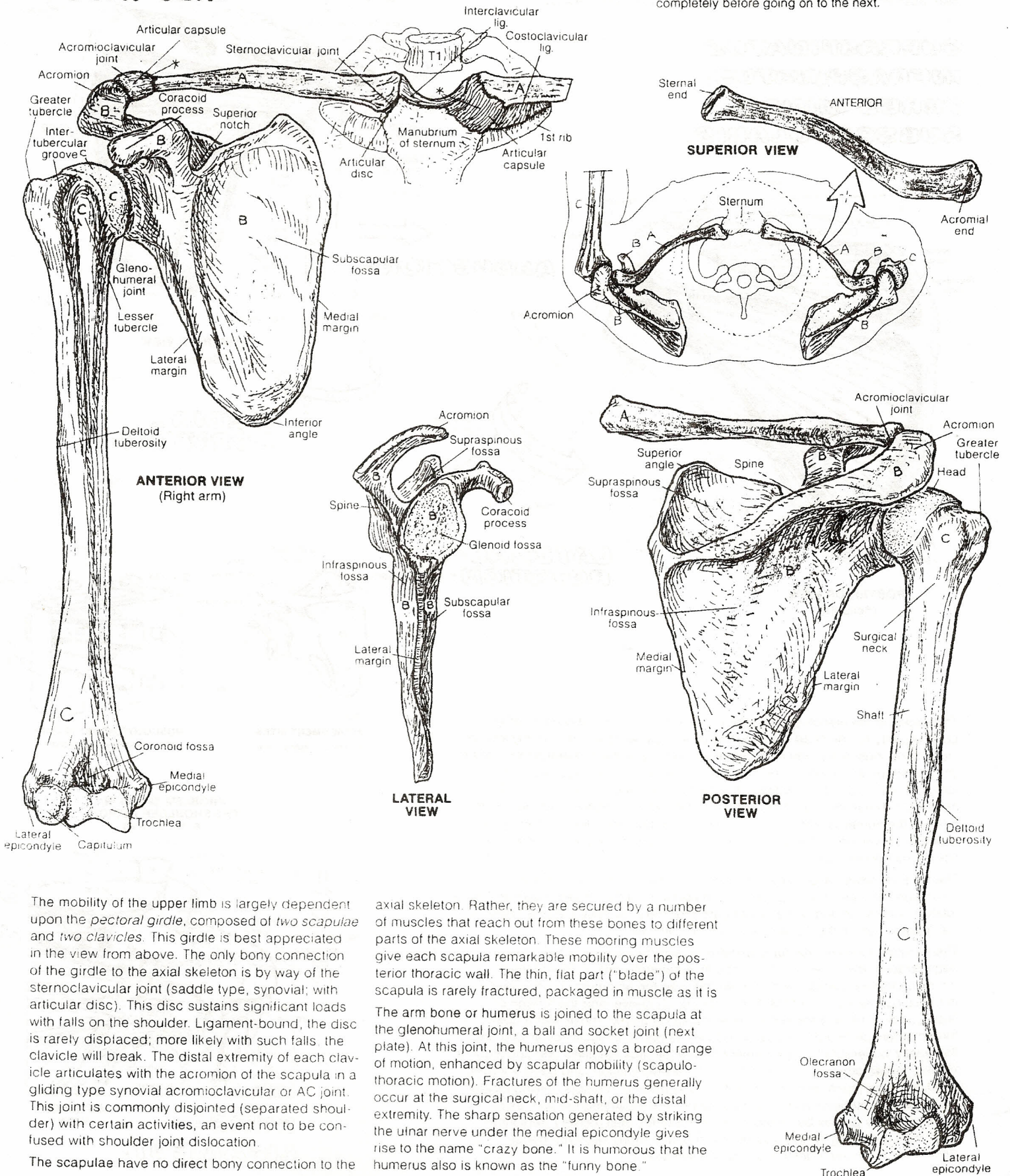


PECTORAL GIRDLE & ARM BONE

CLAVICLE
SCAPULA

HUMERUS

CN: Use very light colors in order to see surface detail. (1) Color each view completely before going on to the next.



