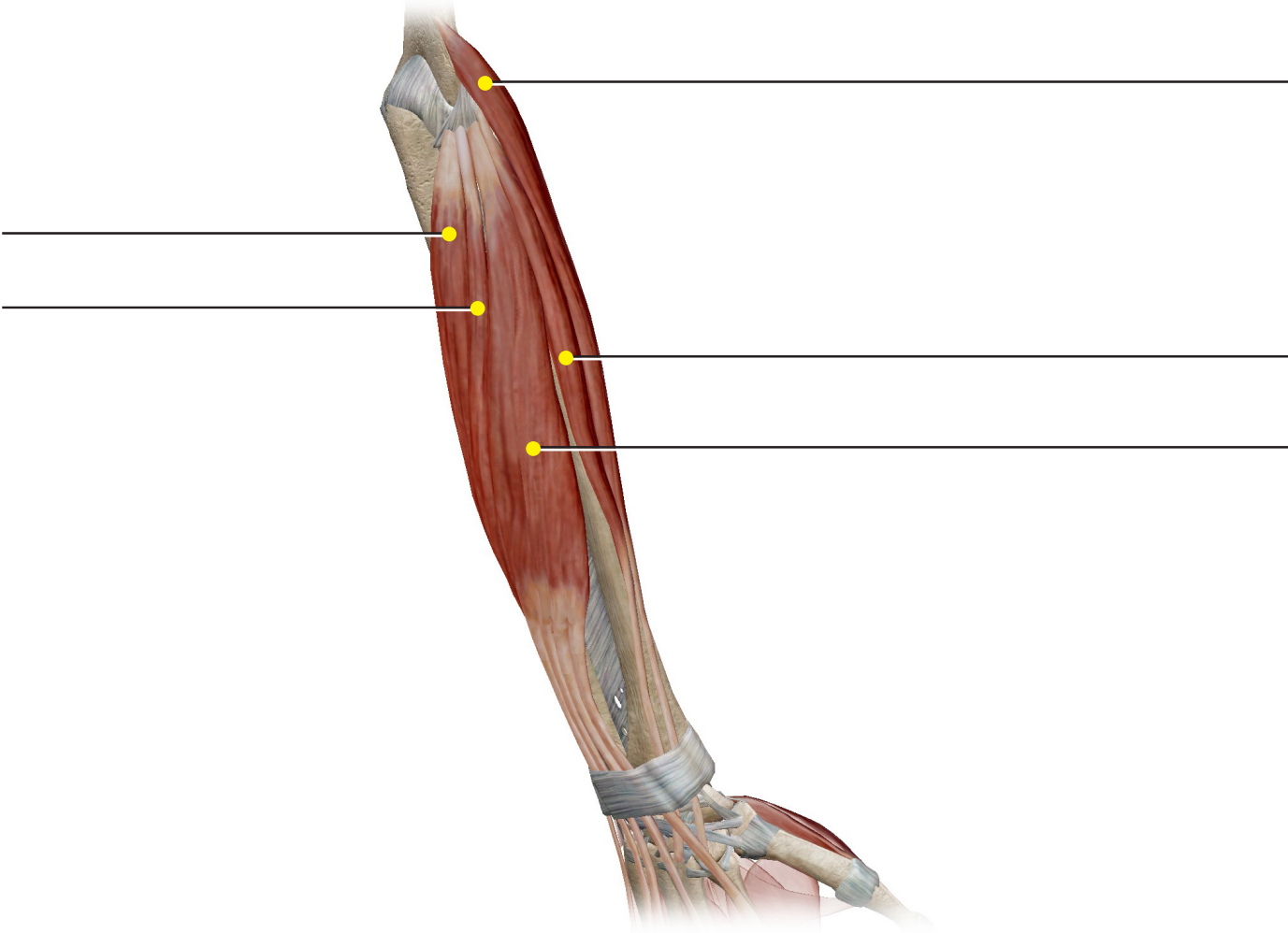
Module 16.39 Hand: Superficial Flexors



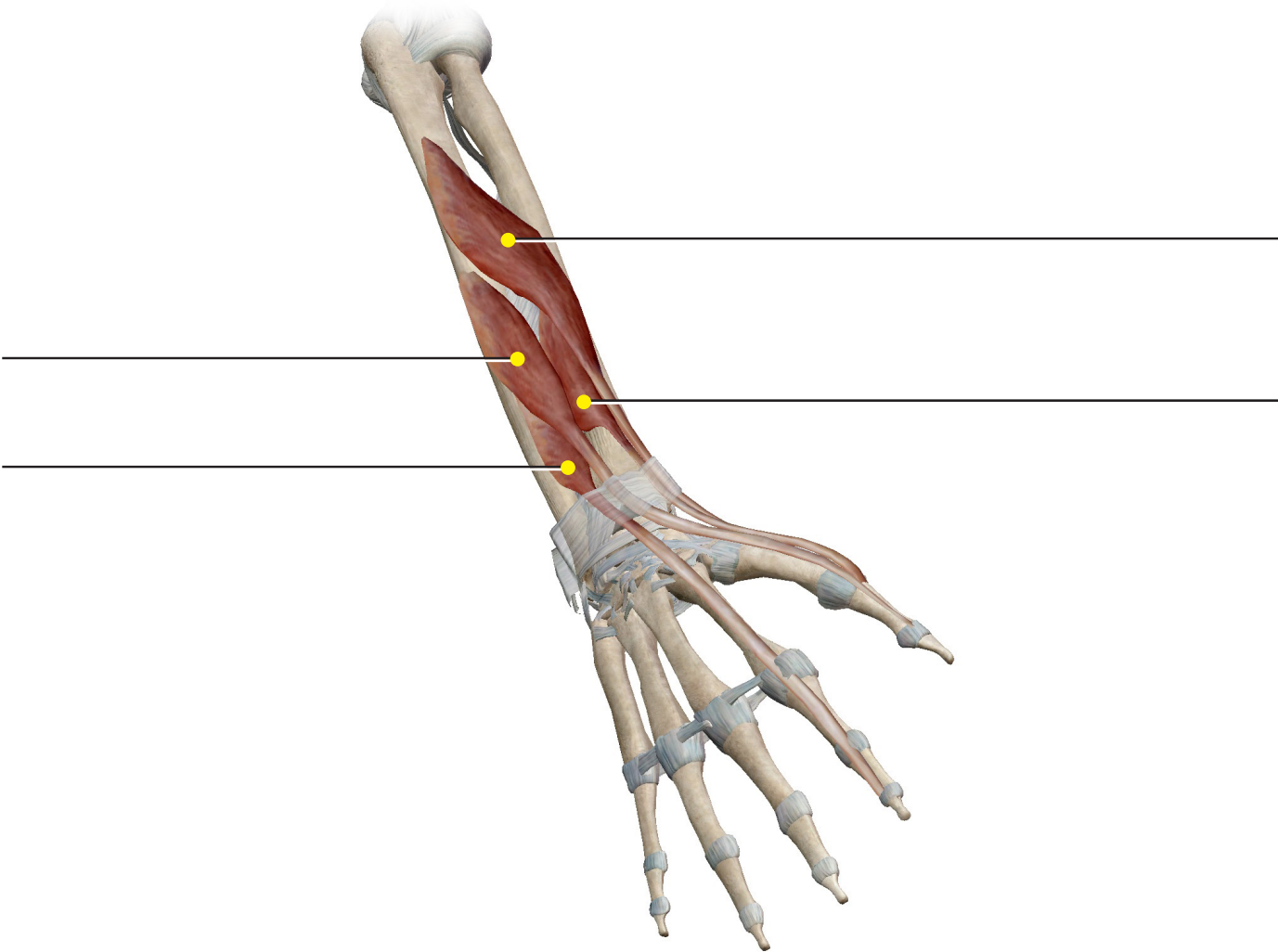