The mobility of the upper limb is largely dependent upon the *pectoral girdle*, composed of two *scapulae* and two *clavicles*. This girdle is best appreciated in the view from above. The only bony connection of the girdle to the axial skeleton is by way of the sternoclavicular joint (saddle type, synovial; with articular disc). This disc sustains significant loads with falls on the shoulder. Ligament-bound, the disc is rarely displaced; more likely with such falls, the clavicle will break. The distal extremity of each clavicle articulates with the acromion of the scapula in a gliding type synovial acromioclavicular or AC joint. This joint is commonly dislocated (separated shoulder) with certain activities, an event not to be confused with shoulder joint dislocation.

The scapulae have no direct bony connection to the

axial skeleton. Rather, they are secured by a number of muscles that reach out from these bones to different parts of the axial skeleton. These mooring muscles give each scapula remarkable mobility over the posterior thoracic wall. The thin, flat part ("blade") of the scapula is rarely fractured, packaged in muscle as it is

The arm bone or humerus is joined to the scapula at the glenohumeral joint, a ball and socket joint (next plate). At this joint, the humerus enjoys a broad range of motion, enhanced by scapular mobility (scapulothoracic motion). Fractures of the humerus generally occur at the surgical neck, mid-shaft, or the distal extremity. The sharp sensation generated by striking the ulnar nerve under the medial epicondyle gives rise to the name "crazy bone." It is humorous that the humerus also is known as the "funny bone."

MUSCLES OF SCAPULAR STABILIZATION

TRAPEZIUS_A

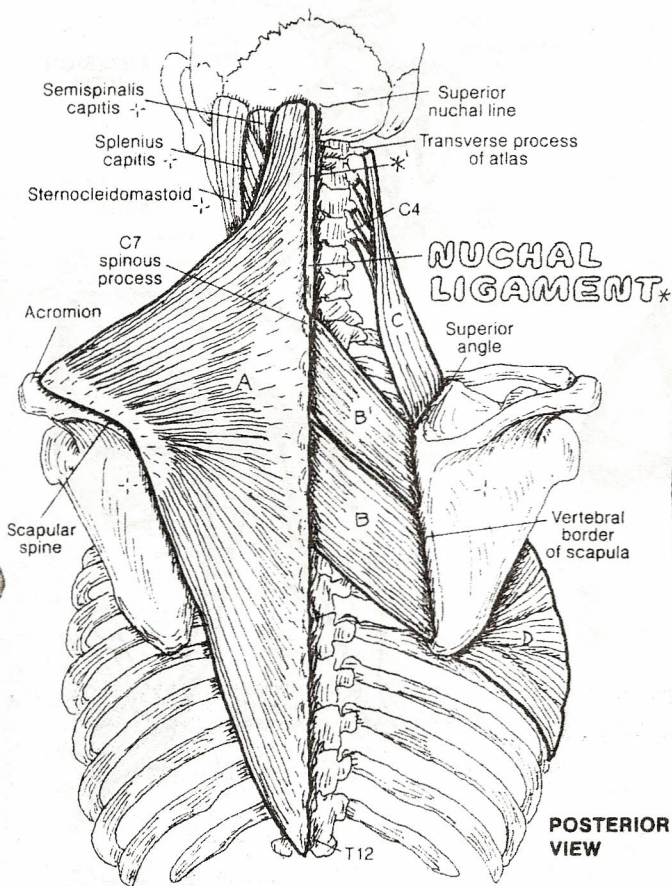
RHOMBOID MAJOR_B, MINOR_B

LEVATOR SCAPULAE_C

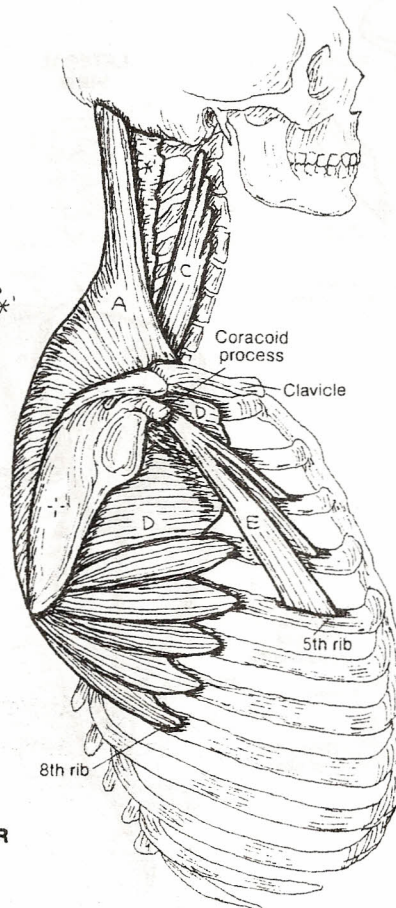
SERRATUS ANTERIOR_D

PECTORALIS MINOR_E

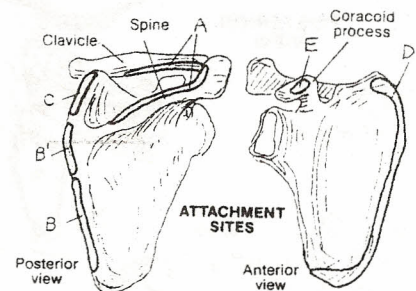
CN: (1) Color the six muscles of scapular stabilization. Note that the two rhomboids receive the same color (B). In the two main views, color gray the nuchal ligament and its title. (2) Color the attachment site diagrams at upper right. (3) In the illustrations below describing scapular movement, note that the three regions of trapezius (A) play different roles. Color gray the scapulae, the arrows, and the movement titles.



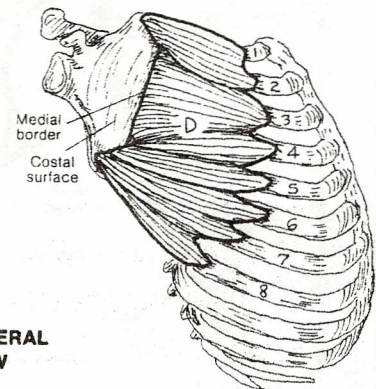
POSTERIOR VIEW



LATERAL VIEW



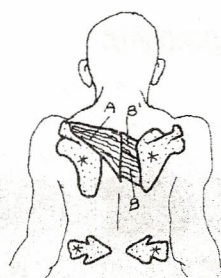
Scapula is shown pulled away from the thorax to reveal attachment of serratus anterior to the medial border of the scapula.



The scapula lies on the posterior thorax, roughly from T2 to T8. It has no direct bony attachment with the axial skeleton. Enveloped by muscle, it glides over the fascia-covered thorax during upper limb movement (scapulohoracic motion). Bursae have been reported between the thorax and the scapula; so has bursitis. The scapula is dynamically moored to the axial skeleton by muscles attaching the scapula to the axial skeleton. These *muscles of scapular stabilization* make possible considerable scapular mobility and, therefore, shoulder/arm mobility.

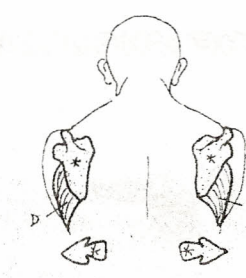
Note the roles of these six muscles in scapular movement, and note how the shoulder and arm are affected. *Pectoralis minor* assists *serratus anterior* in protraction of the scapula such as in pushing against a wall; it also helps in depression of the shoulder and downward rotation of the scapula. Consider the power resident in *serratus anterior* and *trapezius* in pushing or swinging a bat. Note the especially broad sites of attachment of the *trapezius* muscle. Trapezius commonly manifests significant tension with hard work—mental or physical. A brief massage of this muscle often brings quick relief.

MOVEMENTS OF THE SCAPULA*



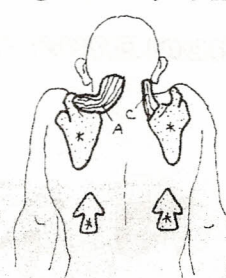
RETRACTION.

Military posture
("squaring the shoulders")



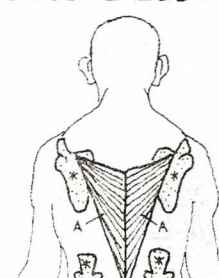
PROTRACTION.

Pushing forward with
outstretched arms and hands.



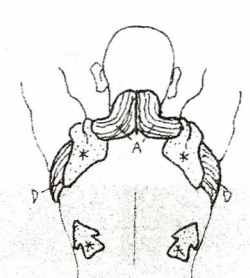
ELEVATION.

Shrugging the shoulders
or protecting the head.



DEPRESSION.

Straight arms on parallel
bars, holding weight.