Module 16.40 Hand: Deep Flexors



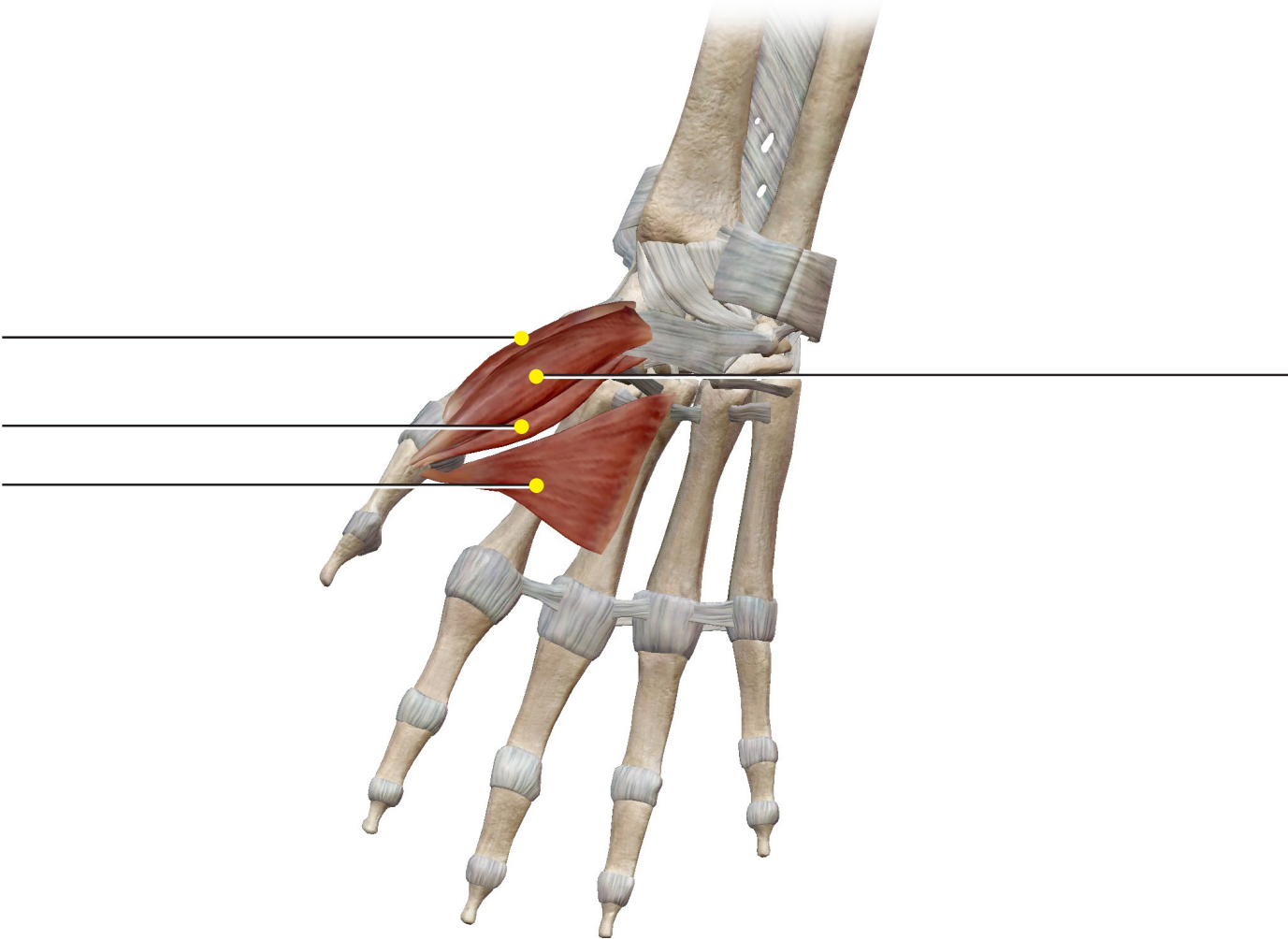