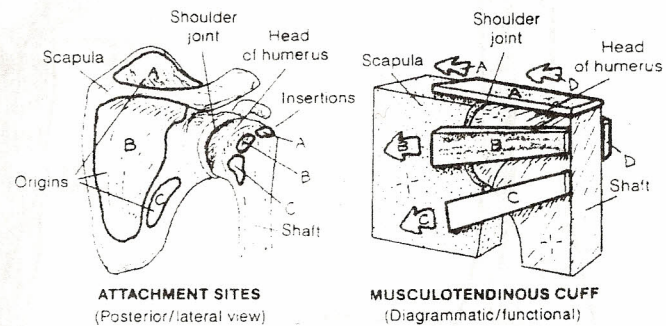
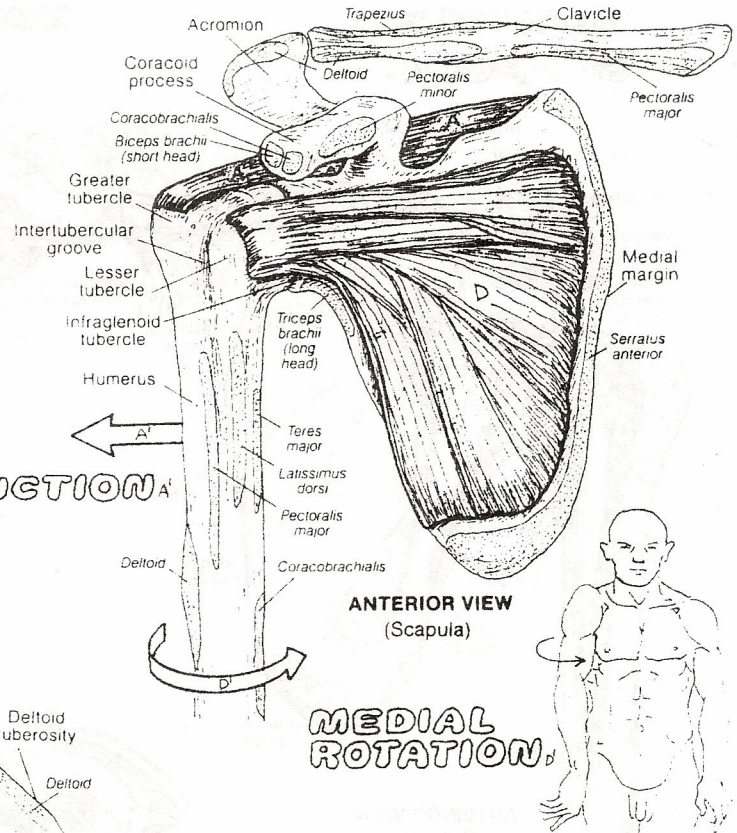
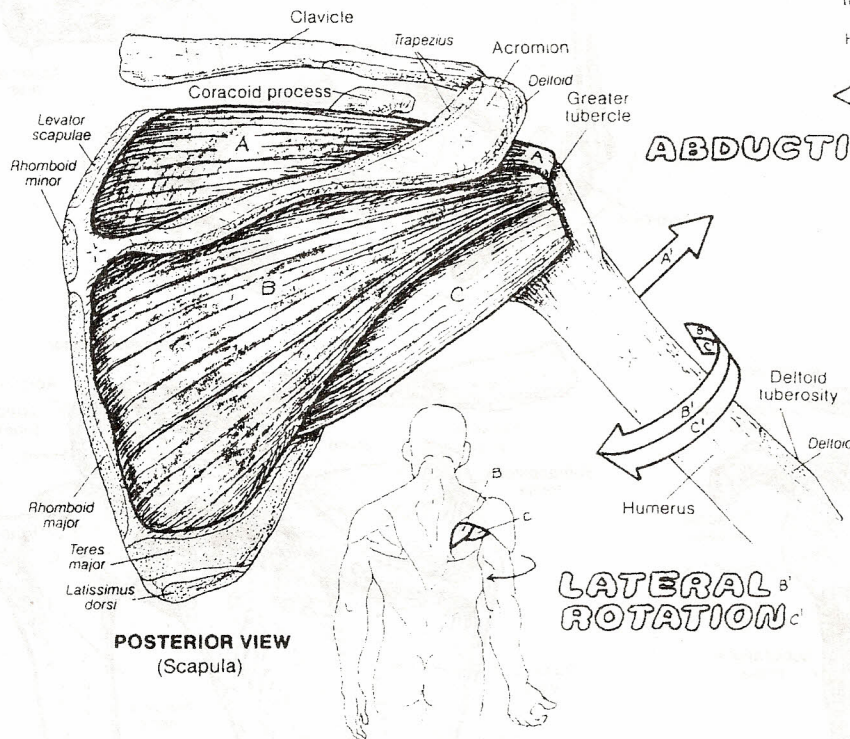
UPWARD ROT.*

Lifting or reaching
over head.

MUSCLES OF MUSCULOTENDINOUS CUFF

CN: (1) In addition to the four muscles, color the arrows and titles describing their actions. (2) Color the muscular attachment sites and the diagram of the function of the cuff muscles at mid-right. (3) Do not color the problem spot numerals in the lower illustration. They are there to identify locations discussed in the text.

SUPRASPINATUS
INFRASPINATUS
TERES MINOR
SUBSCAPULARIS

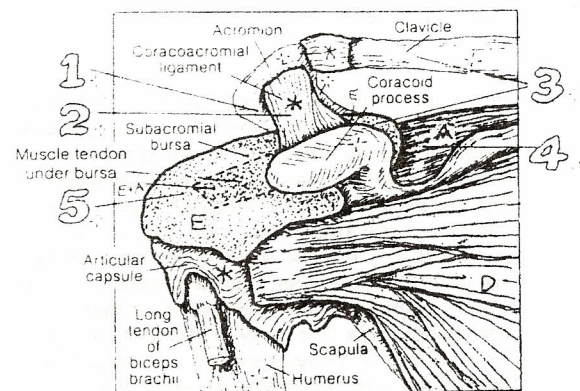


The socket at the glenohumeral joint (glenoid fossa) is too shallow to offer any bony security for the head of the humerus. As ligaments would severely limit joint movement, muscle tension must be employed to pull the humeral head in to the shallow scapular socket during shoulder movements. Four muscles fulfill this function: *supraspinatus*, *infraspinatus*, *teres minor*, and *subscapularis* ("SITS muscles"). These muscles form a musculotendinous ("rotator") cuff around the head of the humerus, enforcing joint security. Especially effective during robust shoulder movements, they permit the major movers of the joint to work without risking joint dislocation.

The SITS muscles have come to be known as the "rotator cuff" muscles, even though one of them, *supraspinatus*, is an abductor of the shoulder joint and not a rotator. Indeed, among some health care providers, *supraspinatus* is known as the "rotator cuff" in the context of a "rotator cuff tear."

The shoulder joint and the *supraspinatus* muscle/tendon are subject to early degeneration from overuse. The problem is generally one of impingement (chronic physical contact and friction) between the acromion (1), the coracoacromial ligament (2), and the distal clavicle (3) above, and the tendon of *supraspinatus* (4) and the subacromial bursa (5) below. Those with a down-turned acromion or a previously dislocated, offset acromioclavicular joint are especially vulnerable to impingement (*supraspinatus* tendinitis and subsequent tearing, subacromial bursitis, limitation of shoulder motion, and pain). All overhead activities (such as those of professional drapery hangers, ceiling plasterers, baseball pitchers) and acromial loading (hose-carrying firemen, those carrying heavy purses by straps over the shoulder, mail delivery persons) pursued over a long period can induce changes (bony spurring, bursal destruction) with impingement signs and symptoms.

PROBLEM SPOTS IN THE SHOULDER REGION (Anterior view)