Module 16.41 Hand: Superficial Extensors



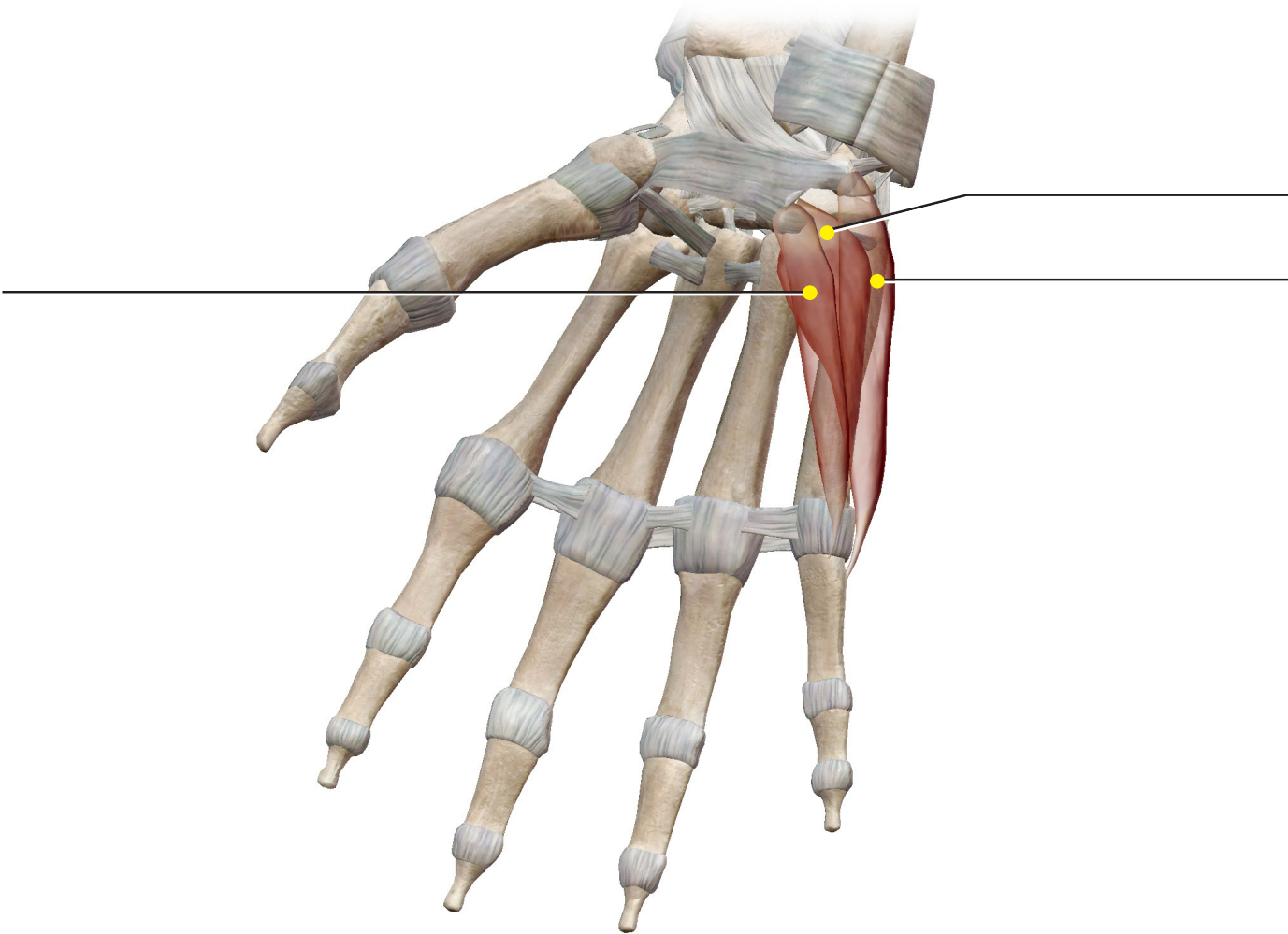
Module 16.42 Hand: Deep Extensors



Module 16.43 Fingers: Thenar



Module 16.44 Fingers: Hypothenar



Module 16.45 Fingers: Midpalmar