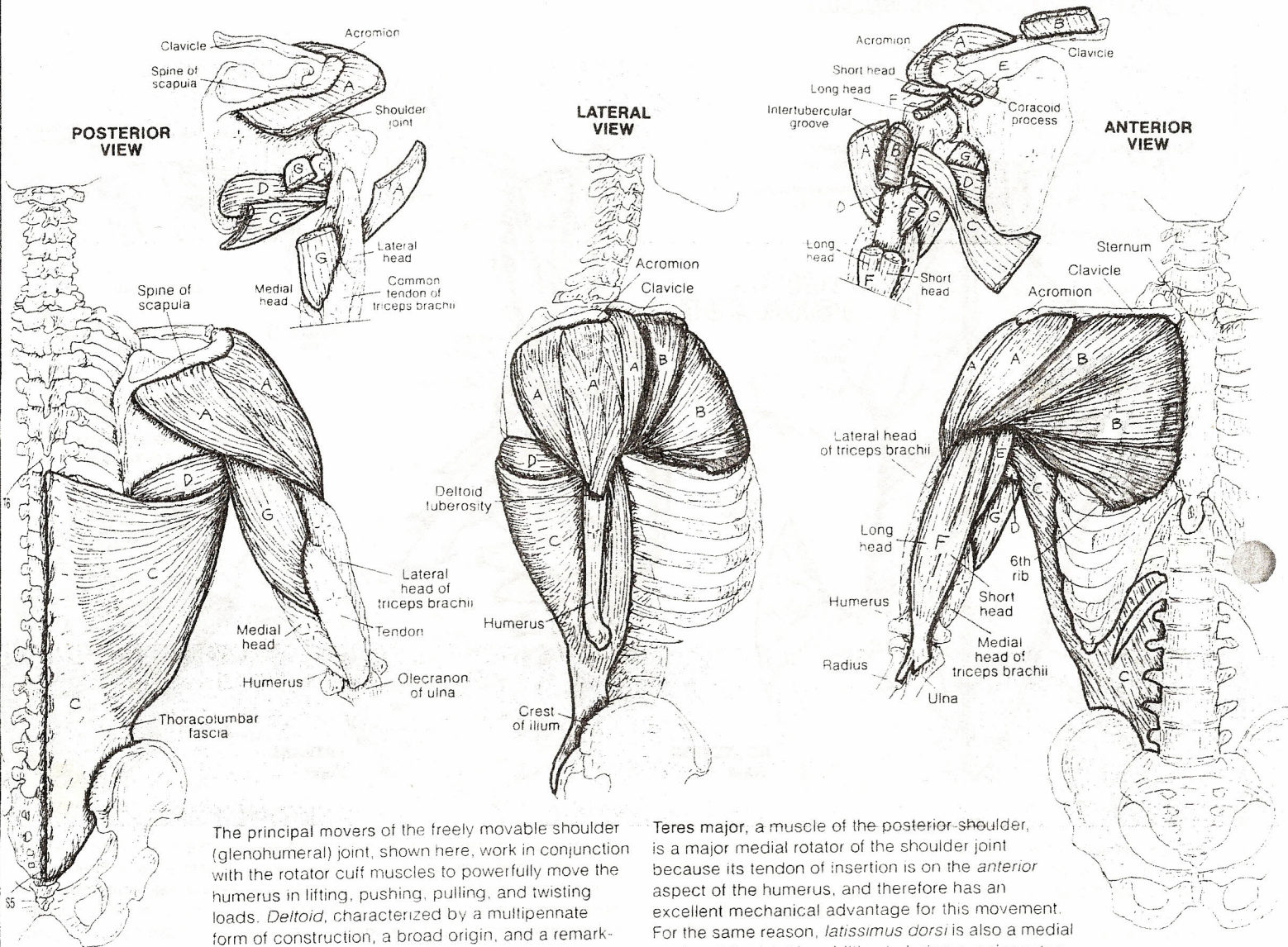


BURSA =
LIGAMENT*

MOVERS OF SHOULDER JOINT

DELTOID, PECTORALIS MAJOR,
LATISSIMUS DORSI, TERES MAJOR,
CORACOBRACHIALIS, BICEPS BRACHII,
TRICEPS BRACHII (LONG HEAD).

CN: (1) Begin with both posterior views, note that the biceps and triceps are not shown on the lateral view.
(2) When coloring the muscles below, note the actions of different parts of the deltoid (A) and pectoralis major (B).



The principal movers of the freely movable shoulder (glenohumeral) joint, shown here, work in conjunction with the rotator cuff muscles to powerfully move the humerus in lifting, pushing, pulling, and twisting loads. *Deltoid*, characterized by a multipennate form of construction, a broad origin, and a remarkably short lever arm, is a powerful mover of the humerus in flexion, extension, and abduction. The clavicular (upper) fibers of *pectoralis major* are effective in flexing the shoulder joint; the sternal/abdominal (lower) fibers extend the flexed joint. Both are effective medial rotators as well.

Teres major, a muscle of the posterior shoulder, is a major medial rotator of the shoulder joint because its tendon of insertion is on the anterior aspect of the humerus, and therefore has an excellent mechanical advantage for this movement. For the same reason, *latissimus dorsi* is also a medial rotator of the joint in addition to being a major extensor. Both heads of *biceps brachii* are active in resisted flexion. *Coracobrachialis* is not a significant mover in either flexion or adduction, and the long head of *triceps brachii* is not a major mover in extension of the shoulder joint.

MOVEMENTS OF THE HUMERUS AT THE SHOULDER JOINT

